



**MINISTRY OF WORKS AND
TRANSPORT
TANZANIA NATIONAL ROADS
AGENCY (TANROADS)**



**Environmental and Social Impact Assessment (ESIA) Study for the
Proposed Upgrading of the Jangwani Bridge Located at Magomeni
Suna Mtaa in Mchikichini Ward and Mtambani "B" in Jangwani Ward,
Kinondoni & Ilala Districts in Dar es Salaam Region - Tanzania**



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REPORT



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EXECUTIVE SUMMARY

1.1 Project Background

The proposed Upgrading of the Jangwani Bridge is a sub project under the Msimbazi Valley Development Project; that forms part of the Dar es Salaam Metropolitan Development Project (DMDP). The project targets developing The Msimbazi River Basin in Dar es Salaam which is a strategically important area of the city for infrastructure, mobility, commerce and ecosystem services including flood control.

The Jangwani valley is part of the Msimbazi River Basin, with a catchment area of about 270 km². The Jangwani Bridge is located around 2.5 km before the outfall of the Msimbazi River into the Indian Ocean. The Jangwani Valley borders with Residential houses along its all directions.

Climate change as well as increase human activities in the catchments at the upstream and downstream of the Msimbazi valley has significantly increased the amount of sediments flowing and depositing the Jangwani valley. Human activities have also encroached the valley and hence affecting the smooth flow of water from the upstream to the Indian Ocean. These has significantly affected the functionality of the Jangwani bridge and as a result affect the ability of the bridge to allow water to flow and hence facing overflow during rainy season.

It's on this basis that the Government of Tanzania is collaborating with the World Bank intends to invest in the Msimbazi valley Development project; that among other components of the project, is the upgrade the Jangwani Bridge as well as widening the bridge to allow easy flow of water and sediments and hence mitigate impacts that were significantly affecting the economy of the Nation, costing peoples life as well as damaging other infrastructures.

This ESIA sets out responsibilities for assessing, managing and monitoring environmental and social risks and impacts associated with each stage of a project as well as each component of the project in order to achieve environmental and social outcomes consistent with World Bank's Environmental and Social Standards (ESSs) as well as those of the Tanzania legal requirement.

1.2 Project Location and Area

The proposed Jangwani Bridge forms a link between the city centre and the north-western part of the city via Morogoro Road, crossing the Msimbazi valley. The corridor for the bridge is within the existing Magomeni Mapipa-Fire section of Morogoro Road cutting across Kinondoni and Ilala Municipalities both located within Dar Es Salaam Region.

1.3 Land Acquisition

The land for proposed construction of bridge and approaching roads shall be within the established road reserve with 60meters on both sides of the centre line. The idea is to uplift the bridge and there is no expected demolition of people's properties.

1.4 Project Components

Bridge

The bridge design includes the bridge deck, piers and abutments including foundations, parapets and drainage. The overall length of the new Jangwani Bridge will be 390m in length.

The layout for new bridge and approaching roads and is similar to the existing road and bridge's situation with a segregated dedicated bus lane, two lanes for normal traffic and a wide pedestrian and cyclist section. Both twin decks will be symmetrical in construction and layout, with each deck 21m in total width.

Surface Water Drainage

Drainage down pipes will be provided at two low points within each span to collect surface drainage from the bus lane and mixed traffic carriageway and the pedestrian and cycling area that are completely segregate by 1.5m reserve. The downpipes will be taken down at the pier columns.

Construction Method

The existing Morogoro Road will be slightly widened at the approaches to the bridge, to allow a gap for the formation of an elevated approach embankment. Construction is anticipated to start with the southern deck first, while the widened northern embankment will accommodate a contraflow of 6 lanes traffic.

When the southern bridge is complete, a traffic management switch-over is anticipated onto the new deck to accommodate six lanes contraflow traffic. This (temporary) scenario has been considered as the governing traffic load condition for the design of the structure.

Road

The proposed roads will include raising the lanes as per present road design. This means, the raising of the embankment has been designed based on the vertical and horizontal alignment. The details of the design of the pavements, drainage and road furniture is based on the design of the present road.

The overall length of the road and bridge will be approx. 1070 m in length, composed of 245 m transition west existing road to bridge, 390 m bridge, 295 m raised embankment including transition to bridge and 140 m raised embankment including transition to east existing road.

Pavement

For this project, the pavement design shall be similar to the existing standard of Morogoro road. It is based on an assumed uniform sub-grade bearing capacity throughout. All pavement types are designed for a high standard of evenness throughout the 20 years design period, and will remain with a high bearing capacity, even after cracking deterioration of the bound layers.

BRT lanes

A rigid pavement of reinforced concrete is adopted for BRT lanes. The carriageway design thickness will be 220 mm concrete rigid pavement on 150mm cement stabilized base. The granular material for base and sub base may be made of recycled material from the existing pavement fit into standards of the Pavement and Material Design Manual - 1999.

Mixed traffic lanes

For the mixed traffic lanes carriageway design thicknesses will be 100 mm asphalt concrete (30-50 mm asphalt wearing course + 40-60 mm asphalt binder course) + 150 mm crushed aggregate class CRR base on 150 mm cement stabilized sub base.

Cycling path

The cycling path is paved by a 30-50 mm asphalt wearing course +150 mm crushed aggregate class CRR base.

Walkway

The pavement of the walkway consists of 200mm x 100mm x 80mm paving block placed in a 50mm thick bed of sand or crusher dust.

Street Lighting

The street lighting system will consist of road lighting luminaires mounted on lighting columns. The columns will be installed in the island section between the footway and the carriageway with the road

lighting lanterns oriented perpendicular to the carriageway. The lighting design will allow for the maximum maintenance and cleaning period permitted (6 years) and will have a design life of 100,000 hrs.

Eastern Culvert

Soil improvement will be applied below the culvert (up to approximately A.S.L.-2m). In seismic conditions the soil improvement limits total settlement below the culvert to approximately 10cm (5cm differential settlement). It is recommended to inspect the culvert after any significant seismic events for possible damages due to excessive soil deformations.

Dredging for Bridge Foundation

To allow bridge construction works to be carried out, dredging of the project's core area covering the length of the bridge and 60m width (RoW) shall be done by the Bridge Contractor. In the event of heavy rain, the contractor shall dredge the river to remove siltation and allow the normal hydraulics of the river. The activity is expected to take place only if the contractor is caught with heavy rains during construction. The extent of dredging would be similar to the activities of the existing contractor engaged by TANROADS on performance based contract. The bills of quantities for the project has allowed up to 307,625 m³ of dredged quantities for the bridge contractor to cater for unexpected weather changes.

1.5 Project Schedule and Life

Site preparation for the proposed Jangwani bridge project is expected to start soon after approval of all related studies, engineering designs, environmental clearance and construction tender award in 2022. The designed life for the bridge is 120.

1.6 Estimated Project Cost

The cost estimate for the bridge is approximately 70 Million USD covering construction costs, river training, protection works, which is based on the designs developed and approaching roads of 0.59 Km.

1.7 Project Phases

Project Planning Phase

This phase involves: Feasibility study, ESIA study, preliminary engineering design, final engineering design and construction planning. During the planning process, the bridge project is given its form and details which becomes more and more detailed in phases, adjusted to correspond to land use planning.

Project Mobilization & Construction Phase

The mobilization and construction phase will take place subsequent to the issuing of Environmental Impact Assessment Certificate and once a construction contract with a suitable contractor is signed. The construction phase is expected to be approximately 21 months for the proposed new Jangwani bridge. The construction phase will involve the transportation of construction materials and equipment to the site and actual construction activities.

Project Operation Phase

Once the construction phase is completed, the bridge will start to operate to serve the intended purposes. The activities that are expected to be executed during operational phase include:

- Transportation of goods, people and services
- Bridge and Facilities maintenance

Due to consistent use of the bridge during operational phase there will be a routine maintenance as the results of wear and tear of the bridge that will affect its quality. Therefore, the bridge will require maintenance throughout the project life. Among others, the maintenance works will include:

- Repainting of marks and signs
- Management of vegetation for erosion protection
- River Cleaning including dredging and
- Repairing cracks on the structure

River cleaning and dredging shall be done by mechanical means just after ending of seasonal rains to provide enough channel depth on either side of the bridge. Sand material is the main dredged material expected due to nature of the river's bed. The river will be dredged in slices of 150mm up to the required depth. Cleaning and dredging procedures shall involve Wami Ruvu Water Basin from the first place. Cleaned waste shall be disposed at Pugu Kinyamwezi dumpsite while Sand shall be used for other construction projects.

1.8 Sources for Construction Materials

Project's construction materials are within the project's area or easily transported to the project area. Types of construction material includes Sand (Pugu Sand Mines & River's Excavations), Cement (Twiga/Nyati/Dangote cement Depots), Aggregates (Lugoba quarries), Reinforcements/Steel (Steel factories in Dar es Salaam), Timber (Sao Hill in Mafinga), Stones (Lugoba quarries).

1.9 Water Supply

Water during construction of the bridge shall be drawn from DAWASA network as well as deep borehole to be drilled near the project site. The construction activities are expected to use water optimally, an average of 30m³ per day.

1.10 Power Supply for the Project

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

1.11 Storm Water Management

Storm water drainage system shall be constructed within the project campsite depending on the landscape and catchment areas required as well as along the bridge's approaching roads on both sides. Collected storm water will be directed to the existing drainage pattern of the area.

1.12 Waste Generation

Construction phase is expected to generate more solid and liquid wastes than operation phase. Types and management of wastes from the project construction are described hereunder.

Solid Wastes

Solid wastes during construction includes: top soil, gravel, scrap metals, tins and drums cement bags and domestic solid wastes including plastics and food left overs. Waste management systems will be designed at the project site to ensure solid wastes are well stored before disposal and a waste transfer station for domestic waste. During operation phase, solid wastes may include plastic bottles thrown by users mainly littering and others things falling from trucks, however due to enforcement of environmental law and regulations such behavior is being regulated.

Liquid Waste

Liquid wastes will be generated during construction phase mainly through domestic use on the camping area. This will result from showers and sanitary conveniences for construction workers at the camp. Waste water systems will be designed on the camping areas to ensure waste water will be collected and disposed through septic tanks and soak pits. The disposal of the wastewater generated at the construction campsite has the potential to have a minor negative impact on groundwater. During operation liquid wastes may include oil spills from trucks.

1.13 Policy, Legal and Administrative Framework

Tanzania Environmental Policy applicable to the proposed construction Jangwani bridge include National Environmental Policy (1997), National Water Policy (2002), National Land Policy of (1995), National Human Settlement Development Policy of 2000, The National Construction Policy (2003), The National Energy Policy (2003), The National Health Policy (2012), National Investment Policy (1996), National Employment Policy 1997, National Trade Policy (2003) while Tanzania Environmental acts applicable to the proposed construction Jangwani bridge are National Environment Management Act, 2004; The Land Use Planning Act; The Occupational Health and Safety Act; The Workmen's Compensation (Amendment) Act; The Employment and Labour Relations Act; Local Government (District Authorities) Act; Water Resources Management Act; Public Health Act; The Water Supply and Sanitation Act; Environmental Management (Solid Wastes Management) Regulations; The Environmental Impact Assessment and Audit Regulations.

World Bank's ESSs to the Proposed Project are ESS 1: Assessment and Management of Environmental and Social Risks and Impacts, ESS 2: Labor and Working Conditions, ESS 3: Resource Efficiency and Pollution Prevention and Management, ESS 4: Community Health and Safety, ESS 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement, ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources, ESS 8: Cultural Heritage and ESS 10: Stakeholders Engagement and Information Disclosure.

1.14 Biophysical Environment

Climate

The Ilala Municipality has humid temperatures that vary from 26°C in August to 35°C in December and January. The long rains season (March – May) receives an average monthly rainfall of 150mm – 300mm. The short rains season is between October and December with monthly average rainfall ranging from 75mm – 100mm. Ilala Municipality's altitude that ranges between 0 and 900 meters above sea level influences the ecological characteristics of the Municipality. Thus, the Municipality consists of a large lowland area and a small part forming the upland zone.

Kinondoni Municipality experiences a modified type of equatorial climate. It is generally hot and humid throughout the year with an average temperature of 29°C. The hottest season is from October to March while it is relatively cool between May and August with temperature around 25°C. There are two rain seasons: - short rain from October to December and long rain season between March and May. The average annual rainfall is 1300mm. Humidity is around 96% in the mornings and 67% in the afternoons. The climate is also influenced by the Southwest monsoon winds from April to October and Northeast monsoon winds between November and March.

During the months of March to May, the existing bridge has been experiencing frequent flooding as a result of increased intensities of precipitation.

Vegetation

Within the core project area for the proposed bridge there are no mangroves to be affected by the project activities.

The core project area has a variety of vegetation types, there are reeds such as (Matete) *Typha latifolia* and *Phragmites australis* in the more swampy areas and bushes in the drier parts.

Soil Types and Quality

According to the geological map (Quarter Degree sheet no. 186) Dar es Salaam area consists mainly of tertiary soils the chief constituent being alluvial SAND deposits and clayey silty SANDS.

Laboratory analysis results suggest that the quality of sediment in the river bed and at the river banks is in compliance with the national standards (Tanzania Bureau of Statistics, TBS) and international guidelines (SQAGs) for all critical parameters.

Water Quality

The samples were collected at [6°48'38''S;39°15'54''E-Upstream and 6°48'34''S:39°15'56''E]. The results indicate that: Color, BOD, COD and TSS are above the water quality standards' limits for municipal and industrial effluents of Tanzania.

The results on bacterial properties are far beyond the national discharge standards. Therefore the water in the river is not safe for contact with people, not safe for direct consumption and even not safe for farming of vegetables which can be consumed in raw condition.

Air Quality and Noise Level

With respect to gaseous pollutants, all the parameters were of insignificant concentration since the measured parameters CO, CO₂ were less than the detectable limit.

The ambient noise measurement was done to observe the ambient noise level in the area along the proposed project area. It was observed that the noise level is below the standard as it ranges from 53.2 dB (A) – 61.7 dB (A), which are within the limit as per Environmental Management (Standards for the Control of Noise and Vibration Pollution) Regulations, 2019; the recorded figure were due to a moving vehicles/motorcycle as well as wind speed onsite.

1.15 Socio-economic Environment

Population

The project's core area falls under Magomeni, Mzimuni, Mchikichini, Jangwani, Upanga Mashariki, Upanga Magharibi and Hananasif wards. Referring to the National Population Census of 2022, the population for the wards in the vicinity of the project has been provided in subsection 4.3.1 of the main report...

The population living to the proximity to the project shall be relieved from regular flooding of their residential/commercial areas during rainy seasons as a result of dredging of Msimbazi Valley at the upstream and downstream of the proposed bridge. The population is more likely to be fully involved in the construction activities through short term employments.

Economic Activities

The main economic activities taking place in the project's wards are retailing businesses including small and medium shops, hotels, bars and restaurants, transportation services, clearing and forwarding, agro businesses, medical businesses, handcraft businesses, banking businesses and construction business. They play a significant role to the Dar es Salaam Region's economy in terms of revenue and in provision of job opportunities to the residents.

Construction of the project shall boost existing economic activities around the project's wards through daily purchases by the construction workers.

Road Transport

The road infrastructure in project's wards has been mainly connected to Morogoro Road where the bridge is located. The road and bridge provide access to the communities in their vicinity to various socio economic areas i.e. city centre, Muhimbili National Hospital, Kariakoo e.t.c. All the roads from the project's wards connecting to Morogoro Road are of bitumen standard which makes them passable throughout the year, they include Kawawa and United Nations Roads. Both roads shall be impacted by traffic jams during construction phase of the bridge.

Electricity

Electricity is the power source for domestic, commercial premises, institutions and industries. The project's wards are supplied with electricity from the National Grid and used for different economic activities. At the project site, TANESCO's electricity transmission line transverses along the proposed New Bridge towards the city centre and adjacent to the DART Terminal at Jangwani where the contractor's camp site has been located. Since the contractor as well as project activities require electricity, it will be easy to connect to the existing lines.

Water Supply

The main source of water for residents in the vicinity of the project is from Lower (nominal capacity of 180,000 m³/d) and Upper Ruvu (capacity of 196,000 m³/d) which managed by Dar-es-salaam Water and Sewerage Authority (DAWASA). At the proposed project site, there are 2nos parallel DAWASA water mains that shall be affected by the project during pre-construction phase. However, the proposed project can also be connected to DAWASA network to facilitate construction activities.

Solid Waste Generation

Solid waste management is a serious challenge throughout Dar es Salaam. Solid waste generation is increasing as the urban population grows. Total generation of solid waste is estimated at 1kg per person per day. In the wards surrounding the proposed bridge, there are no comprehensive solid waste management system, the bulk of waste is disposed illegally. Illegal disposal areas include beneath Jangwani bridge and at the banks of Msimbazi river. The proposed project is expected to generate solid wastes during demolition and construction phases, both departments from Ilala and Kinondoni Municipalities shall be involved on arrangements for disposal or alternative uses during the project's implementation.

1.16 Stakeholder Consultations

Stakeholder engagement is an inclusive process conducted throughout the project life cycle. Where properly designed and implemented, it supports the development of strong, constructive and responsive relationships that are important for successful management of a project's environmental and social risks and impacts.

Below are views and concerns from various stakeholders that were consulted as part of preparing the ESIA report:

Ministry of Works Transport and Communication, Tanzania Traffic Police Headquarters, DARCOBOA (Dar Es Salaam Commuter Bus Owners Association), Occupational Safety and Health Authority (OSHA), Dar es Salaam City Council (formerly known as Ilala Municipal Council), TANESCO (Tanzania Electricity Supply Company)-ILALA, Tanzania Forest Services Agency (TFS), AMEND, Local Communities in the Project Area and DART Agency.

1.17 Impacts Identification

Interactions between the project activities and the environment were identified for each stage of the project, by using a matrix, Focused Approach Impacts Mapping, and Experts Knowledge. The impacts are categorized in both negative and positive impacts respectively. Negative impacts are such as Noise Pollution, Air Pollution, Water Pollution, occupational health and safety, Traffic Congestion, the spread of HIV/AIDS and Soil erosion. The positive impacts are such as impact on Employment opportunities, impact on Local and Regional development, improvement on Local Trade and skills transfer to Locals.

1.18 Environmental and Social Management Plan

The proposed mitigation measures provide the basis for developing an environmental management plan and monitoring plan for the roads' subproject is required to meet World Bank's and NEMC's environmental approval and permitting requirements. This section provides measures to mitigate the negative impacts of the proposed project and enhance positive ones.

The aim of the ESMP is to ensure that the environmental and social objectives of the project are met. The ESMP is based on the various components of the Project and contains detailed management measures and prescriptions for the various aspects and issues of each particular area. The table 7-1 of the main report contains key issues and their recommended mitigations.

1.19 Monitoring Plan

Monitoring refers to the systematic collection of data through repetitive measurements over a long period to provide information on the characteristics and functioning of environmental and social variables in specific areas over time. This will help in implementing the mitigation measures that are already identified in this report or implement further measures if the impacts are identified to be bigger than anticipated as indicated in table 8-1 of the main report.

1.20 Summary and Conclusion

The proposed Upgrading of the Jangwani Bridge is a sub project under the Msimbazi Valley Development Project; that forms part of the Dar es Salaam Metropolitan Development Project (DMDP). The project targets developing The Msimbazi River Basin in Dar es Salaam which is a strategically important area of the city for infrastructure, mobility, commerce and ecosystem services including flood control.

The Government of Tanzania (GoT) has embarked on three major strategic programs to reduce the vulnerability of Dar es Salaam to natural hazards and the adverse impacts of climate change, and build resilience to adapt to such impacts including the impacts on transport: the Tanzania Urban Resilience Program (TURP), the Dar es Salaam Metropolitan Development Project (DMDP) and the Dar es Salaam Urban Transport Improvement Project (DUTP).

The Flood protection project is part of the Government strategy to develop its road network to support the Socio-Economic development of the country and the Dar es Salaam Region. As part of the investment; the Government intends to invest in the upgrading of the Jangwani Bridge, that currently is affected by floods whenever there is rain and severely during the heavy rain season where the road section is forced to close for many hours.

The project will be implemented by two Ministries namely the Ministry of Works and the President's Office Regional Administration and Local Government; Under the Mow; TANROAD- will implement the project while under PO-RALG TARURA will Coordinate the project.

Design of the bridge has considered sufficient openings to allow free flow of water from upstream of Msimbazi River, dredging of the river is also part of this project. Details of the project's components have been provided in chapter 2.

This ESIA is designed to help TANROADs, PORALG and LGAs manage the risks and impacts of the proposed project, and improve their environmental and social performance, through a risk and outcomes-based approach. This ESIA has ensured that all relevant National and World Bank's environmental and social requirements have been included to be adhered to in order to minimize/mitigate risks and impacts of the project.

The ESIA process has engaged various relevant stakeholders for their views on the proposed bridge project, these included DART, Kinondoni Municipal Council, Ilala City Council, AMEND, Ministry of Works and Transport, DARCOBOA, TANESCO, Tanzania Forest Services (TFS) e.t.c. Their views have been presented on chapter five of this ESIA report and shall be considered during implementation of the project.

For the collected sediment samples, the results suggest that the quality of sediment in the river bed and at the river banks is in compliance with the national standards (Tanzania Bureau of Statistics, TBS) and international guidelines (SQAGs) for all critical parameters..

Also the results for the heavy metals in the fill area samples suggest that the quality of sediment in the floodplains is in compliance with the national standards (Tanzania Bureau of Statistics) and international guidelines (SQAGs) for all critical parameters.

The sediment and water quality of tested samples from the Msimbazi catchment area are in compliance with the national standards (TBS) and international guidelines (SQAGs) for all critical parameters, it is beyond any dispute that the only way to substantially improve river water quality is to identify, implement, manage and legally enforce water quality control measures for effluents at the main sources, hence the effluents of used water in residential areas and industries.

On completion, the bridge will facilitate assured movement of the people to and from the city centre, facilitate economic growth, direct employment to the locals, transfer of skills e.t.c . Negative impacts have also been identified and assessed during mobilization, construction and operation phases of the project, these include: air pollution, noise and vibration, soil erosion, occupational safety and health, pollution from waste generated, destruction of public utilities, increased traffic congestions e.t.c as described on chapter 6. The assessment/valuation of impacts indicates a range of low to moderate/medium significance. However, all the identified negative impacts can be reduced with proper implementation of mitigation measures. Mitigation measures for the identified impacts have been outlined on table 7-1 and monitoring plan on table 8-1.

The Jangwani bridge upgrading activities shall have negative economic impacts resulting from traffic jams during construction. The proposed traffic management plan should be adhered to and updated according to the situation on ground. Based on the results of this sediment and water quality study it can be recommended that reuse of sediment material for the construction of terraces is safe, unless critical results will be found for PAHs and POPs.

ESIA Study Team

A handwritten signature in blue ink, appearing to read 'Nanai', with a stylized flourish extending to the left.

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Appendix I – Project Drawings

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ABBREVIATIONS

A.S.L: Above Sea Level
 AIDS: Acquired Immune Deficiency Syndrome
 BOD: Basis of Design
 BRT: Bus Rapid Transit
 DAWASA: Dar es Salaam Water and Sewerage Authority
 DMDP: Dar es Salaam Metropolitan Development Project
 DoE: Division of Environment
 EIS: Environmental Impact Statement
 ESIA: Environmental and Social Impact Assessment
 ESMF: Environmental and Social Management Framework
 ESSs: Environmental and Social Standards
 EWURA: Energy and Water Utilities Regulatory Authority
 FDCO: Foreign Commonwealth and Development Office
 GDP: Gross Domestic Product
 GIR: Geotechnical Interpretive Report
 GoT: Government of Tanzania
 GRS: Geosynthetic Reinforced Structures
 HIV: Human Immune Virus
 LED: Lighting Emitting Diode
 LMP: Labour Management Procedure
 MCs: Municipal Councils
 MOP: Msimbazi Opportunity Plan
 MOW: Ministry of Works
 MSE: Mechanically Stabilised Earth
 NEMC: National Environment Management Council
 PAD: Project Appraisal Document
 PCN: Project Concept Note
 PEA: Preliminary Environmental Assessment
 PO-RALG: President's Office Regional Administration and Local Governments
 PWDs: People With Disabilities
 RAP: Resettlement Action Plan
 RoW: Right of Way
 RPF: Resettlement Policy Framework
 SEP: Stakeholders' Engagement Plan
 TACAIDS: Tanzanian Commission for AIDS
 TANESCO: Tanzania National Electricity Supply Company
 TANROADS: Tanzania National Roads Agency
 TARURA: Tanzania Rural and Urban Roads Agency
 TTM: Temporary Traffic Management
 TURP: Tanzania Urban Resilience Program
 WB ESF: World Bank's Environmental and Social Framework

1 INTRODUCTION

1.1 Project Background

The proposed Upgrading of the Jangwani Bridge is a sub project under the Msimbazi Valley Development Project; that forms part of the Dar es Salaam Metropolitan Development Project (DMDP). The project targets developing Msimbazi River Basin in Dar es Salaam which is a strategically important area of the city for infrastructure, mobility, commerce and ecosystem services including flood control. Two of four of Dar es Salaam's main traffic arteries cross the main flood plain near the river's discharge to the sea, including the city's first operational Bus Rapid Transit (BRT) corridor. Communities at the lower reaches of the river, which tend to be poor, unplanned settlements, largely depend on close access to Dar es Salaam's central business district for their livelihoods, and benefit from social services within walking distance. The river catchment includes significant natural assets, including protected forest areas in the headwaters down to wetlands and mangrove forests in the lower reaches.

The basin is densely populated and has over the past few decades become highly polluted, experienced rampant environmental degradation. The flood-prone areas in the middle and lower reaches of the Basin have been encroached by settlements and clogged by waste, debris and sedimentation. This has resulted in a situation where annual rains result in loss of life and property, paralysis of key transport networks, and damage to critical infrastructure.

The Government of Tanzania (GoT) has embarked on three major strategic programs to reduce the vulnerability of Dar es Salaam to natural hazards and the adverse impacts of climate change, and build resilience to adapt to such impacts including the impacts on transport: the Tanzania Urban Resilience Program (TURP), the Dar es Salaam Metropolitan Development Project (DMDP) and the Dar es Salaam Urban Transport Improvement Project (DUTP). TURP is a 5-year trust fund partnership implemented by the World Bank and GoT with resources from the UK Foreign Commonwealth and Development Office (FCDO). The main objective of the TURP is to support national and local governments in Tanzania to strengthen the management of climate risk in cities. DMDP is a US\$300 million project implemented by the PO-RALG and financed by the World Bank. The main objective of the project is to improve urban services and institutional capacity in the Dar es Salaam Metropolitan area, and to facilitate potential emergency response. DUTP is a US\$ 450 million project implemented by the Tanzania National Roads Agency (TANROADS) with the objective to improve transport mobility, accessibility, safety, and quality of transport service delivery along the selected corridors in Dar es Salaam.

Addressing flooding in the Msimbazi Basin was recognized as important to urban resilience and mobility in Dar es Salaam under TURP, DMDP and DUTP, given the economic impacts the damages on property and transport infrastructure have had on the poor and vulnerable. The GoT had made past attempts at demarcating the lower Basin as non-developable hazard land as well as a proposal to develop it as a city park, but these efforts were not fully implemented. Limited ad hoc dredging of the river channel to remove accumulated sediment and waste before annual rains has been carried out, but a sustainable and comprehensive management system is not yet in place. It was clear that a multi-sectoral, multi-stakeholder approach would be needed to address the complex institutional, environmental, social and technical challenges posed by regular flooding.

Starting in 2018, the GoT and World Bank facilitated a stakeholder-led participatory planning process (using a design charrette methodology) that involved more than 200 people from 59 institutions and communities. A wide range of actors including government institutions, community members and representative organizations, and technical experts, as well as various studies and activities including the development of the river profile of the Basin and modelling of flood scenarios. For 6 months, in 30

working sessions, stakeholders worked in a collaborative fashion to develop the Msimbazi Flood Mitigation Study and Msimbazi Opportunity Plan (MOP) which includes a strategic framework for open space and environmental management in the wider Msimbazi river Basin (Selander Bridge to Pugu Hills) and a more detailed conceptual plan for flood control, river revitalization, open space, and recreation for the lower Msimbazi flood plain (Selander Bridge to Kawawa Road). The MOP is summarized in the box below. The MOP is to be completed in several phases starting from the lower Basin and moving upstream, with the first phase focusing on the lower Basin.

The Msimbazi Opportunity Plan (from Executive Summary)

- 4.3.1** From a hazardous area for people to the green heart and lungs of the city;
- 4.3.2** From a flood hazard area to an iconic city park surrounded by prime real estate for urban development;
- 4.3.3** From a liability to an asset for Dar es Salaam.

The lungs of the city

- 4.3.4** The Pugu-Kazimzumbwi natural forest reserves;
- 4.3.5** The wooded areas in the upper & middle Basins alongside the riverbanks; and
- 4.3.6** The Mangrove Forest and wetlands between Hananasif and Upanga.

Extending the surface area and quality of these eco-system elements will help Dar es Salaam improve its resilience. These interventions will: (i) improve the water retention capacity in the catchment area and help reduce vulnerability to flooding; (ii) increase carbon capture and mitigate climate change; and (iii) help the city adapt to global warming by developing a cool corridor in the city center.

The heart of the city:

- 4.2.3.1 An iconic City Park bordering the business centre; and
- 4.2.3.2 Other Parks upstream

The Lower Basin between Selander Bridge and Kawawa Road becomes the location of a multi-functional city park of 400 hectares with three activity zones: (i) The river zone is a flood plain that caters for large volumes of water during peak flows after heavy rainfall events but in a controlled and non-hazardous way; (ii) The river plain is also a natural reserve of wetlands and mangrove forests, rich in biodiversity; and (iii) The terraced zone in which the first level is used for sports and leisure activities, but can accommodate occasional flooding, while a second terrace and Basin edge surrounding the Lower Basin are safe from riverine flood hazard. This is the location of 57 hectares of real estate for mixed urban functions including social housing, social amenities, offices and commercial real estate.

In November 2020, the Government of Tanzania requested financing from the World Bank and FDCO for the implementation of first phase of the MOP. Three principles inherent to the design of the Lower Basin are:

- 1.1 Focus on conveyance to drain river water from the basin to the ocean as quickly as possible;
- 1.2 Create elevated terraces to guide the water and create higher edges to protect against flooding; and
- 1.3 Create a City Park with functional uses of the terraces and the flood plain.

The objective of the financing is to reduce impacts of flooding to settlements and critical infrastructure, and create an enabling environment for resilient urban development in targeted communities in the Dar

es Salaam Metropolitan Area. It is envisioned to address these issues through investments in: Flood protection and prevention including the construction of the terraces; Resilient Transport Infrastructure to increase connectivity and mobility including upgrading the Jangwani bridge and surrounding roads to be flood free; measures to control sediment and solid waste in the river including greening and other erosion control measures and urban planning, services and management to redevelop the area to an affordable, livable area creating an enabling environment for economic development and job creation. The investments will be implemented by PO-RALG and LGAs while upgrading of the Jangwani Bridge and its related works, which will be managed by TANROADS.

1.2 Project Description

The Government of the United Republic of Tanzania through the Tanzania National Roads Agency (TANROADS) and the President's Office Regional Administration and Local Governments (PO-RALG) through the Tanzania Rural and Urban Roads Agency (TARURA) intends to invest in the flood protection of the Msimbazi area; The Flood protection project is part of the Government strategy to develop its road network to support the Socio-Economic development of the country and the Dar es Salaam Region. As part of the investment; the Government intends to invest in the upgrading of the Jangwani Bridge, that currently is affected by floods whenever there is rain and severely during the heavy rain season where the road section is forced to close for many hours. The Jangwani bridge is located in Dar es Salaam Region which is the largest city in Tanzania. The bridge is at the boarder of two LGAs hence in the jurisdiction of the Dar Es Salaam City Council (formerly known as Ilala Municipal Council) and Kinondoni Municipality. Geographically the site lies along Latitude -6.810089° and Longitude 39.265499°.

1.3 Project Location

The Jangwani valley is part of the Msimbazi River Basin, with a catchment area of about 270 km². The Jangwani Bridge is located around 2.5 km before the outfall of the Msimbazi River into the Indian Ocean. The Jangwani Valley borders with Residential houses along its all directions see Figure 1-1.

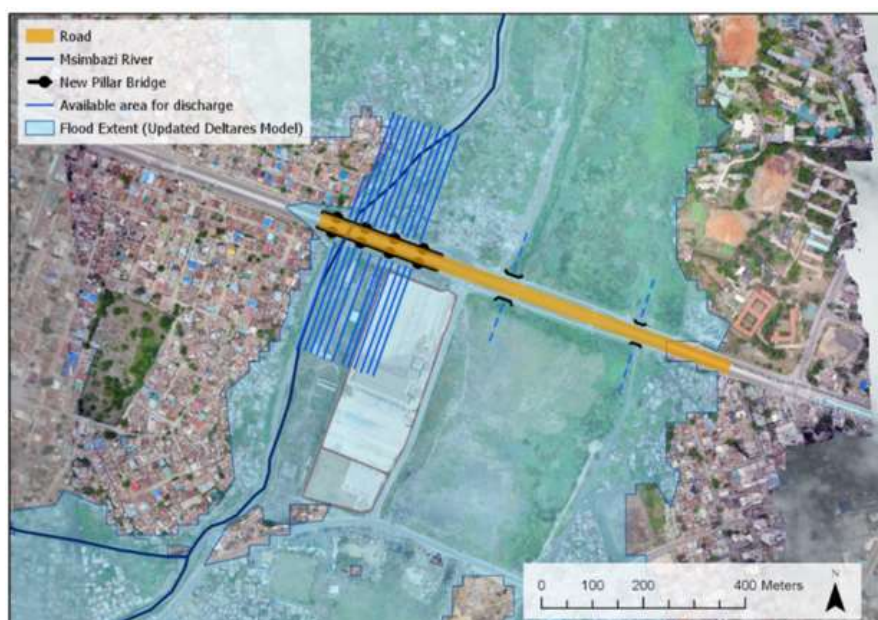


Figure 1-1: Location Map of the Proposed Project

1.4 Background of the Implementing Agencies

The project will be implemented by two Ministries namely the Ministry of Works and the President's Office Regional Administration and Local Government; Under the Mow; TANROAD- will implement the project while under PO-RALG TARURA will Coordinate the project. The project will be co-financed by the WB and the GoT; under this project, PO-RALG is the main beneficiary of the project and TANROADs will implement only the upgrading of the Jangwani Bridge Component. For the TARURA, the project will be coordinated by the World Bank Working Group Project Coordinating Unit and implemented by the Dar es Salaam City Council that has formed a project Implementing Team that comprises staff from the Kinondoni Municipal Council and the Dar Es Salaam City Council.

1.5 Rationale of the Project

Climate change as well as increased human activities in the catchments at the upstream and downstream of the Msimbazi valley has significantly increased the amount of sediments flowing and depositing the Jangwani valley. Human activities have also encroached the valley and hence affecting the smooth flow of water from the upstream to the Indian ocean. These have significantly affected the functionality of the Jangwani bridge and as a result affect the ability of the bridge to allow water to flow and hence facing overflow during rainy season.

Through the Charrette process [multi-disciplinary workshop with the aim of developing a design or vision of a project] for the whole Msimbazi Valley subprojects' designs, in combination with spatial analysis and numerical flood simulations, it became evident that the Jangwani Bridge on Morogoro Road is the most vulnerable bridge to flooding. During extreme events the bridge and the road are often flooded, sometimes lasting for days after the peak. This interrupts transport and mobility as the main connections between Dar es Salaam's City Centre and the city's outskirts are cut. Other vulnerable assets are the Dar es Salaam Area Rapid Transit bus depot and Ali Hassan Mwinyi Road, which crosses the Msimbazi at Selander Bridge. Muhimbili National Hospital is located on higher ground, which on the edge of the river's flood plain, but the property's steep embankment has experienced severe erosion, which threatens some of the hospital's facilities.

It's on this basis that the Government of Tanzania is collaborating with the World Bank intends to invest in the Msimbazi valley Development project; that among other components of the project, is the upgrade the Jangwani Bridge as well as widening the bridge to allow easy flow of water and sediments and hence mitigate impacts that were significantly affecting the economy of the Nation, costing people's life as well as damaging other infrastructures.

The bridge will be elevated with vertical rising profile at 0.5% (1:200) towards the centre, maintaining an average 2.4m freeboard above the design water level including sedimentation of +10.0m a.s.l.

1.6 Objective of this ESIA

This ESIA sets out responsibilities for assessing, managing and monitoring environmental and social risks and impacts associated with each stage of a project as well as each component of the project in order to achieve environmental and social outcomes consistent with World Bank's Environmental and Social Standards (ESSs) as well as those of the Tanzania legal requirement.

The ESIA is designed to help TANROADs, PORALG and LGAs manage the risks and impacts of the proposed project, and improve their environmental and social performance, through a risk and outcomes-based approach. The desired outcomes for the project are described in the objectives of each ESS, followed by specific requirements to help achieve these objectives through means that are appropriate to

the nature and scale of the project and proportionate to the level of environmental and social risks and impacts.

The ESIA shall assist the project implementers to ensure that the upgrading of the Jangwani Bridge is environmentally and socially sound and sustainable and that the environmental and social assessment will be proportionate to the risks and impacts of the project. It also informs the design of the project, and will be used to identify mitigation measures and actions to improve decision making and 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.

ESIA further identifies measures to mitigate or minimize the negative impacts and enhance positive ones and outlines ways to improve the project's sustainability. The findings of the assessment are communicated to stakeholders in the form of an environmental Impact Statement (Environmental Impact Statement). It is expected that the EIS will contribute to decision-making about the project and shape it so that its benefits can be achieved and sustained without causing problems to the Msimbazi Basin and the associated ecosystem as well as communities adjacent to the project area and the nation at large. The mitigation measures identified in the ESIA should be formulated in a manner that they can be “used in the finalization of bridge designs and be included in the Tender Documents”.

This ESIA ensures that all relevant National and World Bank’s environmental and social requirements are adhered to address the risks and impacts of the project.

This Project falls under the list of projects requiring ESIA pursuant to the First Schedule made under Regulation 6(1) of the Environmental Impacts Assessment and Audit Regulations, 2005 and Regulation 17 of its amendments of 2018. In terms of the EIA and Audit Regulations, 2005 read together with amendments of 2018. The proposed upgrading of the Jangwani Bridge project falls into “Type A” projects which are mandatory to ESIA, under section 9 “TRANSPORT AND INFRASTRUCTURE” subsection (a) construction and/or expansion of trunk roads.

The main objective of this ESIA is to identify, predict and evaluate potential impacts of the proposed upgrading of the Jangwani Bridge and incorporate mitigation and/or enhancement measures into the designs/proposals, construction, operation and decommissioning processes of the project. This aims at ensuring project sustainability with least negative impacts on the social, economic and ecological environment of the area.

Specifically, the assessment considered among other things:

- Compatibility of project with National and sectoral policies, legislations and the WB ESF
- Assessment of project alternatives;
- Stakeholders’ engagement
- Costs and benefits of the project to the Tanzanian Government and local communities of Jangwani area, Dar es salaam Region and the National at large;
- Potential impacts of the project on the surrounding biodiversity and vice versa;
- Mitigation options for negative impacts and enhancement options for positive ones;
- Environmental Management and monitoring issues related to the project

1.7 Study Methodology

The study methodology involved literature review, various specific studies, stakeholder's consultation, field visit and scoping. Scoping aimed at determining the extent of the study and stakeholder involvement. Scoping also helped the study to be specific and avoid unnecessary data collection, minimize costs and help subsequent production of unhelpful report.

1.7.1 Literature Review

To address the identified objectives, a preliminary review of the available information on the proposed development and related literature, including legislations and national policies was undertaken. The review helped to identify areas where further information would be needed in order to focus the scoping exercise and the full ESIA in general. Furthermore, the review helped to identify stakeholders and pertinent issues related to the proposed project.

The detailed review focussed on social characteristics and ecological aspects of the Msimbazi Basin was useful in assisting describe the current baseline conditions. The review considered the current infrastructure as well as environmental characteristics, such as wildlife composition and abundance and habitat (plant species types and distribution). In addition, information on the current socio-economic environment within the immediate impact area and area of influence were reviewed and used to establish a baseline.

Review of relevant literature was undertaken during initial preparations and continued throughout the preparation of this ESIA. This helped in the identification of areas where further information would be needed in order to focus the preparation of the ESIA, and identification of stakeholders and pertinent issues related to the proposed project.

The following documents were reviewed:

- World Bank's Environmental and Social Framework (2018);
- legislation and national policies
- Msimbazi Opportunity Plan's (MOP) Executive Summary, and its Volumes A (Strategy and Management Framework); and B (Detailed Plan for the Lower Basin);
- The World Bank Group's City Resilience Program: Supporting Msimbazi Opportunity report Msimbazi Special Planning Area;
- Flood modelling studies;
- Project Brief; Project Concept Note (PCN); and Project Appraisal Document (PAD).
- Scoping report for the Upgrading of the Jangwani Bridge
- Background literature of the relevant environmental and social conditions of four participating municipal councils (MCs) of Ilala, Kinondoni, Temeke, Kisarawe and Ubungu; and
- Recently approved ESMF, RPF, SEP, LMP prepared in line with World Bank's Environmental and Social Framework (ESF) for the Msimbazi Project. - This ESIA is guided by these framework documents

1.7.2 Study Area

Identification of boundaries for the proposed new Jangwani bridge was undertaken during the scoping exercise. and the boundaries delimit the project within an area where impacts, both positive and negative, will be felt on the environment, to the economy and to the local community. There are two types of

boundaries that have been considered in this ESIA in general, these constitute: Project Footprint Area/Core Impact Area and Area of Influence (AoI)

1.7.2.1 Project Footprint Area

The Project Footprint is the area that may reasonably be expected to be physically touched by Project activities, across all phases. Physically, there is no demarcation of fencing for the Project Site boundaries and hence it is contiguous with the rest of the area. The direct impact zone for this project is considered to be 60m RoW of the proposed bridge alignment.

1.7.2.2 Area of Influence

The effects of the Project activities on a particular resource or receptor will have spatial (distance) and temporal (time) dimensions. Some activities would impact a larger radius than other identified impact sources. The spatial and temporal dimensions have therefore been taken into account to define a Project's Area of Influence. The AoI for this project has been considered as 1km radius from the project site.

Table 1-1: Area of Influence

S/No	Environmental and Social Issues	Area of Influence	Justification
1	Air Quality	500m	Dust emissions, fugitive dust, etc. is typically observed within 100-200m from the construction/operation area. A minimum of 500m AoI has been taken to capture all sources of these emissions including vehicular movement across access roads
2	Noise Pollution	500m	Noise can often be detected up to 400-500m from any operation
3	Water Environment	500m	Water body located in the vicinity of the project area may get impacted due to activities at project footprint and allied sites
4	Land Environment	500m	Impacts on soil and land are often restricted to the Project footprint area. An AoI of 500m taken into account indirect effects usually occur due to vehicular/ heavy machinery movements and activities at allied sites
5	Socio-economic Conditions	1km	An AoI of 1 km radius is considered for socioeconomic consultations to determine perceived impacts due to the Project including employment opportunities and increased anthropogenic/vehicular activity in remote areas

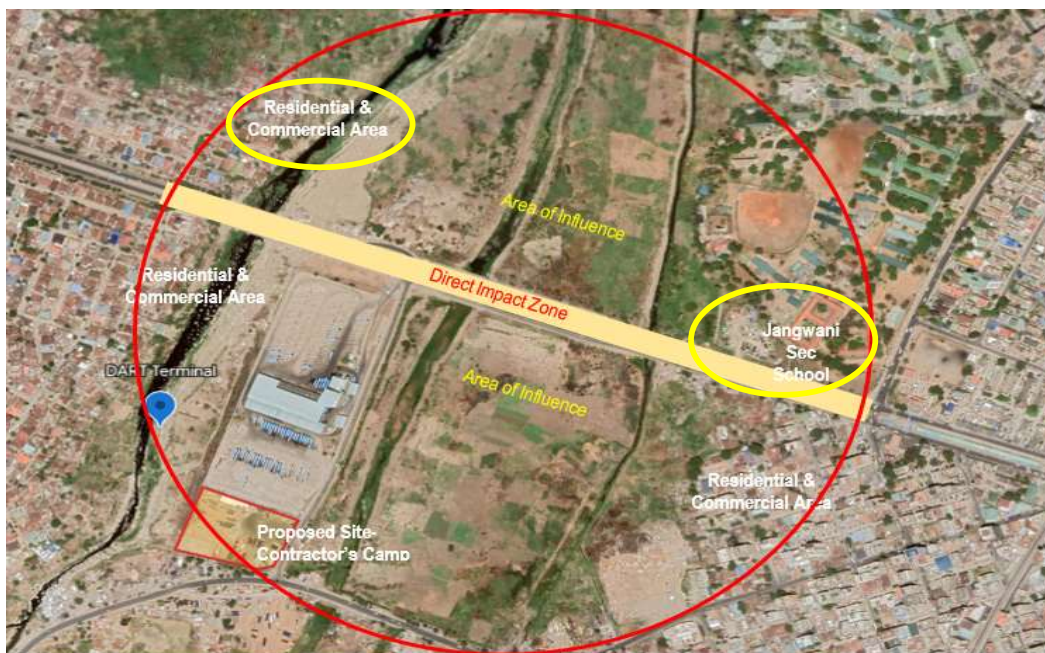


Figure 1-2: Boundaries for Construction of the Proposed New Bangwani Bridge; Sensitive Receptors Rounded in Yellow

1.7.3 Consideration of Alternatives

Possible alternatives considered were looked in terms of: design alternatives, process alternatives (e.g. in waste management), input alternatives (e.g. energy or water sources) and without the project alternative. Comparison of the various alternatives in terms of identified impacts, mitigation measures and associated costs were used to identify the most appropriate project alternative.

1.7.4 Stakeholder Involvement

The consultation of this ESIA was guided by the Stakeholders Engagement Plan prepared for the Msimbazi Valley Development Project. The plan prepared tentative list of Stakeholders, methods of consulting the stakeholders as well as proposed information to be obtained from the stakeholders. considered were those affected positively and negatively by the proposed project, they include local communities living closer to the project area formal organizations and public/community organizations and groups. Stakeholder participation involved public meetings and individual consultations/interviews.

The ESIA team established lines and methods of communication and interaction with the stakeholders including use of letters to inform the public about the study and the consultations.

It should also be noted that the Upgrading of the Jangwani Bridge is one of the subprojects under the MBDP; which under its preparation; stakeholders were consulted. During the consultation which was commonly known as the Charrette; 54 meetings were conducted which were attended by more than 1,500. Some of the views and concerns raised during Charrette form part of this report.

1.7.5 Impact Assessment

The impacts of proposed development were identified drawing from the scoping report and updating the checklist accordingly. Impact prediction or estimation of the magnitude, extent or duration of the impacts was done in comparison with the situation without the project. The initial baseline condition prior to project implementation provided the basis for forecasting the future scenario with or without the project

and compares the changes with existing established standards, relevant national and sectoral laws and regulations while taking cognizance of stakeholder views and concerns. The approach to impact prediction was to give ratings for each identified potential impact and producing a correlation matrix. In the matrix ratings ranged from 0 to +3 for positive impacts and from 0 to –3 for negative ones, where:

- +3 - Very High Positive Impact
- +2 - High Positive Impact
- +1 - Minor Positive Impact
- 0 - No Impact
- 1 - Minor Negative Impact
- 2 - High Negative Impact
- 3 - Very High Negative Impact

1.7.6 Site Visit

To complement the preliminary review of available information, a visit to the proposed project area was necessary. The site visits entailed assessment of the current bridge, the social economic situation, resettlement impacts, the alternative routes to be used during construction, and the ecological and archaeological impacts if any as well as other physical features, in order to identify the kind of issues and impacts that are likely to be of importance in the ESIA process. The visit was carried out by a multidisciplinary team from NORPLAN that was accompanied by officials from PO-RALG and TANROADS. In other scenarios site visits were conducted in collaboration with other stakeholders such as a team from the Tanzania Traffic Police. The visit provided an opportunity to assess the sites and share views among the team by looking at the project layout, forecasting various project activities in relation to the site morphology and characteristics features as well as compatibility with other MOP activities and plans. This approach enabled the team to come up with best option of implanting the proposed development with minimal impacts.

1.7.7 Other Specific Studies

As part of preparation of the ESIA for the bridge as well as other subprojects under the MBDP various studies were conducted, these include the following:

- Geotechnical Interpretation / study;
- Hydraulically and Morphological Verification Study for Improved River Channel Design;
- Heavy Metal Pollution Assessment along Msimbazi River;
- Geomorphology Assessment;
- Msimbazi Sediment Quality Assessment;
- Msimbazi Mangrove Assessment; and
- Flood Modelling for the Msimbazi Middle Catchment.

2 PROJECT DESCRIPTION

2.1 Overview

This chapter provides an overview of the preliminary project's components to be designed and an overview of the site and project activities.

The purpose of this chapter is to present sufficient project information to inform the ESIA Process in terms of design parameters applicable to the project. It is important to note that the project description details are as per design.

2.2 Project Location and Area

The proposed Jangwani Bridge forms a link between the city centre and the north-western part of the city via Morogoro Road, crossing the Msimbazi valley. The corridor for the bridge is within the existing Magomeni Mapipa-Fire section of Morogoro Road cutting across Kinondoni and Ilala Municipalities both located within Dar Es Salaam Region.



Figure 2-1: Location for Proposed Bridge

2.3 Project Features

The proposed bridge will be located within geographic coordinates $[-6.810006^{\circ}; 39.265033^{\circ}]$ on the western side and $[-6.811199^{\circ}; 39.268390^{\circ}]$ on the Eastern side. The proposed bridge shall be constructed with bitumen standard approaching roads on both sides, with approximate lengths of 245m on Magomeni Side (West) and 435m on Fire Side (East).



Figure 2-2: Impression of the New Jangwani Bridge with the widened and deepened river, deepened flood plain and terraces

The overall length of the road and bridge will be approx. 1070 m in length, composed of:

- approx. 245 m transition west existing road to bridge;
- approx. 390 m bridge;
- approx. 295 m raised embankment, design level +11.4m a.s.l. including transition to bridge;
- approx. 140 m raised embankment, design level +10.4m a.s.l. including transition to east existing road.

Based on the functional requirement, the present situation and knowing that the road will be raised the following design is prepared:

- 2x 1 mixed traffic lane, 6.5 m wide, asphalt paving
- 2x 1 BRT lanes, 3.7 m wide, concrete paving
- 2x 1 cycle lanes, 2.5 m wide, asphalt paving
- 2x 1 pedestrian walk ways, 4 m wide, paving blocks
- 2x 1 green zone, 1.5 m wide between traffic and cycling
- 2x 1 hard shoulders, 1.0 m along walkway at raised embankment

2.3.1 Bridge

The bridge has been designed to comply with British Standard BS 5400 and other relevant design codes.

The bridge design includes the bridge deck, piers and abutments including foundations, parapets and drainage. The overall length of the new Jangwani Bridge will be 390m in length, composed of 13 simply supported span decks, each 30m in length. The superstructure is formed of twin decks, each comprising

of 10 no of precast post tensioned T girder beams composite with reinforced concrete deck slab. The decks shall be separated by a 500mm gap running centrally through the bridge. Metallic parapets perform best in relation to vehicle occupant's risk and therefore the edges of the decks will have N2 Vehicular containment parapets, with the outer parapets having mesh infill panels.

The layout for new bridge and approaching roads is similar to the existing road and bridge's situation . The overall deck width for single bridge of flyover is 21.25m, composed of 1 transit bus lane, 2 mixed lanes, with a segregated cycle track and pedestrian walkway. The below figure 2-3 is an illustration of the new bridge section.

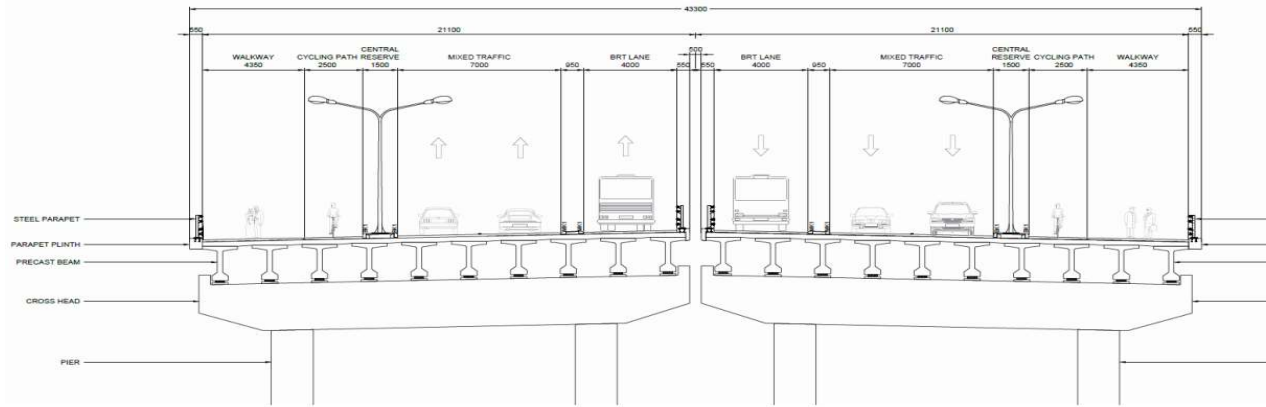


Figure 2-3: Section for New Proposed Bridge

The substructure intermediate piers constitute of a crosshead supported by two round columns Ø1.8m and in turn supported by reinforced concrete pile caps and 16 Ø 1.0m bored piles (See figure 2-4). The western end support will be a full-height abutment wall, supported on similar reinforced concrete pile caps and bored piles, the abutments will have a short return wall. The embankment adjoining the west abutment shall be of Mechanically Stabilised Earth (MSE) construction in the form of a Geosynthetic Reinforced Structure (GRS), this structure is independent of the abutment and will not allow any load transfer between the two.

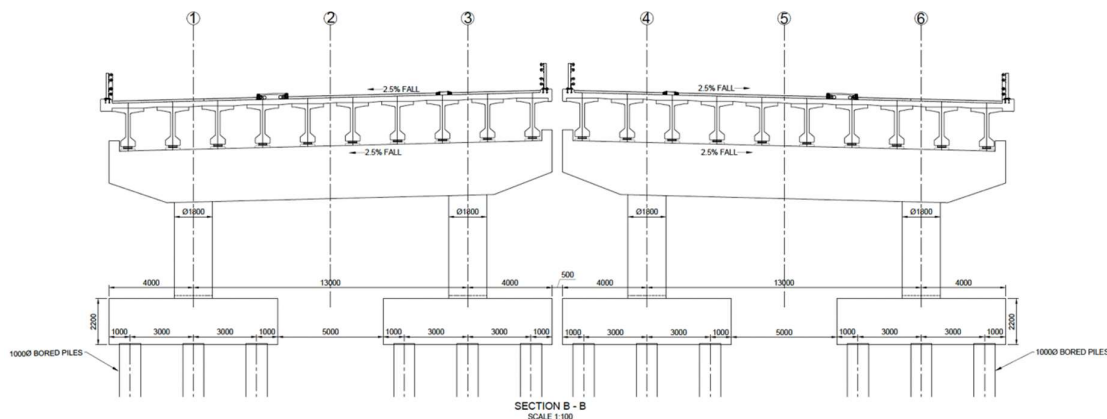


Figure 2-4: Substructure support

There will be a 150mm vertical gap between the abutment concrete and face of the GRS. The eastern abutment will have embankment fill behind with a sloped of 1:2.5 on the outer face, whilst the inner face will be of MSE construction with integral formwork to allow for working space during the temporary traffic management phases between the two decks.

A transition slab will be provided behind the abutments to ensure smooth ride and avoid local settlement and damage to the abutment diaphragm wall.

2.3.1.1 Articulation of the Bridge

A fixed and free articulation arrangement will be achieved by supporting each beam on individual rectangular elastomeric bearing and the provision of vertical dowel bar connections between the end deck diaphragm beam and the pier crosshead. The deck diaphragm beam detail will also include an additional detail of shear keys to prevent transverse movement during seismic activities.

A temperature ranges between 18.5 to 33 degrees Celsius has been assumed for the design and an Asphaltic Plug Joint (APJ) will be specified at each joint.

2.3.1.2 Containment Level of the Parapets

For the outer parapets, a containment level of N2 is applicable, for the following reasons:

1. type of traffic (mixed traffic), low speed (50 km/h) and large distance between carriageway and parapet;
2. buffer zone (with barrier kerb), pedestrian walkway and cycling area between parapet and mixed traffic;
3. bus lanes at centre of the bridge (large distance, kerbs, carriageway and areas in between);
4. straight alignment (low risk for traffic accidents);
5. no consequential damage/injury ('empty' flood plain / river below the bridge);
6. the NPRA Vehicle Restraint Systems and Roadside Areas, Manual N101E (NPRA: source of the TGDM) allows for lower containment category for urban bridges (even lower than N1 or N2);
7. containment type N1 or N2 gives more suitable type of parapets (products) than heavy containment H category that will be suitable for pedestrian area (not falling through, non-climbing) and will allow for more aesthetical appealing options;
8. during the construction phase, for the temporary traffic management, the mixed traffic will be close to the outside parapet for which N1 or N2 is deemed to be sufficient;
9. containment level N1 or N2 allows for standard parapet solutions / products, fulfilling the (commonly used) standard EN-1317-2 taking sufficiently into account the risk of motorized traffic incident for this kind of situation.

An 'open' metal parapet is considered as more attractive for pedestrians using the side walk. If a good quality is specified, the durability is considered sufficient for steel (i.e. 30 years design life). The galvanized steel can be double coated or powder coated in a preferred color. An aluminium, barrier (fixed with stainless steel fittings) can be selected for improved durability and for aesthetic reasons. See below example.



Figure 2-4: Typical Illustration of Metal Parapet Systems

In between the two bridge decks, N2 containment parapets without mesh infill is to be provided.

2.3.1.3 Vertical and Horizontal Alignment of the Bridge

The new Jangwani Bridge will follow the existing horizontal alignment of Morogoro Road maintaining a straight finished alignment. This requires a temporary traffic management plan to keep traffic running on one side of the road, while one of the twin decks is constructed as per concept included in the Basis of Design.

The bridge will be elevated with vertical profile rising at 0.5% (1:200) to the centre, maintaining an average 2.4 m freeboard above the design water level including sedimentation. This will result in the centre of the bridge being 0.5 m higher and both ends at the abutments 0.5 m lower. This longitudinal gradient in the bridge has several advantages for the design: improved pavement drainage, better connection to the existing situation, aesthetic appearance and additional freeboard in the centre of the bridge to allow free flow.

The approach embankment and road will be profiled with a longitudinal gradient of 3% (1:33) to connect to the existing road at the existing road level, taking into account the limitations posed by the built-up area at the western side of the bridge.

2.3.1.4 Bridge Foundation Design

The BS8004 design standard has been used to design bridge foundation. Based on these standards, the following conditions must be met:

- The factor of safety against failure, both the fabric of the foundation and of the supporting soil has to be adequate;
- The settlement of the foundation as a whole and in particular differential settlements, under working load should not be so large as to affect the serviceability of the structure;
- The safety and stability of nearby buildings and services should not be put at risk.

Due to the limited strength encountered in soil units at the surface and the magnitude of ultimate limit state loading on the foundation the design is realized with a spread foundation (base plate / pile cap) on piles.

Pile Diameter

The pile diameter is defined according to the following requirements:

- Workability: The pile should be constructable for companies operating in Tanzania;
- Stiffness and strength: The pile diameter should be sufficient for the design of the reinforcement to be placed in the pile;

- Bearing capacity: The perimeter of the pile should provide sufficient surface area to mobilize the required shaft friction.

To meet these requirements a diameter of 1000 mm is required. The bearing capacity requirement is better met with a pile that is longer than a pile that is wider. Therefore, an even larger pile diameter (e.g. 1200 mm) is not necessary.

Pile Length

The lengths of the piles are defined taking into account:

- The working loads on the piles and the bearing capacity
- The depth of the soil layers on which the piles are founded
- Liquefactions induced soil strength reductions during earthquake loading.

The bearing capacity is calculated for the condition that the piles are founded in non-cohesive soils and for the case that the piles are founded in rock.

In addition, because of the inclusion of seismic hazard in the design, the length of the pile is determined such that the bearing soil unit is not liquefiable. With respect to a design that does not take the seismic hazard and potential for liquefaction into account this leads to longer piles required.

Pile Type

Bored piles are required since the piles will be of large diameter and installed in rock. In addition, there is experience constructing bored piles in the area (e.g. Ubungo fly-over).

2.3.1.5 Vertical Loading

The pile foundations are designed to support the most critical loading combination (F). The loads are presented in Table 2-1 and Table 2-2.

Table 2-1: Working Loads Used for Foundation Design of Piers

	# piles	Fv per pile [kN]
Pier	9	1759

Table 2-2: Working Loads Per Pile Below the Wing-Walls and Western Abutment

	# piles	Fv per pile [kN]
Abutment	8	1565

2.3.1.6 Horizontal Loading

2.3.1.6.1 Piers

Below the Piers the horizontal loads are very low (see Appendix B of the design report). The most significant load on the piles below the Piers is due to inertial loading that may occur during seismic events and Combination-3 ULS presented in table 2-3. The same accounts for the abutment following the application of the MSE behind the Abutment.

Table 2-3: Horizontal Shear ($F_{\text{horizontal}}$) and Moment (M) per pile

	Horizontal per pile [kN]	M per pile [kN]
Seismic inertial loading	220	-
ULS Combination 3	176	418

2.3.1.6.2 Bearing Capacity

The bearing capacity has been plotted below against pile length assuming sand is considered over the whole length of the pile. Also, the condition is plotted where part of the sand profile is expected to liquefy. In addition, the working loads on the piles below the piers is plotted.

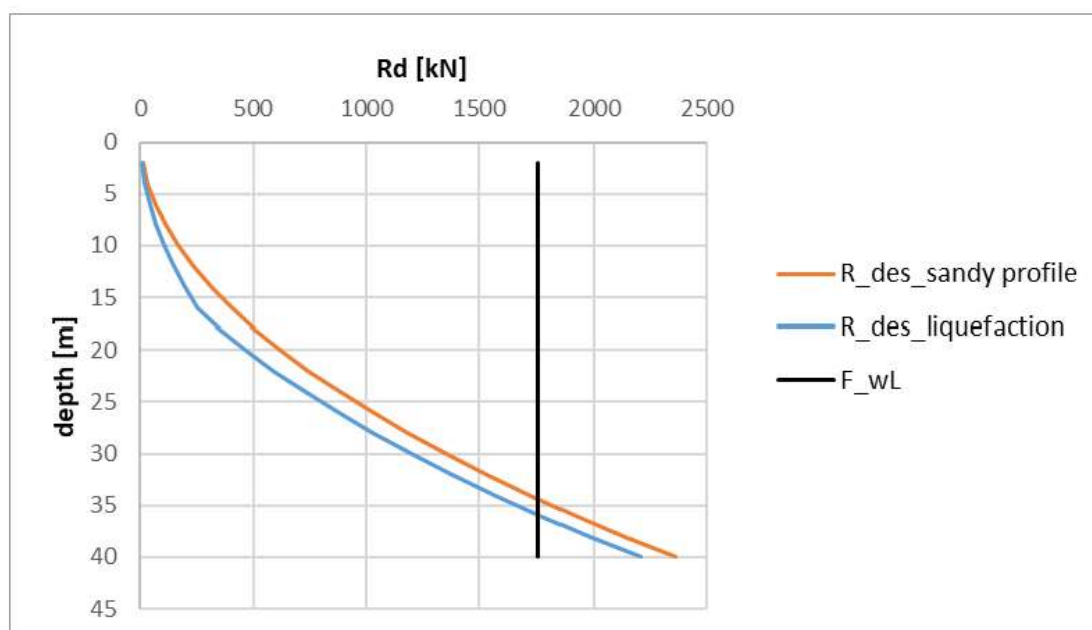


Figure 2-5: Bearing Capacity Calculated for Non-Cohesive Soils

From figure 2-4 above, it can be concluded that the length of the pile in sand required is approximately 35m. Based on the GIR it is observed that this condition cannot be met. This is illustrated in cross sections of the subsoil presented in the GIR and in Error! Reference source not found. On the western side of the bridge, layers of CLAY and SILT were encountered directly followed by the LIMESTONE CORAL ROCK and toward the east the thickness of the SAND layer is maximum 25m to 30m. It is therefore concluded that the piles cannot be founded in the superficial non-cohesive soils and should be extended into the LIMESTONE CORAL ROCK. The bearing capacity calculation in rock is presented in the following section.

Following the load per pile presented in Table 2-2 a minimum rock-socket length of 10m is required for 18 piles below the piers and 15m for 16 piles below the abutments.

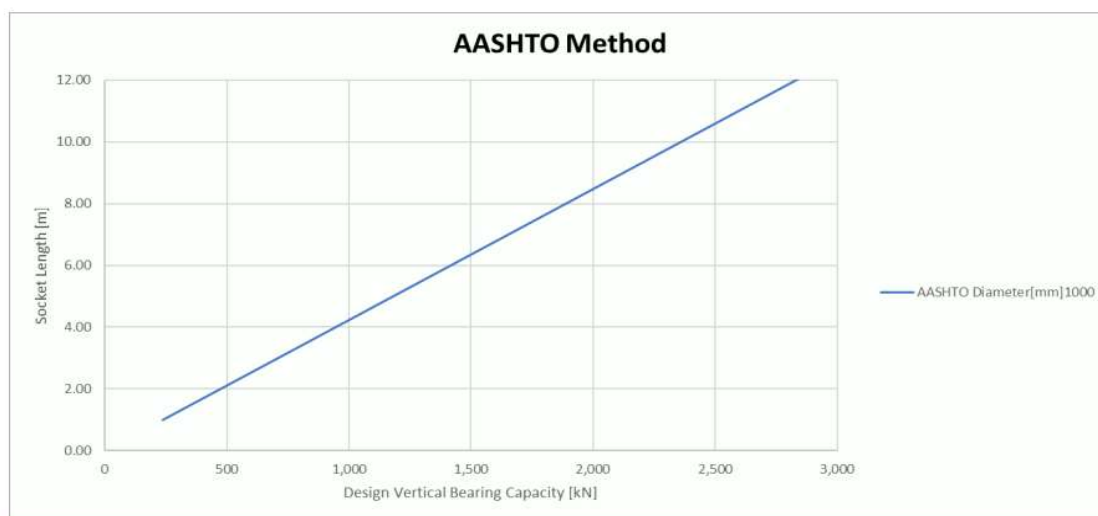


Figure 2-6: AASHTO Pile Bearing Capacity Vs. Rock Socket Length for a Bored Pile With D=1000 Mm.

Since the rock is encountered at varying depths along the alignment of the bridge the length of the piles will vary. The calculation of required socket length per Pier, Abutment, and Wing Wall are presented in Appendix C.1 of the design report. The total length of the piles is described in table 2-4 overleaf.

2.3.1.6.3 Settlement of Piles

Settlement of the pile may occur if the layer that the piles are founded on is soft or an underlying layer is compressible. Calculation of group settlement plus settlement of an individual pile according to the Tomlinson method (Pile Design and Construction Practice) is presented in Appendix C of the design report. The piles are founded on rock which is not underlain by a softer layer therefore the settlement is limited. The total settlement will be approximately 8mm.

Therefore, it can be summarised that, for both the Piers and the Abutments bored piles are required with a diameter of 1000 mm per pile. The total length of the piles is defined per Pier and Abutment following the required bearing capacity and the depth of the rock, see table 2-4. The minimum required length of pile is presented in Table 2-4 of the bridge from west to east.

Table 2-4: Required Pile Installation Depth

Identification	Type	# Piles	Minimum Rock Socket length [m]	Estimated maximum rock depth [m w.r.t a.s.l.]	Installation depth [m w.r.t a.s.l.]	SLS bearing capacity [kN]
A	Abutment	16	9	-34	-43	2125
B	Pier	18	10	-34	-44	2361
C	Pier	18	10	-24	-34	2361
D	Pier	18	10	-24	-34	2361
E	Pier	18	10	-21	-31	2361
F	Pier	18	10	-21	-31	2361
G	Pier	18	10	-21	-31	2361
H	Pier	18	10	-32	-42	2361
I	Pier	18	10	-32	-42	2361
J	Pier	18	10	-32	-42	2361
K	Pier	18	10	-32* tot -37	-47	2361
L	Pier	18	10	-32* tot -37	-47	2361
M	Pier	18	10	-32* tot -37	-47	2361
N	Abutment	16	9	-32* tot -37	-46	2125

* see note below. The rock depth is not known for these areas

Below the western abutment (A) the rock is encountered at around 42m depth. Toward the east the rock is much shallower (around 19 m to 30 m depth). Therefore, the required pile length reduces from west to east (C to J).

However, beyond BH 12 there was no exploratory borehole performed beyond the depth of the rock and so the depth of the rock is unknown for piers K to M and abutment N. Based on the knowledge gained from the GSI it is concluded that large differences in depth of the rock should be considered and the length of the pile should be defined accordingly. Hence the pile installation depth for the eastern part of the bridge is conservatively set at 47m.

It is strongly recommended to determine the depth of the rock for this area through additional investigations. If the depth of the rock can be determined through additional investigations or during pile construction the depth of the pile can be adjusted accordingly.

2.3.2 Road

The proposed roads will include raising the lanes as per present road design. This means, the raising of the embankment has been designed based on the vertical and horizontal alignment.

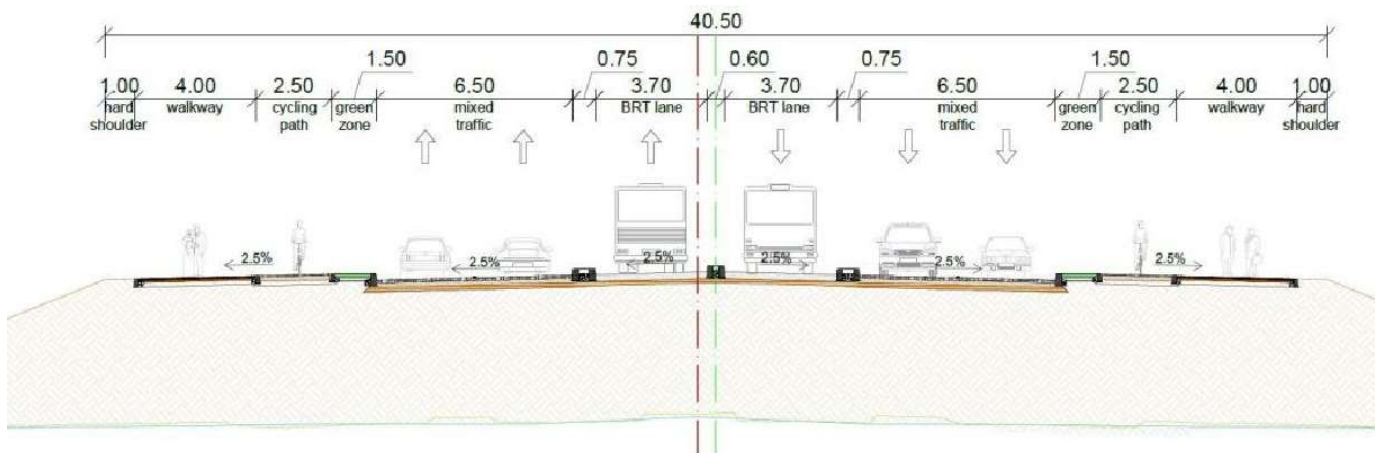


Figure 2-7: Illustration of New Road Section

Road Pavement

The pavement design shall be similar to the existing standard of Morogoro road. It is based on an assumed uniform sub-grade bearing capacity throughout. All pavement types are designed for a high standard of evenness throughout the 20years design period, and will remain with a high bearing capacity, even after cracking deterioration of the bound layers.

2.3.3 BRT Lanes

The project has been designed to include two BRT lanes with similar characteristics as the existing lanes. Two 4m lanes of the BRT has been provided at the center of the project corrido with each bridge holding one unidirection BRT lane. A rigid pavement of reinforced concrete is adopted for BRT lanes. The carriageway design thickness will be 220 mm concrete rigid pavement on 150mm cement stabilized base. The granular material for base and sub base may be made of recycled material from the existing pavement fit into standards of the Pavement and Material Design Manual - 1999.

2.3.4 Mixed Traffic Lanes

The project has allowed for 4 lanes of mixed traffic lane similar to the existing lanes. Two unidirectional lanes with a total width of 7m (3.5m) each has been provided for each bridge making a total of 4 mixed traffic lanes. The mixed traffic lane is separated by a 0.75m median from the BRT lane. Carriageway design thicknesses will be 100 mm asphalt concrete (30-50 mm asphalt wearing course + 40-60 mm asphalt binder course) + 150 mm crushed aggregate class CRR base on 150 mm cement stabilized sub base.

2.3.5 Cycling Path

A 2.5m cycling lane has been allowed in each side of the road. For safety reasons, the cycling lane is separated from the motorised traffic by a 1.5m wide green zone. The cycling path will be paved by a 30-50 mm asphalt wearing course + 150 mm crushed aggregate class CRR base.

2.3.6 Walk ways

The project has been designed to allow for a 4m lane walkway in each side of the road. The walkways shall be paved with a 200mm x 100mm x 80mm paving block placed in a 50mm thick bed of sand or crusher dust.

2.3.7 Street Lighting

The street lighting system will consist of road lighting luminaires mounted on lighting columns. The columns will be installed in the island section between the footway and the carriageway with the road lighting lanterns oriented perpendicular to the carriageway. An additional luminaire will be installed on the lighting column shaft at a lower height to illuminate the footway. The luminaires will be LED (Lighting Emitting Diode) emitting a neutral white light.

The lighting design will allow for the maximum maintenance and cleaning period permitted (6 years) and will have a design life of 100,000 hrs. The lighting system will be controlled via a photocell.

The electrical power/solar power distribution system will consist of a private cable network supplied from a feeder pillar. The feeder pillar will be located in a place where maintenance can be undertaken safely. The feeder pillar will be fitted with a new low voltage 3 phase DNO (Distribution Network Operator) power connection.

2.3.8 Eastern Culvert

Soil improvement will be applied below the culvert (up to approximately A.S.L.-2m). In seismic conditions the soil improvement limits total settlement below the culvert to approximately 10cm (5cm differential settlement). It is recommended to inspect the culvert after any significant seismic events for possible damages due to excessive soil deformations.

2.3.9 Drainage

The Morogoro road shall be well above flood level. Flood events are for a relative short duration (several days, not weeks). The ground water level in the embankment will likely remain lower than the river water level. For surface drainage of the pavements a crossfall of 2.5% is adopted. Surface water from the bus lane will drain towards the mixed traffic lanes and adjacent road gullies through openings in the kerbs that are located between the bus lane and the traffic lanes, similarly as in the existing situation indicated on Figure 2-6.

The water of the bus lane and mixed traffic lanes together will be collected at the lowest kerb and drained by road gullies located each 20m along this kerb between the mixed traffic lanes and the green zone. At the Eastern and Western approaches towards the Jangwani valley, these road gullies will be connected to a large drainage pipe located underneath the cycling path, similar to the existing situation indicated in Figure 2-6. At the central part of the embankment, the road gullies will drain straight into the valley through a pipe with an outfall structure at the toe of the embankment.

The cycling path and walkway will drain towards the shoulders of the embankment into the valley.

The design of the bridge has allowed a crossfall of 2% at the crosshead level to manage surface drainage over the deck and within the crossheads. With the pavement layers, this crossfall can be increased to 2.5%.

Drainage down pipes will be provided at two low points within each span to collect surface drainage from 1) the bus lane and mixed traffic carriageway and 2) the pedestrian and cycling area that are completely segregate by 1.5m reserve. The downpipes will be taken down at the pier columns.

In the east, the road is connected at a level of +10.8 m to tie in with the existing road. Up to the valley, this level is followed to minimize the required footprint and impact for the surrounding and for efficient drainage system for the stormwater run-off.

In the west, the road is connected at a level of +10.8 m to tie in with the existing road. This level is followed up to the location close to the bridge where a slope of 4% is included towards the bridge. The level of +10.8 m is mainly decided in relation to the efficient drainage system for the stormwater run-off.

2.3.10 Utilities

Currently there are a number of service ducts running on the North side of the bridge comprising a water pipe ~600mm in diameter and a number of smaller cable ducts. These are apparatus that are observed on site and no further details / requirements of additional service are known.

It is expected that the smaller cable ducts are relatively easy to relocate to a suitable location in the new bridge as the cables may be placed in the new embankment below the pedestrian pavement. For the detailed design provision will be made for 4 x 100mm diameter ducts in raised central reserve of the bridge section on both decks.

Overhead power lines are expected to be shifted (and raised) and crossing the river separately from the bridge, as in the present situation. These are thus considered not relevant for the bridge design but shall be considered for the construction methodology / sequence.

For the ~600mm water pipe, it is anticipated that DAWASA has specific requirements for the relocation during construction period and for the final situation.

In the present situation it is at existing bridge deck level. There seem to be two options for the new situation:

1. Pipe line buried in embankment toe or Jangwani valley and a trenched river crossing;
2. Pipe line below the sidewalk in raised embankment and crossing the river at the new bridge deck.

For option 1, the pipe line has to be relocated along the embankment at a similar level or slightly deeper / be buried just below surface level.

At the river bed, it shall be deepened by approx. 4 m (present level approx. +6.5 m a.s.l.). The topside can be covered by some scour protection, however there is overall a tendency of siltation of the riverbed and thus erosion risk is limited. The relocation of the pipeline can be done more or less independently, as advanced works prior to start of the road and bridge construction.

For option 2, the pipe line has to be relocated along the embankment and to be raised by approx. 4m and at the bridge by approx. 7 m. The relocation will be interrelated and dependent on the design and construction methodology / sequence of road and bridge. Likely it needs first to be shifted temporarily and later diverted to its final position. Connecting the pipe with brackets to the edge beam has structural consequences and is not preferred. Besides this, connecting the pipe with the outer side of the edge beam of the bridge has a negative impact on the aesthetical appearance. As this will be a new bridge of 390 m length the aesthetical value is considered important as well.

For the detailed design, option 1 is included as the best option. A final decision regarding the new position of this pipe shall be made by TANROADS in consultation with DAWASA.

2.4 Project Phases

2.4.1 Project Planning Phase

This phase involves: Feasibility study, ESIA and RAP studies, preliminary engineering design, final engineering design and construction planning.

During the planning process, the bridge project is given its form and details which becomes more and more detailed in phases, adjusted to correspond to land use planning.

Engineering design determines the approximate location of the bridge, the approaching roads, basic technical solutions and the principles underlying the prevention of negative impacts to the environment. Planning is performed at a level of detail which ensures that the plan is technically, financially and environmentally feasible. Since Tanzanian legislation and the World Bank require an environmental and social impact assessment (ESIA), the proposed new Jangwani bridge project's environmental impact is assessed according to the Environmental Management Act, 2004, EIA and Audit Regulations, 2005 and amendments of 2018 and World Banks' Environmental & Social Management Framework.

During the engineering design phase, the project design co-parties included: Ilala & Kinondoni Municipal councils, TARURA, TANROADS, Wami Ruvu Water Basin, Tanzania Forest Services (TFS), environmental authorities and other planning organizations, land owners, local residents/communities of Jangwani/Magomeni.

The engineering design determines the precise location of the proposed bridge, area required for the bridge, intersections of the proposed bridge and approaching road connections, solutions for pedestrian and cyclists, people with disabilities (PWDs) and vehicles, and other detailed solutions such as measures necessary to the prevention of negative traffic impacts. Since the engineering design settles all issues directly affecting land owners and other parties concerned, interaction is focused on issues to be agreed with co-parties.

Compensation is paid for any damage caused to any external property during final engineering design or construction. Environmental certification by the National Environment Management Council (NEMC) is also done/finalized at this stage.

During project planning phase only, paper works are involved as summarized below:

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

2.4.2 Project Mobilization Phase

The mobilization phase will take place subsequent to the issuing of Environmental Impact Assessment Certificate and once a construction contract with a suitable contractor is signed. The construction phase is expected to be approximately 3 months.

The mobilization phase will involve the transportation of construction materials and equipment to the site.

The laydown area for the proposed project has been identified to be at the Jangwani DART Terminal. The laydown area will be temporary in nature (for the duration of the construction phase) and will include the establishment of the construction site camp (including site offices and other temporary facility for the Contractor/s) and asphalt plant. It is expected the laydown area will be located outside of the footprint of the proposed bridge's corridor; the area will thereafter be rehabilitated (i.e. returned to its pre-construction condition) at the end of the construction phase. However; laydown area selection shall depend on various factors, including the size and conditions of the area and availability of resources; the safety, security and protection its staff and cultural and social considerations. Selection of the area shall involve consideration of access, coexistence with surrounding communities, topography, and vegetation, the potential impact on the environment, environmental causes of disease and other public health issues.

During mobilization, the contractor is expected to perform the following activities:

- Land Acquisition
- Relocation of utilities; transmission lines, project affected people; and removal of bus stop and bus lane;
- Site clearance
- Construction of campsite;
- Construction of Workshop
- Installation of temporary security fence at the camp sites, site office and storage facilities
- Acquisition of materials from a reliable sources and storage;
- Testing of the construction materials;
- Acquisition of other permits such as water borehole drilling & use permits;
- Confirmation of data and accuracy of topographical survey;
- Mobilization of labour force, equipment and plant for construction works;
- Application and acquisition of permits [BH Drilling Permit, Water Use Permit, OSHA License, Fire Certificate, Approvals from TANROADS, TANESCO, DAWASA e.t.c]

The land for proposed construction of bridge and approaching roads shall be within the established road reserve with 60meters on both sides of the centre line. During construction, the corridor for the works shall be 45m to accommodate traffic, demolition works, supply of materials, excavation works e.t.c. There is no expected demolition of people's properties. In addition, the contractor shall be required to prepare the specific Contractor's ESMP and submit to TANROADS for approval before starting the actual construction.

2.4.2.1 Laydown Area

During construction, accessible laydown area is required, existing DART Terminal at Jangwani has been observed as a feasible location. The space at the back of the DART building (See Figure 2-18) has an approximate size of 30,000m² which is possible to accommodate Engineer's office, Contractor's Camp, Asphalt Plant, Material s' storage and contractor's plant and equipment. Currently, DART management is on arrangement to shift from Jangwani Terminal to Ubungu, the New DART Terminal at Ubungu has been completed, has a capacity to accommodate 80 buses.



Figure 2-8: Proposed Site for Project's Laydown Area

Source: Google Earth, Edited by Eng. Nanai

2.4.2.2 Asphalt Plant

The project shall use asphalt concrete during construction of the proposed bridge that necessitate the installation of Asphalt Plant. The plant shall be installed at the proposed contractor's camp as indicated in section 2.8 above.

2.4.3 Project Construction Phase

The construction phase for the proposed new Jangwani Bridge is expected to be 21 months. During this phase, both skilled and unskilled temporary employment opportunities will be created. It is difficult to specify the actual number of employment opportunities that will be created at this stage; however approximately 300 direct employment opportunities are expected to be created during the construction

phase. However, it should be noted that employment during the construction phase will be temporary and none during the operational phase.

Below is a summary of activities during mobilization and construction phase of the proposed project;

- Dredging of the bridge section;
- Dismantle the existing bridge
- Construction of temporary bridges
- Construction of a new bridge
- Earthworks;
- Abstraction and transportation of water to the construction site;
- Collection, storage, transportation and disposal of wastes generated from construction activities;
- Disposal of contaminated sediments
- Dismantle temporary facilities (e.g. bridges, camps).
- Traffic management
- Occupational health and safety management; and
- Landscaping and environmental restoration.

The contractor shall use specialized demolition equipment to minimize generation of noise and demolition time. Wastes generated shall be collected, transported and disposed at Pugu Kinyamwezi dumpsite.

As construction progresses towards the end demobilization phase shall begin. Demobilization will be done for proper restoration of the site after completion of construction activities such as removing/spreading top-soils piled around the site, removing all temporary structures, campsites/offices e.t.c. Other activities shall include clearance of all sorts of wastes including used oil, sewage, solid wastes (plastics, wood, metal, papers, etc).

This shall also involve termination of temporary employments and subcontracts before handing over the project to TANROADS for operation.

2.4.3.1 Dredging for Bridge Foundation

The New Bridge construction works shall require heavy machinery for installation of foundation piles, construction of bridge piers and launching of bridge sections. Existing soft ground/river bed and portion of the bridge section under water are the main construction challenges imposed by the site environment. Between the top soil/ the river bed and existing bridge an opening of approximately 50cm has remained for water passage as a result of siltation consisting of accumulated layers of soft sand resulting from river's erosion upstream.



Picture 2-1: Narrow Water Passage & Accumulated Sand Resulting from River's Erosion
Site Picture: August 2023

To allow bridge construction works to be carried out, dredging of the project's core area covering the length of the bridge and 60m width (RoW) shall be done by the Bridge Contractor. In the event of heavy rain, the contractor shall dredge the river to remove siltation and allow the normal hydraulics of the river. The activity is expected to take place only if the contractor is caught with heavy rains during construction. The extent of dredging would be similar to the activities of the existing contractor engaged by TANROADS on performance based contract. The bills of quantities for the project has allowed up to 307,625 m³ of dredged quantities for the bridge contractor to cater for unexpected weather changes.

However; there shall be dredging for flood mitigation, the activity shall be under LMUP which involve 500m upstream and 1800m downstream of the proposed bridge.

The dredging is expected to take place via (long boom) excavators and dump trucks along the trajectory to be dredged. The dredged material shall be temporarily placed along the river bed while being reused for terracing by LMUP. The piles of dredged materials shall be protected against rivers running water by using perimeter controls. The land requirement for dredged material is estimated to 40 acres.

Construction projects in waterway restoration and protection like the proposed Jangwani Bridge require larger reach and lift capability while still meeting goals for productivity, operating cost, safety, environmental awareness and transportability. The hydraulic excavator models to be used for the task must include a range of stick and boom length options and offer undercarriage options of multiple track shoe widths and types for different conditions.

- For the dredging method / sequence, the following shall be taken into account. During the bridge construction period, as long as the 2 existing box culverts exist, these shall be kept open over a distance of 15 m upstream and downstream of the inlet and outlet (as the raised road will block the discharge over the existing road level, in case of extreme floods during the construction period as long as the new bridge is not yet open).
- During bridge construction period, after initial completion, ensuring that the river has sufficient hydraulic capacity to reduce the flood risk of Morogoro road during construction. This can be

included by maintaining a certain river stretch, e.g. within 200 m upstream and 200 m downstream of the bridge as per design dredge profile with a maximum increase of river bed level of 0.5 m (due to sedimentation), until demolishing of the 2 bridge decks of the existing bridge. Another option could be to include this type of maintenance dredging in the contract as a re-measurable quantity based on the instruction of the Engineer.

- The dredged material were assessed during design and found to be safe for use for the purposes such as terracing and landscaping as it does not contain toxic material. Dredged material will be collected and stockpiled for reuse by the LMUP. If excess is found will be disposed under the main LMUP project since the core activity for the Jangwani bridge project is not river dredging.

2.4.3.2 Construction of temporary bridge and overall traffic management

In order to achieve the overall project objective of designing a new bridge over the Jangwani valley with minimal disruption of traffic during construction is required. The proposed construction method has been designed to accommodate traffic both motorised and non motorised as well as pedestrian during construction of the bridge. Generally, it is designed to; Allow uninterrupted traffic flow, Ensure the continuous operation of the BRT system, and to keep the ability to cross the Jangwani valley at this location.

Phasing of traffic Management

Preparatory work shall involve the following;

- a. Construction of temporary bridge for cyclists and pedestrians (indicated in yellow in Figure below;
 - i. To allow for two-way pedestrian & cyclist traffic
 - ii. The minimum width of 5 m for each direction. i.e. 1 bridge is minimum width of 10m. If two bridges are to be installed, the minimum width per bridge is 5m
 - b. Removal of BRT Bus stop and Bus lanes (indicated in yellow in Figure 2.18 below)
 - i. Kerbs and other obstacles are to be removed to allow traffic flow through all available space
 - ii. The removal of kerbs and bus stop should be done without obstructing BRT busses
 - c. Preparation temporary traffic Phase 1 (indicated in brown in Figure below)
 - i. Widen embankment at the northern part to accompany all traffic
 - ii. Install temporary pavement
 - iii. Indicate all temporary traffic lanes with temporary markings
- Decrease lane sizes to allow two-way traffic on the old Jangwani bridge
- Decrease lane sizes in the western part of the embankment to allow for traffic flow in both directions in the confined road section (confined by retaining walls)



Figure 2-18: Schematization of preparation works for Temporary Traffic

Phase 1 of traffic management shall include

- Move all traffic to the northern part of the bridge & embankment (indicated in green in Figure 2-19)
- Construct the Southern Part of the new bridge and the new embankment (indicated in red in Figure 7-2)
- Prepare the Southern Part of the new bridge and new embankment for temporary traffic (indicated in red in Figure 2-19)
 - Indicate temporary traffic lanes with temporary markings
 - Lanes to be indicated as per Drawings Road

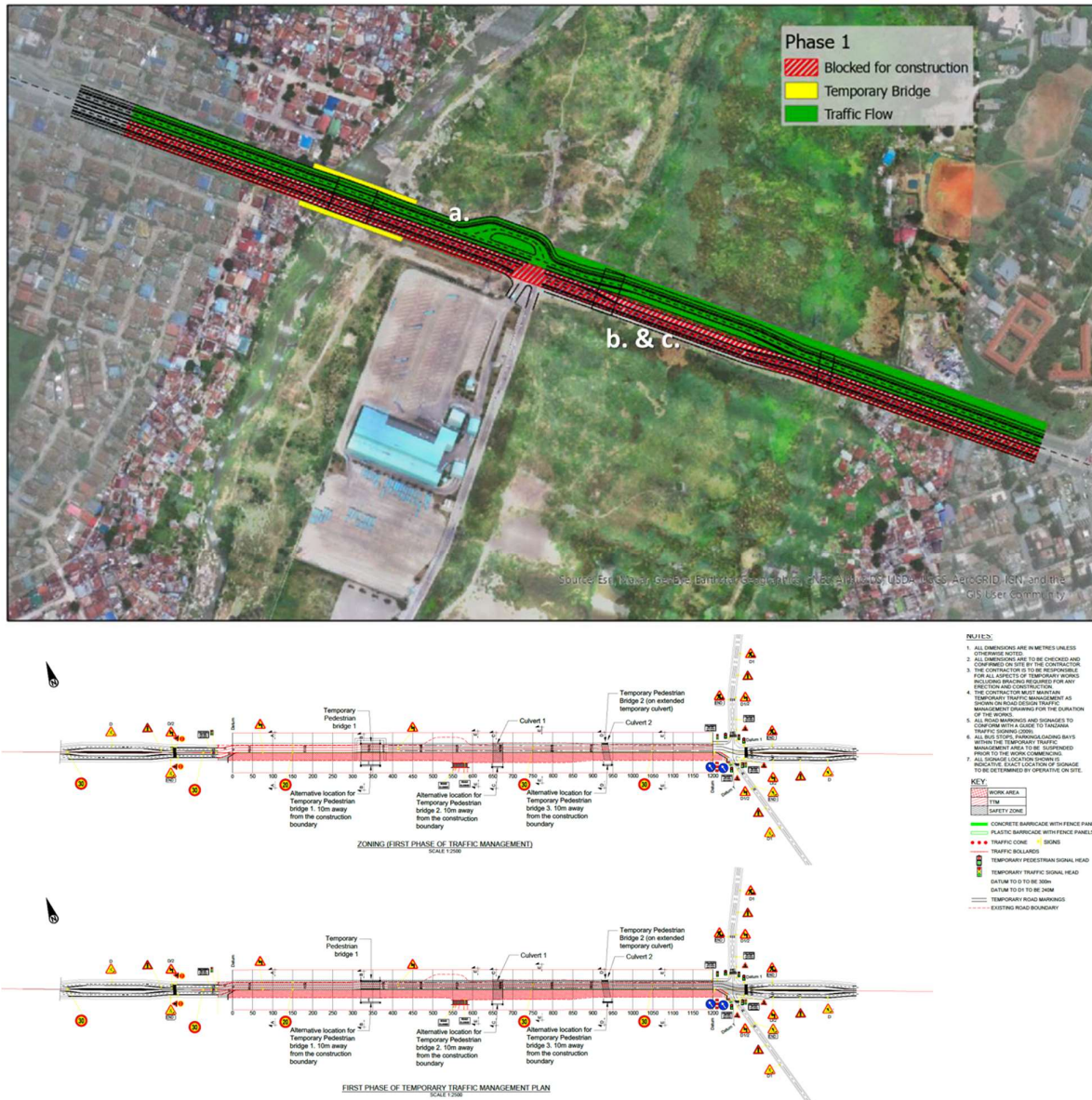


Figure 2-19: Schematization of Temporary Traffic Management- Phase 1

Phase 2 shall involve;

- a. Move all traffic to the Southern part, on the newly constructed bridge section (indicated in green in Figure 2-20)
- b. Construct Northern Part of the new bridge and the new embankment (indicated in red in Figure 2-20)

2.4.3.4 Construction Method for the Road

The basic width of the elevated Morogoro road will be similar to the idealised cross-section shown in Figure 2-6. In cross-section the embankment maybe be raised in two or three steps depending on the traffic management plan, equipment, construction speed and preferences of the Contractor.

The construction phase will include:

- Temporary widening
- Temporary pavement
- Traffic diversion
- Removal of existing pavement and foundation layers
- Widening and raising of the embankment in multiple steps of filling and compacting
- Apply and compact the foundation layers
- Apply pavement to finished road level, including suitable gradients for drainage purposes
- Install lighting and road furniture.

Proper construction sequencing / phasing and well-thought traffic management plan are essential for minimising traffic hindrance.

2.4.3.5 Demolition of the existing bridge and other facilities

The demolition of the existing bridge will be done in phases after opening the pedestrian and cycling bridge before construction of the new deck of the bridge. This will involve removal of superstructure and Substructure of existing bridge except piles and pile caps.

The existing 2 box culverts shall also be removed after the diversion of the traffic. The activity will involve removal of 2 box culvert and slabs including headwalls, wingwall and apron.

The BRT Bus station at Jangwani will be removed before the actual construction starts. It will involve removal of existing BRT Bus Station at Jangwani; approximately 680m² plinth area comprising of concrete foundations and walls, steel framing and structural walls; Aluminium glazed windows and doors.

All works shall be done as per Engineer's direction

2.4.3.6 Culverts' Replacement

Scheduling of the construction activities for the bridge is very important to ensure no activity hinders progress of other activities under the project. Construction of the bridge is likely to be done during both rain and dry seasons. Construction during the rain season is considered to be challenging due to the flowing river water that requires temporary drainage measures to be established. Construction staging shall be done to overcome the challenge.

Replacing of the culverts is expected to affect the traffic, to minimize the disruption to the community/road users. A full closure with a temporary detour is always the preferred option, as it has the lowest overall cost and construction duration. However, a full closure is not possible, and traffic needs to be maintained on-site, by being shifted away from the culvert.

The activity shall require the culvert to be replaced in multiple stages. To protect both workers and vehicles, temporary construction barriers shall be installed within the work zone limits. Replacement Sequence shall be as follows:

Step 1: Set up of traffic control devices and stage 1 configuration.

Step 2: Installation of environmental protection measures (i.e. sandbags, turbidity curtains) upstream and downstream of the culvert. Subsequently, excavate for new footing installation and expose the existing culvert.

Step 3: Construction of a thick concrete working slab for the precast concrete footings without dewatering.

Step 4: Removal of the top portion of the existing culvert and installation of a sandbag cofferdam around the concrete working slab.

Step 5: Installation of precast concrete footing to achieve the top of footing design elevations.

Step 6: Removal of water from within the sandbag cofferdam and fill the gap between the working slab and the bottom of the footing with non-shrink grout.

Step 7: Removal of remaining portion of the existing culvert and install new streambed material within the new culvert channel. Subsequently, installation of the precast prestressed top slab units complete with waterproofing.

Step 8: Install waterproofing across the top slab, backfill the structure, and reinstate the roadway.

The above-noted steps shall then be repeated to install the upstream end of the new culvert in stages 2 and others.

2.4.4 Project Operation Phase

Once the construction phase is completed, the bridge will start to operate to serve the intended purposes. The activities that are expected to be executed during operational phase include:

- Transportation of goods, people and services
- Bridge and Facilities maintenance

Due to consistent use of the bridge during operational phase there will be a routine maintenance as the results of wear and tear of the bridge that will affect its quality. Therefore, the bridge will require maintenance throughout the project life. Among others, the maintenance works will include:

- Repainting of marks and signs
- Management of vegetation for erosion protection
- River Cleaning including dredging and
- Repairing cracks on the structure

River cleaning and dredging shall be done by mechanical means just after ending of seasonal rains to provide enough channel depth on either side of the bridge. Sand material is the main dredged material expected due to nature of the river's bed. The river will be dredged in slices of 150mm up to the required depth. Cleaning and dredging procedures shall involve Wami Ruvu Water Basin from the first place. Cleaned waste shall be disposed at Pugu Kinyamwezi dumpsite while Sand shall be used for other construction projects.

2.4.5 Sources for Construction Materials

Project's construction materials are within the project's area or easily transported to, as indicated on table 2-13 below.

Table 2-5: Types and Sources of Construction Materials for Construction of Jangwani Bridge & Approaching Roads

S/No	Type of Construction Material	Unit	Quantity	Source/s
1	Sand	M3	6600	Pugu Sand Mines & River's Excavations
2	Cement	Ton	13200	Twiga/Nyati/Dangote cement Depots
3	Aggregates	M3	19800	Lugoba quarries
4	Reinforcements/Steel	Ton	420	Steel factories in Dar es Salaam
5	Timber	M3	600	Sao Hill in Mafinga
6	Stones	M3	3400	Lugoba quarries

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

Borrow Areas: Based on investigations conducted by TANROADS, the possible borrow areas/sites for the New Jangwani Bridge construction are: Mji Mwema (Mbutu), Boko and Kisarawe Vigama (3BP were identified). All the three locations are for coral gravels.

Sand Sources: Chamazi sand Mine, Mpiji River, Mbande Sand Mine as well as Pit 1&2 at Kazimzumbwi in Kisarawe have been identified as feasible sand sources for the project.

The identified sources are currently used by other projects in Dar es Salaam and Pwani regions. However; the Bridge construction Contractor shall be required to confirm the quality of the sources prior to start of the construction activities.

Quarry Sites: The Lugoba and Msata quarries are operational and are the only sources of granite aggregates which are used within the Dar es Salaam and Coast regions. The crushed aggregates from these two quarries comply with the Tanzanian Standard Specification for Road Works (2000).

2.4.6 Water Supply

Water during construction of the bridge shall be drawn from DAWASA network as well as deep borehole to be drilled near the project site, additional water sources identified include: Kizinga River in Temeke, Msimbazi River near Magomeni Bridge and Commercial borehole in Kisarawe. The construction activities are expected to use water optimally, an average of 30m³ per day.

2.4.7 Power Supply for the Project

Power supply for the proposed project's construction activities will be provided by TANESCO and generators for performing hot works, lighting etc. During operation phase of the bridge, the project ancillaries might use solar power or connected with TANESCO power lines where necessary.

2.4.8 Storm Water Management

Storm water drainage system shall be constructed within the project campsite depending on the landscape and catchment areas required as well as along the bridge's approaching roads on both sides. Collected storm water will be directed to the existing drainage pattern of the area.

2.4.9 Waste Generation During Construction

Construction phase is expected to generate more solid and liquid wastes than operation phase. Types and management of wastes from the project construction are described hereunder.

2.4.10 Solid Wastes

Solid wastes during construction includes: demolition and construction wastes, top soil, gravel, scrap metals, tins and drums cement bags and domestic solid wastes including plastics and food left overs. Waste management systems will be designed at the project site to ensure solid wastes are well stored before disposal and a waste transfer station for domestic waste. During operation phase, solid wastes may include plastic bottles thrown by users mainly littering and others things falling from trucks, however due to enforcement of environmental law and regulations such behavior is being regulated.

Pugu Kinyamwezi shall be used for disposal of non-hazardous solid waste. Certified hazardous waste contractor shall be deployed for collection and disposal of hazardous wastes.

2.4.11 Liquid Waste

Liquid wastes will be generated during construction phase mainly through domestic use on the camping area. This will result from showers and sanitary conveniences for construction workers at the camp. Waste water systems will be designed on the camping areas to ensure waste water will be collected and disposed through septic tanks and soak pits. The disposal of the wastewater generated at the construction campsite has the potential to have a minor negative impact on groundwater. During operation liquid wastes may include oil spills from trucks.

2.4.12 Construction Waste

The project shall generate Construction and Demolition waste material that can be separated into several categories, which allow for recycling and re-use. Although this may be time and labour intensive, material for re-use and recycling has increased in popularity and value all over Tanzania. High disposal costs at waste disposal grounds, due to volume and weight reduction, can be avoided through material separation. The table below identifies the possible construction/demolition wastes to be generated during the project's implementation and the potential re-use and recycling options for separated materials.

2.4.13 Solid Waste Inventory

Table 2-10 below lists types and estimated quantities expected to be generated during implementation of construction activities for the New Jangwani Bridge. The inventory has also proposed disposal/treatment methods for each type of waste.

Table 2-6: Types, Amounts and Treatment/Disposal of Wastes during Construction Phase

Waste	Types	Estimated Amount	Disposal /Treatment
Solid Waste (Degradable)	Vegetation (Trees and Grasses)	200m3	Source of Cooking Energy for Residents Near the Project

Solid Waste (Non-Degradable)	Scrap metals, drums	500kg per month	Sold to Licensed Recycles/Vendors
	Asphalt, Concrete, Tins, Glasses and Plastics	100kg per month	Disposed at Pugu Kinyamwezi Dumpsite
Liquid Waste	Sanitary	16.8m3/day	Onsite Pits
Hazardous	Used Oils	150Lts/Month	Contracted to Certified Hazardous waste Collector
	Used Oil Filters	12Nos/Month	
	Used batteries	5Nos/Month	
Existing Bridge & Road Demolition	asphalt	660m3	crushed and mixed with new asphalt; road sub-base
	concrete (without rebar)	900m3	road sub-base; re-used in concrete; concrete blocks; fill material; rip-rap on roads/river banks
	concrete (with rebar)		fill material; rip-rap
	separated rebar; metal signs; sign posts; guardrails; culverts	65Tons	re-use for original purpose, processing at a steel mill/Sold to Licenced Collectors
	fill materials (earth, gravel, sand)	3,300m3	clean fill material; landscaping material; cover for exhausted waste dumpsites
Excavation/Leveling Waste	topsoil	2,100m3	landscaping; residential fill; cover for exhausted waste dumpsites; agricultural
	sand	6,300m3	fill; residential; road construction
	earth contaminated with wood; buried utilities	2,100m3	cover for exhausted waste dumpsites
Site clearance	trees and brush	10m3	firewood; landscaping chips; composting; disposal at authorized dump sites
	soils	330m3	landscaping agricultural and residential fill
	mixed concrete, rubble	50m3	land reclamation fill; bank stabilization/rip rap or cover for exhausted waste dumpsites

2.5 Waste Generation During Operation

During operation, wastes may be generated from specific maintenance operations (e.g. road re-surfacing, upkeep of landscaped areas) and may include asphalt, concrete and organic wastes (vegetation) and littering by the public using the bridge. The total volumes and types of waste materials will be dependent upon the nature and frequency of the maintenance works undertaken and cannot be accurately estimated at this stage.

2.6 Project Schedule and Life

Site preparation for the proposed Jangwani bridge project is expected to start soon after approval of all related studies, engineering designs, environmental clearance and construction tender award in 2022. The designed life for the bridge is 120 years as specified in BS 5400: Part 1.

2.7 Estimated Project Cost

The cost estimate for the bridge is approximately 70 Million USD covering construction costs, river training, protection works, which is based on the designs developed and approaching roads of 0.59 Km.

2.8 Proposed Design Modifications

During stakeholders' consultation process, views/concerns on the bridge design were collected and should be incorporated to ensure usability by different groups in communities.

- Bridge design should be iconic so as it accommodates the development that the Government intends to undertake in the Jangwani Valley area
- Design should consider to increase the length of bridge near to Fire traffic light area, because during rainy season water will flood all the area.
- Provision of safe pedestrian crossing points based on pedestrian desire lines
- Ensure step-free access for persons with disabilities
- Mitigate use of pedestrian footpaths by motorcycle riders
- Use of tactile paving- to help alert persons with visual impairment

3 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

3.1 Overview

This section is aimed at reviewing relevant environmental resource and planning legislations and regulations to ensure that “Upgrading of the Jangwani Bridge” meets policy and legislative criteria, and that relevant requirements are built into project design and implementation. The policy review also outlines specific procedures and measures to be carried out before, during and after project development.

3.2 National Policies

Environmental awareness in the country has significantly increased in recent years. The government has been developing and reviewing national policies to address environmental management in various sectors. Among others, the objective of these policies is to regulate the development undertaken within respective sectors so that they are not undertaken at the expense of the environment. The national policies that address environmental management as far as the Project is concerned and which form the corner stone of the present study include the following:

3.2.1 National Environment Policy 2021

The National Environmental Policy serves as a national framework for planning and sustainable management of the environment in a coordinated, holistic and adaptive approach taking into consideration the prevailing and emerging environmental challenges as well as national and international development issues. It is worth noting that, effective implementation of this policy requires mainstreaming of environmental issues at all levels, strengthening institutional governance and public participation in environmental management regime. Subsection 1.2.11-In order to strengthen gender mainstreaming efforts in environment and natural resources management there is need to integrate gender aspects in environmental management by considering all social groups and raising awareness on the roles of gender in environmental management..

Section 3.6 states that; The Government shall: i) Promote green technologies and integrated management of municipal waste, chemicals waste; e-waste and waste emanated from oil and gas operations; ii) Strengthen national capacity in waste management, urban planning and control of noise pollution; iii) Enhance collaboration with Private Sector to address environmental pollution; iv) Enhance public awareness and participation in pollution control; and v) Enhance regional and international cooperation on pollution control.

The proposed Upgrading of the Jangwani Bridge has observed the policy objectives by addressing environmental impacts through ESIA study. The project shall also ensure all wastes generated by the project are effectively managed throughout the construction period. During construction, both TANROADS and contractor shall ensure involvement of females in project’s environment management activities that will be implemented by the project for the purpose of preventing and minimizing environmental and social impacts resulted from the project activities.

3.2.2 National Employment Policy 2008

Due to the growing number of unemployed labor force, the specific objective of the National Employment Policy was to provide strategies for employment creation and sustainability. Among its specific objectives is section 3.5 improvement and transformation of the informal sector for creating decent jobs, section 3.7 facilitates Tanzania job seekers to acquire appropriate skills and section 3.9 employment of individual through enhancing accessibility to business support services including capital, market access for private sector entrepreneurs including self-employers for increased productivity and income.

The project will contribute to the achievement of the objectives of this Policy. During construction phase, approximately 300 direct employment opportunities are expected to be created for both skilled and unskilled labour. The project will also provide self-employment for food business and small retailers along the project site. Cumulative impact of employment of other components of the project are also expected to be significant.

During the project operation phase, the bridge will bring business development, open up markets, and facilitate the growth of the economy of Dar es salaam and its outskirts as travel time to and from the CBD will be reduced and there will be no further closing of the Morogoro Road during rainy seasons.

3.2.3 National Land Policy, 1997

The policy requires that, in accordance with sub-section 7.1.1, before any development activity is taken on the land, the government will ensure that permits, licenses, claims and rights for exploitation of natural resources are issued in line with land use policies, and environment conservation policies and programs.

Some of the key Objectives of the policy are presented in section 2.4 to ensure that land is put to its most productive use to promote rapid social and economic development of the country and section 2.8 to protect land resources from degradation for sustainable development.

On land tenure, the policy dictates in subsection 4.1.1 (I) c) that the rights and interests of citizens in land shall not be taken without due process of the law and paragraph (d) that full, fair and prompt compensation shall be paid when land is acquired.

On compensation for acquiring land, The Policy dictates in subsection 4.2.20 that in order to reduce problems, compensation for land acquired for public interest will be based on the concept of opportunity cost including (i) market value of the real property (ii) disturbance allowance (iii) transport allowance (iv) loss of profit or accommodation (v) cost of acquiring or getting the subject land (vi) any other cost or capital expenditure incurred to the development of the subject land.

The proposed upgrading of the Jangwani Bridge Project will contribute to the achievement of the objectives of this Policy. It will promote social economic development of the area and be able to connect both sides of the valley.

The proposed project will ensure that soil erosion measures are taken into consideration during construction and Mangrove management plan is put forth so as to protect land resource (from degradation for sustainable development. In addition, the project will use land planned for road use, thus its construction will have no consequences for people .

3.2.4 The Construction Industry Policy 2003

The National Construction Industry Policy aims to create an enabling environment for the development of a vibrant, efficient and sustainable local industry that meets the demand for its services to support sustainable economic and social development objectives. One of the key objectives of the Policy in section 7.2 (b) is to emphasize the development of an efficient and self-sustaining roads network that is capable of meeting the diverse needs for construction, rehabilitation and maintenance of civil works for trunk, regional, districts and feeder roads network.

Also subject to paragraph (c) to improve capacity of public sector and private sector client so as to ensure efficient transparent and effective implementation and management of construction project. The policy

directs that the government shall ensure both local and donor procurement policies provide a comprehensive framework for fostering the local construction industry in Tanzania. And paragraph (g) to mobilize adequate resource from public sector and private sector for construction and maintenance of public infrastructure.

The proposed bridge project will lead to the achievement of the policy's objectives because its construction accommodates various road users' needs. The design aims to increase the bridge's carrying capacity, accessibility efficiently and self-sustaining capable of meeting the diverse needs for construction industry.

The government of Tanzania with co finance of the World Bank has set a budget of 70 Million USD for the upgrading of the Jangwani Bridge Project purposefully to provide accessibility to residents and other economic activities. The bridge will open up more areas and stimulate economic and social development that is needed for the development construction industry in the country.

3.2.5 National Mineral Policy 2009

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

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

The proposed project will lead to the achievement of the objectives of the mining policy by using locally available sources for sand, gravel, aggregates etc. as part of implementation of policy's objectives.

3.2.6 Human Settlement Development Policy 2000

The policy defines Human settlement as not simply housing, merely the physical structure of the city town or village but an integrated combination of all human activity processes including residence, education, health, work, culture, leisure and the physical structure that support them.

One of the key objectives of the policy in section 3.2(ii) is to promote level of provision of infrastructure and social services for sustainable human settlement development and (iii) to facilitate level of employment opportunities and eradication of poverty. The policy states that Infrastructure and services constitute the backbone of urban economies and economic activities. Therefore, all-weather roads for efficient transport are essential for increased productivity and the establishment of manufacturing industries. Lack of roads and other services in many settlement results to poor environmental condition.

The proposed bridge project will complement the objectives of this policy. The construction will provide efficient year-round transportation services. This will stimulate development of trade and increase accessibility to other social services that are needed for individual and national development including development of the project areas.

3.2.7 National Water Policy 2002

One of the key objective of water policy in subsection 4.1.1 is to have in place fair and equal procedures in access to and allocation of water resources so that all social and economic activities are able to

maximize their capacities; subsection 4.1.2 to have criteria for prioritization of water allocations so as to ensure that socio-economic activities and the environment receive their adequate share of the water resources on the basis of its availability, and to enable the sectors increase productivity and to mitigate conflicts.

Section 2 of this Policy explains that water is a basic natural resource for sustenance of life and for socio-economic development. Many social and economic activities rely heavily on availability of adequate supply of fresh water. As a sink, water sources are used as receptors for wastewater discharges from industrial, municipal and agricultural sources. Deliberate efforts are, therefore, needed towards protection and sustaining the resource and to ensure that it is used efficiently and effectively for the benefit of the present and future generation.

Chapter 4 of this policy dictates that all water abstractions and effluent discharges into water bodies shall be subject to a "water use permit" or "discharge permit" to be issued for a specific duration. Water use permits shall be issued only for a determined beneficial water use. Procedures, criteria and guidelines for issuing of the permits will be prepared and operationalized.

The construction activities of the upgrading of the Jangwani Bridge is anticipated to require the contractor in collaboration with relevant authorities to obtain temporary water use permit as well as waste water discharge permit.

The bridge construction activities are likely to result in contamination of the Msimbazi valley and the Indian Ocean due to debris transported by runoff. The construction will also likely to result in soil erosion from earth cutting and filling activities. Construction activities including water diversion at bridges' sites are susceptible to alter the natural drainage flows. The project through the contractor/proponent is committed to adhere to waste management procedures, best practices on earth cuts and fills to safeguard the valley and the Indian Ocean.

3.2.8 Policy on HIV/AIDS Policy 2001

HIV/AIDS is a major National crisis that affects all sectors at all levels. Therefore one of the main objectives of the policy is to prevent transmission of HIV/AIDS through various strategies such as section 3.2 (a) i) to create and sustain an increased awareness of HIV/AIDS through targeted advocacy, information, education, and communication for behaviour change at all levels by all sectors. This hinges on effective community involvement and empowerment to develop appropriate approaches in prevention of HIV Infection, care and support to those infected and affected by the epidemic including widows and orphans. The policy emphasizes on coordinated and effective multi-sectoral approach towards curbing this epidemic and to mobilize adequate financial resources for HIV/AIDS activities, and calls forth for every sector to budget, raise funds and mobilize material and human resources for its own HIV/AIDS prevention and control activities.

HIV/AIDS awareness and education will be provided by the PIU and the contractor on the project areas during feasibility phase and construction phase.

3.2.9 Women and Gender Development Policy 2000

The main objective of the Policy in section 12 is to create an enabling environment for women and men to fulfill their roles in society based on gender needs. Also, this policy aims at balancing the gaps in women's participation in development activities. The policy enables Tanzanian women to participate effectively and efficiently in identifying their potential and identifying problems and resolving them by using available resources to supplement their income and alleviate poverty as a whole and bring a better

life. This includes the ability to make decisions in various areas of implementation. The policy has taken into account that in achieving that goal men must fulfill their roles in our communities and thus engage with women in various social and economic roles.

The policy dictates in section 34 that in order for both women and men to be involved, to ensure that the contribution of women and men to the development of the nation is recognized and appreciated and to ensure both men and women actively participate in development project. The project complements the objectives of this policy and thus ensures that both men and women are involved in the success of the project, they are involved in the Environmental and Social Impact study and will continue to be involved in the process through employment opportunities.

3.2.10 National Transport Policy 2011

The vision of the policy is to have efficient and cost-effective domestic and international transport services to all segments of the population and sectors of the national economy with maximum safety and minimum environmental degradation.

And the mission is to develop safe, reliable, effective, efficient and fully integrated transport Infrastructure and Operations which will best meet the needs of travel and transport at improving levels of Service at lower costs in a manner, which supports government strategies for, socio-economic Development whilst being economically and environmentally sustainable.

The proposed project is in line with the policy's vision and mission since it will provide service to the population of Dar Es Salaam Region and its outskirts, the upgrading of the bridge shall facilitate economic boost through provision of reliable and timely transportation of people, raw materials to the industries and finished products to various markets.

3.3 Legal Framework

3.3.1 Environmental Management Act (2004)

One of the key objectives of this Act in the provisions of Part II, section 7(1) is to provide for and promote the enhancement, protection, conservation and management of the environment. In order to attain the objective of this Act several principles should be observed including subsection (3) e) Public participation principle which requires the involvement of people in development project policies, plans, and processes for the management of the environment. Subsection (3) h) the generation of wastes be minimized, wherever practicable wastes should in order of priority be re-used, re-cycled, recovered and disposed safely in a manner that avoids creating adverse effect or if this is not practicable is least likable to cause adverse effects. The proposed project will comply with the objective of this Act by ensuring effective implementation of Environmental Management Plan including public participation in project development and waste management plan in each phase of the project development.

The provisions of Part V section 60(1) requires that an applicant for water use permit issued under relevant laws governing management of water resources, abstraction and use of water shall be required to make a statement on the likely impact on the environment due to the use of water requested.

The proposed project's construction will require the contractor to apply for water use permit issued under relevant governing laws and as required by this Act.

The provisions of Part VI section 81(1) requires that any person being a proponent or a developer of the project or undertaking of any type specified in the third schedule of this act to which environmental Impact Assessment is required to be made by the law governing such project or undertaking or in the absence of

such law by regulation made by the minister shall undertake or cause to be undertaken at his own cost environmental Impact Assessment study.

The bridge project is listed as the project which require EIA in the third schedule section 3 of this Act. The project complies with the provisions of this section by conducting EIA prior to project design and execution.

Subject to the provisions of section 110(2) which requires that a person who discharges any hazardous substances, chemical oil or mixture containing oil in any water or any other segment of the environment commits an offense. And (4) it will be duty of every organization producing, transporting, trading, storing and disposing of such wastes. The bridge project will comply with the provisions of this section by ensuring proper management of hazardous substances, chemical and oils as recommended in the Environmental Management Plan.

3.3.2 Road Act (2007)

The Road Act provide provisions on road management including the road authority and responsibilities of each actor; road classification and declaration of roads including required procedures and authority; execution of road works including procedures, power and right of land holders; road safety including required road furniture and signs; road construction access and rights of notice to affected land holders and restriction on the use of the road including during construction and weight during operation.

According to the first schedule to this Act and the provisions of part III, section 11 and section 12 (b) which shows road classification and reclassification, the proposed bridge project classifies as a public road.

The provisions of Part III section 14 subsection (2) b) requires that survey should be carried out by a professional surveyor. In addition, the authenticated plans or survey shall be submitted to the Director of Surveys and Mapping for registration as directed in the provisions of subsection (3). The proposed bridge project complies with the provisions of this section by ensuring that the survey has been carried out by professional surveyors and the authenticated plans will be submitted to Director of survey and mapping for registration as required by this Act.

The provisions of Part III, section 16 of this Act directs that where it becomes necessary for the road authority to acquire a land owned by any person for the purposes of this Act, the owner of such land shall be entitled to compensation for any development on such land in accordance with the Land Acquisition Act. Land Act, Village Land Act and any other written law. The proposed bridge project will ensure to comply with this Act as directed in the provision of this section by conducting Resettlement Action Plan whereby all affected parties will be fairly evaluated for their properties and compensated.

The provision of Part VII, section 42 (1) requires that notwithstanding anything contained in any other written law regulating the maximum weight, speed and dimensions to be carried on any public road. During the operation phase, the proposed project under TANROADs shall ensure to comply with the provision of this Act for the purpose of safeguarding the safety of the public or of preserving the condition of bridge by fixing a limit to the maximum weight, speed or dimensions of vehicles which may lawfully be driven or hauled over any part of a road.

3.3.3 Energy and Water Utilities Authority (EWURA) Act (2001)

This Act provides guidance in EWURA administrative system by specifying roles and responsibilities of every actor and related stakeholders, power and proceedings of authority, complains and dispute resolutions, enforcement and compliance.

The provision Part II section 6(f) dictates that it shall be the duty of authority (Energy and Water Utilities Regulatory Authority) to enhance the welfare of Tanzanians society by taking into account the need to protect and preserve the environment. The proposed project through the contractor shall take into account the need to preserve and protect environment by ensuring good storage and transportation of fuel, control oil seepage and ensure proper re-use or disposal of waste oil.

3.3.4 Water Resources Management Act No 11 of (2009)

The Act provides a description of water resource management framework in Tanzania including roles and responsibilities of every actor and related stakeholders. One of the Key objectives of this Act in Part II section 4(1) is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways which take into account the fundamental principles of sustainability including subsection (h) preventing and controlling pollution and degradation of water resources. The proposed bridge project will adhere to the objective of this Act by ensuring that water sources are protected from pollution during construction.

The provision of Part VI, section 39(1) requires that the owner or occupier of land on which any activity or process is performed which is likely to cause pollution of a water source, shall take all reasonable measures to prevent any such pollution from occurring, continuing or recurring. The proposed bridge project will comply with this Act by adhering to proper waste management practices during construction activities.

3.3.5 Mining Act 2010

This Act provides guidance on general principles, administrative system of mineral in Tanzania and responsibilities of each actor and related stakeholders, categorizations of mineral rights, types of mineral licenses, charges, right of entry, registration and dispute settlement.

One of the key general principles of this Act in Part II, section 6(1) states that no person shall, on or in any land to which this Act applies, prospect for minerals or carry-on mining operations except under the authority of a mineral right granted or deemed to have been granted, under this Act. However, section 7(3) states that nothing in this Act shall prevent any person engaged in the construction of tunnels, road, dams, aerodromes and similar public works of an engineering nature from utilizing as building materials any minerals derived from a source approved by the Minister in writing. The proposed project will comply with the provisions of this Act by ensuring that all quarrying and sand mining activities are done in the sources approved by the Ministry as required.

3.3.6 Occupational Health and Safety Act (2003)

This act provides guidance on health and safety administrative system and responsibilities of every actor, requirements and procedures for registration of workplaces, safety provision, health and welfare provisions, safety special provision, hazardous material and processes, chemical handling provisions, offences penalties and regal proceedings.

The provisions of Part III, section 15 requires that there shall be a register of work place in which inspector shall enter such particulars in relation to every work place as he may consider necessary for the purpose of this Act and subject to section 16(1) that any person being an occupier of the work place shall before operations be required to register under this Act. The proposed upgrading of the Jangwani Bridge project will comply with the provisions of this Act by ensuring that the contractor registers the work place by following all required procedures under this Act.

3.3.7 HIV and AIDS (Prevention and Control) Act No. 28/08 (2008)

The HIV and AIDS Act gives provision of general duties by specifying general responsibilities of every actor, emphasize on provision of public education and programs on HIV and AIDS, testing and counselling, confidentiality, health and support services, stigma and discrimination, rights and obligations of persons living with HIV and offences and penalties.

The provisions of Part II, section 4(1) a) requires that Every person, institution and organization living, registered or operating in Tanzania shall, be under the general duty to promote public awareness on causes, modes of transmission, consequences, prevention and control of HIV and AIDS; also, subsection (2) a) and b) integrate or priorities on HIV and AIDS in their proceedings and public appearances; and advocate against stigma and discrimination of people living with HIV and AIDS. The proposed bridge project will comply with the provisions of this Act by ensuring that HIV and AIDS awareness and education is provided to workers and all people living close to the project area.

Subject to the provisions of section 6 (1) that every ministry, department, agency, local government authority, parastatal organization, institution whether public or private, shall design and implement gender and disability responsive HIV and AIDS plans in its respective area and such plans shall be main streamed and implemented within the activities of such sector. Subject to subsection (4) every sector preparing a plan or programme under this section shall before implementation of such plan or programme, submit them to TACAIDS for coordination and advice. The proposed bridge project complies with this Act, it shall implement HIV and AIDS plans that are designed by TANROADs in respect to this Act.

3.3.8 Local Government Laws (Miscellaneous Amendments), No. 13 (2006)

The local government Laws (Miscellaneous Amendments) provides amendments of local government (district authorities) Act, amendment of local government Act (urban authorities), amendment of local government (elections Act), amendment of the regional administration Act. The law has specified roles and responsibilities of every authority and related stakeholders.

The provisions of Part II, section 2, of this Act gives instructions that this part shall read as one with the Local Government (District Authorities) Act, in this Part referred to as the "principal Act".

The principal Act is amended in section 54A (a) in Part III, section 20 (h) of this Act requires to provision and secure enabling environment for successful performance of the duties of the urban authority; paragraph (i) ensure compliance by all persons and urban authorities with appropriate government decisions, guidelines in relation to the promotion of the local government system; and paragraph (j) do such acts and things as shall facilitate or secure the effective, efficient and lawful execution by the urban authorities of the statutory or incidental duties."

The proposed bridge project will comply with the provisions of this Act by ensuring consultation with all levels of local government, including the Dar es salaam City Council, Kinondoni Municipal council, ward executive officers and mtaa executive officers to ensure compliance by all levels of authorities in relation to the promotion of the local government system.

3.3.9 Land Act No. 2/04 (2004), Amendment of the Land Act (1999)

This Act has provided general amendments of Land Act of 1999 by adding section 2 which identifies a "sale" be used as transfer of interest in or over land on condition attached to a granted right of occupancy. Section 19 requires that a person who is in a cooperate body or company made under company ordinance including a corporate body the majority of whose shareholders or owners are non-citizens, may only obtain the offered right of occupancy approved by Tanzania Investment Act 1997 to facilitate compliance with development. Section 20 which clarifies that land acquired by non-citizen will have no value except

shall be paid compensation on unexhausted improvement. Section 37 explains the sale of right of occupancy and repeal and substation of part X that gives guidance on mortgage, Mortgage right of occupancy, lease, sublease and subsequent mortgage. And also explains rights and responsibility of all actors and stakeholders including mortgagor and mortgagee.

The proposed project will ensure to comply with the amendments of this Act.

3.3.10 Land Acquisition Act 1967, Revised in 2012

The act offers clarification on the power of the president to acquire land in the public interest or national economy, compensation on land acquired and related conditions, notice and proceedings where the land is withheld and declaration of right of occupancy.

The provision of part II, section 3 clarify that the President may, subject to the provisions of this Act, acquire any land for any estate or term where such land is required for any public purpose. Subject to paragraph (a) subsection (1) section 5 which clarifies that as seen fit by the president that land in certain locally should be examined for the view to its possible acquisition for public interest then workmen authorized by the minister in his behalf are then allowed to enter the land for survey and paragraph (d) to clear, set out and mark the boundaries of the land proposed to be taken and the intended line of the work proposed.

Subject to subsection (2) that as soon as conveniently may be after any entry made under subsection (1), the Government shall pay for all damage done in consequence of the exercise of any of the powers conferred by subsection (1), and, in the case of a dispute as to the amount to be paid, either the Minister or the person claiming compensation may refer such dispute to the Regional Commissioner for the region in which the land is situated and the decision of the Regional Commissioner shall be final.

The provisions of part II (b), section 11 subsection (1) require that, where any land is acquired by the President under section 3 the Minister shall on behalf of the Government pay in respect thereof, out of moneys provided for the purpose by Parliament, such compensation as may be agreed upon or determined in accordance with the provisions of this Act. Section 12(2) whether such land is in an urban area or in a rural area, any compensation awarded shall be limited to the value of the unexhausted improvements of the land.

Also subject to the provisions of paragraph (a-d) section 30 clarifies that it shall be lawful for the President to require any corporation to which land has been declared for use to enter a contract with the Government with regard to payment of compensation cost of acquired land, terms of land use, time of land to be used and terms to which the public will be entitled to use and benefit from the work done by corporation.

The provisions of section 36, subsection (1) requires that the minister will grant development proponent a right of occupancy over the land for proposed project, the provision of section 37(3) requires that the development proponent make full disclosure of all trust and other referred interests on the land in a specified time without which or by falsifying the statement shall be convicted. Section 38(1) and (2) specify that no fees or stamp duty shall be paid under land ordinance for such granted right of occupancy on the first registration.

The proposed upgrading of the Jangwani Bridge is a public development project that will be carried out on the land zoned as road, all project's activities shall be conducted within the RoW.

3.3.11 Contractors Registration Act (1997)

This Act provides general provisions on roles and responsibility of contractor's Board and every other related actor, gives guidance on registration procedures and necessary conditions.

The provisions of section 7 subsection (1) part III, states that the Registrar shall keep and maintain registers of contractors of different types, categories and classes in which the name of every person

entitled to have his name in them as a registered contractor. Subject to this is subsection (6) in the case of an individual, the qualifications and skills as prescribed by the Board necessary to enable him to discharge in satisfactory manner the obligations which he may reasonably be expected or called upon to undertake as a contractor belonging to the category, type and class in respect of which registration is being sought. The provision of section 10(3) requires that upon registration, the person shall be issued with a certificate of registration indicating the registration number, type, and category, and class, date of registration and duration of registration. Subject to this provision is section 32b) which gives warning that any fraudulently procures or attempts to procure, whether for himself or for any other person, registration as a contractor or a trading license for a contractor; or commits an offence.

The proposed project will ensure to comply with the provisions of this Act by employing contractors that are registered following the procedures underlined by this Act and with relevant certificate of registration.

3.3.12 Engineers Registration Act 1997 (Amendments 2007)

This Act provides general Amendments of engineers' registration Act of 1997 by deleting and substituting new paragraphs, sections and subsections including redefining engineering project, organizations, institutions, registered engineers and firms. Also clarify the responsibility of the Board, engineers and firms' registration procedures and conditions as well as adding substitutions to help engineers graduate and technicians to get opportunities of being linked to employers and learning.

The provision of subsection 7; the principal Act is amended by adding immediately after section 12 the new section 12A (1) every professional engineer or consulting engineer who has been registered under this Act, shall in addition to such registration possess practicing certificate. Subject to subsection (3) a person who practices engineering activities without valid practicing certificate, commits an offence and can be convicted

Provision of subsection 9; Section 14 of the principal Act is amended in paragraph (a) by deleting subsection (1) and substituting for subsection (1) which requires that a person shall not employ as an engineer any person who is not a professional engineer or consulting engineer, or cause to undertake engineering works or services without employing the services of a professional engineer or consulting engineer. Subject to subsection (5) where an employer employs any person as a trainer engineer or incorporated engineer, this section shall not apply to that employee's employer.

The proposed project will ensure to comply with the Amendments of this Act by ensuring that the project employs registered engineers as required by this Act.

3.3.13 Employment and Labour Relations Act (2004)

This Act gives provisions for fundamental rights of employees including child labor, forced labor discrimination and freedom of association; Employment standards including hours, remuneration, leave and unfair termination of employment; Trade unions, employer association and federation; Organizational rights; collective bargaining; strikes and lock outs and dispute resolutions.

The provision of Part II subpart A, section 5 (1) requires that no person shall employ a child under the age of fourteen years, and subsection (2) a child under eighteen should not be employed in a workplace considered hazardous. Also subject to Subpart B section 6(1) which clarifies that any person who procures, demands or imposes forced labor, commits an offence. Subpart C, subsection 7(2) requires that an employer shall register, with the Labour Commissioner, a plan to promote equal opportunity and to eliminate discrimination in the work place. And Subpart D section 9 (1) a) every employee shall have the right to form and join a trade union; and section 10(1) a) every employer shall have the right to form and join an employer's association;

The proposed project will employ direct employments, notwithstanding the provisions of this Act, the project will comply with the provisions of this Act by ensuring that all the requirements, restriction and rights of employees are respected and guided as underlined by this Act. The project will also comply with the Labour Management Procedure that has been prepared for this project.

3.3.14 Urban Planning Act (2007)

This Act provides for fundamental principles of urban planning, institutional framework and responsibilities of every actor, the planning processes, land acquisition and compensation and supplementary planning power.

The provisions of Part II section 3a) states that with a view to giving effect to the fundamental principles of the National Land Policy and the Human Settlements Development Policy, all persons and authorities exercising powers, applying or interpreting the provisions of this Act shall be under the duty to improve the level of the provision of infrastructure and social services for sustainable human settlements development.

Provision of part IV, section 29(I) requires that no person shall develop any land within a planning area without planning consent granted by the planning authority or otherwise than in accordance with planning consent and any conditions specified. Subject to the provision of subsection (3) that Where in connection with an application for planning consent to develop land and subject to any other relevant law, the planning authority is of the opinion that proposals for industrial location, dumping sites, sewerage treatment, quarries or any other development activity shall have injurious impact on the environment, the applicant shall be required to submit together with the application of an environmental impact assessment report.

The proposed upgrading of the Jangwani Bridge project will ensure to comply with the provisions of this Act by consulting planning authority for fulfilment of all required procedures, has conducted Environmental Impact Assessment and the report will be submitted to the authority, will ensure compensation wherever needed as the payable rates required by this Act.

3.3.15 Worker's Compensation Act (2008)

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

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

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

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

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

Provision of section 76(1) requires that where a mandator in the course of or for the purposes of his business enters into an agreement with a contractor for the execution by or under the supervision of the contractor of the whole or any part of any work undertaken by the mandator, the contractor shall, in respect of the employees of the contractor employed in the execution of the work, register as an employer in accordance with the provisions of this Act and pay the necessary assessment. The provision of section 78 requires that an employer or the relevant trade union shall notify any employee who is injured in an accident or who contracts an occupational disease of his rights and the procedures to be followed in order to claim compensation under this Act.

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

3.3.16 The Sexual Offences Act 1998

An Act provide special provisions in regard to sexual and other offences to further safeguard the personal integrity, dignity, liberty and security of women and children.

The provision of Section 138D subsection (3) requires that for the avoidance of doubt, unwelcome sexual advances by words or action used by a person in authority, in a working place or any other place, shall constitute the offence of sexual harassment. The proposed project will ensure to comply with the provisions of this Act by ensuring that sexual harassment offenses are translated at work place for every employee to know their rights.

3.3.17 Law of the Child Act, 2009

This Act provide general provisions of rights and welfare of the child including care and protection of a child conditions. Also clarifies responsibilities of different actors including parents in ensuring the rights of a child whether at home, foster home, school, institutionalized care, and workplace or in custody.

The provision of Part II section 12 requires that a person shall not employ or engage a child in any activity that may be harmful to his health, education, mental, physical or moral development.

The provisions of Part VII, section 78(1) a person shall not employ or engage a child in any kind of exploitative labour. Subject to the provision of subsection (2) that every employer shall ensure that every child lawfully employed or engaged in accordance with the provisions of this Act is protected against any discrimination or acts which may have negative effect on him taking into consideration his age and evolving capacities. In addition to section 79(1) the child shall not be employed or engaged in a contract

of the service performance which shall require a child to work at night. And subject to provision of section 81 (1) a child has a right to be paid remuneration equal to the value of the work done.

The proposed project will comply with the provisions of this Act by ensuring does not employ a child, not involve child labour or impose a forced child labour in any phase of project execution it should be noted that under the Project a specific Labour Management Procedure has been prepared that will guide all relevant issues associated with labour.

3.3.18 Water quality - Sampling - Part 15: Guidance on the preservation and handling of sludge and sediment samples [EMDC 1(999) DTZS /ISO 5667-15]

As part of ISO 5667 it provides guidance on procedures for the preservation, handling and storage of samples of sewage and waterworks sludge, suspended matter, saltwater sediments and freshwater sediments, until chemical, physical, radiochemical and/or biological examination can be undertaken in the laboratory.

The project adhered to the required procedures during Sediment Quality Assessment in the Msimbazi Valley.

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 Annexes, 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 design of the New Jangwani Bridge has 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 sustainable, and to enhancing 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.

The New Jangwani Bridge project under Msimbazi Valley Development Project engaged various stakeholders during preparation of Environmental and Social Management Framework (ESMF) and other supporting Environmental and Social Safeguard Instruments i.e. Labour Management Procedures (LMP), Resettlement Policy Framework (RPF), Stakeholders Engagement Plan (SEP) and Gender-Based Violence Action Plan (GBV Plan). At project's level, the proposed bridge has been conducted with ESIA study to comply with Environmental and Social Policy for Investment Project Financing. During the study, various stakeholders from Mtaa level to National Level were engaged, their views captured and used for influencing the design of proposed project as indicated in chapter 5 of this ESIA.

3.5 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 on the basis of 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 taken into account.

Under New Jangwani Bridge project, these guidelines shall be implemented during construction and operation of the urban roads and drainage channels' subprojects.

3.5.1 General EHS Guidelines: Environmental- Hazardous Materials Management

These guidelines apply to projects that use, store, or handle any quantity of hazardous materials (Hazmats), defined as materials that represent a risk to human health, property. When a hazardous material is no longer usable for its original purpose and is intended for disposal, but still has hazardous properties, it is considered a hazardous waste.

The level of risk for sediments in Msimbazi Valley where the proposed New Jangwani Bridge is part of it has been established through assessment process based on: The types and amounts of hazardous materials present in the project and Analysis of potential consequences based on the physical geographical characteristics of the project site, including aspects such as its distance to settlements, water resources, and other environmentally sensitive areas.

In addition, the project shall:

- Train operators on release prevention, including drills specific to hazardous materials as part of emergency preparedness response training;
- Preparation of written Standard Operating Procedures (SOPs) for equipment or equipment as well as for transfer operations by personnel trained in the safe transfer of the hazardous material;
- Identification of locations of hazardous materials and associated activities;
- Document availability of specific personal protective equipment and training needed to respond to an emergency;
- Understand potential impacts and risks associated with the management of any generated hazardous waste during its complete life cycle ·
- Ensure that contractors handling, treating, and disposing of hazardous waste are reputable and legitimate enterprises, licensed by the relevant regulatory agencies and following good international industry practice for the waste being handled ·
- Ensure compliance with applicable local and international regulations

3.6 Requirements of World Bank Environmental and Social Standards

The 10 Environmental and Social Standards (ESSs), together with their Annexes, set out the requirements for Borrowers relating to the identification and assessment of environmental and social risks and impacts associated with projects supported by the Bank through Investment Project Financing. The Bank believes that the application of these standards, by focusing on the identification and management of environmental and social risks, will support Borrowers in their goal to reduce poverty and increase prosperity in a sustainable manner for the benefit of the environment and their citizens.

The standards: (a) support Borrowers in achieving good international practice relating to environmental and social sustainability; (b) assist Borrowers in fulfilling their national and international environmental and social obligations; (c) enhance non-discrimination, transparency, participation, accountability and governance; and (d) enhance the sustainable development outcomes of projects through ongoing stakeholder engagement.

Table 3-3 below describes the application of ESSs to the proposed upgrading of the Jangwani Bridge.

Table 3-1: Application of World Bank's ESSs to the Proposed Project

ESSs	Yes/No	Application
ESS 1: Assessment and Management of Environmental and Social Risks and Impacts	Yes	The Project will exert site-specific environmental and social impacts which will be managed through this ESMF. Site-specific ESIA's and ESMPs will be prepared to recommend E&S measures to be incorporated into designs of the specific subprojects.
ESS 2: Labor and Working Conditions	Yes	A number of project workers will be employed for the implementation of the project including construction of different investment subprojects. Project workers will be provided with information and documentation that is clear and understandable regarding their terms and conditions of employment. The information and documentation will set out their rights under national labor and employment law (which will include any applicable collective agreements), including their rights related to hours of work, wages, overtime, compensation and benefits, as well as those arising from the requirements of this ESS. This information and documentation will be provided at the beginning of the working relationship and when any material changes to the terms or conditions of employment occur. In order, to ensure fair treatment of workers, the Project will ensure that terms and conditions of employment (hours, rest periods, annual leave, non-discrimination and equal opportunity in recruitment and employment), respect for workers organizations, inclusion of redundancy plans, the prohibition of forced labor and of worst forms of child labor, occupational health and safety, including use of Personal Protective Equipment (PPE), and operation of a worker grievance mechanism for workers to address employment-related concerns, including sexual harassment, are aligned with the requirements of national law and ESS2. To protect workers, the project will ensure the application and implementation of all appropriate Occupational Health and Safety (OHS) measures, to avoid and manage the risks of ill health, including in relation to COVID-19, accidents and injuries. Labour Management Procedures (LMP) have been prepared to ensure these requirements of ESS2 and national law are observed and included in the specifications for contractors. The project will manage any labor influx and work camps for project workers in accordance with the provisions ESS2 and ESS4. As the situation permits and depending on the public health circumstances, the project will ensure compliance with national law, policies and protocol requirements as well as World Health Organization and World Bank guidance¹ regarding the COVID-19 situation in relation to stakeholder consultations, project worksites and related areas.
ESS 3: Resource Efficiency and Pollution Prevention and Management	Yes	Implementation of most of the investment subprojects will involve construction activities that will generate dust, erosion, sediments, solid and liquid wastes that will be properly managed via ESIA's and ESMPs. More or less similar impacts are likely to be experienced during operation phases and will be managed by the same tools as well as operation and maintenance plans.

¹ World Bank Technical Note: Public Consultations and Stakeholder Engagement in WB-supported operations when there are constraints on conducting public meetings. March 20, 2020; and "ESF/Safeguards Interim Note: COVID-19 Considerations in Construction/Civil Works Projects", April 7, 2020.

ESSs	Yes/No	Application
ESS 4: Community Health and Safety	Yes	Construction activities (excavation, vehicle operations, work at height, use of chemicals, use of crane or other heavy equipment etc.) may have irreversible effects of disability or fatality to community. Localized negative impacts (like dust emissions, accidents, etc.) to sensitive receptors such as schools, religious buildings and community centers will need to be managed. The Project will require Contractors to prepare appropriate plans for emergency preparedness and response, management and safety of hazardous materials, traffic and road safety, security personnel, etc. as per the requirement of ESS4. Implementation of the Project is likely to trigger influx of workers or job seekers and their followers into sub-project areas. However, SEA-SH risks might also be triggered by labour influx during the construction phase. Prior to start of construction activities, the contractor shall be required to prepare/develop and implement a Labor Influx Management Plan in line with ESS2, and ESS4. The project workforce could facilitate an increase in the transmission of HIV and other communicable diseases to members of the local/host communities. As the situation permits and depending on the public health circumstances, the project will ensure compliance with national law, policies and protocol requirements as well as World Health Organization and World Bank guidance² regarding the COVID-19 situation in relation to stakeholders consultations, project worksites and related areas.
ESS 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Yes	Land acquisition, restrictions on land use and involuntary resettlement are likely during the implementation of the Project. The RPF will provide guidance on RAP preparation. The project shall try to minimize land acquisition and its accompanying measure of resettlement wherever possible especially during detailed engineering design of the bridge Since the project does not involve any resettlement, unforeseen land acquisition that might result from design changes or other activities by the contractor shall be in line with the ESS 5. Compensation of the PAPs that will be affected by the above scenarios will comply with ESS5 and the Tanzania legal requirements.
ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	Yes	Unless it is meant to enhance protection and/or conservation, no sub-projects will be financed inside or near protected areas and sensitive habitats. Sub-projects will be screened for potential direct and indirect impacts on natural habitats.
ESS 8: Cultural Heritage	Yes	The Project will be implemented in the Msimbazi basin area in Dar es Salaam though not likely for elements of cultural heritage to be found in the project area; however potential for cultural heritage resources to be found unexpectedly (chance finds) during construction is taken into consideration. Chance finds procedures will be included in the Specifications for the contracts.

ESSs	Yes/No	Application
ESS 10: Stakeholders Engagement and Information Disclosure	Yes	A Stakeholders Engagement Plan (SEP) has been prepared to guide implementing agencies on how to 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. In ensuring that the project complies to the ESS10, the ESIA has been prepared by consulting stakeholders that include local communities, etc.

3.7 Administrative Framework

In general, the key authority responsible for environmental protection and natural resources management is the Ministry of Natural Resources and the Environment through Division of Environment (DoE) and National Environment Management Council (NEMC). The Ministry is empowered by legislation which governs the use of the natural resources and environment. The Ministry is aided by other government ministries and local government authorities to safeguard the environment.

Below are relevant Institutions, their Roles and Responsibilities to the Proposed upgrading of the Jangwani Bridge Project.

Generally, Tanzania has various Acts, Regulations and guidelines on environmental and social issues relevant to the proposed project. Tanzania is also a signatory to and has ratified various international conventions on environmental and social sustainability. Some of the laws, regulations and guidelines that are relevant to the environmental and social management of the proposed upgrading of the Jangwani Bridge are summarised in the table below.

Table 3-2: Pertinent Legislations for the Upgrading of the Jangwani Bridge

	Legislations	Summary of the most relevant requirements	Required Permit, Licence or Authorization
•	Environmental Management Act (EMA) No. 20 of 2004	This is a principal law that governs all environmental matters in the country. Section 81 of the Act refers to the obligation to undertake EIA by the project Proponent at his/her own cost prior to commencement or financing of a project or undertaking. The Act prohibits any development to be initiated without an EIA Certificate. This is ESMF establishes the process for complying with this requirement.	Environmental Certification (EIA Certificate)
•	Land Acquisition Act, No 47 of 1967	This Act governs compensation and acquisition for public purposes in Tanzania. Sections 4 to 10 provide conditions to be considered, specifying requirements prior to the acquisition of the land such as preliminary investigation for the land to be taken, issuing notice of intention to take land and the mode in which notices will be made. A RPF has been prepared to guide land acquisition likely to occur during MBDP implementation.	Approved Valuation Report by the Chief Government Valuer (N/A)
•	Land Act No. 4 of 1999	The Land Act No. 4 of 1999 is the principal law regarding all land matters such as the management of land, settlement of disputes and related aspects other than the Village Land	Land Acquisition for Borrow Pits/Sand Mines/Quarry Sites

	Legislations	Summary of the most relevant requirements	Required Permit, Licence or Authorization
		Act No. 5 of 1999 that specifically deals with “village land” matters.	
	The Land Use Planning Act No. 6 of 2007	This Act governs matters that are related to the preparation, administration and enforcement of land use plans. It provides for the procedures for preparation, administration and enforcement of land use plans; to facilitate an orderly management of land use, empower land occupiers and users to make better and more productive use of lands, to enhance security and equity in accessing land and its resources.	Certification of the Project Drawings by Ilala City Council and Kinondoni Municipal Council
	The Occupational Health and Safety Act No. 5 of 2003	The law requires employers to provide a good working environment to workers in order to safeguard their health and ensure safety at the workplace. The employers need to perform medical examinations to determine fitness before engaging employees. Employers must also ensure that the equipment used by employees is safe and shall also provide personal protective equipment (PPE) as appropriate. This shall be adhered to by all consultants and contractors who will be employed under MBDP. Compliance to this Act will also be important alongside WB ESHS Guidelines which have always insisted among other things prevention of accidents on sites of construction. During implementation of MBDP all contractors will be required to strictly adhere to the Occupational Health and Safety Act to ensure that no accident or fatality occur and that all social concerns surrounding communities in construction areas, such as issues of HIV/AIDS, pregnancies, gender discrimination and GBV are well addressed.	Registration of the Project with OSHA and Acquisition of OSHA Registration Certificate as well as Compliance Certificate
	The Workers Compensation Act No. 20 of 2008	The Act governs adequate and equitable compensation for all employees on grounds of injury, rehabilitation for occupational illnesses or injury and compensation to dependents and relatives upon fatality. Under this Act, the proponent shall be obliged to compensate employees in the case of injuries, death, and diseases while rendering their services to the employer/developer. It is therefore the responsibility of the project proponent to make sure that all requirements of this Act and working standards are adhered to in order to ensure a safe working environment for workers and prevent accidents and other occupational health and safety risks.	Registration of the Project with Workers Compensation Fund and Acquisition of Registration Certificate
	Water Resources Management Act No.11 of 2009	Article 39 elaborates on the need to prevent pollution and the penalties to be taken against one who pollutes water resources. Section	Apply and Acquire for Drilling Permit, Water use Permit and Discharge Permit

	Legislations	Summary of the most relevant requirements	Required Permit, Licence or Authorization
		63(1) stipulates that a Discharge Permit is required for any person who wishes to discharge effluents from any commercial, industrial or agricultural source or from any sewerage works or trade waste systems or from any other source into surface water or underground strata. The discharge permit is to be granted by a Water Officer. The Act also contains two schedules which set standards for receiving waters and effluents. The Act also emphasizes the need to protect aquatic biological diversity stipulating a need for integrated planning and management of ground and surface sources.	
	The Employment and Labour Relations Act No. 6 of 2004	This Act requires the Proponent to observe all core labour rights and related matters including establishing basic employment standards, providing a framework for collective bargaining, and providing for the prevention and settlement of disputes. A LMP has been prepared to guide labour issues under MBDP.	Acquisition of Work Permits for Foreign Workers
	The HIV and AIDS (Prevention and Control) Act No.28 of 2008	This Act requires the employer, in consultation with the responsible Ministry, to establish and coordinate a workplace programme on HIV/AIDS for employees under the proponent's control and such programme shall include the provision of gender-responsive HIV/AIDS education, the distribution of condoms and support for people living with HIV/AIDS.	N/A
	Public Health Act, 2009	The central theme of this Act is to provide for the promotion, preservation and maintenance of public health with a view to ensuring the provisions of comprehensive, functional and sustainable public health services to the general public and to provide for other related matters. Major issues addressed in this Act include operation of housing and hygiene, human settlements, solid and liquid waste, food and nutrition, control of diseases and workers' health.	N/A
	The Roads Act No. 13 of 2007	This Act has a total of ten parts which among other things describe about road management, roads classification and declaration, execution of road works, restriction of use of roads and financial provision on undertaking various road activities. Other issues described in the Road Act are offences, penalties and recovery as well as road safety and road of access. This Act also provides description on initiation of the road agency TANROADS to deal with road construction and management within the country. Although this Act was approved and	Use of Borrow Pits Under TANROADS

	Legislations	Summary of the most relevant requirements	Required Permit, Licence or Authorization
		came to being about ten years earlier than TARURA establishment it is however envisaged that some parts of the Act will be used by PO-RALG/TARURA in executing MBDP activities. The TARURA establishment order gives functions and responsibilities of TARURA which among other things will be to develop and maintain rural and urban roads network, which coincide with Part three of the Road Act on road classification and declaration.	

3.8 Summary of National Regulations

Table 4 below summarizes applicable regulations for the proposed Upgrading of the Jangwani Bridge

Table 3-3: Relevant Regulations and Guidelines for Upgrading of the Jangwani Bridge Project

	Key Regulations	Summary of the most relevant requirements
•	Environmental Impact Assessment and Audit Regulations of 2005 and its amendments of 2018	The Environmental Impact Assessment and Audit Regulations No.349 of 2005 were made pursuant to Section 82 (1) and 230 (h) and (q) of the Environmental Management Act Cap 191 of 2004 and its amendment in 2018. The regulations provide the procedures and requirements for undertaking EIA for various types of development projects with significant environmental impacts. In addition, the Regulations provide a list of projects that qualify for Environmental Assessment procedures in Tanzania. Regulation 46(1) classifies projects into two types: (I) Type A Projects requiring a mandatory ESIA; and (ii) Type B projects requiring a Preliminary Environmental Assessment (PEA). The First Schedule lists typical examples of Type A and B projects. The Regulation was amended in 2018 and project categorization was changed to Type A, Special category, Type B1 and B2 based on the risky levels.
•	The Environmental Management (Water Quality Standards) Regulations, 2007	The applicant for a water right is obliged to indicate the likely impact on the environment and comply with prescribed effluent or receiving water standards, which are not below the standards specified in the regulations if the water right or permit is granted. Other sections of this Regulation is 18 (1) that relates to "duty to comply with environmental quality standards" which stressed the importance of complying to the standards outlined in these regulations such as the prohibition of the discharge of hazardous substances, and any other harmful materials.
•	Environmental Management (Air Quality Standards) Regulations, 2007	Section 8 (1) of the regulations clearly prohibits release of hazardous substances, chemical, gas or mixture containing gaseous and hazardous substances into the environment unless the release or emission is permitted under these regulations.
•	Environmental Management (Hazardous Waste Management) Regulations, 2009	The first schedule of the regulations provides categories of wastes controlled by these regulations and schedule two provides a list of hazardous and non-hazardous wastes. The third schedule in the regulations is a list of hazardous characteristics. In relation to road subprojects, hazardous wastes are associated with the project during the construction and operation phase. During any transportation and/or management of hazardous waste, Contractors will oblige to the requirements of the Regulations.

	Key Regulations	Summary of the most relevant requirements
•	Environmental Management (Solid Waste Management) Regulations, 2009	These Regulations provide guide for waste management in Tanzania. It requires waste disposal and management to be guided by Precautionary principle, Polluter pays principle and the producer extended responsibility principle. Schedule 1 of the Regulations highlights the types of waste and recommended modes of treatment for the same. To mention a few, schedule 1 suggests that plastic waste should be recycled, and any chemical industrial solid waste should be incinerated at high temperatures. The contractors under Jangwani Bridge Project will comply with these Regulations when dealing with solid waste.
•	Environmental Management (Standards for the Control of Noise and Vibration Pollution) Regulations, 2015	These regulations are set to provide for the implementation of sections of the EMA (2004) related to noise and vibration pollution. The maximum permissible noise levels for some activities are specified in the First Schedule of the regulations. And specific to construction sites is 75 dBA and 65 dBA during the day and night, respectively.
•	The Roads Management Regulations of 2009	This Regulation is made under the Roads Act No. 13 of 2007. This Regulation clarifies various issues described in the Roads Act by giving details on their implementation arrangements. Issues underlined in Roads Management Regulations are those related to management of roads such as general control of roads, control of use of roads, road management, road of access, prohibited activity, closure of road for urgent action, obstruction to other road users, obstructing road or drain or water course and stopping or clogging drain to mention few. The issue of road width and reserve is also described where each road category is given its width to be reserved as per the requirement of the Road Act of 2007. The MBDP's road subprojects will use this regulation especially in determining the width of roads which has always caused confusion in road construction especially when it comes to compensation in urban areas.
•	Environmental Code of Practice for Road Works of 2009	The purpose of this Environmental Code of Practice for Road Works is to define environmental criteria to be applied in Tanzania during the feasibility, design, construction and operation of road infrastructure. It is important to have criteria to safeguard the environment to be applied during road construction in order to minimize indirect and cumulative environmental impacts that are involved in the road sector development and management include: loss of biodiversity; resettlement; land degradation; induced development; deforestation; pollution of air, water and soil; roads safety and human health. The preparation of this Environmental Code of Practice for Road Works follows the enactment of the Road Sector (Environmental Protection) Regulations made under section 61(2) of the Roads Act (2007) and the enactment of the Environmental Management Act (2004) to enforce environmental management issues and EIA requirement in the country. Being in the road construction, and due to the fact that TARURA is a new entity and hence lacking important documents to guide its implementation of E&S issues, it is important for them to adopt this document and implement it during implementation of the MBDP.
•	The Occupational Safety and Health (General Administrative) Rules, 2015.	These regulations, among other things, have rules that requires registration of the workplace; establishment of Health and Safety Committees at workplaces; Handling of Hazardous Chemical Substances; Display of substituted notices and signs; etc. Contractors who will be contracted to implement MBDP's investment sub-projects shall be required to comply with these rules.
•	The Occupational Health and Safety (Building and	These regulations require contractor to comply with the requirements of these Rules that provide the assurance of health, safety and welfare of all

	Key Regulations	Summary of the most relevant requirements
	Construction Industry) Rules, 2015.	persons engaged in-(a) building operations or works of engineering construction undertaken by him; or (b) in any activity incidental to and at the site of the building operations or works of engineering construction or construction work. The regulations have rules on Duties and Responsibilities; Risk Assessment; Safety Measures; Health and Welfare; Keeping of Records; Safety in Vehicles; Working Platforms; Fall Protection; Lifting Operations; Excavations Shafts and Tunnels; Demolition; and Offences and Penalties. Contractors who will be contracted to implement MBDP's investment sub-projects shall be required to comply with these rules.
•	The Occupational Safety and Health (Lifting Appliances and Gears) Rules, 2015.	These regulations have specific requirements on Permission to install and use lifting appliance; Particulars of lifts, escalators or passenger conveyors; Inspections and Tests of hoist or lift; Maximum load of a hoist or lift; Chain, ropes and lifting tackles; Examination of chain, ropes and lifting tackles; Cranes and other lifting machines; Maximum working load; Reporting of plants due for inspection; Maintenance; Register of chains, ropes, other lifting tackles cranes and other lifting machines; Record keeping; and Offences and Penalties. Contractors who will be contracted for the bridge project shall be required to comply with these rules.
•	The Occupational Safety and Health (First Aid and Welfare Facilities) Rules, 2015.	These regulations have specific requirements on Basic requirements; First aid attendant qualifications; First aid procedures; Information on post exposure; Sanitation; Accommodation for clothing; Change-rooms; Dining room; Prohibition; Seat; Condition of rooms and facilities; First aid attendant; First aid records; Multiple employer workplaces; First aid attendant responsibilities; and Offences and penalties. Contractors who will be contracted to implement MBDP's investment sub-projects shall be required to comply with these rules.

3.9 Analysis of Gaps between World Bank's ESSs & National Legislation

During the project's implementation, if there are identifies gaps in the National's ES Framework, TANROADS and PO-RALG will work with the Bank to identify measures and actions to address such gaps. Such measures and actions may include where necessary, measures and actions to address any capacity development issues pertaining to the developer/TANROADS, any relevant national, subnational or sectoral implementing institution, and any implementing agency. The agreed measures and actions, together with the timeframes for their completion form part of the project's ESCP. In that case, where there is a difference between national legislation and World Bank's ESSs, the latter will be applied for the New Jangwani Bridge project.

Table 3-4: Gaps Analysis Between World Bank's ESSs and National Legislation

WB Safeguard Requirements	Tanzanian Requirements	Gaps	Gaps' Remedies
ESS1: Social and Environmental Assessment and Management System Environmental and Social Assessment It requires carrying out an environmental and social assessment of the project to assess the environmental and social risks and impacts of the project throughout the project life cycle. Environmental and Social Commitment Plan Under ESS1, the environmental and social commitment plan which sets out measures and actions required for the project to achieve conformance with the ESSs over a specified time frame is required to be developed and implemented. Stakeholder Engagement and Information Disclosure As part of the ESIA undertaking, continuous engagement with stakeholders and provide sufficient information throughout the life cycle of the project, in a manner appropriate to the nature of their interests and the potential environmental and social risks and impacts of the project	<u>Environmental Management Act No. 20 of 2004</u> The Act refers to the obligation to undertake EIA by the project Proponent at his/her own cost prior to commencement or financing of a project or undertaking. The Act prohibits any development to be the project to be initiated without an EIA Certificate. Environmental Impact Assessment study has been carried prior to the commencement or financing of a project or undertaking. It also provides for the adoption of the guidelines by the council on public participation, especially those likely to be affected by the project being the subject of an Environmental Impact Assessment study or review. Section 90 provides for calling of public hearing by the council.	The laws of Tanzania do not provide for lifecycle environmental and social risk assessment Environmental and social commitment plan is not reflected in the environmental legislations of Tanzania It does not mention information disclosure to the project affected community during the study rather by the call from the National management Council when there is a need to classify the projects, types of impacts and Environmental and Social instruments to guide the projects' implementation.	The project has adopted ESS1 for environmental and social risks and impact assessment
ESS 2: Labour and Working Conditions Protecting the Workforce Child Labour and Minimum Age. A child under the minimum age will not be employed or engaged in connection with the project. The minimum age specified 14years unless national law specifies a higher age.	There are several legislations in Tanzania that governs labour and working conditions <u>The Occupational Health and Safety Act No. 5 of 2003</u> The law requires employers to provide a good working environment to workers in order to safeguard their	There is no significant gap between the national laws and the WB ESS. However, there is no single document or law that presents the Labor and Working Conditions issues in particular. The information is available in different pieces of documents. Issues regarding to community workers are not captured in the National Legislations. However, it might not be an	For the project to adequately capture labour and working condition issues, the WB ESS 2 will apply.

WB Safeguard Requirements	Tanzanian Requirements	Gaps	Gaps' Remedies
Forced Labor It prohibits the employment of forced labor, which consists of any work or service not voluntarily performed that is exacted from an individual under threat of force or penalty. This covers any kind of involuntary or compulsory labor, such as indentured labor, bonded labor, or similar labor-contracting arrangements. The borrower will not employ trafficked persons Grievance Redress Mechanism It requires provision of a grievance mechanism for all direct workers and contracted workers (and, where relevant, their organizations) to raise workplace concerns. Such workers will be informed. Measures will be put in place to make the grievance mechanism easily accessible to all such project workers Occupational Health and Safety It is a responsibility of the project implementer to provide a safe and healthy work environment taking into account inherent risks in its particular sector and specific classes of hazards in the work areas. Measures relating to occupational health and safety will be applied to the project. The OHS measures will take into account the General Environmental Health and Safety Guidelines (EHSGs) and, as appropriate, the industry specific EHSGs and other Good International Industry Practice (GIIP). The OHS measures applying to the project will be set out in the legal agreement and the Environmental and Social Commitment Plan (ESCP). Contracted Workers The Borrower will make reasonable efforts to ascertain that third parties who engage contracted workers are legitimate and reliable	health and ensure safety at the workplace <u>The Workers Compensation Act No. 20 of 2008</u> The Act governs adequate and equitable compensation for all employees on grounds of injury, rehabilitation for occupational illnesses or injury and compensation to dependents and relatives upon fatality. Under this Act, the contractor/s are obliged to compensate employees in the case of injuries, death, and diseases while rendering their services to the employer/developer <u>The Employment and Labour Relations Act No. 6 of 2004</u> This Act requires the Proponent to observe all core labour rights and related matters including establishing basic employment standards, providing a framework for collective bargaining, and providing for the prevention and settlement of disputes. No person shall employ a child under the age of fourteen (14) years. Any person who procures, demands or imposes forced labour, commits an offence. Every employer shall ensure that he promotes an equal opportunity in employment and strives to eliminate discrimination in any employment policy or practice. For the avoidance of doubt every	issue in the project as the use of community workers is not foreseen. From the legal perspective, there is no requirement for development and implementation of Labour Management Procedures/ Plan, as an upfront guidance instrument for systematic planning and management of labour during project design and implementation.	

WB Safeguard Requirements	Tanzanian Requirements	Gaps	Gaps' Remedies
entities and have in place labor management procedures applicable to the project that will allow them to operate in accordance with the requirements of this ESS. Community Workers Projects may include the use of community workers in a number of different circumstances, including where labor is provided by the community as a contribution to the project, or where projects are designed and conducted for the purpose of fostering community driven development, providing a social safety net or providing targeted assistance in ecologically sensitive and conflict-affected situations. Given the nature and objectives of such projects, the application of all requirements of ESS2 may not be appropriate. In all such circumstances, the Borrower will require measures to be implemented to ascertain whether such labor is or will be provided on a voluntary basis as an outcome of individual or community agreement. Primary Supply Workers As part of the environmental and social assessment, the Borrower will identify potential risks of child labor, forced labor, and serious safety issues which may arise in relation to primary suppliers	employer shall take positive steps to guarantee equal remuneration for men and women for work of equal value. Every employee shall have the right- (a) to form and join a trade union; (b) to participate in the lawful activities of the trade union.		
ESS 3: Resource Efficiency and Pollution Prevention and Management Pollution Prevention and Management It requires avoidance to 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	Water Resources Management Act, 2019 This legislation is based on the principles of sustainable water resources management guided by; a) the precautionary principle; b) polluter pay principle; c) the principle of eco-system integrity;	There is no significant gap between the ESS 3 and the national legislations regarding to resource efficiency and pollution prevention	Both ESS4 and National Legislation can apply in situations with respect to pollution prevention during project's implementation and operation.

WB Safeguard Requirements	Tanzanian Requirements	Gaps	Gaps' Remedies
law or the EHSs, whichever is most stringent. This applies to the release of pollutants to air, water, and land due to routine, nonroutine, and accidental circumstances, and with the potential for local, regional, and Transboundary risks and impacts. Air Pollution Management In addition to the resource efficiency measures described above, the Borrower will consider alternatives and implement technically and financially feasible and cost-effective options to avoid or minimize project-related air emissions during the design, construction, and operation of the project. Management of Hazardous and Non-hazardous Waste. The Borrower will avoid the generation of hazardous and non-hazardous waste. Where waste generation cannot be avoided, the Borrower will minimize the generation of waste, and reuse, recycle and recover waste in a manner that is safe for human health and the environment. Where waste cannot be reused, recycled or recovered, the Borrower will treat, destroy, or dispose of it in an environmentally sound and safe manner that includes the appropriate control of emissions and residues resulting from the handling and processing of the waste material. Management of Chemicals and Hazardous Materials The Borrower will avoid the manufacture, trade, and use of chemicals and hazardous materials subject to international bans, restrictions or phaseouts unless for an acceptable purpose as defined by the conventions or protocols or if an exemption has been obtained by the Borrower,	d) the principle of public participation in the development policies, plans and processes for the management of the water resources; e) the principle of international co-operation in management of environmental resources shared by two or more states; and f) the principle of common but differentiated responsibilities. This legislation requires application of permit by any person who diverts, dams, stores, abstracts or uses water from surface or underground water source, or for any such purpose constructs or maintains any works from the respective Basin water Board. A person who diverts, dams, impounds, store, abstracts or uses water without water use permit commits an offence and shall, on conviction. Environmental Management (Solid Waste Management) Regulations, 2019 This regulation details the requirements and responsibilities for managing solid waste in Tanzania. It also highlights waste minimization and cleaner production principles alongside the duty to safeguard the public health and the environment from adverse effects of solid		

WB Safeguard Requirements	Tanzanian Requirements	Gaps	Gaps' Remedies
consistent with Borrower government commitments under the applicable international agreements. Management of Pesticides Where projects involve recourse to pest management measures, the Borrower will give preference to integrated pest management (IPM) or integrated vector management (IVM) approaches using combined or multiple tactics	waste. It also highlighted the role of Local Government Authority to manage wastes including issuing permit to a person or firm which wish to operate solid waste disposal sites. The Environmental Management (Water Quality Standards) Regulations, 2007 The regulations requires application of water right by the developer and comply with prescribed effluent or receiving water standards, which are not below the standards specified in the regulations if the water right or permit is granted Environmental Management (Air Quality Standards) Regulations, 2007 These regulations require compliance with the minimum water quality standards. It prohibits release of hazardous substances, chemical, gas or mixture containing gaseous and hazardous substances into the environment unless the release or emission is permitted Environmental Management (Hazardous Waste Management) Regulations, 2021 Hazardous wastes are always associated with the construction projects and operation of the subcomponents of this project such as health centers (medical waste). The regulations provide		

WB Safeguard Requirements	Tanzanian Requirements	Gaps	Gaps' Remedies
	for proper management of these wastes in accordance with relevant law governing the operation of the facilities. Any damage is caused by hazardous waste which has been deposited into the environment, a person who deposited, caused or permitted a waste to be deposited, is liable for the damage to the environment and human health. Environmental Management (Standards for the Control of Noise and Vibration Pollution) Regulations, 2015 The regulations provide for a prohibition for any person to make or cause to be made any loud, unreasonable, unnecessary or unusual noise that annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and that of the environment.		
<u>ESS4: Community Health and Safety</u> ESS4 addresses the health, safety, and security risks and impacts on project-affected communities and the corresponding responsibility of Borrowers to avoid or minimize such risks and impacts, with particular attention to people who, because of their particular circumstances, may be vulnerable. Community Health and Safety The Borrower will evaluate the risks and impacts of the project	<u>Public Health Act, 2009</u> This Act provides for the promotion, preservation and maintenance of public health with a view of ensuring the provision of comprehensive, functional and sustainable public health services to the general public and to provide other related matters. It secures the improvement of health habits and life style of people, environmental sanitation and hygiene, preventing and controlling living	The national legislations on community health and safety are silent about the security personnel	ESS 4 will apply in case of any situation involving security personnel

WB Safeguard Requirements	Tanzanian Requirements	Gaps	Gaps' Remedies
on the health and safety of the affected communities during the project life cycle, including those who, because of their particular circumstances, may be vulnerable. The Borrower will identify risks and impacts and propose mitigation measures in accordance with the mitigation hierarchy. Infrastructure, Equipment Design and Safety The Borrower 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. Structural elements of a project will be designed and constructed by competent professionals and certified or approved by competent authorities or professionals. Structural design will take into account climate change considerations, as appropriate. Hazardous Materials Management and Safety The Borrower will avoid or minimize the potential for community exposure to hazardous materials and substances that may be released by the project. Safety of Services Where the project involves provision of services to communities, the Borrower 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 Borrower will also apply the concept of universal access, where technically and financially feasible.	infectious or communicable and other diseases. It requires notification of any infections or communicable diseases to the responsible authorities to protect other members of the community. <u>The Roads Act No. 13 of 2007</u> This legislation governs the formulation of the road authorities and their duties. On the community health, the road authorities under this act has a responsibility to ensure safety of the community by; ensure that the necessary road furniture is erected on the public roads, ensure to the safety of road users during the design, construction, maintenance and operation of a public road by providing sidewalks, overhead bridges, zebra crossings and other matters related thereto. The road authorities are also vested powers to close the road when it has been satisfied that it has a road safety concern to ensure safety of the public. <i>Other relevant legislations are as provided in the section under Resource Efficiency and Pollution Prevention and Management above</i>		

WB Safeguard Requirements	Tanzanian Requirements	Gaps	Gaps' Remedies
Traffic and Road Safety The Borrower will identify, evaluate, and monitor the potential traffic and road safety risks to workers, affected communities, and road users throughout the project life cycle and, where appropriate, will develop measures and plans to address them. The Borrower will incorporate technically and financially feasible road safety measures into the project design to prevent and mitigate potential road safety risks to road users and affected communities. Ecosystem Services The project's direct impacts on ecosystem services may result in adverse health and safety risks to and impacts on affected communities. With respect to this ESS, ecosystem services are limited to provisioning and regulating services as defined in ESS1. Where appropriate and feasible, the Borrower will identify the project's potential risks and impacts on ecosystem services that may be exacerbated by climate change. Adverse impacts will be avoided, and if they are unavoidable, the Borrower will implement appropriate mitigation measures. Community Exposure to Disease The Borrower will avoid or minimize the potential for community exposure to waterborne, water based, water-related, and vector-borne diseases, and communicable and non-communicable diseases that could result from project activities, taking into consideration differentiated exposure to and higher sensitivity of vulnerable groups. Where specific diseases are endemic in communities in the project area,			

WB Safeguard Requirements	Tanzanian Requirements	Gaps	Gaps' Remedies
the Borrower is encouraged to explore opportunities during the project life cycle to improve environmental conditions that could help minimize their incidence Emergency Preparedness and Response The Borrower will identify and implement measures to address emergency events. An emergency event is an unanticipated incident, arising from both natural and man-made hazards, typically in the form of fire, explosions, leaks, or spills, which may occur for a variety of different reasons, including failure to implement operating procedures that are designed to prevent their occurrence, extreme weather, or lack of early warning. The measures will be designed to address the emergency event in a coordinated and expeditious manner; to prevent it from injuring the health and safety of the community; and to minimize, mitigate, and compensate for any impacts that may occur. Security Personnel When the Borrower retains direct or contracted workers to provide security to safeguard its personnel and property, it will assess risks posed by these security arrangements to those within and outside the project site. In making such arrangements, the Borrower will be guided by the principles of proportionality and GIIP, and by applicable law in relation to hiring, rules of conduct, training, equipping, and monitoring of such security workers. The Borrower will not sanction any use of force by direct or contracted workers in providing security except when used for preventive and defensive purposes in proportion to the			

WB Safeguard Requirements	Tanzanian Requirements	Gaps	Gaps' Remedies
nature and extent of the threat. The Borrower will (i) make reasonable inquiries to verify that the direct or contracted workers retained by the Borrower to provide security are not implicated in past abuses; (ii) train them adequately (or determine that they are properly trained) in the use of force (and where applicable, firearms) and appropriate conduct toward workers and affected communities; and (iii) require them to act within the applicable law and any requirements set out in the Environmental and Social Commitment (ESCP)			
ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement Eligibility for Compensation Loss of Profits Entitlements and eligibility Affected persons may be classified as into three categories: a) Persons with formal legal rights to the land or assets they occupy or use; b) Persons with no formal legal rights to land or assets, but have a claim to the land or assets they occupy or use that is recognized or recognizable under national law; and c) Persons with no recognizable rights to land or assets they occupy or use. Compensation for loss of profit and income In cases where land acquisition or restrictions on land use affect commercial enterprises regardless of size and whether licensed or unlicensed. Compensation for loss of assets When land acquisition or restrictions on land use (whether	Land Acquisition Act No. 4 and 5 (1967) Provides for the following: Minister responsible for land to authorize any person to enter upon the land and survey the land to determine its suitability for a public purpose. ▪ The Government of Tanzania is supposed to pay compensation to any person who suffers damage as a result of any action. Eligibility under Tanzanian Law is limited to those who can prove <i>de jure</i> or <i>de facto</i> land ownership. Seasonal land/resource users are not covered, nor are persons who have constructed on or otherwise use road reserves (i.e., "encroachers"). According to the Land Assessment of the value of Land for Compensation)	Currently in Tanzania there is no specific-resettlement policy itemizing procedures and processes to prevent PAPs from being left worse off by a project. There is no gap between Tanzanian Law and ESS5 with regard to eligibility for compensation of persons with formal legal rights and those without formal legal rights but with a claim to land under customary practices. ESS5, however, has stronger protections for informal residents and land users than does Tanzanian Law. Tanzanian regulations provide for income restoration allowances where the PAPs have incurred losses of business income. This has not, however, been applied in practice. There is a gap between the two approaches of Market Value and Replacement Cost. Under the Market Value approach, the amount paid often fails to replace the lost land and assets. There are no provisions requiring government to pay	Under New Jangwani Bridge project no individuals' owned pieces of land shall be acquired for the project development. However, in cases where land from individuals shall be necessary be acquired during construction, ESS5 shall apply.

WB Safeguard Requirements	Tanzanian Requirements	Gaps	Gaps' Remedies
permanent or temporary) cannot be avoided, the Borrower must offer affected persons compensation at replacement cost, as well as other assistance as necessary to help them improve or at least restore their pre-intervention standards of living and livelihoods. Assistance to vulnerable and severely affected PAP Public Land Users ("Encroachers") The RAP must provide transitional relocation assistance to physically displaced persons during their relocation to the new site, which may include but not be limited to, transportation, food, shelter, and social services. User rights Land users/residents with no recognizable legal rights or claim to the land or assets they occupy or use are recognized as having a right to compensation for lost housing, income generation, livelihood activities, and access to resources, although not for the land itself. Grievance Handling Procedures Stakeholder engagement and information disclosure A project grievance mechanism must be in place as early as possible in project development to address specific concerns about compensation, relocation or livelihood restoration measures raised by the displaced persons (or others) in a timely manner	Regulations, 2001, as well as the Village Land Regulations, 2001, compensation for loss of any interest land shall include loss of profits. Tanzanian Law provides for the calculation of compensation on the basis of the market value of the lost land and unexhausted improvements plus disturbance and accommodation allowances as well as loss of profits where applicable. Tanzanian Law has no provisions requiring the government to pay special attention to vulnerable groups in the administration of compensation. Tanzania law on compulsory acquisition and compensation is limited to those who can prove <i>de jure</i> or <i>de facto</i> land ownership. Under s.13 of the <i>Land Acquisition Act, 1967</i>, if dispute or disagreement regarding the below-listed below is not settled by the concerned parties within six weeks of the date of publication of the expropriation notice, the Minister or person holding claim in the land may institute a suit in the high court of Tanzania for the determination of the dispute.	special attention to vulnerable groups or indigenous peoples. Tanzanian Law does not recognize seasonal land/resource users/persons who have done any development on affected land as eligible for compensation for assets or provision of resettlement and livelihood assistance. Tanzanian Law does not provide for the establishment of grievance resolution mechanisms specific to particular resettlement operations. Tanzania has a well-established and accessible local grievance redress mechanism through existing systems and structures.	
ESS 6: Biodiversity Conservation and Sustainable	Wildlife Conservation Act of 2009	There is no significant gap existing	

WB Safeguard Requirements	Tanzanian Requirements	Gaps	Gaps' Remedies
Management of Living Natural Resources ESS6 recognizes the importance of maintaining core ecological functions of habitats, including forests, and the biodiversity they support. Habitat is defined as a terrestrial, freshwater, or marine geographical unit or airway that supports assemblages of living organisms and their interactions with the non-living environment. All habitats support complexities of living organisms and vary in terms of species diversity, abundance, and importance. ESS 6 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/Sub-Saharan African Historically Underserved Traditional Local Communities, whose 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.	Prohibits livestock keeping, crop cultivation or any agricultural activities in any wetland reserve areas Tanzania Forest Act of 2002 Safeguards ecosystem stability through conservation of water catchments and Requires all developmental projects in watersheds to adhere to Environmental Impact Assessment (EIA) mitigation measures National Environment Policy of 2021 Aims at strengthen conservation of wildlife habitats and biodiversity; enhance conservation of forest ecosystems for sustainable provision of environmental goods and services; manage pollution for safe and healthy environment; enhance conservation of aquatic ecosystem for sustained ecological services and socioeconomic wellbeing Environment Management Act No. 20 of 2004 -Recognizes wetlands as fragile ecosystems that play an important role in water systems and Mandates the National Environmental Management Council (NEMC) to oversee the management of all natural resources including wetlands.		

WB Safeguard Requirements	Tanzanian Requirements	Gaps	Gaps' Remedies
ESS8: Cultural Heritage	The Antiquities (Amendment) Act, 1979, and the Antiquities Act, 1964 (hereinafter referred to as the "principal Act"), and The Environmental Management Act, 2004, Section 73 – “Protection of natural and cultural heritage - Any matter or activity relating to protection and conservation of natural and cultural heritage shall take into account necessary requirements for the protection of environment as provided for under this Act”.	The National Legislation does not provide well defined Chance Finds Procedure for onsite use, consultation of stakeholders during assessments and implementation, disclosure requirements & procedures, among others.	The ESS8 shall be complied during implementation of the project. In case there is an indication of presence of any cultural sites during detailed study, Chance Finds Procedure should be prepared
ESS 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.	The Environmental Management Act, 2004 Provides for ESIA studies to conduct robust stakeholder engagement and information disclosure. EIA/EA regulations 2005 and amendments 2018 Public participation is a key requirement during the ESIA process. The regulations requires environmental experts or firm of experts to ensure that there is adequate stakeholder participation in all stages of the Environmental Impact Assessment and their concerns are fully taken into account during the assessment of impact. The ESIA shall define the mechanisms for stakeholder participation	The legislations does not clearly indicate the need for stakeholder engagement plan and grievance redress mechanism. It also does not clearly define the information disclosure requirement	ESS 10 will apply for the project

WB Safeguard Requirements	Tanzanian Requirements	Gaps	Gaps' Remedies
	during the monitoring and auditing process followed through. The regulations require constant liaising with relevant authorities and consult stakeholders including local communities in case of any new development or changes as regards to implementation of your project plan or activities		

3.10 Environmental and Social Management Framework

The World Bank's Environmental and Social Policy for Investment Project Financing sets out the requirements that the Bank must follow regarding the projects it supports through Investment Project Financing. The Environmental and Social Standards set out the requirements for Borrowers relating to the identification and assessment of environmental and social risks and impacts associated with projects supported by the Bank through Investment Project Financing. The Bank believes that the application of these standards, by focusing on the identification and management of environmental and social risks, will support Borrowers in their goal to reduce poverty and increase prosperity in a sustainable manner for the benefit of the environment and their citizens. The standards will: (a) support Borrowers in achieving good international practice relating to environmental and social sustainability; (b) assist Borrowers in fulfilling their national and international environmental and social obligations; (c) enhance non-discrimination, transparency, participation, accountability and governance; and (d) enhance the sustainable development outcomes of projects through ongoing stakeholder engagement. The ten Environmental and Social Standards (ESS) establish the standards that the Borrower and the project will meet through the project life cycle, as follows:

- ESS1: Assessment and Management of Environmental and Social Risks and Impacts;
- ESS2: Labor and Working Conditions;
- ESS3: Resource Efficiency and Pollution Prevention and Management;
- ESS4: Community Health and Safety;
- ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement;
- ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- ESS7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities;
- ESS8: Cultural Heritage;
- ESS9: Financial Intermediaries; and
- ESS10: Stakeholder Engagement and Information Disclosure.

The proposed upgrading of the Jangwani Bridge which is a Sub-Project under the Msimbazi Basin Development Project (MBDP) may have adverse environmental and social impacts which must be identified and necessary measures to address them taken as part of the Project approval and implementation. Considering that the actual sites/design has been clearly established; having the ESIA is a pre-requisite for their approval for implementation.

This ESIA has been prepared in line with the World Bank's Environmental and Social Standards (ESSs). This ESIA has been prepared alongside other framework documents as listed below:

- Environmental and Social Management Framework (ESMF)
- Resettlement Policy Framework (RPF);
- Stakeholder Engagement Plan (SEP);
- Labor Management Procedures (LMP); and
- Environmental and Social Commitment Plan (ESCP).

3.10.1 Environmental and Social Management Authorities

The administrative and institutional arrangements for environmental management in Tanzania that are relevant to various projects are stipulated in the Environmental Management Act (EMA) No. 20 of 2004. In the Act, NEMC and DoE are key institutions among seven spelt in the Act with regard to the management of environmental issues. Part III, Section 13(1) of EMA (2004) states that the Minister responsible for the environment shall be overall in-charge of all matters relating to the environment and shall in that respect be responsible for ensuring adequate implementation of the Act, regulations and other guidelines necessary for the promotion, protection and sustainable management of environment in Tanzania.

The legal institutions for environmental management in the country are outlined below.

3.10.1.1 National Environmental Advisory Committee

Advise the Minister Responsible for Environment.

3.10.1.2 Minister responsible for Environment

Issue guidelines and designate duties to various entities; approval by issuing of decision letter / EIA Certificate for development projects; delegate responsibility for EIA authorization to Director of Environment, LGAs and Sector Ministries.

3.10.1.3 Director of Environment

Coordinate, advise, assess, monitor and report environmental related aspects and activities; responsible for environmental policy and legal formulation and implementation; integration of environmental considerations into development policies, plans, programmes, strategies and projects; undertake strategic environmental assessment. The Director provides advice to Minister for approval of Environmental Impact Assessment report (EIS) and issuance of EIA Certificate.

3.10.1.4 National Environment Management Council (NEMC)

Undertake enforcement, compliance, review and monitoring of environmental impact assessment. NEMC role is to initiate /develop procedures and safeguards for the prevention of activities which may cause environmental degradation; provide advice and technical support to different stakeholders; enforce and ensure compliance of the national environmental quality standards.

Under the EMA, NEMC has specific roles and responsibilities in the undertaking EIA for new development projects (Part III – XI); Environmental Audit for existing development projects (Part X); and Environmental Monitoring and Reporting (Part XI). NEMC is empowered to establish specific offices or to appoint or designate officers to effectively perform its functions.

3.10.1.5 Registrar of EIA Expert /Firm of Experts /Environmental Auditor/ Inspectors

Register and keep registry of qualified firms/individuals authorized to offer services in undertaking EIA, Initial and Control Environmental Audit Environmental Inspection, EIA training and other technical support.

3.10.1.6 Environmental Inspector (Appointed or Designated)

Empowered to enter on any land, premise or facility of the project for the purpose of inspection, to examine records and to make enquiries on the project or for the purpose of monitoring the effects of activity carried out on that land, premise or facility upon the environment.

3.10.1.7 NEMC Zonal Offices

Headed by Zonal Managers replicate all functions and departments of NEMC including overseeing Compliance and Enforcement; EIA; Research and Planning etc. There are 7 NEMC zonal offices and the proposed project is under the Eastern Zone covering Dar es Salaam (center), Pwani, and Tanga

3.10.1.8 Sector Ministries

Responsible for all sector-specific environmental matters within the Ministry including participation in Cross-Sectorial Advisory Committee for review of EIA Reports; review and verification of Environmental Audit Reports, monitoring on-going projects, and submit Monitoring reports to NEMC.

3.10.1.9 Regional Secretariat

Assist the Regional Commissioner; oversee/advise implementation of national policies, enforcement of laws and regulations at regional level. EMA, Cap. 191 Section 34 confers additional roles to the Regional Secretariat to coordinate all environmental matters within respective region.

3.10.1.10 Local Government Authorities (City, Municipal, District, Township, Ward, Village, sub-village “Mtaa and Kitongoji”)

Perform basic functions including promoting social and economic wellbeing and development of areas and people within jurisdictions including relevant to environmental and social management. EMA, Cap. 191 Section 37 confer additional functions for the environment committees; give general powers to the LGAs including to undertake inquiries and investigations, summon any person, resolve conflicts among various parties, inspect and examine any premise, order to remove substance or article harmful to the environment and prosecute or sue any violator.

3.10.1.11 LGA Environment Management Officer (designated / appointed)

Enforce, advise the Environment Management Committee, gather/ manage information, and report on state of local environment. EMO are tasked to monitor the preparation, review and approval of environmental impact assessment for local investments.

3.10.1.12 LGA Standing Committee on Urban Planning and Environment

The Committee is established under Section 42 (1) of the Local Government (Urban Authorities) Act, 1982 as a standing committee responsible for urban planning. EMA cover additional functions for the environment committee, include overseeing proper management of environment within an urban area.

3.10.1.13 Standing Committees of Economic Affairs, Works and Environment of a Township

Established under Section 96(1) of the Local Government (District Authorities) Act, 1982 while EMA, Cap. Additional functions for the environment committee include overseeing proper management of environment within a township.

3.10.1.14 Other Actors as per EIA and Audit Regulations, 2005

- Investor/ Developer / Project Proponent

Oversee and meet costs of Environmental assessment and implementation of ESMP/EMoP; undertake Initial Environmental Audits and Environmental Control Audit, Self-auditing during implementation of ESMP; undertake Baseline Survey before project implementation as basis for undertaking effective monitoring.

- General Public

Empowered by EMA and EIA Regulations to participate in all environmental management matters concerning them and at all stages of the EIA process specifically to raise issues and concerns and to appeal when dissatisfied.

From the description of legal institutions for environmental management given above, PO-RALG/TARURA and LGAs will required to deal with management of environmental and social issues as Sector Ministry, Regional Secretariat, LGAs, and Investor/ Developer / Project Proponent.

3.10.2 Land Management Authorities

3.10.2.1 Minister Responsible for Lands / Land Use Planning

Sole authority over all land matters: duty of formulation and implementation of Land Policy and Act; issuing permit for using land (other than village or reserved land); urban planning and use and development of land; designate any Body or Organ as a planning authority and to declare any area of land to be a planning area.

3.10.2.2 Commissioner for Lands

Sole authority responsible for land administration: principal administrative officer and professional officer and advisor to the government in land matters at all levels; has power to delegate the powers to officers at Local Authority to work and comply with his/her directives.

3.10.2.3 Qualified Valuers

Land (Assessment of the Value of Land for Compensation) Regulations, 2001 (Regulation 5) directs that every assessment of the value of land and unexhausted improvement (properties / assets) is done by a qualified Valuer.

3.10.2.4 Chief Valuer

Land (Assessment of the Value of Land for Compensation) Regulations, 2001 (Regulation 6) directs that every assessment of the value of land and unexhausted improvement (properties / assets) is done by a qualified Valuer is verified by the Chief Valuer of the Government or Representative.

3.10.3 Other Authorities Relevant Authorities

3.10.3.1 Tanzania Electric Supply Company Limited (TANESCO)

Under the Ministry of Energy and Minerals, its core functions are generation, transmission, distribution, supply and use of electric energy. At so many location TANESCO use road reserves for transmission infrastructure.

3.10.3.2 Energy and Water Utilities Regulatory Authority (EWURA)

In the electricity sector to regulate transmission and distribution of petroleum and natural gas; in the water sector responsible for (i) licensing and regulating water supply and sanitation services (ii) establishing standards, guidelines and tariffs chargeable in relation to water supply and sanitation services (ii) Monitoring water quality.

3.10.3.3 Water Basin Authorities

Established to manage water resources in nine (9) water basins: Pangani River Basin, Rufiji River Basin, Lake Victoria, Wami-Ruvu, Lake Nyasa, Lake Rukwa, Internal Drainage Basin to Lake Eyasi, Manyara and Bubu depression, Lake Tanganyika, Ruvuma and Southern Coast.

3.10.3.4 Water and Sewerage Authorities

These are urban based, established to offer water supply and sanitation services in respective urban centers. The authorities issue permits for discharging liquid wastes.

3.10.3.5 Tanzania National Roads Agency (TANROADS)

Issue approvals or permit for undertaking physical works on roads or road reserves, issue permit for extraction of construction minerals, issue permit for using roads above set limits (tonnage, width etc.).

3.10.3.6 Occupational Health and Safety Authority (OSHA)

Oversee safety, health and welfare of persons at work, carries out all workplace inspections; hygiene surveys and measurements, occupational health examinations of workers, offer advice on ergonomics and scrutinize workplace drawings.

3.10.3.7 Ministry of Home Affairs, Fire and Rescue Services Force

Protection against fire hazards, to issue permit for use of fire-fighting equipment's, Inspection of fire equipment commissioning of fire protection and detection system installed, to perform research on fire hazards and fire incidences.

3.10.3.8 Workers Compensation Fund (WCF)

Workers Compensation Fund (WCF) is a social security scheme established under the Workers Compensation Act No. 20 of 2008. The Fund is responsible for compensating workers who suffer occupational injuries or contract occupational diseases arising out of and in the course of their employment. In case of death of workers, the Fund is responsible for compensating dependants as per set criteria. The Scheme is operated under social security and insurance principles.

3.10.3.9 Tanzania Commission for Aids (TACAIDS)

Prevention and control spread of HIV/AIDS, to promote advocacy and education on HIV/AIDS, to protect human and communal rights of people infected with and affected by HIV/AIDS.

4 ENVIRONMENTAL & SOCIAL BASELINE

4.1 Overview

Baseline data on environment is important to understand existing physical, biological, cultural, economic and social environmental characteristics. This information serves as the basis for identification, prediction and evaluation of impacts of the project activities. There are two principal objectives in examining and defining the existing environment:

- To provide a baseline against which environmental conditions of the project will be measured and to document conditions which were either existing or developing before the introduction of the project and not due to the project.
- To identify existing environmental issues without the project.

The baseline environmental quality has been assessed through secondary data and primary data via field studies within the impact zone for various components of the environment, including: air quality, noise, water quality, sediments quality, vegetation, land and socio-economic. For this ESIA study, the baseline survey covered the study area defined in Section (1.7.2“Project Boundaries”). Considerations are given to both the environment and ancillary area that seems to be affected.

4.2 Biophysical Environment

4.2.1 Climate

The Ilala Municipality has humid temperatures that vary from 26⁰C in August to 35⁰C in December and January. The long rains season (March – May) receives an average monthly rainfall of 150mm – 300mm. The short rains season is between October and December with monthly average rainfall ranging from 75mm – 100mm. Ilala Municipality’s altitude ranges between 0 and 900 meters above sea level influences the ecological characteristics of the Municipality. Thus, the Municipality consists of a large lowland area and a small part forming the upland zone.

Kinondoni Municipality experiences a modified type of equatorial climate. It is generally hot and humid throughout the year with an average temperature of 29⁰C. The hottest season is from October to March while it is relatively cool between May and August with temperature around 25⁰C. There are two rain seasons: - short rain from October to December and long rain season between March and May. The average annual rainfall is 1300mm. Humidity is around 96% in the mornings and 67% in the afternoons. The climate is also influenced by the Southwest monsoon winds from April to October and Northeast monsoon winds between November and March.

During the months of March to May, the existing Jangwani Bridge has been experiencing frequent flooding as a result of increased intensities of precipitation.

4.2.2 Hydrology

The width of the Jangwani bridge openings have been estimated as these culverts are clogged for a large part by sediment. Table 4-1 shows the dimensions of the bridges included the Delft3D Flexible Mesh model.

Table 4-1: Bridge Dimensions

No	Bridge_ID	NAME	Width (m)	Height (m)	Length (m)	Bed level
1	br_K01	-	16	1.9	8	6.1
2	br_K02	-	10	2	26	7.8
3	br_K03	Kibangu Road Bridge	21.2	2.25	10	14.932
4	br_M01	Selander bridge	50	3	33	-0.25
5	br_M02	Jangwani West bridge	45	0.6	42	4.6
6	br_M03	Jangwani East 2 culvert	21	0.75	50	4.2
7	br_M04	Jangwani East 1 culvert	14.5	2	38	4.3
8	br_M05	Kigogo Road bridge	20	4.2	12	5.5
9	br_M06	Kawawa bridge	40	2.2	26	7.587
10	br_M07	Nelson Mandela Road Bridge	20.1	4.4	30	12.615
11	br_M08	Railroad bridge	39.2	5	7	19.161
12	br_M09	Vingunguti Bridge	32.11	2.07	10	25.171
13	br_M10	Kinyerezi Bridge	33	4	10	46.349
14	br_N01	Mkwajuni culvert	10	0.85	28	5
15	br_N02	-	8	2	4	7.06

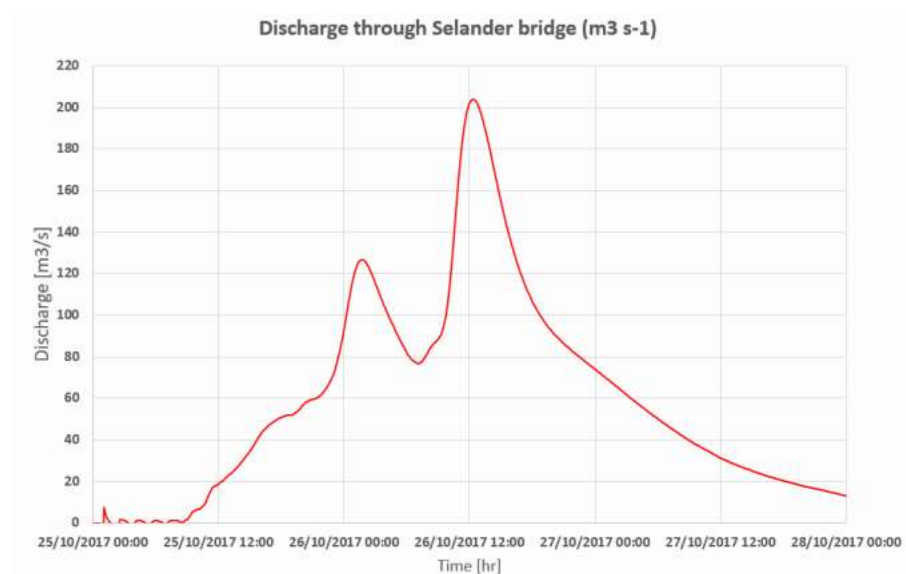


Figure 4-1: Hydrograph showing discharge of Msimbazi river at Selander bridge for the October 2017 event

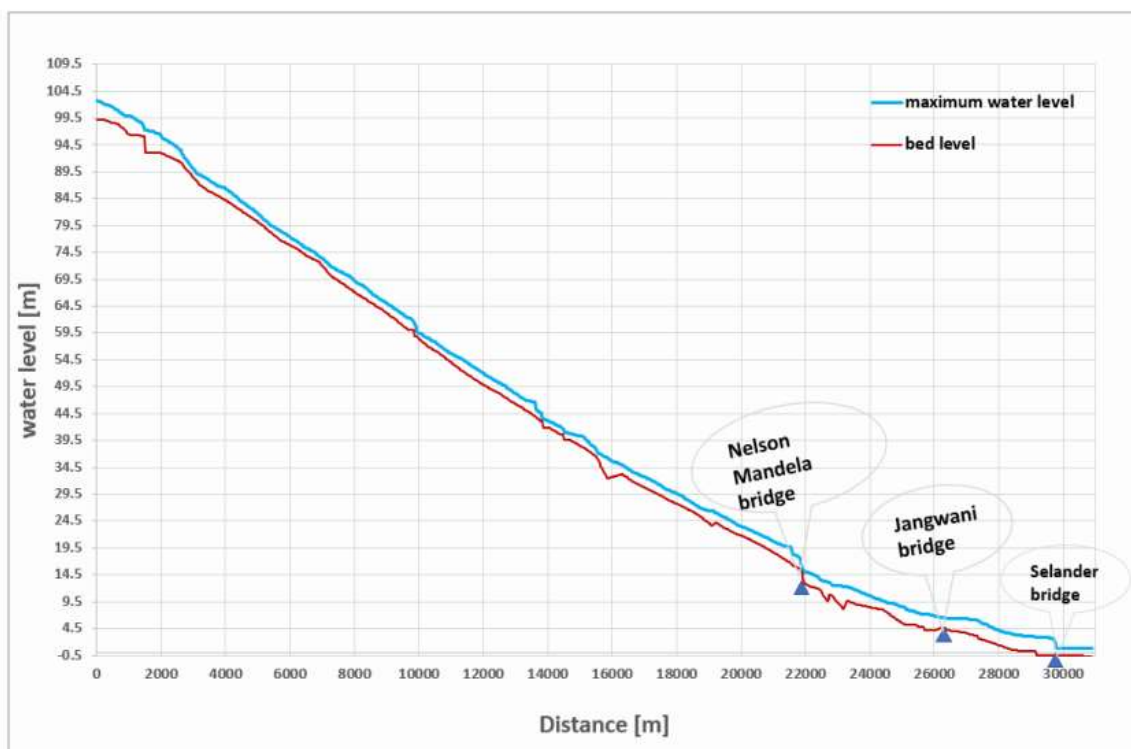


Figure 4-2: Longitudinal Profile of Msimbazi River with Bed Level and Simulated Maximum Water Levels for the October 2017 Event



Figure 4-3: Water Level Record Locations in the Flood Model.

Table 4-2: Water Depth Records for The October 2017 Event

Location	Water depth (cm)
C1001	100
C1002	132
C1003	160
C1004	90
C1005	10
C1007	
C1008	140
C1009	130
C2001	130
C2002	130
C2003	150
C2004	200
C2005	15
C2006	10
C2007	10
C2008	140

Upstream of the Jangwani bridge the simulated flood depths are relatively higher than the depth indicators. And upstream in the Ng'ombe river the simulated water levels are lower than the depth indicator points except for one of the points. This off set is likely due to the fact the model has no accurate bridge cross sections and river profiles in this part of the model. Besides the comparison with the historic records, we can see that the flood extent at the Jangwani bridge (flooded bridge deck) matches quite well with historic pictures of that event.

All together we can say that with available data and information the model shows a quite realistic representation of the October 2017 flood event both in flood extent and flood depths. Therefore, the model is usable for scenario analysis.

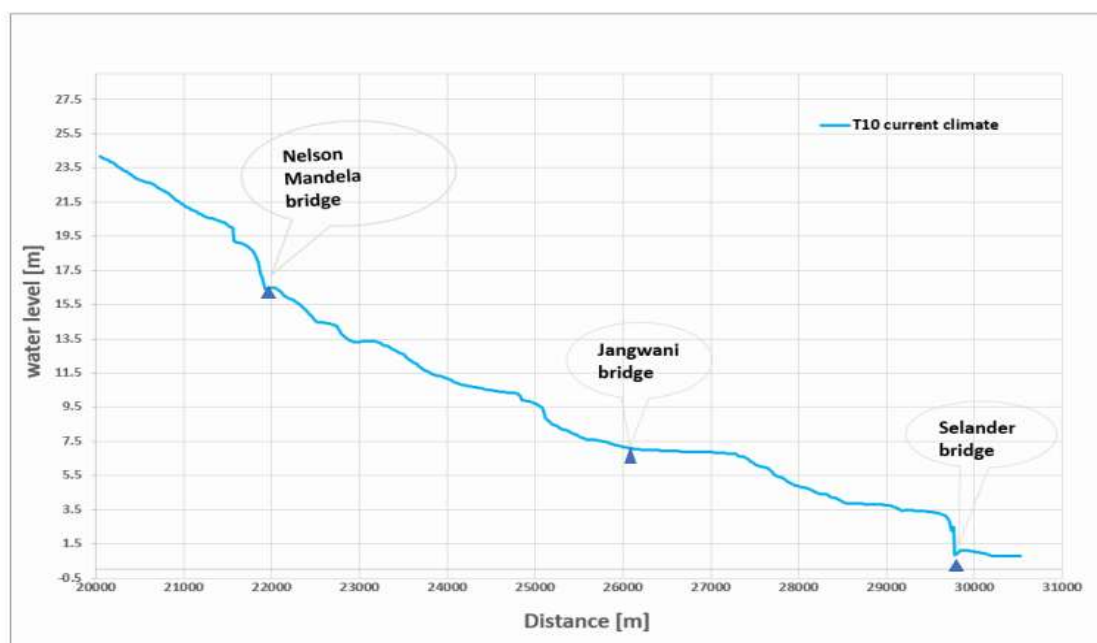


Figure 4-4: Longitudinal Profile of Msimbazi River with Simulated Maximum Water Levels for The T10 Event

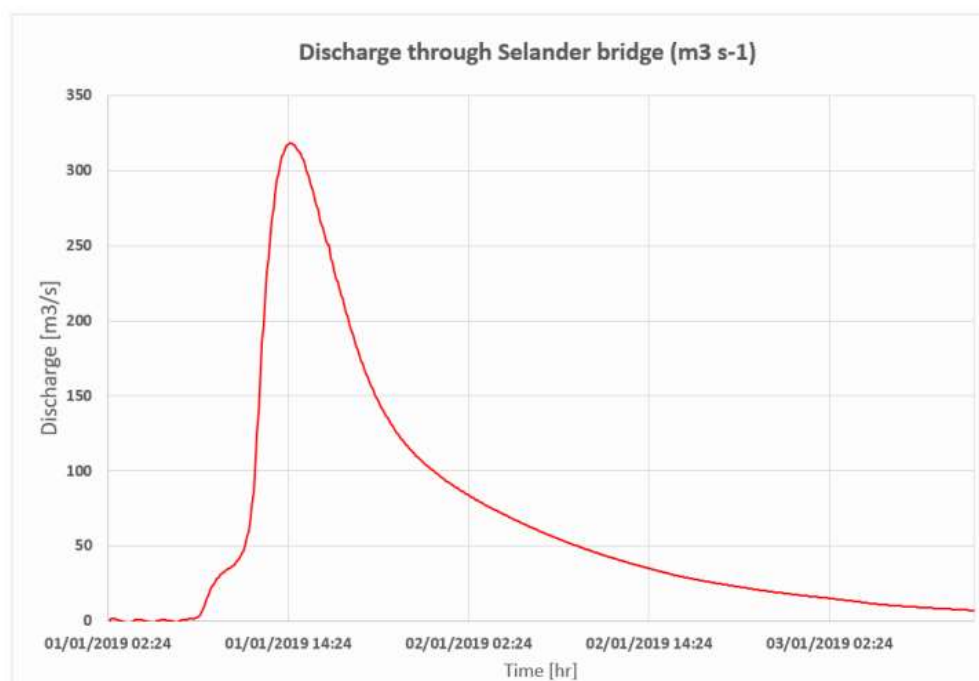


Figure 4-5: Hydrograph Showing Discharge of Msimbazi River at Selander Bridge for T10 Event

4.2.5.2.1 Flood Causes:

The main causes of flooding identified in the previous flood studies still apply for the current situation:

- Flow capacity of main river (limited conveyance capacity based on profile)
- Solid waste and sediment dumping blocking bridge openings in the middle Msimbazi.
- Backwater effect of flood plain (Mangrove area) in the lower Msimbazi

A general cause of the flooding is the limited channel capacity of the main river in the middle catchment. At most locations the river is less than 20 m wide, and (likely) less than 2 m deep at normal water levels. Notably, the river channel between Vingunguti and Railroad bridge has less than 0.5 m depth where significant flow passes from upstream. Additionally, near the Jangwani Bridge, the main river is about 10 m wide and nearly 1 m deep. It is insufficient to convey a flow of approximately 20 m³/s or more, which represent a low/moderate flood event. Further downstream of the Msimbazi river near Muhubili Hospital, the main river width reduces even further, leading to the main river width of just 5 m at some stretches.

During higher flow conditions, early overtopping of the embankments and the backwater effect causes higher water levels upstream. Overall, the normal channel dimensions are not sufficient to convey a flow of about 75 m³/s based on the average slope of 0.003 much less the maximum flow of a T10 event that may range from 250 – 350 m³/s.

The vegetation cover in front of Selander Bridge is layered with sediments and solid waste, which has a high impact in delaying conveyance and causing backwater effect upstream near Jangwani bridge. Bridges crossing the tributaries and Msimbazi river obstruct the river flow (Figure 4-10). The bridge openings,

often simply culverts, are too small to effectively convey the river flow. The most obstructing bridges, based on the modelling, are as shown in figure 4-6 below.

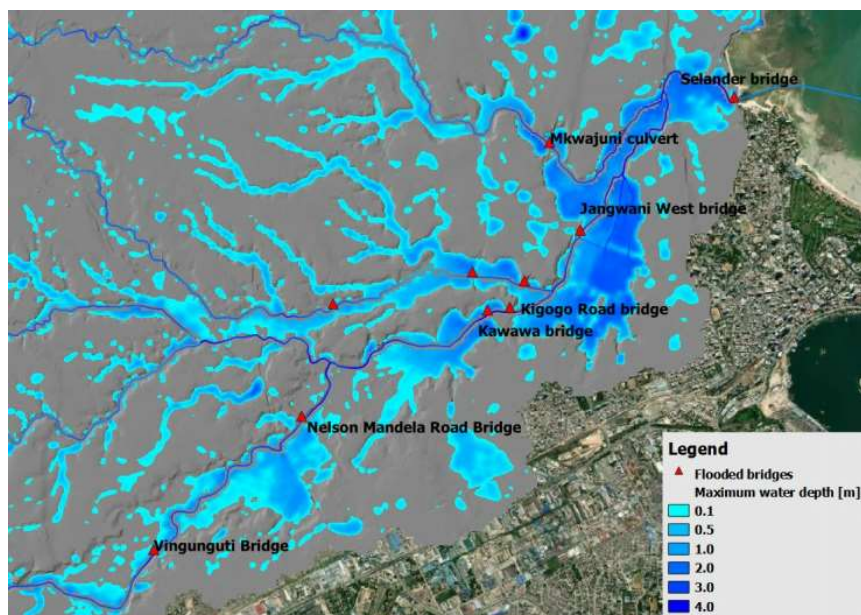


Figure 4-6: Bridges Obstructing Flow for The T10 Event

4.2.3 Vegetation

4.2.3.1 Mangroves

However; within the core project area as well as influence area for the proposed bridge there are no mangroves to be affected by the project activities.



Picture 4-1: Absence of Mangroves within the Project's Core Area

Source: Site Pictures, August 2023



Picture 4-2: Absence of Mangroves within the Project's Influence Area

Source: Site Pictures, August 2023

4.2.3.2 Grasses

The core project area has a variety of vegetation types, there are reeds such as (Matete) *Typha latifolia* and *Phragmite australis* in the more swampy areas and bushes in the drier parts.



Picture 4-3: Type of Grasses within the Core Project Area

4.2.3.3 Fauna

Types of macrofauna were observed: epifaunal gastropod snails and crabs. The study also found the presence of birds, reptiles and molluscs. There are no endangered/rare species identified within the project's core area.

4.2.4 Soil/Sediments Quality

In order to verify the quality of soils at the in the Msimbazi catchment area which covers the area of influence for proposed New Jangwani Bridge, sediment quality analysis has been undertaken by means of sampling and laboratory analysis.

The soil samples were taken at three depths, namely the surface top layer, 1 meters below ground surface and 2meters below ground surface. See Figure 4-8

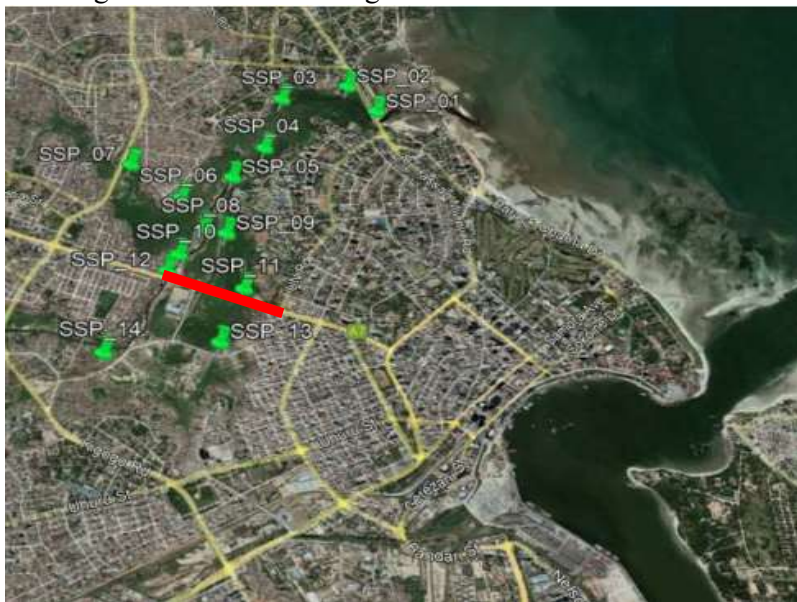


Figure 4-7: Corresponding Soil Sampling Locations (at the River Bed) to the Bridge Site (SSP11 & SSP12)

4.2.3.4 Heavy Metals

The soil samples were tested in different laboratories on different categories including physiochemical properties, bacterial properties, heavy metals, persistent organic pollutants, polyromantic hydrocarbons (PAH). The water samples have only been tested on physiochemical properties, bacterial properties and heavy metals.

African Assay Laboratories Ltd, Mwanza, Tanzania, was engaged to carry out the analysis of the water and soil samples as an ISO certified entity. African Assay Laboratories Ltd outsourced part of the analysis to other ISO certified laboratories, including SGS Institute Fresenius GmbH, Herten, Germany and the Tanzania Agriculture Research institute (Ukiruguru).

The three main standards the results were tested against are i) the Sediment Quality Assessment Guidelines (SQAG's for Florida Coastal Waters), ii) Tanzania Soil Quality Standards, iii) Tanzania Water Quality Standards (both of the Tanzanian Bureau of Standards, TBS) and iv) WHO water quality standards.

The results of the tested samples for the borrow areas for the heavy metals in the sediments. Analysed metals include Arsenic (As), Mercury (Hg), Cadmium (Cd), and Chromium (Cr), Nickel (Ni), Lead (Pb), Copper (Cu) and Chromium Hexavalent – (Cr VI)). Others are Iron (Fe), Manganese (Mn), Zinc (Zn) and Aluminium (Al).

The results presented in Appendix III suggest that the quality of sediment in the river bed and at the river banks is in compliance with the national standards (Tanzania Bureau of Statistics, TBS) and international guidelines (SQAGs) for all critical parameters. Variation is observed, mainly in higher concentrations of heavy metals in the banks than in the river bed. The variation is hard to explain but might be heavily influenced by anthropogenic activities including but not limited to effluents from industrial undertakings, municipal wastewater treatment works, solid waste dumping, release of oil and grease by garages, Vingunguti Abattoir and usage of fertilizer for urban farming.

4.2.5 Water Quality

The laboratory results for the physiochemical characteristic of the water samples collected upstream and downstream of the proposed bridge have been attached as Appendix II of this ESIA. The samples were collected at [6°48'38''S;39°15'54''E-Upstream (WS-01) and 6°48'34''S;39°15'56''E]-Downstream (WS-02). The parameters include; pH, Colour, EC, Total Dissolved Solids (TDS), Ammonia-Nitrogen, TSS (Total Suspended Solids), Turbidity, BOD (Biological Oxygen Demand) and COD (Chemical Oxygen Demand) and heavy metals. The results indicate that: Color, BOD, COD and TSS are above the water quality standards' limits for municipal and industrial effluents of Tanzania. Comparison with the International Financial Corporation (IFC) guidelines, only COD levels are within the permissible level.

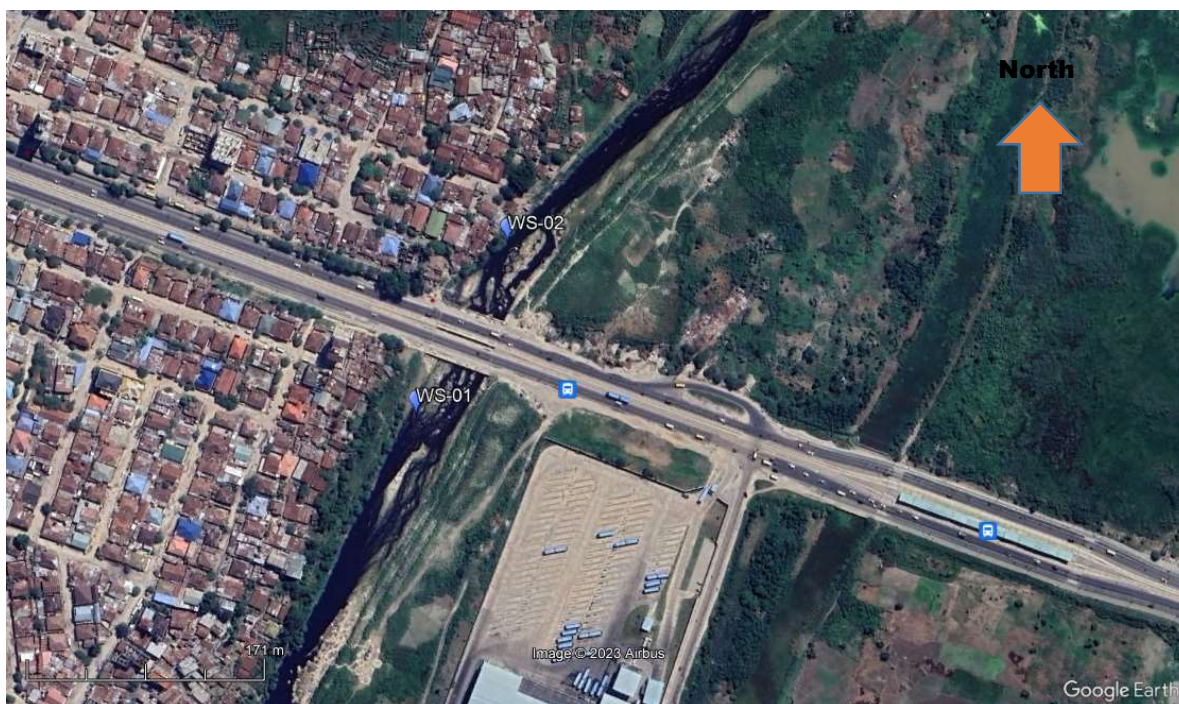


Figure 4-8: Water Sampling Points at Jangwani Area

Spatial variations have been observed and are likely to be influenced by the prevailing anthropogenic activities which are reflected in quality of water in the tributaries that join Msimbazi river. Nevertheless, it should be noted that the analysis of water in the current study concentrated on the Middle Basin of the Msimbazi area which is expected to be less contaminated.

Bacterial properties

The analysis on bacterial properties was done through targeting Faecal Coliform which is an indicator for contamination by human feces. Results show that for Total Coliforms between 9×10^6 to 11×10^6 /100ml has been measured against the national standard limit of 10,000/100ml. The results are far beyond the national discharge standards. The International Finance Corporation (IFC) Standard recommends a guideline value of 400a, the “a” represents “Not applicable to centralized, municipal, wastewater treatment systems which are included in EHS Guidelines for Water and Sanitation”. Based on the water quality analysis report, the water in Msimbazi river is not safe for contact with people, not safe for direct consumption and even not safe for farming of vegetables which can be consumed in raw condition.

4.2.6 Soil & Geology

According to the geological map (Quarter Degree sheet no. 186) Dar es salaam area consists mainly of tertiary soils the chief constituent being alluvial SAND deposits and clayey silty SANDS. At some locations CORAL LIMESTONE ROCK exists.

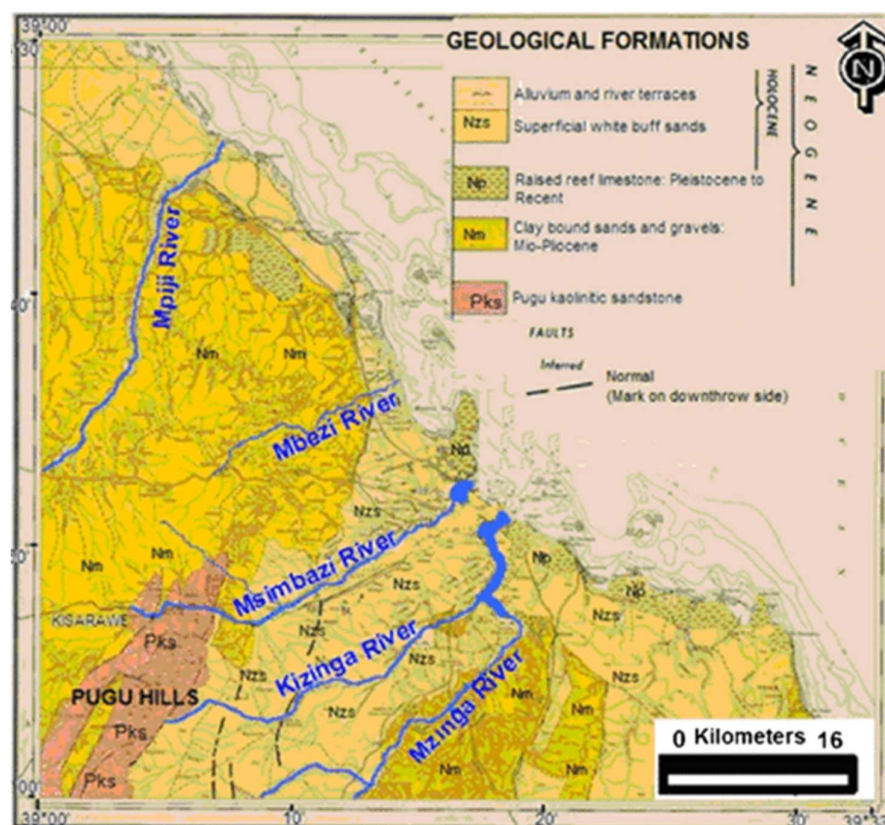


Figure 4-9: Geological Map for the Project Area
Source: Ibrahim Chikira, 2014

Twenty-three boreholes were drilled in the area to depths ranging from 15.0m to 75.0m during the period of August 2020 to January 2021. The aim of the investigations was to check the subsoil conditions in the area for the proposed New Jangwani bridge and to determine the relevant soil properties for the foundation design of the bridge. Twenty three boreholes drilled so far have revealed the following soil profiles, Table 4-3 below has been taken as an example among the drilled boreholes.

Table 4-3: Representative Soil Profiles for Jangwani Bridge Site

BH1	
0.0m – 2.0m	Loose grey fine SAND
2.0m – 6.0m	Loose grey medium dense fine SAND
6.0m – 7.5m	Medium dense black silty fine SAND
7.5m – 12.0m	Loose black silty fine SAND
12.0m – 18.0m	Medium dense grey fine SAND
18.0m – 22.0m	Stiff greenish blue silty CLAY
22.0m – 24.0m	Dense white coarse SAND
24.0m – 30.0m	Stiff greyish yellow silty CLAY
30.0m – 38.0m	Very stiff to hard greyish yellow silty CLAY
38.0m – 45.0m	Weak white CORAL LIMESTONE ROCK
45.0m – 54.0m	Hard white CORAL LIMESTONE ROCK
54.0m – 55.0m	Very stiff bluish green silty CLAY

From the laboratory results, the grain size distribution shows mainly clayey SAND material with some gravel. The fractions are as follows:

Clay	0% – 53%
Silt	0% – 58%
Sand	15% – 100%
Gravel	0% – 32%

The natural water content of the material ranges from 1.6% to 45.7%. The liquid limit of the material varies from 24.0% to 107.0% while the plastic limit ranges from 15.8% to 46.4%. The internal angle of friction of the material lies between 15° and 26° with a cohesion of about 14 to 63kN/m under drained conditions.

The stiffness modulus, E_s , varies from 2.2 MN/m to 5.2 MN/m for a stress range between 100 to 200kN/m. The consistency index of cohesive soils varies from 0.45 to 0.91 indicating firm to stiff materials.

4.3.3.1 Dredged Material

The dredged material was collected close to borehole BH 1 [See Figure 4-10] and consists mainly of silty SAND with no gravel. The fractions are as follows: Clay (0%-3%), silt (1%-32%), SAND (65%-95%). The density of solids of the materials is 2.65-2.66Mg/m. The liquid limit of the silty SAND ranges from 25.0% to 26.2% while the plastic limit varies from 21.3% to 21.6% with the plasticity Index ranging from 3.4 to 4.9.

The maximum dry density at modified Proctor ranges from 1770-2055kg/m while the optimum water content varies from 8.70% to 15.8%. The CBR of the dredged material ranges from 4.8% to 10.2%.

California Bearing Ratio (CBR) and Proctor tests were performed to assess the feasibility of re-using the material in the construction of the embankment. The results of these tests are presented in Table 4-4.

Table 4-4: Summary of Laboratory Test Results on Dredged Materials

Dredged Sample Location	Parameter	Unit	Test	# of Test	Average Value
A	CBR value	-	CBR	2	8.6
C	CBR value	-	CBR	2	7.4
C	Density of solids	Mg/m ³	density	2	2.655
A	Maximum dry density	g/cm ³	Proctor	2	1912
A	Optimum moisture content	%	Proctor	2	10.5
C	Maximum dry density	g/cm ³	Proctor	2	1789
C	Optimum moisture content	%	Proctor	2	14.9
A	Natural water content	%	water content	2	8.2
C	Natural water content	%	water content	2	24.7

4.3.3.2 Rock Quality

The CORAL LIMESTONE ROCK encountered at the site is generally very weak. Fairly hard rock was found at BH 1 and BH 13 [See Figure 4-11] with rock quality designation ranging from 5% to 40%, but mostly below 25%. The formation at the bridge site consists of CORAL LIMESTONE ROCK ranging from MIOCENE to RECENT calcareous sediments with LIMESTONE of marine origin that was

subsequently covered by SAND and CLAY brought by rivers. It is very soft and non-homogenous rock. The rock cannot be assumed to have the same properties throughout the base area of the constructed pile. The rock can have variable properties within the pile diameter. Some areas may have cavities and low strength while others may have no cavities with higher strength.



Figure 4-10: Map for Performed Boreholes
Source:CDR, Wema, Deltares, 2021

4.3.3.3 Chemical Test Results on Soil Samples

Chemical test results on soil samples derived from the boreholes drilled on site indicate the following ranges for the analysed parameters: pH (6.43 – 8.24), Sulphate (18-78mg/kg), Chloride (25-102mg/kg), E/Conductivity (520-1154 μ S/cm) and Salinity (0.0-0.6).

According to the Unified Soil Classification System (USCS) the samples from the subsoil can be classified as SP (i.e., poorly graded SAND) and in some cases as SCL (i.e. clayey SAND, the clay having low plasticity), and in another case as SML (i.e., silty SAND, the silt having low plasticity). In a few cases as SCI (i.e clayey SAND, the clay having intermediate plasticity).

4.3.3.4 Geotechnical Hazards

Based on the general geology and the results of the GSI the following geotechnical hazards are identified which should be considered for the design:

- **Limestone Cavities:** the basement rock is identified as weak coral LIMESTONE ROCK. Due to dissolving of limestone rock in fresh water it is common that cavities may be form in the rock. In this location, cavities of few centimetres have been found (size vary from 4 to 6 cm as per Sapphire Report).
- **Liquefaction:** loosely packed and poorly graded SANDS and FILL material may be susceptible to liquefaction during earthquake loading.

- Deformation of plastic CLAYS: loading of the clay may lead to excessive deformation of constructions.
- Bearing capacity failure: exceedance of soil strength may lead to structural failure of the bridge or embankment and roads.

4.2.7 Air Quality and Noise Levels

To ensure that the project construction are conducted in clean working environment and activities minimize contribution to environmental pollution, baseline data for air quality and noise were collected. The measurements involved dust levels (Particulate Matter PM10 and PM2.5), sound level and ambient pollutant gases. Measurement's readings for ambient gas concentrations, dust levels, and noise levels have been compared with existing local and international standards i.e. Tanzania Bureau of Standards TZS 750: 2015, TZS 845: 2019 (3rd Ed) and TZS 932: 2017 (2nd Ed) and IFC Standards.

Sampling Points/Locations

Sampling was done at the area adjacent to Jangwani Secondary School-Sampling Point 01 ($6^{\circ}48'44''\text{S}$ and $39^{\circ}16'20''\text{E}$) on LHS of the proposed bridge's approaching road towards Fire area, another sampling was conducted adjacent to the residential settlements (Magomeni Suna)-Sampling Point 02 ($6^{\circ}48'32''\text{S}$ and $39^{\circ}15'45''\text{E}$), Sampling Point-03 [$6^{\circ}48'35.56''\text{S}$; $39^{\circ}15'54.82''\text{E}$] and sampling Point-04 [$6^{\circ}48'45.36''\text{S}$; $39^{\circ}16'21.93''\text{E}$]

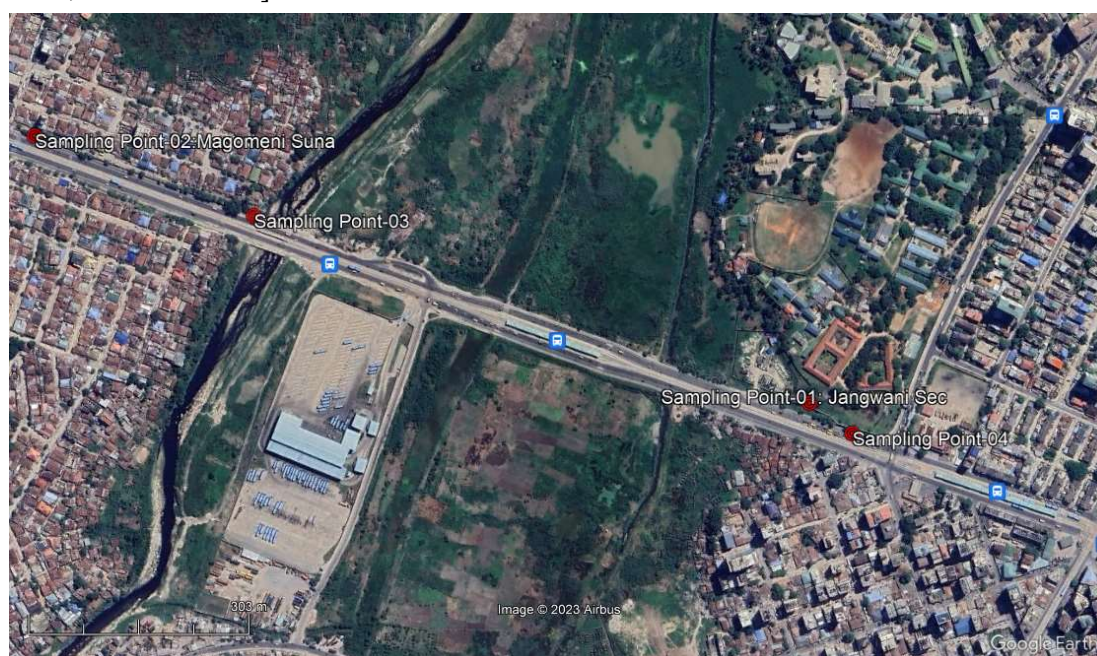


Figure 4-11: Location for Sampling Points

4.3.3.5 Air Quality

Temtop (Airing-1000 2nd) was used to monitor PM2.5, PM10 Particles, having a Sensor for both Indoor & Outdoor air quality.

DOEATOW CO-Carbon Monoxide Detector used to detects the presence of the carbon monoxide (CO) to the environment; the CO detectors have been designed to measure CO levels over time and sound an alarm before dangerous levels of CO accumulate in an environment.

Carbon Dioxide Meter having NDIR Channel Sensor for measuring CO₂ at the range of 0~9999ppm with Alarm Set was used. The GMI model PS500 with serial number 250678 was used to detect sulfur dioxide (SO₂), nitrogen dioxide (NO₂) and nitric oxide (NO).

Samples were taken at the time interval of 10 minutes at the height of about 1m from the earth surface and the results for the parameters CO , CO₂, PM_{2.5}, and PM₁₀, are provided in Table 4-5 to Table 4-8 respectively while Noise Levels have been indicated in Tables 4-9 & 4-10.

Table 4-5: Carbon Monoxide Measurements

Location	Pollutant	Measured Value (ppm)	
		Min Value	Max Value
Adjacent to Jangwani Secondary School [S-01]	CO	<0.1	14
Adjacent to community residents - Magomeni Suna [S-02]		<0.1	8
Limit	Local Standards	9	
	IFC Standards	N.M	

Table 4-6: Carbon Dioxide Measurements

Location	Pollutant	Measured Value (ppm)	
		Min Value	Max Value
Adjacent to Jangwani Secondary School [S-01]	CO ₂	398	506
Adjacent to community residents - Magomeni Suna [S-02]		382	432
Limit	Local Standards	N.M	
	IFC Standards	N.M	

Table 4-7: Particulate Matter Measurements

	Pollutant	Measured Value in $\mu\text{g}/\text{Nm}^3$	
		PM _{2.5}	PM ₁₀
Adjacent to Jangwani Secondary School [S-01]		30.7	54

Adjacent to community residents - Magomeni Suna [S-02]	Particulate Matter(s)	18.2	32
Limit	Local Standards	25	60-90
	IFC Standards	25	50

Table 4-8: SO₂ & NO₂ Measurements

Measurement Location	Pollutant	Measured Value in [ppm]	
		SO ₂	NO ₂
Sampling Point-03	Gaseous Pollutants	0.0	0.1
Sampling Point-04		0.0	0.1
Limits	Local Standard	0.2	N.M
	IFC Standards	500 µg/Nm ³	200 µg/Nm ³

With respect to gaseous pollutants, all the parameters were of insignificant concentration since the measured parameters CO, CO₂ were less than the detectable limit. The gaseous detected due to the hydrocarbon fuel combustion from the vehicles and oxidation process.

4.3.3.6 Noise and Vibration

ADA-ZSM 130 Sound Level Meter model IEC 651 TYPE II was used to measure the level of noise levels. Ground vibration were determined by using XTECH SDL-800 vibration meter with resolution value of 0.1 mm/s, accuracy of ±5%, velocity up to 199.9 mm/s, frequency range of 10 Hz to 1 kHz for capturing almost all possible vibrations for workplace assessments.

The ambient noise measurement was done to observe the real time ambient noise levels in the areas along the proposed bridge. It was observed that the noise levels are below the standard limit as they range from 53.2 dB (A) – 61.7 dB (A). The range is within the limit as per Environmental Management (Standards for the Control of Noise and Vibration Pollution) Regulations, 2019; the recorded figure were due to a moving vehicles/motorcycle as well as wind speed onsite.

Table 4-9: Noise Level Measurements

Location	Pollutant	Measured Value (dB (A))	
		Min Value	Max Value
Adjacent to Jangwani Secondary School [S-01]	Noise Level	56.4	61.7
Adjacent to community residents at Magomeni Suna [S-02]		53.2	59
Limit	Local Standard	45 -60 dB(A)	
	IFC Standards	35-40 dB(A)	

Table 4-10: Vibration Measurements

Measurement Location	Pollutant	Measured Value in [mm/s]
Sampling Point-03	Ground Vibration	0.4
Sampling Point-04		0.3
Limits	Local Standard	5

Measured vibrations levels at Sampling Point-03[6°48'35.56"S; 39°15'54.82"E] and sampling Point-04[6°48'45.36"S; 39°16'21.93"E] were below the tolerance limit for ground vibration of 5mm/s as per Environmental Management (Standards for the Control of Noise and Vibration Pollution) Regulations, 2018. The ground vibrations as a result of piles driving during construction are likely to cause annoyance to the nearby residents and pupils during class hours.

4.3 Socio-economic Environment

4.3.1 Population

The Jangwani bridge area falls under Magomeni, Mzimuni, Mchikichini, Jangwani, Upanga Mashariki, Upanga Magharibi and Hananasif wards. Referring to the National Population Census of 2022, the population for the wards in the vicinity of the project are as indicated below.

Table 4-11: Population in the Project's Wards

Municipality	Ward Name	Male	Female	Total Population
Kinondoni	Magomeni	7,629	7,612	15,241
	Mzimuni	10,433	10,507	20,940
	Hananasif	13,281	14,334	27,615
Ilala	Jangwani	7,326	6,467	13,793
	Upanga East	4,467	4,850	9,317
	Upanga West	5,593	6,252	11,845

Source: NBS,2022

The population living to the proximity to the project shall be relieved from regular flooding of their residential/commercial areas during rainy seasons as a result of dredging of Msimbazi Valley at the upstream and downstream of the proposed bridge. The population is more likely to be fully involved in the construction activities through short term employments.

4.3.2 Land Use

The project site is currently used by the existing Jangwani bridge and approaching roads on both sides of the bridge. On the eastern north and south of the bridge, residential and commercial buildings are just adjacent to Morogoro road, on the western north there is Jangwani Secondary School and south there are commercial and residential buildings just after the road reserve.

contractor's camp site has been located. Since the contractor as well as project activities require electricity, it will be easy to connect to the existing lines.

4.3.6 Water Supply

The main source of water for residents in the vicinity of the project is from Lower (nominal capacity of 180,000 m³/d) and Upper Ruvu (capacity of 196,000 m³/d) which managed by Dar-es-salaam Water and Sewerage Authority (DAWASA). At the proposed project site, there are 2nos parallel DAWASA water mains that shall be affected by the project during pre-construction phase. However, the proposed project can also be connected to DAWASA network to facilitate construction activities.

4.3.7 Solid Waste Generation

Solid waste management is a serious challenge throughout Dar es Salaam. Solid waste generation is increasing as the urban population grows.

Jangwani; Mchikichini; Upanga West and Magomeni Wards are situated in the area of influence for the proposed Jangwani bridge. The communities live along Msimbazi valley mostly rely from CBOs as they are main solid waste collectors to collect and transport waste i.e. Magomeni ward is served by Magomeni Taka Group; sometimes they collect and transport to unknown places, usually they drops at un authorized areas illegally like in msimbazi valley, open spaces near community surrounding. This type of behavior causes heavy flooding situation during the rain seasons and unsightly environmental condition.

Table 4-12: Solid Waste Generation at the Project's Wards

LGA	Ward	Population	Sw Generation
KMC	Magomeni	15241	15 t/d
DCC	Jangwani	13793	14 t/d
	Upanga West	11845	12 t/d
	Mchikichini	19076	19 t/d

Source: Based on census statistics report 2022

The proposed project is expected to generate solid wastes during demolition and construction phases, both departments from Ilala and Kinondoni Municipalities shall be involved on arrangements for disposal or alternative uses during the project's implementation.

4.3.8 Cultural Heritage

The indigenous inhabitants of the areas in the vicinity of the proposed New Jangwani Bridge were Zaramo and Ndengereko. However, due to urbanization, many people of different ethnicity have migrated and made heterogonous tribal composition in the areas, whereby no single ethnic group accounts for more than 25% of the total population.

At or near the proposed project site, there are no cultural heritage site that has been identified or reported, however; incase any of the cultural resource is encountered during construction, chance find procedures shall be adhered to.

4.3.9 Gender Based Violence (GBV) Issues

Gender-based violence (GBV) or violence against women and girls (VAWG), is a global pandemic that affects 1 in 3 women in their lifetime. In the project's wards violence is often associated with physical violence, verbal violence (including hate speech), psychological violence, sexual violence and socio-economic violence. However; exact figures for reported cases could not be justified during the study.

4.3.10 Health Facilities,

Communities surrounding the project site have reliable access to various health facilities; in Magomeni and Upanga there are different health facilities (hospitals, health centers, dispensaries and clinics) belonging to the Government and private owners. These include: Magomeni District Hospital, Mikumi Hospital, Muhimbili National Hospital among others. During construction, the project workers can have access to these hospitals for various medical treatment.

4.3.11 Educational Facilities

Within the project's wards, there are a number of educational facilities including primary and secondary schools. However; Jangwani Secondary School is the one located within the project's area of influence. The bridge is expected to impact school's activities during both construction and operation phases.

5 STAKEHOLDER CONSULTATIONS

5.1 Overview

This chapter presents the procedure for identification and consultation of the stakeholders as part of ESIA Process for the proposed Jangwani bridge project . The stakeholder identification and consultation was done in accordance with Regulations 13, 15 of EIA and Audit Regulations of 2005 and Regulation 17 of its amendments of 2018), and Step2 of the Fourth Schedule for the EIA Process and World Bank Environmental and Social Framework particularly ESS10.

Identification of the relevant stakeholders as well as conducting public consultation was main aspect of ESIA study. Public consultation was one of the ways of obtaining relevant information related to the study. Public consultation helped in identifying the issues and concerns related to the project. The consultation was done with technocrats in Kinondoni and Ilala Municipal Offices. Other interested stakeholders including the local NGO and authorities are presented in the next sections of this ESIA.

5.2 Importance of Stakeholders Involvement

Stakeholder participation and involvement is important in the ESIA process. Section 89 of the EMA No. 20 of 2004 emphasize its importance by providing guidance on public participation issues and states its importance in the EIA. Regulation 17 of the EIA and Audit Regulations and amendments of 2018 (URT, 2005) provides further directives and procedures for public participation in the EIA process. Stakeholder participation involves processes whereby all those with interest in the outcome of a project participate in decisions on planning and management of the proposed development.

Views and concerns from stakeholders have been reflected in the ESIA document and have contributed to the project modifications, identification of impacts as well as mitigation and enhancement measures for the identified impacts.

5.3 Methods of Stakeholders Involvement

5.3.1 Stakeholders Identification and Engagement Process

The main stakeholders identified for the proposed Jangwani bridge project include; Ministry of Works, PO-RALG, TANROADS, TARURA, TANESCO, OSHA, LGAs in Dar es Salaam Region specifically Dar es Salaam City Council and Kinondoni Municipal Council as well as Communities residing around the Jangwani Bridge project site. Stakeholder engagement allows stakeholders to understand the project, the risks, impacts and opportunities of the Project in order to achieve desired positive outcomes. The public participation process was designed to provide information to and receive feedback from stakeholders for use throughout the EIA process and overall project phases. The consultation and engagement process took place from 23rd March 2022 through April 2022 for the first round and further consultations and engagement in January 2023. Tentative schedule of consultation and engagement is as per table 5-1 below

Table 5-1: Tentative schedule of consulted stakeholders

No	STAKEHOLDER	DATE CONSULTED	VENUE
1	Ministry of Works and Transport	06 th APRIL 2022	Dodoma Office HQ
2	Tanzania Traffic Police Headquarters	23 rd MARCH 2022	Traffic Police Office HQ-Dar es Salaam
3	DARCOBOA	23 rd MARCH 2022	DARCOBOA Office HQ-Dar es Salaam (Ilala)
4	Occupational Safety and Health Authority (OSHA)	23 rd MARCH 2022	OSHA Office HQ-Dar es Salaam (Kinondoni)
5	DAR ES SALAAM CITY COUNCIL	28 th MARCH 2022	Dar es Salaam City Council-Ilala
6	TANESCO –ILALA	25 th MARCH 2022	TANESCO Office HQ-Dar es Salaam (Ilala)
7	TANZANIA FOREST SERVICES AGENCY	24 th MARCH 2022	Dar es Salaam Office
8	AMEND	14 th APRIL 2022	Online Meeting
9	Bodaboda and Bajaji drivers at Suna and Mzimuni	02 nd JANUARY 2023	At their Parking areas
10	Land Transport Regulation Authority	3 rd JANUARY 2023	HQ office – Dar es salaam
11	Wami Ruvu Water Basin Water Board	28 th July 2023	Consultation by email

5.3.2 Stakeholders Analysis

After identifying and grouping stakeholders, stakeholder analysis was used to characterize stakeholder groups' interests, how they will be affected by the proposed Jangwani bridge 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 a project were engaged as early as possible during project design. By engaging with the 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.

5.3.3 Public Meetings

Dissemination of project information among communities along the proposed project through local community leaders and later through meetings was an important aspect of the public participation process; they needed to be appropriately informed about what is planned in their area.

The community consultations were conducted with the intention to;

- Provide clear and accurate information about the Project to the communities
- Inform communities along the way leave about the Project schedule
- Gathering from population and their representatives about main environmental and social concerns and perceptions regarding the road upgrading
- Gather opinions and suggestions directly from the communities on their preferred mitigation measures

- The discussions focused on environmental, social economic and road safety issues in the area raised by community groups that are likely to be impacted during the project construction and operation phases.

Results of the consultation and concerns by the stakeholders is presented in preceding sections of this report and further summarised in *Appendix III*.

5.4 Project Information Disclosure to the Public as Part of Consultation

In compliance with ESS 10 (and other relevant ESSs) and the EIA and Audit Regulations, 2005 and amendments of 2018; disclosure of relevant safeguard documents helps affected communities and other interested parties to understand the scope and associated risks, impacts and opportunities. The implementing agencies will continue providing the respective communities and other stakeholders with access to the required relevant information. The ESSs for instance requires that before a sub-project is approved, the applicable documents (ESMF, RPF, ESIA and RAPs) must be disclosed and made available to the public/communities for review at strategically accessible places (e.g. World Bank website, websites and offices of PO-RALG, TARURA, TANROADS, and participating LGAs offices as well as to the most preferable newspapers.) in a form, manner and understandable language preferable Kiswahili language. This allows the public and other stakeholders to comment on the possible environmental and social impacts and risks of the project. Therefore, this ESIA once approved by NEMC and the World Bank will be disclosed.

5.5 Proposed Design Consideration Raised by Stakeholders

Below are views and concerns from various stakeholders that were consulted as part of preparing the ESIA report:

5.5.1 Ministry of Works Transport and Communication

This is the Ministry that overlooks all major National and Regional Roads and therefore responsible for the upgrading of the Jangwani Bridge through TANROADS. The Ministry revealed that this upgrade is important for the Transport sector specifically for the Dar es Salaam and the Country at large. With the upgrade of the bridge transport will be efficient even during the rainy season and also ensure the BRT if functional year round. The current situation is also expensive for the Country as during rainy season the section of the road is forced to close affecting traffic of cars that include the BRT. Cost of dredging very after rain seasons will also be minimized once the bridge was upgraded.

With regard to the construction activities, it was recommended that the dredged soil during construction; the quantity should be established so as it is known its quality so as to know if can be useful to the other uses; and if it is polluted to find the best way of disposal. It was also suggested to increase the length of dredging so as to control silting problems as this is the main cause of Jangwani bridge to flood.

The Ministry also emphasized that TFS as a major stakeholder should be consulted for the case of Mangroves during dredging activities to see if there are sections that may be removed so as to increase the dredging lengths. The consultations shall consider all the necessary stakeholders such as communities and ward/mtaa governments. Issues of Health and Safety during various phases of the project that include design, construction as well as operation was emphasized; both community safety and occupational safety;

With regard to the bridge design, the Ministry recommended that the bridge design should be iconic so as it accommodates the development that the Government intends to undertake in the Jangwani Valley area.

The Ministry also recommended that draft final design stakeholders should have an opportunity to review and comment.

5.5.2 Tanzania Traffic Police Headquarters

The Tanzania Traffic Police is responsible for ensuring traffic flows as well as safety of those using roads both pedestrians as those using cars; it was therefore important to obtain their views regarding the project. The Police find the project important and therefore accept its implementation it will mitigate the challenge of flooding in Jangwani area. The traffic police revealed that the flooding at Jangwani has been a major source of traffic congestion for Dar es Salaam.

During construction phase the contractors should propose the diversion road to be used and that it is important that the Traffic police are involved in establishing the alternative routes especially during rush hours. TANROAD should make sure that all diversion roads should be clear and remove obstacles like arbitrary parking on the road so as to reduce traffic jam.

The traffic requested to know if during the construction phase will the bridge be constructed in one road way (single phase) or all roads simultaneously. This was cleared that the it will be single phase so as to reduce impacts associated with congestions. On diversion, roads should have temporally traffic lights to control cars when there are no traffic officers. The diversion routes should be constructed and maintained before the construction phase starts.

TANROADS together with Traffic should announce and encourage communities through radio stations and televisions to use diversion roads during construction phase in order to reduce jams to the construction road. The proposed diversion road should be open at any time.

With regard to the design, it was recommended to consider increasing the length of bridge near to Fire traffic light area so as to enhance safety measures associated with the current situation which according to the police has been an accident spot.

5.5.3 DARCOBOA

DARCOBOA is a Dar Es Salaam Commuter Bus Owners Association, considering that their members use the bridge to commute from the City centres to various parts it was important to consult them to inform them about the project and also to obtain their views regarding the project.

The association revealed that the proposed project is accepted because flooding in Jangwani area is a challenge for so long and this was affecting time travelled to and from city Centre, risking commuter's life as well as significant cost of operations and maintenance.

During construction phase; the diversion route should be upgraded before the construction phase started if need be and maintain to reduce time travelled as well as maintenance costs of the buses. It is also important that during the construction phase trucks are not allowed at high pick hours especially trucks ferrying construction materials for the project so as to minimize the traffic jam.

After the bridge is completed there should be changes at Fire traffic light area because there is a problem of traffic lights in that area which has also been a major source of jam; TANROADs needs to re configure and involve stakeholders as part of the configuration.

As a mechanism to reduce traffic congestion DARCOBOA recommends that it is important for the government to encourage people to use public transportation during construction in order to reduce number cars coming to town.

5.5.4 Occupational Safety and Health Authority (OSHA)

OSHA insisted the importance of the project proponent ensuring that the Contractor/s is/are registered with OSHA prior to start of works. It is also important that some workers in the project have to attend First aid and Safety and Health training at OSHA and they will be there is a provision of certificate after the attendance of that training. It should be noted that medical examination should compulsory be conducted to all workers.

All the workers on site should be wearing appropriate PPEs depending on the nature of a work. Sanitary facilities should be standard and consider all gender e.g one toilet for 25 men and one toilet for 20 women. The sanitary facilities are either permanent or temporary and should have water at all times; Contractors should have the following documents submitted to OSHA during registration.

Baseline Risk Assessment which includes Traffic Plan Management, Safety plan management; Policy document which used to guideline risk occurred during construction phase.

Further emphasis is that:

- All machines should be inspected example lift gears, crane lift.
- All accident should be registered to registration book for report of numbers of accidents occurred.
- All section should be fully equipped with first aid box and first aid post.
- Emergency plan should be prepared by contractors

5.5.5 Dar es Salaam City Council

The Dar es Salaam City Council formerly known as Ilala Municipal Council forms part of the immediate project area; as part of the Jangwani Bridge is located in the council. Considering that the Project Coordinating unit of the Msimbazi basin development project the majority of Ilala city officials are aware of it. The council continues to admit that awareness should be provided to all potential stakeholders, particularly local communities owning property adjacent to the proposed project. Responsible Municipals should be involved in the valuation process in case of any affected property. Double valuation should be avoided as well as double compensation as within that area that has been a number of other projects that have also paid compensation to the local communities within the Jangwani valley area. However, compensation of affected property that are eligible for compensation should be compensated promptly and fairly following National and WB compensation standards where applicable.

5.5.6 TANESCO –Ilala

TANESCO is the Tanzania Electricity Supply Company responsible for generation, transmission, distribution and supply of electricity in the Country. It is important to consult them as demolition of existing structures and construction activities are likely to affect some of their infrastructures. Therefore, discussion with TANESCO revealed that the site for the proposed project should be inspected in order to realize whether there is TANESCO infrastructures which are underground or overhead.

Further elaboration was that TANESCO infrastructures are categorised into two types which are transmission line and distribution lines, if the project area touch or affects the transmission line consultation should be done in TANESCO head quarter because this is high voltage electricity and if is distribution line consultation should be done in Regional office. It is also important to note that within the project site there is TANESCO underground infrastructures.

There is also an ongoing project which is installation of concrete electric poles; therefore, communication is important as we need to stop in areas which form part of the project site. In case the proposed project affects any infrastructure and it requires to be reallocated, the project should incur all the cost.

5.5.7 Tanzania Forest Services Agency

Tanzania Forest Services Agency is a government agency responsible for overlooking forests in the country. Considering that the Msimbazi river where the Jangwani bridge is to be constructed is pouring in the Indian Ocean, the proposed project is likely to affect the Mangrove Forest located about 1.5kms downstream. Consultation with the TFS revealed that Mangrove end of border is where the high tides take place so it is important to conserve mangrove to reduce impacts of high tides to inland infrastructures.

Incase mangrove will be affected by the project implementation; this should be reported to TFS in order to make valuation of the area where the mangrove has been affected for further action. It should however be noted that under the MBDP a Mangrove management plan is prepared.

5.5.8 AMEND

AMEND is a not-for profit organization with an aim of using Science, evidence-based programs and advocacy to help ensure safe, healthy and equitable journeys in developing countries as they grow and mobilize. AMEND's broad recommendations regarding the upgrade of the Jangwani Bridge are:

- 1) **Provision of safe pedestrian crossing points based on pedestrian desire lines:** an analysis of pedestrian catchment areas and hence pedestrian desire lines will be required to ensure that safe crossing points can be provided as close as possible to these desire lines so as to mitigate pedestrians crossing at unsafe locations.
- 2) **Ensure step-free access for persons with disabilities:** ensure ramps and dropped kerbs are provided at all key locations to allow for step free access for persons using wheelchairs or persons with other disabilities throughout. Ramp gradients and other specifications would need to be provided in line with Tanzanian and international standards
- 3) **Mitigate use of pedestrian footpaths by motorcycle riders:** at a number of locations in Dar es Salaam and other cities, AMEND has noted the challenge of motorcycle riders making use of pedestrian footpaths. This leads to a high road safety risk for pedestrians. Closely spaced bollards may prevent access by motorcyclists but this also prevents access by persons in wheelchairs. To mitigate this, AMEND had made use of motorcycle barriers on projects in Tanga, which allow pedestrians and wheelchair users to have access, but not motorcyclists. Please note that should this recommendation be quoted in any report or carried forward; we would be grateful for AMEND's work to be referenced. You may see motorcycle barrier recommendation in AMEND's Infrastructure Toolkit.
- 4) **Use of tactile paving:** consider using tactile paving at key locations such as at crossing points and places where there is a change in step to help alert persons with visual impairment to these features.

5.5.9 Local Communities in the Project Area

These area communities adjacent to the proposed bridge but also includes communities in the flood prone area of the Msimbazi Valley; these include:

S/N	Municipality	Ward	Sub Ward
1	Kinondoni Municipal	Hananasifu	Mkunguni A
2			Mkunguni B
3			Hananasif
4			Kawawa
5		Magomeni	Suna
6		Mzimuni	Idrisa
7			Mtambani
8			Mwinyi Mkuu
9		Kigogo	Kigogo Mbuyuni
10	Dar es Salaam City Council Dar es Salaam City Council	Upanga Magharibi	Charambe
11		Jangwani	Mtambani A
12			Mtambani B
13		Kariakoo	Kariakoo Kaskazini
14		Mchikichini	Misheni Kota
15			Ilala Kota
16			Msimbazi Bondeni

The flood prone communities of the Msimbazi have been intensively consulted from the concept phase of the project as well as other phases of the project preparation. For this particular project, Mtambani B communities as indicated in table above are the relevant stakeholder/community directly affected by the construction of the project. Generally, their views and concerns are summarized as follows:

- Once the bridge is upgraded there will be minimal or no floods in the Jangwani area
- The bridge should consider pedestrian walk
- What is the design of the project will it be like the new Tanzanite bridge
- All people living in unsafe areas should be relocated
- Government should consider payments of compensations for the affected assets in the flood prone areas
- Sensitization of the community on this Project and associated processes
- The compensated areas should be protected to avoid further encroachment
- Mechanism must be in place to Stop further individual developments in the valley

In addition, Suna Mtaa community was also consulted during preparation of this ESIA, their concerns/views are:

- We need the project and we will be happy for its implementation
- The recent floods reached up to Ubungo Mtaa, we suggest the bridge structure to begin at Kiyonga Mtaa
- Contractor is required to ensure construction activities do not cause negative impacts to the human settlement and other properties near by project site
- The proposed project shall consider provision of pedestrian walk ways to facilitate the movement of people and students between Mapipa Mtaa and Mzimuni Mtaa during construction and operation phase to avoid accident risk which are frequently occur
- Local communities shall be involved in all project phases

- We advise the proposed project to provide employment opportunities to youth from Suna Mtaa
- We advise Mtaa Office to be consulted during monitoring of the implementation of the proposed project



Picture 5-1: Consultation with Suna Community Members-01/May/2024

5.5.10 DART Agency

DART Agency is a government entity with a key role of establishing and operating the Bus Rapid Transit (BRT) system for Dar es Salaam branded Dar Rapid Transport (DART).

Consultation with DART revealed that the floods at Msimbazi have a significant impact to their infrastructure, and properties as during any rain season the Jangwani bridge over flows affecting and stopping its services which is a major loss to individuals using the services and the Nation at large. The impact also affects the structures as well as busses that might be parking at the main depot located at the Jangwani area.

Therefore, the accept the project though the implementation should ensure that the depot has already been located or an alternative access provided to the depot. As of now DART has already identified an alternative site to locate the depot.

5.5.11 Wami Ruvu Basin Water Board

The Wami/Ruvu Basin Water Board is responsible for protecting, maintaining and conserving water and environmental resources that fall under their jurisdiction including Msimbazi River. Consultation was made with Eng. Adria T Massawe who gave the following observations;

- The contractor shall have a special program for controlling waste water discharges to Msimbazi River and other water sources nearby the proposed project such as ocean.
- Solid waste Management shall be controlled by embankment's walls as to avoid any pollution the water sources

- The contractor/TANROADS shall have a permit for water abstraction from any point of water source (surface water/borehole) before starting the construction activities
- Before obtaining any water use permit, the basin office shall survey the area to satisfy oneself on the amount of water available for such activities

TANROADS shall ensure the contractor follows all the required procedure by Wami/Ruvu Basin Office before starting construction activities to protect all source of water from pollution activities that may rise from improper management of both solid and liquid wastes

5.6 Summary of Stakeholder's Views and Concerns

Therefore, major issues raised by stakeholders can be summarised as follows:

- Direct benefit of the project on improved traffic and safety
- Safety measures to pedestrians as part of design
- Environmental conservation
- Visual impact of the bridge – to beautify the City
- Benefits to local communities and the National at large
- Resettlement/Compensation issues
- Alternative design of the project
- Awareness of the proposed project to stakeholders
- Waste management challenge (Liquid and solid waste)
- Management of traffic during construction phase
- Contractor is required to ensure construction activities do not cause negative impacts to the human settlement and other properties near by project site
- The proposed project shall consider provision of pedestrian walk ways to facilitate the movement of people and students between Mapipa Mtaa and Mzimuni Mtaa during construction and operation phase to avoid accident risk which are frequently occur
- The proposed project to provide employment opportunities to youth from Suna Mtaa

Detailed Stakeholders' views have been attached as Appendix III

6 ASSESSMENT OF IMPACTS AND IDENTIFICATION OF ALTERNATIVE

6.1 Overview

The proposed Jangwani Bridge's Environmental and Social impacts are discussed in this chapter. This chapter outlines the potential negative and positive impacts associated with the project. It evaluates how the project will interact with elements of the physical, ecological, social, cultural, or human environment to produce impacts on resources/receptors and potential negative impacts and mitigation measures. Project activities' potential environmental and social impacts are considered during the mobilisation, construction, and operation phases. In addition, the project's closure and decommissioning phase impacts have been highlighted.

Determining the boundaries within which the ESIA will be conducted is essential to determine how the impacts will be felt. Various impacts were identified through fieldwork, participatory observation, and discussions with key stakeholders within project boundaries that define the limit with which the project has an influence or influences the project. This ESIA considers three types of boundaries: institutional, temporal, and spatial.



Figure 6-1: Residents and Muhimbili National Hospital/Sensitive Receptors on the North (West and East)

6.2 Methodologies for Identification of Impacts

The assessment of environmental impacts and their significance is mainly dependent on the extent and duration of the expected change, the size of the resource affected and their sensitivity to the change. Impact identification is designed to ensure that all potentially significant impacts are identified and taken into account in project design and implementation. Several 'tools' are available to assist in impact identification. The most frequently used are checklists of impacts, although matrices, network diagrams and map overlays are also commonly used. In this ESIA study, the following are the method used.



Figure 6-2: Residents and Jangwani Girls Secondary School/Sensitive Receptors on the South (West and East)

6.2.1 Matrix

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

6.2.2 Focused Approach-Impacts Mapping

The approach was used to identify and locate all possible impacts' receiving environments from upgrading the Jangwani Bridge.

6.2.3 Experts Knowledge

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

6.3 Identification of Impacts

6.3.1 Susceptible Impacts' Generating Actions

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.

Table 6-1: Concrete Actions on the Project Phases

Phase	Action
Design and Planning	Valuation of Properties and compensations, stakeholders involvement, environment certification, disclosure
Mobilisation	Permitting and/Licensing
	Demarcation of working zones
	Land clearing, Setup & construction of contractor's camp/s including provisional facilities (building offices, machinery and equipment warehouses, concrete plant,)
	Transportation of consumables, equipment, materials and Staff
	Storage of materials, equipment and machinery
	Identification of detour roads
	Relocation of utilities
	Construction of camps
Construction	Construction/Maintenance of access roads
	Sourcing/preparation and transport of construction materials, aggregates, gravel, sand and stone borrowing, preparation of cement, timber, reinforcement bars, asphalt, casting of pre-cast materials such as concrete culverts etc.
	Construction & Maintenance of Diversions
	Site clearing works
	Earth works including removal of top soils, excavation, cutting/filling, and compaction
	Demolition/relocation of existing structures
	Removal of BRT bus stop and bus lane
	Construction of temporary Bridge
	Dismantling of existing bridges
	Disposal of construction waste and dredged materials
	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
	Collection and disposal of dredges, spoilt materials removed from excavation of existing road
	River dredging
	Demobilisation (camps, temporarily installations), restoration of sites, Land restoration in provisional roads and temporarily disturbed areas
Operation	Transportation of people and goods
	Maintenance of the bridge/siltation removal
	Replacement of road safety signs and markings
	Road maintenance
	Patch sealing
Site Abandonment/ Decommissioning	Dismantling and demolition of structures
	Cleaning and rehabilitation
	Waste disposal

6.3.2 Impacts' Generating Actions

This section selected key biological, physical, and social receptors from the baseline data. Then, the impacts of the Project activities on each of these "Valued Ecosystem Components" were evaluated using a significance ranking process.

The environment's complexity and its systemic nature were broken down into several levels to obtain concrete and straightforward factors

Table 6-2: Components and Factors of the Environment

Environment	Component		Factor
Abiotic	Climate		Microclimate, Temperature, Rainfall
	Atmosphere		Air Quality
			Noise
	Land		Structure
			Quality
			Restoration
	Surface water		Surface drainage (run-off patterns)
			Quality
Groundwater		Aquifer's recharge	
		Quality	
Biotic	Flora	Fauna	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

6.3.3 Identification Methodologies for Project Impacts

6.3.3.1 Matrices (Activities-Environment Interactions)

Interactions between the project activities and the environment were identified for each phase of the subproject, by using matrices presented tables 6-3 - 6-5

Table 6-3: Matrix 1; Identification of Impacts for Upgrading Jangwani bridge in Dar es Salaam -Planning & Mobilisation Phase

	Components		Climate	Atmosphere		Land		Surface Water			Ground Water		Flora	Fauna				Ecosystem	Landscape		Socioeconomic																						
Phase														Terrestrial			Aquatic						Economic																Services				
	Actions/Factors		Climate & Microclimate	Air Quality	Noise & Vibration	Structure/Topography	Erosion/Quality	Surface drainage /Hydrology	Water Quality/Pollution	Downstream Effect	Aquifer's recharge	Ground Water Quality	Vegetation Coverage	Species/Category	Habitat	Distribution	Species/Category	Habitat	Distribution	Species/Category	Biodiversity	Quality	Change of Land use	Resettlement	Jobs/Employment	Local and Regional Development	At Risk Population i.e., Child Labor	Occupational Health & Safety	Local Life Style	Improved Local Trade	Migrant Population	Gender Based Violence	Spread of HIV/AIDS	Community Stability	Cultural/Religion Values	Improved Road Condition	Tourism	Water	Energy/Electricity	Energy/Fuel Transfer	Communication	Waste Management & Disposal	
Planning & Design	Valuation of Properties and compensations																					⊖	⊖		⊖			⊖	⊖		⊖												
	Disclosure																																										
Mobilisation	Permitting and/Licensing							⊖				⊖											⊖	⊖		⊖			⊖						⊖		⊖	⊖	⊖				
	Delimitation of working zones																						⊖			⊖											⊖						
	Land Clearance		⊖	⊖	⊖	⊖	⊖		⊖	⊖	⊖		⊖	⊖	⊖	⊖	⊖				⊖	⊖			⊖	⊖								⊖		⊖						⊖	
	Construction of contractor's offices including provisional facilities (building offices, machinery and equipment)			⊖	⊖	⊖			⊖		⊖		⊖		⊖	⊖	⊖				⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖										⊖	⊖			⊖	
	Transportation of consumables, equipment, materials and Staff			⊖	⊖																	⊖								⊖	⊖	⊖		⊖			⊖						
	Storage of materials, equipment and machinery					⊖			⊖			⊖				⊖						⊖						⊖															

Table 6-4: Matrix 2; Identification of Impacts for Upgrading Jangwani Bridge in Dar es Salaam -Construction Phase

	Components		Climate	atmosphe re		Land		Surface Water			Ground Water		Flora		Fauna				Ecosys tem	Landsc ape	Socioeconomic																						
Phase Construction														Terrestrial			Aquatic						Economic																Services				
	Actions/Factors		Climate & Microclimate	Air Quality	Noise & Vibration	Structure/Topography	Erosion/Quality	Surface drainage /Hydrology	Water Quality/Pollution	Downstream Effect	Aquifer' s recharge	Ground Water Quality	Vegetation Coverage	Species/Category	Habitat	Distribution	Species/Category	Habitat	Distribution	Species/Category	Biodiversity	Quality	Change of Land use	Resettlement	Jobs/Employment/ Risk of Child Labor	Local and Regional Development	Traffic	Occupational Health & Safety	Local Life Style	Improved Local Trade	Migrant Population	Gender Based Violence	Spread of HIV/AIDS	Community Stability	Cultural/Religion Values	Improved Road Condition	Tourism	Water	Energy/Electricity	Energy/Fuel Transfer	Communication	Waste Management & Disposal	
	Sourcing/preparation and transport of construction materials such as aggregates, gravel, sand and stone borrowing, cement, timber, reinforcement bars, asphalt, casting of pre-cast materials such as concrete culverts etc.			⊖	⊖																				⊖	⊖	⊖	⊖		⊖					⊖								
	Construction & Maintenance of Diversions			⊖	⊖	⊖	⊖	⊖	⊖	⊖			⊖	⊖	⊖	⊖	⊖				⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖		⊖	⊖		⊖	⊖	⊖	⊖	⊖		
	Site clearing works, including cutting of few trees			⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖		⊖	⊖	⊖	⊖	⊖				⊖	⊖	⊖	⊖	⊖	⊖						⊖								⊖			
	Earth works including removal of top soils, excavation, cutting/filling, and compaction			⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖		⊖	⊖	⊖	⊖	⊖				⊖	⊖	⊖	⊖	⊖	⊖								⊖		⊖	⊖	⊖	⊖	⊖			
	Demolition/relocation of existing structures/utilities			⊖	⊖	⊖	⊖	⊖	⊖	⊖				⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖			⊖	⊖								⊖		⊖	⊖	⊖	⊖	⊖			
	Bitumen processing and tarmacking activities																																										
	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			⊖	⊖	⊖	⊖	⊖	⊖	⊖				⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖			⊖	⊖									⊖		⊖	⊖	⊖	⊖	⊖		
	Removal of BRT bus stop and bus lane			⊖	⊖	⊖	⊖	⊖	⊖	⊖		⊖										⊖	⊖		⊖		⊖	⊖				⊖	⊖	⊖	⊖		⊖	⊖	⊖	⊖	⊖		
	Construction of temporary Bridge			⊖	⊖	⊖		⊖	⊖	⊖	⊖	⊖										⊖			⊖	⊖								⊖		⊖	⊖	⊖	⊖	⊖			
	Dismantling of existing bridges			⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖			⊖	⊖								⊖		⊖	⊖	⊖	⊖	⊖			
	Disposal of construction waste and dredged materials			⊖	⊖	⊖	⊖	⊖	⊖	⊖				⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖		⊖	⊖									⊖		⊖	⊖	⊖	⊖	⊖		
River dredging				⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖		⊖	⊖	⊖	⊖	⊖	⊖		⊖				⊖													⊖			
Collection and disposal of dredges, spoil materials removed from excavation of existing road			⊖	⊖																																				⊖			

Table 6-5: Matrix 3; Identification of Impacts for Upgrading Jangwani bridge in Dar es Salaam - Operation, Maintenance and decommission Phase

	Components		Climate	atmosphere		Land	Surface Water			Ground Water		Flora	Fauna			Ecosystem	Landscape	Socioeconomic																									
Phase														Terrestrial			Aquatic						Economic															Services					
	Actions/Factors		Climate & Microclimate	Air Quality	Noise & Vibration	Structure/Topography	Erosion/Quality	Surface drainage /Hydrology	Water Quality/Pollution	Downstream Effect	Aquifer' s recharge	Ground Water Quality	Vegetation Coverage	Species/Category	Habitat	Distribution	Species/Category	Habitat	Distribution	Species/Category	Biodiversity	Quality	Change of Land use	Resettlement	Jobs/Employment/ Risk of Child Labor	Local and Regional Development	Traffic	Occupational Health & Safety	Local Life Style	Improved Local Trade	Migrant Population	Gender Based Violence	Spread of HIV/AIDS	Community Stability	Cultural/Religion Values	Improved Road Condition	Tourism	Water	Energy/Electricity	Energy/Fuel Transfer	Communication	Waste Management & Disposal	
Operation	Transportation of people and goods			⊖	⊖			⊖														⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖		⊖	⊖	⊖	⊖	⊖	⊖	⊖					
	Land restoration in provisional roads and temporarily disturbed areas														⊖	⊖	⊖																										
	Road Maintenance			⊖	⊖	⊖																			⊖	⊖			⊖						⊖							⊖	
Decommissioning	Dismantling and demolition of structures			⊖	⊖	⊖		⊖														⊖			⊖		⊖											⊖	⊖			⊖	
	Cleaning & Rehabilitation			⊖	⊖			⊖		⊖					⊖	⊖									⊖	⊖												⊖				⊖	

6.3.3.2 Focused Approach Impacts Mapping/Identification

This is a collaborative process of reflecting the reality along the proposed bridge road’s sections in order to find implementable solutions/mitigations to avoid or reduce the impacts. See table 6-6 below

Table 6-6: Location / Source-Based Impacts Identification

Chainage			Description	Picture Presentation	Impact	Site-Specific Mitigation Measures
Start	Intermediate	End				
0m			At the start of the project, (raised embankment wall) there is access roads both LHS and RHS to Magomeni Suna and Mwinyi Mkuu streets respectively		- Noise, dust and vibration is likely to affect the nearby facilities - Temporal blocking of roads shall cause disturbances to the road users - Potential for accidents and injuries - Relocation of utilities	- Construction should be done in day time only - Early notice to locals regarding the vibration and noise construction works - Find appropriate accessible way to the residents of Magomeni Suna and Mwinyi Mkuu streets - Put enough road signs to guise the road users - Spray water to reduce dust pollution - Relevant authority such as TANESCO/DAWASA/TTCL shall be consulted for their infrastructures relocation before construction activities
	250m		There is temporally office container owned by Milembe Company Limited who has entered a performance based contract with TANROADS for desiltation of Msimbazi river to avoid flooding at Jangwani in the event of heavy rain		Demobilisation of Milembe Company Limited Equipment and temporary office	Early notice shall be given to the Milembe Company Limited once the contractor is given possession of the site to demobilize
	330m		There is an accessible way at LHS heading to Magomeni Suna residents		- Noise, dust and vibration is likely to affect the nearby facilities - Temporal blocking of roads shall cause disturbances to the road users - Potential for accidents and injuries	- Construction should be done in day time only - Early notice to locals regarding the vibration and noise construction works - Find appropriate accessible way to the residents of Magomeni Suna - Put enough road signs to guise the road users - Spray water to reduce dust pollution

Chainage			Description	Picture Presentation	Impact	Site-Specific Mitigation Measures
Start	Intermediate	End				
	345m		There is a residential houses both LHS and RHS; also there is some commercial activities at LHS		- Noise, dust and vibration is likely to affect the nearby facilities - Temporal blocking of roads shall cause disturbances to the road users - Potential for accidents and injuries	- Early notice shall be given to the residents and the people who are doing commercial activities in case of noise activity - Awareness on the safety observation when crossing the construction site - Provision of universal temporary access to the businesses and settlements
	360m		The Existing Jangwani bridge both LHD and RHS		- Potential Water contamination - Accident - Demolition of the current bridges - Dredging of Msimbazi River crossing the bridge - Collection, storage, transportation and disposal of wastes generated from construction activities	- Provision of road signs and road safety awareness campaign; and limit servicing equipment closer to water sources - Identification of risks (and implementation of mitigation measures) to water quantity and quality for the community during construction activities. - The use of specialized demolition equipment's shall be used to avoid noise - Wastes generated shall be collected, stored, transported and disposed to the proposed specific dumpsite
	615m		There is a diversion/U turn to BRT depot at LHS and BRT depot at RHS		Change of the road uses/demolition of the current use	Provision of road signs and road safety awareness campaign for Provision of road signs and road safety awareness campaign for the road users;
	685m		There are culverts both LHS and RHS		- Demolition of the current culverts - Potential Water contamination - Accident	- Provision of appropriate road signs and and traffic signals; - Limit servicing equipment closer to the river - Supply workers with appropriate PPEs specifically hard hats, gloves, safety boots and dust musk - Barricade the site to avoid potential trespass that would risk the health of the road users

Chainage			Description	Picture Presentation	Impact	Site-Specific Mitigation Measures
Start	Intermediate	End				
		730m	There is Jangwani BRT bus stand		• Demolition of the current Jangwani BRT bus stand • Accident	• Provision of road signs and road safety awareness campaign; and limit servicing equipment closer to water sources • Proper management and disposal of the solid wastes obtained from demolition activities

Since impacts' mapping is location based, categorisation of impacts has resulted into the following:
Aimed at specific impacts along the road section

Table 6-7: Impacts Integration

S/No	Categorised Impacts from Mapping Approach	Impacts from Matrices	
		Component	Factors
1	Road safety impacts at road junctions	Socioeconomic/economic	At Risk Population / Road Accidents / Occupational Health & Safety
2	Road safety impacts at community centers	Socioeconomic/economic	At Risk Population / Road Accidents / Occupational Health & Safety
5	Disruption of water services (DAWASA)	Socioeconomic/services	Water
6	Disruption of electrical services (TANESCO)	Socioeconomic/services	Electricity/Energy
7	Disruption of communication services (TTCL)	Socioeconomic/services	Communication
8	Interference with local market activities (Kariakoo market)	Socioeconomic/economic	Improved Local Trade
9	Interference with worshipping services along the proposed roads	Socioeconomic/economic	Cultural/Religion Values
10	Transportation inconveniences during construction	Socioeconomic/services	Transportation
11	Clearance of terrestrial vegetation	Flora	Vegetation Coverage/ Species/Category
12	Generation Noise & Vibration	Atmosphere	Noise & Vibration
13	Air quality deterioration	Atmosphere	Air Quality

6.4 Impacts Prediction & Evaluation

After identifying impacts as a result of the proposed project's activities, their significance was determined, that is, whether they are acceptable or unacceptable and thus require mitigation measures. The significance of an impact was determined by considering the impact characteristics and the importance (or value) attached to them by the consultant team.

Information provided by the consultant's team of experts was used to calculate an overall impact score by multiplying the product of the nature, magnitude and the significance of the impact by the sum of the extent, duration and probability based on the following equation (*S Gerber, V Stippel, D Henning and N Naidoo, 2017*).

$$\text{Overall Score} = (N \times M \times S) \times (E + D + P)$$

Where:

N = Nature;

E = Extent

M = Magnitude

D = Duration

P = Probability

S = Significance

Table 6-8: 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. The following definitions and scoring system applied

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 – 0-5years.
- 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 in the following way:

Table 6-9: Ranking of Overall Impact Score

Impact Rating	Low/Acceptable impact	Medium	High	Very High
Score	0 to -30	-31 to -60	-61 to -90	-91 to -117

Table 6-10: Impact Prediction

	Project preparation phase	Construction phase	Operation and maintenance
Biophysical environment			
Climate		Flooding may occur if planning is not done properly. Construction should be scheduled to avoid the months of heavy rainfall which are between March and May.	
Hydrology		Impact on the river hydrology: The use of water from the Msimbazi river could affect the hydrology of the river. Also, during piling, blockage of the river may occur that limits the channel capacity as a result may lead to flooding.	Improved drainage of the bridge and approach roads. with the installation a new drainage system, new culverts and elevation of the bridge, it is expected that drainage of the Jangwani area will be improved.
Natural habitats		Destruction or disturbance of habitats at the bridge construction and dredging site as well as raw material extraction sites: The river banks harbor the habitat for some species both aquatic and terrestrial. Dredging activities in particular will result to habitat destruction. Borrow areas, sand pits, and water abstraction will disturb natural habitats.	

	Project preparation phase	Construction phase	Operation and maintenance
<u>Vegetation</u> <u>Grasses</u>		The construction activities such as clearing and grubbing as well as dredging will affect some species of grasses that are observed in the banks of lower Msimbazi river. The affected species include <i>Typha latifolia</i> and <i>Phragmites australis</i>	
Threatened flora		Risk of destruction of threatened plant (mangrove) species at raw material extraction sites: raw material extraction may lead to disturbance or destruction of threatened plant species.	
Fauna		The construction activities especially piling and dredging will have impact on the habitats of the fauna such as of epifaunal gastropod snails and crabs. Other fauna species include birds, reptiles and other crustaceans and molluscs.	
Threatened Fauna			
Soil Quality		Risk of soil contamination by leakage and spillage from the construction equipment and project vehicles during servicing and operation. Construction equipment uses hydrocarbons such as gasoline, oil and grease which if not properly handled can lead soil contamination.	

	Project preparation phase	Construction phase	Operation and maintenance
Water Quality		Increased sediments as a result of construction activities. Excavation and clearing and grubbing may result to increased sediments in the Msimbazi river which impairs the quality of water by increasing the turbidity and TSS Contamination by sludge from construction workers. If proper and adequate sanitation facilities are not provided to the workers, there is a possibility of contamination of the Msimbazi river water by fecal sludge.	
Geology and Soils		Impact on soil quality from accidental spillage of oil and fuel and poor management of waste and sanitation: all construction activities represent risk of accidental spillage of oil and will generate waste that could affect soil quality.	
Dredged Material			

	Project preparation phase	Construction phase	Operation and maintenance
Air quality		Emission of air pollutants from machinery and trucks: machinery and trucks will emit air pollutants such as CO ₂ , CO, nitrogen oxide (NO _x), PM ₁₀ , PM _{2.5} , SO ₂ . Trucks and construction machines are high NO _x emitters. Asphalt manufacturing also emits gaseous emissions. The construction activities will further increase the CO and PM which is already high at the adjacent areas such as Magomeni Suna	Impact on air quality: air emission from vehicle combustion exhaust will rise with the increase in the traffic at Jangwani bridge. The pollutants such as CO and PM are already at the higher side. With increased traffic these pollutants will further increase if measures are not taken
Noise		Increase in noise level: As of current situation, the noise levels are within permissible limit. Since all construction activities generate noise; some activities will be particularly noisy such as removal of existing pavement, bus stop, dismantling the bridges and truck transport.	Impact on noise level: noise level will rise with the increase in vehicular traffic
Socio-economic and cultural environment			
	Some socio-economic components may be affected if tendering process for contractors do not include specific requirements for their safeguard.		

	Project preparation phase	Construction phase	Operation and maintenance
Population distribution and settlement around the Jangwani bridge project			Improved livelihood for the community near Msimbazi Valey and Jangwani Bridge: The population living to the proximity to the project shall be relieved from regular flooding of their residential/commercial areas during rainy seasons as a result of dredging of Msimbazi Valley at the upstream and downstream of the proposed bridge. The population is more likely to be fully involved in the construction activities through short term employments
Land Use			
Economy and Economic Activities		Construction of the project shall boost existing economic activities around the project's wards through daily purchases by the construction workers.	
Roads and Traffic condition		Both roads shall be impacted by traffic jams during construction phase of the bridge.	

	Project preparation phase	Construction phase	Operation and maintenance
Electricity		Power disruption due to relocation of electric poles and overhead cables. Relocation of the electric poles and cables shall involve cutting down the power. This will affect economic activities of the community nearby	
Water supply		Disruption of water supply services due to relocation: Relocation of parallel DAWASA water pipes at the existing Jangwani bridge will result to outage of water service to the users connected to these pipes.	
Waste Generation		Management of demolition waste: demolition of BRT bus stop, road embankment and the bridge decks will lead to waste which will have to be properly managed and may strain local waste management facilities.	
Cultural and Natural Heritage		Risk of disturbances and destruction to unknown cultural heritage sites: risk of discoveries of artefacts is inherent to all construction involving excavation and use of borrow areas and quarries.	

	Project preparation phase	Construction phase	Operation and maintenance
Safety, security and hazard		Disturbance to traffic during work and safety of the traffic and other users of the bridge section: construction work could disturb traffic and will represent traffic safety risks. Health and safety risks for communities at quarry and borrow areas: blasting at the quarry, presence of machinery and movement of trucks represent safety risks for communities.	Improved Bridge safety: Elevation of the bridge and increased flood relief features of the Jangwani area represents the improved safety of the road users and the surrounding communities from floods.
Livelihood, employment and economic activities		Job opportunities: construction activities represent an opportunity for temporary employment for members of local communities.	Improved Jangwani area: the improved Jangwani area to allow all weather access to the city center and the business center of Kariakoo will encourage economic development.

	Project preparation phase	Construction phase	Operation and maintenance
Vulnerable Groups			Universal access. The new bridge will accommodate all road users including cyclist and pedestrian by provision of dedicated lanes. The new bridge will also ensure universal access to persons living with disabilities.
HIV/AIDS		Spread of HIV: the arrival of workers is often associated with an increase in HIV prevalence.	
Gender-Based Violence		Risk of an increase in Gender-Based Violence: presence of workers is often associated with risk of GBV and sexual harassment in the workplace. Women and girls from neighboring communities are particularly at risk.	
Child labor and forced labor			

	Project preparation phase	Construction phase	Operation and maintenance
Labor conditions, occupational health and safety		Risk of poor labor conditions due to high level of informality: construction activities, involvement of primary suppliers in the chain of goods and services and workers engaged through third parties (such as subcontractors, brokers, agents, or intermediaries) represent risk of poor labor conditions. OHS risks to workers: demolition and construction activities, including pavement work, represent inherent OHS risks. Contraction of the traffic active site will exposed workers to important safety hazards from vehicular movement on the reduced or interrupted lane capacity	

Table 6-11: Impacts Evaluation

Component		Factor/Impact	Natu		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	Null	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				
Biophysical Environment																																	
Climate		Climate		⊖		⊖					⊖	⊖	⊖	⊖					⊖						⊖		⊖			-2	10	-20	
Hydrology		Surface drainage /Hydrology		⊖	⊖						⊖			⊖			⊖							⊖			⊖			-1	6	-6	
		Aquifer's recharge		⊖		⊖					⊖	⊖	⊖	⊖				⊖				⊖				⊖			-1	6	-6		
Natural Habitat		Biodiversity		⊖	⊖						⊖	⊖		⊖			⊖					⊖				⊖			-1	4	-4		
Flora		Grasses		⊖	⊖						⊖			⊖			⊖							⊖			⊖			-1	5	-5	
		Threatened Flora		⊖	⊖						⊖			⊖			⊖							⊖			⊖			-1	4	-4	
Fauna	Terrestrial	Habitat		⊖	⊖						⊖			⊖			⊖							⊖			⊖			-1	5	-5	
	Aquatic																																
		Threatened Fauna		⊖	⊖						⊖			⊖			⊖							⊖			⊖			-1	4	-4	
Soil Quality		Erosion/Quality		⊖	⊖						⊖	⊖		⊖			⊖							⊖			⊖			-1	6	-6	
Water Quality		Ground Water Quality		⊖		⊖					⊖	⊖	⊖	⊖				⊖				⊖				⊖			-1	6	-6		
		Water Quality/Pollution		⊖		⊖					⊖	⊖	⊖		⊖		⊖					⊖				⊖			-2	5	-10		
Geology and Soils		Quality	⊖			⊖							⊖		⊖				⊖					⊖		⊖			2	5	10		
Dredged Material		Quality																															
Air Quality		Noise		⊖	⊖						⊖	⊖	⊖	⊖			⊖						⊖			⊖			-1	5	-5		
		Vibration		⊖	⊖						⊖	⊖	⊖	⊖			⊖					⊖				⊖			-1	4	-4		
Socioeconomic and Cultural Environment																																	
Population distribution and settlement around the Jangwani bridge		Local and Regional Development	⊖				⊖						⊖		⊖				⊖						⊖			⊖		4	11	44	
Land Use		Land Acquisition & Resettlement		⊖	⊖					⊖					⊖		⊖								⊖			⊖		-4	7	-28	
Livelihood, Economic Activities		Jobs/Employment	⊖			⊖					⊖	⊖			⊖		⊖							⊖			⊖			2	7	14	
Roads and Traffic		Traffic		⊖		⊖					⊖		⊖			⊖				⊖			⊖				⊖			-9	9	-54	
		Improved Local Trade	⊖			⊖					⊖	⊖	⊖		⊖				⊖					⊖			⊖			4	9	36	
		Spread of Covid-19, HIV/AIDS		⊖				⊖			⊖			⊖					⊖				⊖				⊖			-2	10	-20	
Utilities	Services	Water		⊖		⊖					⊖			⊖			⊖						⊖				⊖			-1	6	-6	
		Energy/Electricity		⊖		⊖					⊖			⊖			⊖						⊖				⊖			-1	6	-6	
Solid Waste Generation		Waste Management & Disposal	⊖			⊖					⊖	⊖		⊖			⊖						⊖				⊖			2	7	14	
		Cultural/Religion Values		⊖		⊖					⊖			⊖			⊖						⊖				⊖			-1	6	-6	
Safety, Security and Hazard		Traffic and Community Safety		⊖		⊖					⊖				⊖		⊖						⊖					⊖		-4	6	-24	
		Gender Based Violence		⊖		⊖					⊖	⊖		⊖					⊖				⊖				⊖			-2	8	-16	
Child Labour and forced labour		Risk of child labour		⊖		⊖					⊖	⊖	⊖		⊖		⊖						⊖				⊖			-2	6	12	
Labour Conditions Occupational health and safety		Occupational Health & Safety		⊖	⊖						⊖	⊖			⊖		⊖						⊖				⊖			-4	5	-20	

6.5 Environmental and Social Impacts Assessment

6.5.1 Climate (-ve)

Mobilization & Construction Phase

The construction of infrastructures impacts the environment and contributes enormously to climate change. Construction practices/related activities of the project i.e., clearing/demolition of the current bridge, road and BRT station and the input of steel, cement and asphalt are the contributors of material-related greenhouse gas emissions. On the other hand, construction activities may be affected by climate if proper timing is not done. The Msimbazi river and especially at the Jangwani bridge area has a history of frequent flooding during moderate to heavy rains. In the event of heavy rains during construction, road users may suffer inaccessibility if flood control measures are not in place. GHG emissions from the materials and equipment have contribution to the climate change over the Dar es salaam City.

Impact Significance

Impacts on the climate and meteorology of the local area will be low since there will be minor changes in surface reflection, no aerodynamic disturbances and average temperature and rainfall increase during the operation of the project. However, over the long run the impact can accumulate but with minor significance over a wider area.

6.5.2 Impact on Surface Drainage /Hydrology and water quality(-ve)

Construction Phase

Two concrete box culverts are currently available at the project site.. These culverts seem not to contribute significantly to the hydraulic discharge capacity of the Jangwani, but are important to allow water flow from these south and south eastern flooded areas towards the Jangwani further downstream. The culverts (in the present situation, in case the bridge is sometimes blocked) also avoid a large water level difference over the embankment, allow water flow in normal run-off situations and prevent or reduce stagnant water at the south east side. The 2 culverts will be upgraded and widened to accommodate new design. If not properly sized will affect the river hydraulic transparency affecting flow of water. During construction of the bridge, the culverts may be overwhelmed if proper channelling is not provided.

The proposed Jangwani bridge is located on the Msimbazi river valley. Construction activities has a potential to contribute to the pollution of water. Activities such as piling, clearing, demolition of the existing Jangwani bridge decks, culverts and BRT bus stop will contribute to the change of water quality in the Msimbazi river if proper care is not taken. Current water quality at Msimbazi river complies to the TBS requirement of effluent discharge. This quality may change during construction due to the above mentioned activities.

Also, the construction of the project will make use of materials such as cement, asphalt etc which when find a way to water may cause contamination through rainwater runoff or spillage. Construction activities can introduce pollutants into surface waters including sediment, cement waste, fuel and lubricants. These compounds directly impact the water's physical and chemical quality status and indirectly influence the living organisms in water.

Suspended solids may also originate in products such as concrete waste for construction and demolition of the structures, milled bitumen etc. which are either accidentally released or dumped during demolition works and cleaning the equipment that has held the products. The washout from concrete mixing plants or ready-mix concrete Lorries is particularly damaging due to the highly alkaline nature of uncured concrete. In addition, the release of significant volumes of sediments to

the water bodies by storm water runoff or direct disposal, can lead to changes in the flow patterns of the water course will be affected as well. Still, this effect is addressed with the impacts on fauna.

Water for construction is expected to be sourced from different sources such as Kizinga River, Msimbazi River which are mainly surface water and the DAWASA water supply network. If proper care is not taken during extraction used may lead to significant contamination or overutilization.

Impact significance

Regarding impact on hydrology, the intensity of the impact would be medium, the extent would be local as all culverts will be rehabilitated and the duration is temporary. The significance of the impact would be low.

On the water quality, the intensity of the impact would be medium as construction works are often associated with an increase in turbidity in the water course. The extent would be local and the duration is temporary. The significance of the impact would be medium.

6.5.3 Dredging Impacts (-ve)

Construction Phase

Removal of sediments/dredging may have adverse impacts on biodiversity. Impacts may be due to physical or chemical changes in the environment at the dredging site. The extent of such impacts depends on the characteristics and the sensitivity of the area to be dredged, and of the dredging technique to be applied.

The potential (negative) impacts of dredging activities on species and their habitats at the project site include:

- Substrate removal and thus habitat and species removal;
- Alteration of bottom topography and hydrography, and thus destroying of local habitats and the risk of direct physical/mechanical stress to the species present;
- Alteration of sediment composition, i.e. of substrate characteristics in the surrounding of the dredging site, resulting in a change of the nature and diversity of benthic communities, e.g. decline of individual density, species abundances or biomass;
- Local resuspension of sediments and increase of turbidity

Dredging will affect a river's composition, diversity and resiliency in a variety of ways. River banks of the dredged area will become prone to erosion. Eroded banks will stimulate further build-up of silt, moreover, disturbance of bank vegetation caused by erosion will remove cover and shade.

Suspension of dredging sediments shall suffocate mangroves when the aerial roots become flooded, preventing oxygen from reaching the root system. Dredging and filling activities have caused flooding of mangrove habitat. Standing water covers the aerial roots, making it impossible for oxygen to reach these specialized roots as well as the underground root systems. Eventually this shall lead to the deaths of mangrove trees downstream of the bridge.

Impact Significance

For the bridge construction project, the dredging intend to remove siltation in the event of heavy rains during construction. The activity entails to maintain river hydraulic flow and avoid flooding

on the bridge construction site and nearby areas. the impact on the ecosystem of the river would be local with low significance as the activity depends on the occurrence of heavy rains during construction. The bridge contractor may not perform this activity and concentrate on the construction of the bridge, embankment and culverts in case he will not be caught with heavy rains.

6.5.4 Impact on Groundwater & Increased River Pollution (-ve)

Construction Phase

Construction of the proposed Jangwani bridge involves activities such as piling and removal of piles for the old bridge that may cause potential groundwater contamination. Potential pollution of groundwater could also occur as a consequence of leaks or accidental spills at the construction site of hydrocarbons from construction vehicles and machinery, as well as of other hazardous chemicals handled for various purposes in executing the construction works (e.g., lubricants, solvents, acids, paints, resins) and dismantling of Jangwani Bus Terminal. Accidental leaks and spills of hazardous materials may also occur at product storage areas and hazardous waste storage areas. Leaked or spilled hazardous contaminants most often will reach groundwater indirectly leaching through the soil or, for some construction activities, directly when the groundwater table is exposed to the atmosphere. Some of the sources proposed for construction water is a Commercial Borehole which when not used properly may have significant impact to the ground water resources and aquifer.

Impact Significance

The significance of impact on the ground water is considered moderate and local. Piling activities are carefully studied to ensure that the aquifer is not touched during construction. On the leakages and accidental spills, the impact would have minor significance.

Operation Phase

Concerning the potential impacts on groundwater during operation, the same operational activities discussed for surface water may also have an impact on groundwater, as the substances released by these activities end up in the soil, from which contaminants are transported downwards, via percolation of rainwater, until reaching the groundwater table. The magnitude of the impact is thought to be minor.

6.5.5 Impact on Vegetation Coverage and Habitats (-ve)

Construction Phase

Construction of the Jangwani bridge and associated activities especially new culvert construction, and dredging involves site clearance that entails removing vegetation cover. This also applies for the offsite areas of material extraction such as Chamazi sand mine, Mpiji River, Mbande sand mine and Kazimzumbwi Pit 1 & 2 where sand will be sourced.. The impact of vegetation clearance is more pronounced in river dredging activities that shall involve the clearance of vegetation in the river banks and also in material source areas particularly borrow pits. The impact will extend to the storage area for dredged materials, demolition materials and camp sites.

According to the design the dredging activities will not touch the available mangroves downstream of the bridge; and if the case occurs the responsible contractor shall consult responsible authority (TFS) before any construction activities as explained in table 5-1. The Msimbazi river is also a habitat for aquatic organisms such as cat fish, some other reptiles and amphibians. The project especially dredging activities may result to disturbance/destruction of breeding sites for these

organisms. Construction of the culverts will lead to removal of vegetation cover especially at km 0+685 culvert both on the left and right handside of the road.

Impact Significance

The construction of New Jangwani bridge and associated structures will be done on the existing bridge and road. there will be very limited clearance of vegetation at the construction site as the orientation is the same except some few improvement. The impact on the vegetation cover and habitat would be local and with minor significance.

On the dredging activities, it intends to maintain hydraulic flow of the river during rain season as it is being done by the contractor hired by TANROADS for disltation of the river. The impact on the vegetation and habitat would be minor as they are already disturbed.

On the material sources such as Chamazi sand mine, Mpiji River, Mbande sand mine and Kazimzumbwi Pit 1 & 2, the impact significance on the habitat and vegetation would minor as all are the existing sources being used for other projects.

6.5.6 Soil Quality (-ve)

Construction Phase

Roads and bridge contruction uses heavy machinery and vehicles which uses diffent fluids and lubricants. Construction of Jangwani bridge and approach roads will make use of materials such as asphalt, binders and cement which if spilled to the ground may impare the quality of soil.

Soil erosion is likely the result of increased surface runoff caused by the removal of vegetation cover associated with site clearing and material extraction in borrow areas. Similarly, removing vegetation cover and compaction of paved roads will be required during the construction of access roads. Soils that are bare or compacted limit water infiltration and increase surface run off; increased surface runoff accelerates soil erosion.

Operation Phase

There is an increasing concern about water pollution during the operational phase by diffuse emissions of various environmental hazards emitted by transportation activities. Road transportation is associated with the diffuse release of inorganic and organic substances into the environment. These substances upon settling and deposition, may pollute the surface water entering through the roadside drainage system along the tracks. Some of these contaminants include: copper, zinc, chromium and polycyclic aromatic hydrocarbons (PAH), lubricants and herbicide substances.

Impact Significance

Mishandling of the equipment and lack of proper service may lead to spillage that has a risk of soil contamination. Other activities such as earthwork, removal of pavement layers, demolition waste, waste collected at the camps, and green waste from vegetation removal are important aspects of construction activities. The intensity of the impact is medium, the extent will be punctual and the duration is temporary. The significance of the impact would be minor. Regarding erosion, the impact significance is considered minor that is likely to occur at the construction site

6.5.7 Air pollution (-ve)

Mobilisation & Construction Phase

Emissions in the air during construction will occur due to exhaust gases such as SO_x, NO_x, CO, and VOC from construction machinery (rippers, bulldozers and excavators, trucks and tanks). Generally, a low concentration of these pollutants is expected. Still, when the machines are operating or when the motor is not functioning properly (potentially due to the poor maintenance of the construction machines), potential harmful polluting material may be released. Still, a fast dispersion of these pollutants within the project site is expected. It is also expected to potentially jeopardise a small number of people because of the small number of settlements along the proposed route. The baseline air quality data of the Jangwani area indicates high levels of CO and PM at the adjacent residential areas of Magomeni Suna. Presence of the construction activities at the site will contribute to the increase levels of these pollutants especially CO in the neighbourhoods if the equipments are not well maintained.

Dust will appear as a result of the earth works and the activity of preparing the terrain and clearance, excavation, demolition activities of the BRT station and bridge decks, transportation of construction materials etc. These activities shall generate dust and solid particles especially PM₁₀ and PM_{2.5}. Generating dust may influence the ability of the surrounding vegetation to survive and maintain efficient transpiration. The occurrence of dust may also represent a potential source for health problems for the workers (disruption of breathing) in the sections where the construction works are conducted and the neighbourhoods in the project area. Dust may represent a source of irritation and health risk.

Impact Significance

With the presence of machinery, air pollution from engines and from the generation of dust will increase quite significantly the concentration of pollutants. The proposed upgrading of approach roads and the construction of Jangwani bridge stretches along the existing road. Therefore, critical sensitive receptors of air pollution (including dust) along with the proposed site i.e residential houses and Jangwani Secondary School, trading centres, shall be impacted. The significance of the impact will be medium of punctual extend and short term duration.

Operation Phase

Emissions from vehicles travelling along the Jangwani bridge will be visible during operation, i.e., from the exhaust gas system. Exhaust gases from vehicles are thought to contain remnants of atmospheric air, water vapor, carbon dioxide (CO₂), and various kinds of compounds in either gaseous or particulate form, with the highest concentration in areas with a high number of vehicles and motors working in place or stopping. The impact of toxic gases may have consequences for people who have been directly and for an extended period exposed to them through direct and indirect actions (inhaling). The smoke affects the respiratory organs, the skin, and so on. Carbon monoxide acts as both a poison and an antioxidant Nitrogen dioxide causes asthma, allergies and malignant diseases in the respiration system.

Impact Significance

The road and the bridge will continue to operate at the existing capacity and therefore the impact significance would be minor during the operation phase

6.5.8 Noise & Vibration (-ve)

Construction Phase

Construction of the proposed Jangwani bridge and approach roads is linked with activities that cause noise. Noise shall be generated from the equipment to be used. The noise levels can be associated with specific construction sites, i.e., similar activities such as clearing, bridge and other structures' dismantling, dredging, compaction, and vehicle movement. The noise generated by construction activities at on-site locations will be temporary. The levels will vary and be of increased intensity, i.e., the noise will be unequal and intermittent, reaching its maximum during the operation of the construction machines at the time of excavations/clearance/demolition/compaction etc.

Most of the construction works will be done along the roads with no residential houses, worship buildings, some schools and trading centers adjacent to it. Therefore, the noise during construction is of temporary (short term) inconvenience so that the impact is not significant except in the immediate surroundings of the construction sites.

Construction of the proposed bridge and link roads is linked to a series of activities that cause vibrations due to using construction mechanisation and blasting activities as well as transportation of construction materials. However, the impact of the ground vibrations is not expected; since no domestic houses located in a proximity of the project areas. Hence, no houses might be prone to cracks and damage due to the vibrations especially during compaction activities.

Impact Significance

Typically, equipment and construction machines are emitting average noise levels between 80 and 110 dBA which is quite an important increase of noise. It is expected that the impacts from vibrations would be local with low significance at the construction site and shall be limited to the local workers. Increased noise level would impact the nearby Magomeni community and the Jangwani Secondary School.

Operation Phase

Considering that the proposed Jangwani bridge is not very near to the sensitive receptors (trading centers, schools, residential houses, worship buildings, etc.), no noise will mainly impact the surrounding population in mentioned areas. The increased vehicular traffic due to conveniences of use of the road might cause noise impact to extend to Jangwani Secondary school and the surrounding residential areas. However, in case of a significant increase in traffic frequency, the noise impact will be more apparent and appropriate reduction measures will be needed.

Impact Significance

Since there is no major increase in traffic foreseen due to construction of the new bridge, the impact significance would be low.

6.5.9 Impact on economy and economic activities (-ve)

Construction Phase

The proposed roads sections at the Jangwani bridge connect roads to different areas within the Dar es Salaam Municipality. The bridge also serves as the connecting link to Muhimbili and Mnazi mmoja hospitals and other services found in the city center such as schools and colleges/universities

located at the city's centers and workers to various economic sectors. Therefore, the construction period will considerably affect the activities, as mentioned earlier.

This project shall use local resources such as sand and quarrying in the short term, which may hinder local community's ability to utilise it for other purposes. It is observed at the site that there are currently sand mining activities going on.



Picture 6-1: Ongoing Sand Mining Activities at The Upstream of Jangwani Bridge

Impact Significance

The accessibility to the services in the city center will be impacted during construction phase. The impact would be localised, short term and with medium significance.

On the negative side, there will be a loss of income to the local population depending on sand mining within the river/near the bridge and impact on their economy since people from different places of Dar es Salaam city utilise the sand from the Msimbazi river's project section. During construction of the Jangwani bridge, these miners will lose their income. The impact will continue after construction as they won't be able to mine the sand as there will be minimum depositions for mining. This would lead to loss of income. The impact significance would be medium with long term duration.

Operation Phase

One of the significant outcomes of the construction of the proposed Jangani bridge and the rising of the embankment of the connecting roads will be the increased business ventures and opportunities that will be accelerated by uninterrupted access to CBD and Kariakoo main market. This will increase trade and commerce with neighboring areas and the state. In addition, the people along the project roads are expected to take advantage of the project positively.

Impact Significance

As the improvement of Jangwani area will alleviate floodings permanently, the community will enjoy performing the economic activities throughout the year especially from the major economic centers of City center and Kariakoo. Access to services will also improve. The impact will be of long term with medium significance.

6.5.10 Roads and Traffic condition

Construction with live traffic represent great impact to the traffic. Both roads shall be impacted by traffic jams during construction phase of the bridge. The road to Jangwani depot will be closed and hence the traffic diverted to other local roads. Due to this, traffic will significantly be affected in the local roads near the project. Further, due to reduced traffic carriageway the traffic congestion will be intense at Jangwani area if proper traffic management is not implemented.

Impact Significance

Throughout the construction period, the traffic from and to the CBD will be impacted. The impact would be short term with medium significance.

6.5.11 Destruction of Public Utilities & Access

Construction Phase

Electric Power Supply lines, telecommunication cables, water supply pipes, are always located along the road. During rehabilitation or construction of road or bridge projects, these utilities are always encountered. When installing new subsurface infrastructure, it is very easy to damage existing service cables and pipelines or temporarily interrupt supplies to consumers.

Impact Significance

Investigations during ESIA revealed that there are the number of service ducts running on the North side of the bridge comprising a water pipe of approximately 600mm in diameter and several smaller cable ducts. Electric overhead cables are also located near the bridge and some cross the existing bridge. As the proposed bridge will be elevated, cables will require relocation as the clearance distance from the object may not be enough. Also, a telecommunication line was observed in the project proximity that will require relocation. During construction of connecting roads, the contractor might encounter unidentified utilities which will also be replaced or relocated. Relocation of these utilities will result to short term service disruption. The impact would be short term with medium significance.

6.5.12 Waste Generation (-ve)

Construction Phase

The construction activities of Jangwani Bridge and related infrastructure is associated with production of wastes ranging from normal to hazardous wastes. These wastes can either be solid waste or liquid waste. The waste streams are Construction and demolition activities and Domestic activities of the workers at the camp, office and site. The solid waste includes Spoil, rubbles, Tree logs, metals, glasses, papers, river dredging materials etc. Meanwhile, liquid waste includes Sewage, oils, etc. The quantities are provided in chapter two of this report. These wastes if not well handled can change the aesthetic nature of the project area and can even lead to water pollution in case of improper disposal of oils.

Impact significance

Because the project will include the demolition of major structures such as bridges, road embankments, and bus stops, a massive amount of demolition wastes such as concrete wastes, iron bars, metal scraps, aluminum wastes, glasses, debris, packaging materials, plastic materials, wood waste debris, bituminous waste, and so on will be generated that should be

managed with special care as the construction wastes have complex composition. The demolition waste impact would be local, short term and its significance would be major.

Further to demolition wastes, the project shall involve river dredging of a total length of approx. 2300 m. (500 m upstream of the bridge and approx. 1800 m downstream) with a bed level width of 30m and a height of dredging ranging from 0m to 1.5m. This activity if executed shall generate approximately 103,500 cum of dredged material. This is significant amount of waste that shall require proper handling due to complexity of its content. However, as evidenced by test results on dredged soil samples done during feasibility study of lower Msimbazi valley, most of the existing soils are suitable for construction of fill, improved subgrade and pavement layers in road works. If excess, the dredged material will be stockpiled to be used for terrace developments and parking. The quality of sediment in the river bed and at the river banks as well as on the terrace locations is in compliance with the national standards (Tanzania Bureau of Statistics) and international guidelines (SQAGs) for all critical parameters. The impact would be local, short term with minor significance.

Concrete works during the construction of the bridge, culverts, and lining of roadside drains is likely to cause leakage of concrete slurry in the river. In addition, the concrete slurry is likely finding their way to rivers either directly during the construction of culverts or through storm water system, especially when concreting is done. Lime is a major cement component and is found in all concrete products. It dissolves in water to produce an alkaline solution which is dangerous to both flora and fauna. Although some of the demolition materials will be reused in the project, a significant amount will still need to go for disposal. The impact would be local, short term and the significance would be moderate.

The project activities will generate different types of liquid waste and solid waste. Liquid waste will include bituminous materials, wastewater, lubricant, used oils and fuels from machines and vehicles, and effluents from workshops and campsites. Leakage or spillage of fuel and lubricants from machinery and improper waste disposal while laying of cables may also be a possible source of impact on the water environment. The vulnerable receptors are the Msimbazi River and Jangwani wetland.

In addition, even the generally non-toxic chemicals such as chloride, sodium, sulphate and ammonia which may be released as a result of leaching of demolition waste and cement wastes, are known to degrade groundwater quality. The impact is expected to be with low significance, negative and short term.

6.5.13 Impact on Traffic, road users and local communities during construction

Nuisances (noise, dust, odours, presence of spoil materials) and risk of collision during construction activities may affect health and safety of people. Community members using the road, and particularly vulnerable road users such as pedestrians and bicyclists, are particularly at risk. Safety risks from induced traffic on smaller street roads (when vehicles avoid congestion from construction work and material transportation trucks) is also a typical issue to foresee. Machinery movement and activities such as demolition of the BRT bus stop and bridge decks presents health risk to the community nearby and road users if proper protection measures are not taken.

All borrow areas and quarries represent important safety risk for workers and community members. Project installations such as concrete and bitumen batching plants are associated with emissions such as NO_x, SO_x and PM that could be harmful to human depending on the exposure time. Community members and road users can be exposed to fugitive dust from dragged materials from the Msimbazi valley if construction works are not well controlled. If haphazardly disposed, the dredged materials may lead to loss of aesthetic view and blockage of access. Dredged materials contains organic matter that may lead to unpleasant odours. There is however no health impact related to the contaminants in the dredged material is foreseen as the dredged material was proved not to have any harmful chemical substance.

Impact Significance

Also, due to material haulage vehicles, the traffic towards the bridge from different parts of the city especially on the material haulage routes will be impacted if not properly planned. The impact would be short term with medium significance.

6.5.14 Livelihood, employment and economic activities (+ve)

Construction Phase

The economic benefits during the construction phase are positive since it relates to the project activities induced by increased employee spending. Considering that a more significant proportion of the total population is economically inactive, the project will increase opportunities for a more significant percentage of the local population by giving them access to employment opportunities. Employment opportunities will be created for skilled and non-skilled labor in the communities around the proposed project. The communities can absorb the non-skilled employment opportunities arising during construction phase. During construction of the proposed project, almost 100 employments will be generated mainly for construction workers.

Gender distributions in various construction sections are expected. As a result, women can be expected to work in work camps and contractor administration or as supervisors. Thus, a positive spin-off effect during the construction period on the local economy is expected.

Direct and indirect business opportunities will potentially increase significantly for local contractor/s and especially subcontractor/s during construction works. Food and some construction materials will be supplied locally and thus increase local trade. The local economy will also experience opportunities for providing skilled services from e.g. Like craftsmen, security guards and equipment operators. When the local people are employed during construction, they will acquire skills in construction activities which they can use in future. Therefore, there will be skills transfer by employing as many local as possible.

The construction phase is expected to create both direct and indirect employment opportunities and have a medium magnitude.

Impact Significancy

Regarding job opportunities, local employments are expected during construction. The intensity of the positive impact will be medium, of punctual extent and temporary duration (since local employment will only be provided during reconstruction).

6.5.15 Labour Condition and Occupational Health & Safety Impacts (-ve)

Impact issues related to the workforce comprise on-site accommodation, off-site accommodation, reactivation of old facilities, activation of new facilities, security of workers accommodation, accommodation standards, occupational health and safety, worker's right, rules and obligations and employment standards. Impacts arising from the influx of a workforce in the communities include community tensions, community health, safety and security.

It is expected that a substantial part of the workforce will be recruited locally by contractor/s. For the workforce outside the region, workers accommodation camps will be constructed. Smaller camp/s for temporary accommodation of foreign specialist workers may also be required. There is a high possibility that these camps will be located on-site, i.e., outside the communities. To avoid and mitigate the potential negative impact on local communities caused by workforce influx, there will be a low occurrence of off-site accommodation, i.e., within the communities.

Construction Phase

Usually, construction workers are exposed to a lot of occupational hazards. Even though construction workers are trained and know basic safety measures, accidents can still happen. Every day's risks during regular construction work make it difficult for job sites to remain accident-free. Accidents on site could be caused by accidental falls, and malfunctioning of tools and equipment such as cranes, conveyors, vehicle crushes and other equipment. Accidents can result in serious injuries that could lead to permanent disability or death.

The impacts could extend to the general public if trespass occurs due to poor barricading of the construction site. Both painted and galvanized mild steel barricading steel can be used during construction of the side's lane of the existing bridges.

If haphazardly disposed, the dredged materials may interrupt the access to the site that would result to unsafe access to the site. Dredged materials contains organic matter that may lead to unpleasant odours to workers. There is however no health impact related to the contaminants in the dredged material is foreseen as the dredged material was proved not to have any harmful chemical substance.

It is expected that this impact could potentially result in effects on workers of a potentially high magnitude when they occur.

Impact Significance

Risks of poor labor condition would be of medium intensity with local extent since it could affect all workers at a temporary duration.

Regarding OHS risk, on the worst case, a severe accident could be of high intensity, permanent in duration and of punctual extent. However, this is a risk with a low probability to take place. In other cases, such as a minor accident, the intensity would be low, and the significance would be low.

6.5.16 Spread of disease such as Covid-19 and HIV/AIDS (-ve)

Construction Phase

Several studies revealed basic conditions created by big infrastructure construction projects trigger the spread of HIV/AIDS. These include:

1. The concentration of men (single and married) living away from their families at the construction sites.
2. The movement of people through the new infrastructure, the spread of HIV within populations, was due to the same set of activities unprotected sex, and sex with multiple partners.
3. The combination of disposable cash, leisure time, and distance from home drew workers to commercial sex establishments. The flow of people to and from cities/towns raised the risk of HIV infection, but, more specifically, men who used the roads frequently, such as migrant workers, were more likely to visit commercial sex establishments and spread HIV.

The construction sector has a predominantly migratory labor force, making it a prime contributor to the spread of HIV/Aids. Labor camps/ offices are a breeding ground for the spread of HIV/Aids and Sexually Transmitted Infections (STIs), compounded by the situation where migrant workers on contract generally ignore or are ignorant of the consequences of casual sexual relationships.

The construction sector has the potential to play an important role in the country's inter-sectoral approach to coping with the epidemic. The sector also provides entry-level local jobs, which may be crucial to the survival of youth-headed households and extended families in areas hard hit by the epidemic. In addition, construction sites can provide a convenient location for Covid-19 and HIV/AIDS programmers to both construction workers and rural communities.”

Impact Significance

Due to the urban setup of the project the impact significancy would be low.

6.5.17 Resettlement Impact

The upgrading of the Jangwani Bridge and its approach roads as well as dredging activities shall not constitute any kind of resettlement since the design of the bridge as well as the roads has as much as possible utilised the existing RoW. For any unforeseen resettlement associated with the offsite project areas, the contractor shall ensure compliance of ESS5 of the WB the Tanzania legal requirements in acquisition and compensation process.

Impact Significance

As for the current design, there is no displacement of people. If happens either by design modification or from the off site areas, the significance of the impact would be low since all the major activities have been planned to be conducted within the RoW.

6.6 Environmental and Social Risks Assessment

This section presents the assessment of risk level at the stages of construction and operation, with particular emphasis on selected adverse events that can significantly affect the workforce, community surrounding the project and the project itself during construction and operation of the project. It aims to determine undesirable events that may occur during the construction of Jangwani Bridge and the level of risk during operation.

The analysis and assessment of the risk level using the matrix method is presented below. The risk matrix is a graphical method of assessing the level of risk using a two dimensional matrix, in which

one variable is the probability of the hazard occurrence and the other variable is its effects. When estimating the risk parameters (the likelihood of a given threats and its effects), the risk value was determined and then placed in a designated place in the matrix (Tables 6-10 and 6-11). The first step is to determine in tabular form the level of probability (Table 6-12) and the size and category of losses (Table 7). The assumed data that were the source material in the risk.

Table 6-10: Risk Matrix

Probability					Consequences
Level 1	Level 2	Level 3	Level 4	Level 5	
Very Low	Low	Medium	High	Very High	
1	2	3	4	5	Level 1
2	4	6	8	10	Level 2
3	6	9	12	15	Level 3
4	8	12	16	20	Level 4
5	10	15	18	25	Level 5

Table 6-11: Risks during Construction and Operation of the Project.

Assessment of Severity	Risk	Description
1	Slight	Does not require preventive actions
2-4	Low	Does not require any preventive actions. After an event occurs, monitoring of changes is recommended.
5-12	Moderate	Plans and procedures are required for control actions to reduce the probability of event occurrence.
13-20	High	Risk management plans need to be prepared. Works may be performed only under constant supervision
21-25	Unacceptable	Risk is at unacceptable level. Technology and/or design need to be changed as well as the scope of works performed simultaneously within a given area

Table 6-12: Qualitative Description of the Probability Scale for the Bridge Construction Project.

Level	Probability	Description
Level 1	Very Low	will occur not more than once during construction
Level 2	Low	will occur twice during construction
Level 3	Medium	will occur 3–5 times during construction
Level 4	High	will occur 6–10 times during construction
Level 5	Very High	will occur more than 10 times during construction

In risk assessment, probability values were assigned to specific events, then effects were estimated in four categories (structural losses, human injuries and fatalities, environmental damage, and social damage). The study adopted a 5-point probability scale (Table 6-12) and a 5-point impact scale (Table 6-13). The results are presented in Table 6-14.

Table 6-13: Estimation of Losses Associated with Threats in the Investment Projects

Category of Loss	Assigned Value	Loss Values
Structural damage	Level 1	insignificant, less than 10,000 \$
	Level 2	small, 10,000 \$ to 40,000 \$
	Level 3	Medium, 40,000 \$ to 100,000 \$
	Level 4	large, 100,000 \$ to 200,000 \$
	Level 5	catastrophic, over 200,000 \$,
Injuries and fatalities	Level 1	No fatalities or injured persons. Nobody or few persons require medical aid.
	Level 2	Few injured persons, no fatalities. First aid required.
	Level 3	Medical assistance required, no fatalities. Some require hospital transfer.
	Level 4	Numerous injuries, people require hospital transfer, few fatalities (max 3).
	Level 5	Many people with numerous injuries. Many require hospital transfer. More than three fatalities.
Environmental losses	Level 1	Immeasurable effect on the natural environment.
	Level 2	Minor impact on the natural environment, short-term effect
	Level 3	Some effects in the environment but short term or small effects with long term effect.
	Level 4	Long term effects in the environment.
	Level 5	Large impact on the environment and/or permanent damage.
SEA-SH and Child Abuse	Level 1	Normal (Developmentally expected, Socially acceptable, Consensual, mutual and reciprocal, Shared decision making)
	Level 2	Inappropriate (Single instances of developmentally inappropriate sexual behaviours, Socially acceptable behaviour within peer group, Generally consensual and reciprocal, Context for behaviour may be inappropriate)
	Level 3	Problematic and concerning (Developmentally unusual and socially unexpected, No overt elements of victimization, Consent may be unclear, May not be reciprocal, May involve an imbalance of power, May be compulsive)
	Level 4	Abusive (Includes misuse of power, Coercion and force to ensure victim compliance, Intrusive, Lacking informed consent or not freely given, May include elements of expressive violence)
	Level 5	Violent (Physically violent sexual abuse, Highly intrusive, Instrumental violence which is physiologically and/or sexually arousing to the perpetrator, Sadism)

The identified risks/threats during both construction and operation phases for the proposed new Jangwani Bridge have been analyzed in table 6-14 overleaf.

Each of the risk in this case has been treated as the product of **Probability and Severity**

Statistical studies of accidents show that among the causes of accidents for investment projects, incidents and accidents caused by humans have the largest share. They account for 70% of the total number of accidents that occurred due to careless behaviour of injured workers. About 17% are events caused by improper organization of work or poor organization of the workplace. Technical

causes account for 13% of the total number of events, originated by structural defects, improper operation of machinery or equipment.[*Magdalena Kaup , Dorota Łozowicka*]

Table 6-14: Risk Assessment for Construction and Operation of the New Jangwani Bridge

(Scenarios)	Undesired Event during Construction/Operation	Cause of Event	Possible Consequence	Probability	Results				Risk Assessment			
					Structural Damage	Injuries and Fatalities	Forced Labor	SEA-SH & Child Abuse	Structural Damage	Injuries and Fatalities	Forced Labour	SEA-SH & Child Abuse
1	Bridge Materials Degradation	• higher temperatures, • increased precipitation, and • relative humidity	• bridge deformation	1	5				5			
2	Floods	• higher temperatures, • increased precipitation	• total submersion • Increasing the scouring rate of piers and bridge foundations, and build-up of sediments • Damage bridge and connected approaching roads due to flooding, inundation, and erosion of land that accommodates infrastructure Decrease expected lifetime of bridges	1	5				5			
3	OHS [Failure of equipment or electric installations, Collapse of structure, Collapse of piles driven into the ground due to local changes in the soil structure, Falling of excavations during excavation works	• improper handling of equipment, • leaking pipes and connections, • damage to the installation as a result of work carried out, • faulty control and measurement apparatus and safety devices, • improperly made and maintained electrical installations and devices, • human error	• suspension of work until failure is corrected, • demolition and/or repair of damaged facilities, • delay in completion of work, • material damage, • injuries and/or fatalities,	5		3				15		
4	SEA-SH and Child Abuse	• Family environment characterized by physical violence and conflict • Childhood history of physical, sexual, or emotional abuse • Emotionally unsupportive family environment • Poor parent-child relationships, particularly with fathers • Association with sexually aggressive, hypermasculine, and delinquent peers • Involvement in a violent or abusive intimate relationship • Poverty • Lack of employment opportunities • Lack of institutional support from police and judicial system • General tolerance of sexual violence within the community • Weak community sanctions against sexual violence perpetrators	• anxiety and fear, depression, self-harm and thoughts of suicide. Panic attacks, low self-confidence, obsessions, eating disorders, and alcohol and drug use	2				2				4
5	Forced Labour	• Poverty • conflicts, • inequalities (including based on gender) and • persecution	• Mental health • Self esteem	2			2				4	

6.6.1 Climate Change Risks

Operation Phase

6.6.1.1 Accelerated Material Degradation

It is expected that a changing climate will have a negative effect on the degradation of construction materials and accelerate the process. The higher temperatures, increased precipitation, and relative humidity in the project area may all contribute to an increased risk of deterioration of the bridge.

Approaching roads will be subjected to extreme temperature loads in future and cause road pavement to soften and expand. This can create rutting and potholes, particularly in high-traffic areas, and place stress on bridge joints. The risk towards the project is moderate

6.6.1.2 Higher Flood Levels and more Frequent Flooding

Floods have always been a cause of concern for the safety of infrastructure, including bridges. A significant increase in the risk of flooding is expected in the future. Sea level rise, caused mainly by the higher temperatures and the accompanying thermal expansion of ocean water, and the increase in precipitation in future contribute to an increased flooding risk.

Extreme rains may result in floods, which could disrupt traffic and weaken or wash out the soil and other infrastructures that support the approaching roads and the bridge. Exposure to flooding events shall also shorten the life expectancy of the structures. In addition, the stress of water may cause damage, requiring more frequent maintenance, repairs, and rebuilding.

The identified risks resulting from flooding are moderate.

6.6.2 OHS/HSE Risks

Construction Phase

Bridge construction is one of the sectors that contribute to the percentage of accidents that happened on a construction site. Below are the likely OHS risks expected during construction of the New Jangwani Bridge.

- Head injuries are caused by falling or flying objects, or by bumping the head against a fixed object
- During some operations it is not feasible to reduce the noise levels or duration of employee exposure to permissible levels / Permissible Noise Exposures. Exposure to high noise levels can cause hearing loss or impairment. It can also create physical and psychological stress.
- Foot and leg injuries from falling or rolling objects, sharp objects, hot surfaces, and wet slippery surfaces.
- Hands are exposed to hazards such as skin permeable harmful substances, severe cuts or lacerations, severe abrasions, punctures, electrical shocks, chemical burns, thermal burns, and harmful temperature extremes.
- The use of low/high access systems often presents fall hazards. Workers may be exposed to falls while working on elevated structures, climbing onto and off of equipment, and even while walking by falling through holes or by slipping or tripping.
- Use of scaffolds exposes workers to a number of different hazards. Predominant hazards when working on scaffolds are falling from the scaffold and being struck by a falling object while

working on or below a scaffold. The falls are most commonly caused by either the planking or scaffold support structures giving way, or by falling off the edges of the work platforms.

- Plant and Machineries may be involved in accidents due to mechanical failures or operator errors, resulting in injuries to operators themselves or to bystanders.
- Trenching and excavation work presents a serious risk to all project workers. The greatest risk is the cave-in of a trench or excavation. Cave-in accidents are much more likely to result in worker fatalities than any other excavation-related accidents. Other hazards include contact with buried utilities.
- The accumulation of construction debris resulting from poor housekeeping may pose a significant fire hazard in addition to tripping and falling hazards

The identified OHS risks are expected to be high.

6.6.3 SEA-SH Risks

Construction Phase

The proposed project is not an exception from others as it will involve the employment of both men and women from within the project area and outside. During the construction phase, SEA-SH risks shall be expected from those seeking employment. The demand for employment will influence sex corruption in exchange for employment; moreover, workers may use their income to seduce people's wives and school girls, resulting in families' misunderstanding and violence.

During construction, Sexual harassment can take various forms. It can include unwelcome hugging, kissing or other types of inappropriate physical contact, staring or leering, intrusive questions about your private life or physical appearance, unwanted invitations to go out on dates, requests for sex, or sexually explicit emails, calls, text messages or online interactions.

Below are SEAH risk factors that are likely to be associated with the construction of the bridge.

The Influx of Workers – during the construction phase low wage workers are often employed informally (no formal contracts or background checks), are predominantly male, often come from outside the project area and are only present for a short time. They come into close contact with all community groups in a project area and, therefore, the risk of SEAH is increased.

Numerous negative impacts of labor influx are concerned with sexual contacts between male workers and local girls and women. Unwanted pregnancies, sexually transmitted diseases, and abandonment by the men. Female dropout rates at local schools might rise. Community men might feel resentment against the workers and grow suspicious of the fidelity of their own wives and girlfriends—which might cause them to enhance the sometimes forceful control that they exercised over these women. Women who shall be hired into the bridge project shall become targets of sexual harassment on the job.

Since the project area has substantial number of experienced workers who had been involved in various similar projects, labour influx is expected to be low and automatically occurrence of SEA-SH risks associated with are minimized and hence low significance.

Transportation – the bridge project shall involve transportation of materials to and from work sites; new access routes may be created, or workers may use existing access routes used by communities and thereby coming into close contact with all community groups. Women and other vulnerable groups from the community, who are employed by the project, may be exposed to risks on their way to/from the work site.

SEA-SH risks resulting from transportation of materials are expected to be low.

Changes to Power Dynamics – the arrival of a large workforce can disrupt the power dynamics in the project communities and within households, as women in the communities come into contact with mobile workmen in a variety of ways. The bridge project can also offer opportunities for women to earn an income (through direct employment on the project during construction or indirectly via associated services such as catering) – this can also alter power dynamics in the project communities and within households.

Males at the project sites that reinforce aggressive forms of masculinity are often associated with higher levels of sexual harassment against women, as they can create disrespect for, objectification of, or hostility towards women.

Impacts of SEA-SH risks from Changes to Power Dynamics are expected to be low during the project construction.

6.6.4 Risk of improper behaviour of security personnel

Security personnel at work sites and workers camp are sometimes associated with undue use of force and other forms of abuses. In the case of the project, security arrangements will consist of common measures, such as fencing or signs and security guards at night. This is considered a negative impact, short term with a low magnitude.

Since security arrangements will consist of common measures, such as fencing or signs and trained security guards, the intensity of the impact would be medium and short term duration. The calculated risk is low.

6.6.5 Risk of Child Labor, Child Abuse and Forced Labour

Construction phase

Child labour and Child abuse are still challenges in the development countries including Tanzania. The child can be forced to work or adopt the culture from the society; Children learn a sense of responsibility and take pride in carrying out tasks that help a family to survive. By observing and working with others, children learn skills and gain knowledge that will help them in their later lives. Work in this sense becomes a door to the world of adulthood and earning and is part of the progression from childhood to adulthood. Unfortunately, many children do work that actually impedes their growth and development; moreover, they become more vulnerable to child abuse from adults in the workforce. The proposed project is expected to experience this kind of impact to the communities.

Child and forced labor have severe impacts to the victim. As for all risks that may affect the physical or emotional integrity of persons, such cases are of high intensity. For this project, the risk areas include

material extraction sites [quarry mines, borrow areas and work /construction site) and the level of risks is expected to be low.

6.7 Identification of Alternative

6.7.1 No project alternative

The no project alternative entails retaining the current status quo without elevating the existing Jangwani bridge... Adopting this option would mean continued acceptance of regular flooding during rainy seasons and missing all the positive benefits that would accrue from the new Jangwani Bridge project, including improvement and elimination of floods.

6.7.2 Alternative Design of the Jangwani Bridge

Consultation with various stakeholders that include the Ministry of Works, PO-RALG, local communities recommended that the bridge design should be iconic so as it accommodates the development that the Government intends to undertake in the Jangwani Valley area. This ESIA therefore recommends for the respective institutions (PO-RALG, Ministry of Works, Ministry of Finance, World Bank, TANROADs, TARURA) to consider change of design that will not only save the purpose of the project but also beautify the City of Dar es Salaam without major change on the cost of implementing the project.

6.7.3 Dredging Options to Avoid/Reduce Impacts on River Ecosystem, Including Downstream Mangrove Forest.

Dredging is a necessary activity that is required to increase the depth of Msimbazi Valley and remove the unwanted deposits and allow smooth flow of water to the Indian Ocean. But by its very nature, the act of dredging will change the environment. Removal of sediments/dredging may have adverse impacts on marine species and habitats. Impacts may be due to physical or chemical changes in the environment at the dredging site. The extent of such impacts depends on the characteristics and the sensitivity of the area to be dredged, and of the dredging technique to be applied.

The potential (negative) impacts of (conventional) dredging activities on species and their habitats along the proposed dredged section of Msimbazi Valley in relation to the construction of New Jangwani Bridge can, arbitrarily, be described as:

- Substrate removal and thus habitat and species removal;
- Alteration of bottom topography and hydrography, and thus destroying of local habitats and the risk of direct physical/mechanical stress to the species present;
- Alteration of sediment composition, i.e. of substrate characteristics in the surrounding of the dredging site, resulting in a change of the nature and diversity of benthic communities, e.g. decline of individual density, species abundances or biomass;
- Local resuspension of sediments and increase of turbidity

There are three types of dredging, namely: mechanical, hydraulic and combined-Mechanical/Hydraulic that can be deployed by the project, however, assessment of alternative dredging techniques has based on: the dredging accuracy and dispersion beyond the area to be cleaned.

In addition, other reasons for the choice of dredging plant employed include:

- Water depth - Backhoe and grab dredgers are limited to shallow waters while trailer suction dredgers can remove material from deeper water. However; water depths at the project area is intermittent and specifically during rainy seasons, this makes the use of dredging vessels impossible. Long boom excavators shall be used during dredging of foundation for the Jangwani Bridge.
- Accessibility of area - Trailer dredgers are used to dredge large areas, they require enough space to complete a turning circle. For restricted areas, backhoe and grab dredgers are most suitable.
- Availability of contractor/vessels - The dredging operation needs to be timed to coincide with the availability of the contractor. The use local contractors to minimise costs.

Due to the nature of Msimbazi valley (Shallow Water and Accessibility Restrictions), **Long Boom excavators are the feasible options**. Other auxiliary environmental equipment includes silt screens and/or air bubble screens. These screens enclose the area being dredged and prevent sediment from drifting into the general water body. The turbidity is then limited to the area being dredged and disturbance of the aquatic environment is kept to a minimum.

Dredging operations should be conducted with precision especially on mangrove areas. Dredging suffocates mangroves when the aerial roots become flooded, preventing oxygen from reaching the root system. Dredging and filling activities have caused flooding of mangrove habitat. Standing water covers the aerial roots, making it impossible for oxygen to reach these specialized roots as well as the underground root systems. Eventually this leads to the deaths of mangrove trees.

6.7.4 Options of Management/Disposal of Dredged Sediments.

The results of the physical/chemical/biological characterization should indicate whether the dredged material is suitable or not for open land disposal. Toxicity levels of heavy metals indicated on analysed sediments' samples are within permissible limits, however, management of expected dredged materials require environmental friendly disposal alternatives.

Available disposal alternatives include:

- Alternative 1: Open-water disposal – This involves placement of dredged material within Msimbazi river, currently the river depth has been seriously reduced by siltation as a result of soil erosion contributed by human activities upstream. Disposal of the dredged material within the river shall only negatively contribute to the existing siltation.
- Alternative 2: Confined disposal – This type of disposal is associated with an area specifically designed for the containment of contaminated dredged material that provides control of potential releases of contaminants to the environment. The toxicity levels of heavy metals on the samples are within permissible limits and thus this alternative is of less concern.

Alternative 3: Beneficial use - includes disposal methods that use the material for some productive purpose such as habitat development.

Considering the nature, sources and composition of sediment materials in Msimbazi valley, as depicted in the laboratory results, the key recommendation is to reuse for terracing.

7 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

7.1 Overview

Through a systematic assessment, the ESIA team has identified several significant environmental and social impacts that may potentially result from the establishment of the proposed project in its all phases. As a result, a set of measures has been developed to reduce overall residual impacts to acceptable levels and as low as reasonably practicable to manage and mitigate these impacts, which will be more useful to the design engineering team in developing the best final design for proposed project implementations. Implementing and tracking the effect of these management and mitigation measures is an essential element in ensuring that the assessed residual impact levels are confirmed.

The proposed mitigation measures provide the basis for developing an environmental management plan and monitoring plan for the roads' subproject is required to meet World Bank's and NEMC's environmental approval and permitting requirements.

The key objectives of this Environmental and Social Management Plan (ESMP) are to:

- Collate the various mitigation and management measures developed throughout the EIA into a single point;
- Identify implementation mechanism (e.g. responsible entities, financing sources, monitoring and reporting requirements) to ensure actual implementation of all mitigation and management actions throughout the various phases of the project;
- Define monitoring requirements to determine the efficacy of all mitigation and management measures; and
- Provide all stakeholders with clarity on what impacts have been identified. How they will be mitigated and managed, and by what means.

This section provides measures to mitigate the negative impacts of the proposed project and enhance positive ones. These measures need to be incorporated into the design and implementation plan or management system of the 'Jangwani Bridge' proposed construction at Jangwani area Dar es Salaam. Experience shows that the true cost of a project's environmental and social mitigation is not accounted for in the financial and economic analysis of a project. As a result, the environment and local people often bear these costs rather than the developer.

There is growing recognition that proponents are responsible for internalising environmental costs in the project cost. This change in attitude encourages governments and agencies to require proponents to avoid or minimise impacts through good design or design modifications (mitigation) and produce plans for managing impacts to keep these within acceptable limits. Mitigation measures must be implemented in collaboration with the affected communities to become fully aware and involved in managing those impacts.

7.2 Capacity Building & Training

TANROADS as the main implementation Agency for this subcomponent has a vast experience in management of E&S issues of big infrastructure project. Currently, the Agency have 6 and 2 permanent employed environmentalists and Sociologists respectively. The team is supported by 2 environment management expert and 3 social management expert under the support of Dar es Salaam Urban Transport Project financed by the World Bank. Despite of having vast knowledge in the implementation of

projects, the team still need training on the application of new World Bank Policies (ESF). For successful implementation of the project's E&S issues owing its sensitivity, capacity enhancement through training should be done to the project implementation entity. The training can be in the form of the whole project staff or Training of Trainers (TOT), and it can be in the form of short or long workshop. This training will ensure that the E&S specialists are able to manage and monitor the E&S aspects of project activities. Further to project's E&S staff, other project implementation staff including engineers and relevant stakeholders will participate in the training so that they can have general overview of implementation of E&S issues related to the project.

The project is located in the Kinondoni and Ilala Municipality. These councils (Kinondoni & Ilala) have got at least one (1) environmental officer and one (1) Community Development Officer who solely deal with environmental and social/communities' issues on daily basis. Other staffs in these departments and whole Councils has limited knowledge of newly operating WB safeguard requirements and generally lack experience in environmental and social issues. Such low capacity represents a risk to the implementation of environmental and social requirements as contained in the ESMPs and as required by the WB's Environmental and social Framework (ESF) of 2018. It is therefore necessary to address this weakness through capacity building through technical assistance that will support the Municipal Councils during the implementation of the ESMPs. The technical assistance will specifically provide the necessary support to districts in their work with contractors as well as other entities involved in the implementation of the ESMPs.

The technical assistance will include support to experts and training that will cover:

- General knowledge of environmental and social requirements and project procedures, and
- Important specific knowledge in environmental and social procedures and requirements for project staff, consultants, and national contractors.

Specifically, the above will include: assistance with the preparation of documents and implementation of training programs on E&S management and monitoring for contractors and relevant staff of the project's implementation entity and municipal/districts to perform their tasks. The training program shall include:

S/No	Training Programme	Training Period/Schedule
1	Fundamentals of ESF and Introduction to the World Bank's ESF, Preparation of the Environmental and Social instruments in compliance with the requirements by WB's Environmental and Social Framework (ESF) and ensuring their readiness as part of the Project preparation	<i>1st month of having Project Staff in place at Implementation phase.</i>
2	Training on the waste management from the project	<i>2nd month of having Project Staff in place at Implementation phase</i>
3	Training on implementation of Stakeholder Engagement Plan	<i>1st month of having Project Staff in place at Implementation phase</i>

S/No	Training Programme	Training Period/Schedule
4	Gender Based Violence (GBV) and Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH)	<i>1st month of having Project Staff in place at Implementation phase</i>

Given the nature, locations, and scale of construction, it is anticipated that the safeguard technical assistance support and training will be provided during the first 1 year of the project implementation. The WB safeguard specialists will support this in the capacity building program, in particular in the training activities as appropriate.

7.2.1 Cost Estimation for Capacity Building & Training

S/No	Training Activity	Project Month		Total (USD)
		1	2	
1	Fundamentals of ESF and Introduction to the World Bank's ESF, Preparation of the Environmental and Social instruments in compliance with the requirements by WB's Environmental and Social Framework (ESF) and ensuring their readiness as part of the Project preparation	8,000.00		8,000.00
2	Training on the waste management from the project		12,000.00	12,000.00
3	Training on implementation of Stakeholder Engagement Plan	12,000.00		12,000.00
4	Gender Based Violence (GBV) and Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH)	12,000.00		12,000.00
Total Budget				44,000.00

7.3 Awareness and Education

The Contractor should encourage environmental awareness among his foremen before and during implementation of the proposed project. 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, and concrete)
- Post sign at key locations reminding foremen how to properly store construction materials, handle and dispose of toxic wastes, dispose of 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.

The main Contractor needs to be aware that he/she is responsible for education and informing all Sub-Contractors (if any).

7.4 Impact Mitigation Plan

Mitigation planning involves undertaking activities during the design, implementation and operation phases to eliminate, offset, or reduce adverse environmental impacts to acceptable levels. An impact mitigation plan describes the mitigation measures, the responsible institution to implement when to implement and the cost of implementing proposed mitigation measures. The proposed impact mitigation/enhancement plan for the proposed construction of the Jangwani Bridge is summarised in Table 7-1. In addition, the table includes measures to deal with the impact and estimated costs of implementing the mitigation measures.

The developer and contractor must set aside an amount of money to deal with some of the mitigation measures that will be addressed before they become an issue. In contrast, several other mitigation measures will occur during various project implementation stages.

Project developers will integrate the cost of implementing these mitigation measures into the overall project cost; however, since some of the measures will be implemented by local and central government institutions, the relevant institutions will bear the cost of such measures. Furthermore, based on the EMA (URT 2004), NEMC will be responsible for follow up to ensure conditions set out in the environmental certificate are implemented.

TANROADS will ensure a designated environmental unit, personnel, and facilities to follow up on implementing the ESMP to comply with national and international standards, including producing monitoring reports as per NEMC approved schedule.

Table 7-1: Environmental and Social Management Plan for the Proposed Construction of Jangwani Bridge

Phase	S/No	Impact	Mitigation Ref #	Proposed Mitigation Measure	Mitigation Component for costing	Responsibility	Cost/Year TShs
MOBILISATION AND CONSTRUCTION	1	Loss of Habitat	M1.1	For any of the conserved tree's species be damaged, cut or removed off-site, a permit shall be obtained from the responsible Institution before construction	Permit from Ministry of Natural resources	Contractor	Part of BoQ
			M1.2	The development footprint should be rehabilitated and returned to an ecological functional state. Recommendations for rehabilitation must be provided in the ESMP	Vegetation covers and planting of trees shall be done	Contractor	Included in M1.1
			M1.3	Avoidance of any encountered habitat especially during river dredging	Habitat identification shall be done before dredging	Contractor	Included in M1.1
	2	Visual impact	M2.1	Control clearing on the area in the construction limits and quick revegetation upon completion of construction;	Refer to M1.2	Contractor	No cost
			M2.2	Planting mixtures of grass, shrubs and trees should be tailored to help re-establish the original site flora.	Refer to M1.2	Contractor	Part of BoQ
			M2.3	All the exposed areas should be planted with grass once construction activities are complete. This should be undertaken in phases; grassing activities should be undertaken on a section by section basis to bind the loose soils together, preventing accelerated soil erosion rates.	Refer to M1.2	Contractor	Included in M2.2
			M2.4	Adopt landscape design principles e.g. the raised road embankment must be in harmony with existing landscape i.e should blend and follow the surrounding topography without excessive cuts and fill;	Design	Consultant& TANROADS	No cost

Phase	S/No	Impact	Mitigation Ref #	Proposed Mitigation Measure	Mitigation Component for costing	Responsibility	Cost/Year TShs
	3	Employment opportunities and Source of Income	M3.1	Sensitisation of communities on the existing work opportunities in the project	Facilitation for both Sensitisation Meetings and training	TANROADS	7,000,000
			M3.2	Training in entrepreneurship skills	Training materials	TANROADS	2,500,000
			M3.3	Gender Policy shall be implemented as it also provides guidelines to ensure gender sensitive plans, programmes and strategies are highly committed to road works and activities	Preparation of Gender Policy	TANROADS	500,000
			M3.4	Promote labour-based construction works to employ unskilled local people from the project vicinity	NA	TANROADS	No cost
			M3.5	Advertise the jobs locally to attract skilled labour resident to the areas	Posting Through MEOs, WEO & City Council's Notice Boards	Contractor	No cost
			M3.6	Remuneration for all employees shall be not less than the minimum wage specified in the Tanzanian Wage order	NA	Contractor	No cost
	4	Solid Waste Generation (Including spoil material, Overburden, Stripped Vegetation, metal scraps, demolition materials, used tires etc).	M4.1	Dredged material should be sorted and used as fill material. Any excess material shall be stored on the river banks and used in landscaping for grassing and tree planting.	Construction and Restoration	Contractor	No Cost
			M4.2	Domestic waste will have to be sorted into degradable and non-degradable	Proper solid waste management system	Contractor	No cost
			M4.3	Waste management hierarchy (3 or 4Rs – reduce, reuse, recycle (and recover) which is an acceptable guide for prioritising waste management practices should be considered	Refer to M4.2	Contractor	No cost
			M4.4	Hazardous waste such as used lead acid batteries, metal scraps, used tires etc shall be collected	Refer M4.2	Contractor	Part of BoQ

Phase	S/No	Impact	Mitigation Ref #	Proposed Mitigation Measure	Mitigation Component for costing	Responsibility	Cost/Year TShs
				separately and disposed by the NEMC authorised waste dealer			
			M4.5	Demolition materials shall be sorted based on their type, reuse whichever possible and disposed based on the type	Refer M4.2	Contractor	Included in M4.4
	5	Contamination and disruption of water source/s	M5.1	Material stock pile should be located away from the watercourses.	Proper Storage	Contractor	No cost
			M5.2	Maintenance of vehicles and equipment should be done in designated areas (workshop) and not in water ways	Maintenance area	Contractor	No cost
			M5.3	Drums used for oil storage should be placed on top of wooden structures during loading and offloading and these can be kept well for further use to minimise the extent of spilling oil in several locations. Used oil drums shall be stored in a lined surface to avoid spillage	Proper Storage	Contractor	No cost
			M5.4	Vehicles should be well serviced to minimise leakage	Maintenance Services	Contractor	Part of contractor's costs
	6	Noise Generation	M6.1	Construction equipment should be well maintained to minimise cracking noise from exhaust pipes	Refer to M5.4	Contractor	Covered in M5.4
			M6.2	Proper guidelines for workers will be put in place as a need to maintain order and minimising noise concerns.	Refer to M3.3	Contractor	No cost
			M6.3	Noisy construction operations to be executed during the day (before 6pm)	Refer to M3.3	Contractor	No cost
			M6.4	Provide hearing protection devices to all workers exposed to excessive noise	Provision of ear plugs	Contractor	Part of BoQ

Phase	S/No	Impact	Mitigation Ref #	Proposed Mitigation Measure	Mitigation Component for costing	Responsibility	Cost/Year TShs
			M6.5	Proper maintenance of construction equipment.	Refer to M5.4	Contractor	Refer M5.4
	7	Land and water pollutions from poor construction waste management	M7.1	The project proponent and Contractor shall make sure that they establish good and efficient solid waste disposal and collection system within the premises by contracting to the licensed and experience waste management contractor;	Availability of dustbins	Contractor	Part of BoQ
			M7.2	Use of durable, long- lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generating over time;	Nature of the material used	Contractor	No cost
			M7.3	Provision of facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements;	Purchase of Empty Plastic Barrels for Storage of Used Oils	Contractor	Covered in M7.1
			M7.4	Purchase of perishable construction materials such as paints incrementally to ensure reduced spoilage of un used materials;	NA	Contractor	No cost
			M7.5	Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste;	NA	Contractor	No cost
			M7.6	Use of construction materials containing recycled content when possible and in accordance with accepted standards;	NA	Contractor	No cost
			M7.7	Wastes which will be inadvertently dumped in unauthorised locations will be removed immediately and disposed at an approved site;	Waste transportation	Contractor	Contractor's cost
			M7.8	The contractor shall have adequate facilities for handling the construction waste. A large Skip Bucket shall be provided at the campsite;	Types of waste collector facility used	Contractor	Covered in M7.1

Phase	S/No	Impact	Mitigation Ref #	Proposed Mitigation Measure	Mitigation Component for costing	Responsibility	Cost/Year TShs
	8	Deterioration of ambient air quality by dust and fumes	M7.9	The skip bucket shall be collected and disposed to dumpsite	Disposal techniques	Contractor	Covered in M7.1
			M8.1	Speed of vehicles should be controlled to reduce dust by use of speed calming devices e.g., rumble strips/humps	Humps	Contractor	Part of BoQ
			M8.2	Water should be sprinkled (3-4 times a day) to suppress dust especially in the dry season not only where the works are on-going but in all the affected roads	Water truck/Bowser	Contractor	Covered in M8.1
			M8.3	All trucks carrying the granular material should be covered	Cover	Contractor	Contractor's cost
			M8.4	Minimise vegetation clearing around all work sites including proposed campsite	NA	Contractor	No cost
			M8.5	Construction equipment and vehicles should be maintained to minimise gaseous emissions	Refer to M5.4	Contractor	No cost
			M8.6	Provision of dust respirator with filters to employees exposed directly during vegetation clearance excavations, transportation as well as Gravel mining and stone quarry operations	Availability of N95 Respirators	Contractor	Covered in M6.4
	9	Influx of People into the Area	M9.1	Local labour should be given priority for employment as this will solve many of the problems associated with influx of people.	Refer to M3.4	Contractor	No cost
			M9.2	There should be sensitisation of the workers in cultural values and norms of the area.	Refer to M3.1	Contractor	Contractor's cost
			M9.3	The project should plan for additional infrastructure to cater for increased population for example, water sanitation and health facilities.	Availability of all necessary infrastructure	TANROADS/Po RALG	Part of project cost
			M9.4	Local authorities shall need to be strengthened in order to deal with the increased cases of indiscipline	Community cultural respect	TANROADS/Po RALG	Part of project cost

Phase	S/No	Impact	Mitigation Ref #	Proposed Mitigation Measure	Mitigation Component for costing	Responsibility	Cost/Year TShs
	10	Increased Risk of Diseases		brought about by the increased population influx, and any disputes that are likely to ensue;			
			M9.5	Project should set up internal controls and security systems for its materials	Fence and Security company	Contractor	Part of contractor's cost
			M10.1	The project should work closely with respective government departments, local NGOs, and/or faith based organisations, and local communities involved in Covid-19, HIV and reproductive health	Provision of health and Safety education	Contractor	Covered in of BoQ
			M10.2	Mega awareness campaigns on Covid-19, HIV/AIDS and other STDS should periodically be organised	Refer to M10.1	Contractor	Covered in M10.1
			M10.3	Counselling and testing services to the workers and community members should constantly be made available.	Refer to M10.1	Contractor	Covered in M10.1
			M10.4	There is need for continuous sensitisation of the workers and community members about Covid-19, HIV/AIDS and other STDs.	Refer to M10.1	Contractor	Covered in M10.1
	11	Occupational Health and Safety	M11.1	Regular maintenance of equipment, engines and electrical installations; maintaining clean and tidy workplace, providing signals and lighting; providing protection in the walkways, providing worksite rules, safe working procedures and allocating appropriate places to carry out the work.	Security of the area and safe working place	Contractor	No cost
			M11.2	The contractor should locate stores to reduce risks to workers on-site and make arrangements for the safe use, handling, storage, transport, and disposal of articles and substances before work starts to the engineer's satisfaction.	Good House Keeping	Contractor	No cost

Phase	S/No	Impact	Mitigation Ref #	Proposed Mitigation Measure	Mitigation Component for costing	Responsibility	Cost/Year TShs
			<i>M11.3</i>	The Contractor should provide appropriate protective clothing and safe equipment to all staff and labour engaged on the Works sites despite their contractual status to the engineer's satisfaction. These will include; high visibility vests, protective boots, gloves, masks, protective footwear and hard hats.	Availability of Proper PPE	Contractor	Refer M6.4
			<i>M11.4</i>	The Contractor should designate a full time Safety Officer qualified to handle the specific tasks.	Presence of Qualified HSE Officer	Contractor	Part of project cost
			<i>M11.5</i>	All employees shall be trained in how to ensure their own safety and reduce risks at work site	Training	Contractor	Part of contractor's cost
			<i>M11.6</i>	Contractor should provide and maintain access to all work places in the condition that will reduce risks.	Diversion/Accessibility	Contractor	Part of BoQ
			<i>M11.7</i>	Contractor should provide adequate waterborne sanitation, and refuse collection and disposal complying with the laws of Tanzania or By-laws.	Safe drinking water	Contractor	Part of contractor's cost
			<i>M11.8</i>	Latrines and other sanitary arrangements should be put in place where work is in progress.	Clean sanitary facilities	Contractor	Covered in M11.7
			<i>M11.9</i>	Contractor shall comply with Government regulations in case of epidemic outbreaks.	Refer to <i>M10.1</i>	Contractor	No cost
			<i>M11.10</i>	The Contractor should manage the risk of spreading of contagious diseases.	Refer to <i>M10.1</i>	Contractor	No cost
			<i>M11.11</i>	Contractor shall reduce occupational health hazards	Ergonomic hazards shall be considered	Contractor	No cost
			<i>M11.12</i>	Ensure the presence of well-trained first aiders at each working location and well-equipped nurse station/clinic.	First Aid kit/Clinic	Contractor	Part of contractor's costs

Phase	S/No	Impact	Mitigation Ref #	Proposed Mitigation Measure	Mitigation Component for costing	Responsibility	Cost/Year TShs
			<i>M11.13</i>	Barricades and signs should be used during construction of the bridge	Provision of barricades and signs	Contractor	Part of BoQ
			<i>M11.14</i>	contractor should allocate a dedicated emergency vehicle to attend the victims at the site	Availability of dedicated vehicle	Contractor	Part of contractor's cost
	12	Gender Based Violence (GBV)/SEA-SH	<i>M12.1</i>	Ensure effective and on-going community engagement and consultation, particularly with women and girls;	Complaints Register Book	Contractor	Part of contractor's costs
			<i>M12.2</i>	Review of specific project components that are known to heighten GBV/SEA-SH risk at the community level, e.g. compensation schemes; employment schemes for women; etc.	Refer to <i>M12.1</i>	TANROADS/Po RALG	Part of project cost
			<i>M12.3</i>	Develop and implement GBV/SEA-SH Grievance Mechanism	Refer to <i>M12.1</i>	Contractor	Part of contractor's costs
			<i>M12.4</i>	Specific plan for mitigating these known risks, e.g. sensitisation around gender-equitable approaches to compensation and employment; etc.	Refer to <i>M12.1</i>	Contractor	Part of contractor's costs
			<i>M12.5</i>	The contractor will ensure adequate referral mechanisms are in place if a case of GBV/SEA-SH at the community level is reported related to project implementation	Refer to <i>M12.1</i>	Contractor	No cost
			<i>M12.6</i>	The Contractor shall consult/engage GBV Service Provider prior to start of the construction works	Management of GBV/SEA-SH	Contractor	Part of contractor's costs
			<i>M12.7</i>	Survivor center approach must be practiced during management of GBV/SEA-SH cases		Contractor	No cost

Phase	S/No	Impact	Mitigation Ref #	Proposed Mitigation Measure	Mitigation Component for costing	Responsibility	Cost/Year TShs
			M12.8	Ensure the GBV/SEA/SH Code of Conduct is prepared in line with the World Bank GBV Guidance Notice for Major Civil Works		Contractor	Part of contractor's costs
			M12.9	Ensure all workers have been sensitized on the GBV/SEA/SH Code of Conduct and signed during signing of the employment contracts		Contractor/Super vising Consultant/TAN ROADS	Part of contractor's costs
			M12.10	Ensure the GBV Complain Team is formed during the start of the project.		TANROADS	No cost
	13	Child Labour	M13.1	Due diligence and regular monitoring to ensure the non-employment of minors in the supply chain and supporting services;	Prohibition of child labour	Contractor	No cost
			M13.2	Contractor comply with the labour laws of Tanzania that prohibits employing people of the age below 18 years e.g. Employment and Labour Relations Act, 2004 Part II Sub-part A Child Labour;	Refer to M13.1	Contractor	No cost
			M13.3	The Contractor is required to prepare and sign a code of conduct which has clear prohibitions on Child Abuse and Exploitation and a Code of Conduct for Gender Based Violence and report on its implementation in the course of project implementation;	Refer to M13.1	Contractor	No cost
			M13.4	Contractor to develop and implement a Children Protection Strategy that will ensure minors are protected against negative impacts associated by the Project;	Refer to M13.1	Contractor	Part of contractor's cost
			M13.5	Wherever possible, ensure that another adult is present when working in the proximity of children;	Refer to M13.1	Contractor	No cost

Phase	S/No	Impact	Mitigation Ref #	Proposed Mitigation Measure	Mitigation Component for costing	Responsibility	Cost/Year TShs
			M13.6	Not invite unaccompanied children to workers' home, unless they are at immediate risk of injury or in physical danger; and	Refer to M13.1	Contractor	No cost
			M13.7	Refrain from hiring children for domestic or other labour, which is inappropriate given their age, or developmental stage, which interferes with their time available for education and recreational activities, or which places them at significant risk of injury.	Refer to M13.1	Contractor	No cost
	14	Risk of improper behavior of security personnel	M14.1	In the case of the use of private security firms, the terms of the contracts for security personnel must be clearly established and the penalties for misuse of force must be stipulated in the contract	NA	Contractor	No cost
			M14.2	Security personnel shall be required to sign the Workers Code of Conduct and shall take part of induction training and sensitization on the Code of Conduct, the GBV/SEA-SH measures and the project GRM	NA	Contractor	No cost
			M14.3	Guards from recognized private security companies and with a good reputation are recommended for the project.	NA	Contractor	No cost
	15	Health and safety risks for communities during construction	M15.1	The construction contractors shall ensure safe passage at identified crossing sites for pedestrians with appropriate signage using pictograms and adequate protection from work engines and trucks and motorized traffic indicating diversion and entrance.	Construction of detour and protection of site	Contractor	Part of BoQ

Phase	S/No	Impact	Mitigation Ref #	Proposed Mitigation Measure	Mitigation Component for costing	Responsibility	Cost/Year TShs
			M15.2	The contractor shall ensure separate lane for pedestrian from motorized vehicles with appropriate barricades	M15.1	Contractor	Covered in M15.1
			M15.3	Work site shall be clearly delineated and create exclusion zones. Work shall be confined to avoid that dangers spill out onto the sidewalks and streets around. Signage indicating danger using pictograms shall be installed along the work site	M15.1	Contractor	Covered in M15.1
			M15.4	Construction fences and work exclusion zones shall be visible at night, it is therefore required to use orange, fluorescent color for barricades and fences.	M15.1	Contractor	Covered in M15.1
			M15.5	Appropriate traffic control signs shall be installed along the main road, along detours. The contractor shall collaborate with Police force in monitoring vehicles and drivers' behaviours.	M15.1	Contractor	Covered in M15.1
			M15.5	Material borrow areas shall be located and utilised in a way that it shall not risk the life of the local community. Generally the contractor shall follow the requirements of the Environmental code of Practice for road Works, 2009	NIL	Contractor	No cost
			M15.6	Location of the concrete batching and bitumen plants should consider the minimum distance provided in the Environmental code of Practice for road Works, 2009. The plant shall be inspected and serviced to reduce emission	NIL	Contractor	No cost
	16	Destruction of Public Utilities	M16.1	Early notice must be given to the community/ies before any service interruption	Utilities	Contractor	Part of BoQ

Phase	S/No	Impact	Mitigation Ref #	Proposed Mitigation Measure	Mitigation Component for costing	Responsibility	Cost/Year TShs
	17	Mangrove disturbance and Change Species Diversity	M17.1	The developer/ constructor will confine construction activities to the project core area in case of disturbance to Mangrove species the contractor shall consult TFS	Affected Species Mangrove	Contractor	No cost
			M17.2	To protect surrounding waters and confine the spread contamination by using silt curtains, environmental dredging techniques should be used to achieve a high concentration dredged sediment with the lowest possible turbidity.			
	18	Land Acquisition & Resettlement	M18.1	The design/ construction corridor and excavation activities has been designed within the existing RoW. In case of any offsite land acquisition by the contractor for either material sourcing or stockpiling shall ensure compliance with the World Bank ESS5 and National Legislations	Affected Properties	TANROADS/ Contractor	Part of contractor's costs
			M18.2	Primarily through negotiated settlement at full replacement cost	Affected Properties	TANROADS/ Contractor	Covered in M16.1
			M18.3	Additional assistance to be provided to the people who will be resettled for restoring their standards of living and further improvement for them;	Affected People	TANROADS/ Contractor	Covered in M16.1
			M18.4	Project grievance redress committee will be established. Any grievances are resolved on a timely basis, with evidence of formal and informal communication retained.	Committee facilitation	Contractor /TANROADS	Covered in M16.1
			M18.5	Affected persons shall be given the opportunity to participate in property valuation process, sensitised on their rights including eligibility requirement and resettlement assistance if required. Socio-economic survey needs to be undertaken in order to recognise the real situation for all project	Sensitisation and Surveys Meetings	TANROADS/ Contractor	No cost

Phase	S/No	Impact	Mitigation Ref #	Proposed Mitigation Measure	Mitigation Component for costing	Responsibility	Cost/Year TShs
				affected people, taking into consideration those without legal rights over properties and belongings.			
			M18.6	Census to be conducted in line with World Bank's ESS5 requirements in order to facilitate the process and successful outcomes of resettlement	Socioeconomic Survey/Census	TANROADS/ Contractor	No cost
	19	Traffic accident	M19.1	The contractor shall provide prior notice on the closure of the road section is provided through most read or listened media	Notice is timely issued	Contractor	No cost
			M19.2	Proper signage shall be provided to guide the traffic especially when one side of the road and bridge is under construction	Availability of traffic signs	Contractor	Covered in M15.1
			M19.3	The contractor shall ensure involvement of traffic police to assist in controlling traffic including provision of proper signage as well as traffic signals	Traffic signals	Contractor	No cost
	20	Dredged sediments quality	M20.1	The sediments and dredged material quality should be monitored for its proper handling and disposal	Detailed Laboratory Results of the sediments	Contractor/TAN ROADS	Contractor's cost
OPERATION	21	Improved Economy	M21.1	Periodic and routine maintenance of the bridge and its approach road and its facility should be properly streamlined.	Conducted Road Maintenance	TANROADS	Part of annual project maintenance cost
	22	Traffic Accidents	M22.1	Signs and symbols shall be established at all potential black spots on the access roads;	Presence of Road signs	TANROADS	Covered in M21

Phase	S/No	Impact	Mitigation Ref #	Proposed Mitigation Measure	Mitigation Component for costing	Responsibility	Cost/Year TShs
			M22.2	Awareness and education shall be provided to drivers and the general public;	Education to Road users/Road Safety Issues	TANROADS	Covered in M21
			M22.3	Establishment of appropriate and understandable signage (detailed Traffic management procedure during construction is presented in section 2.4.3.2 of this report)	Refer to M22.1	Contractor /TANROADS	Covered in M21
	23	Climate Change Risks (Floods and Heat Factors)	M23.1	Minimise the occurrence of flooding or reduce its magnitude by increasing infiltration within the catchment area draining through the hydraulic structures, or diverting high flows to drainage systems with a higher drainage capacity	Design & Construction of adequate hydraulic structures/culverts	DESIGN CONSULTANT/TANROADS	Shall be included in designs
			M23.2	Raising Road Level and the bridge is one solution to adapt to climate change events, especially flooding. The road and bridge surface level will be raised to an elevation higher than expected flood level to reduce risk of road damage and to prevent an inaccessible road during flood event.	Design & Construction of Raised Road and bridge	DESIGN CONSULTANT/TANROADS	Shall be included in designs
			M23.3	Side slope should be adjusted from 1:2 to 1:3 or flatter to prevent flood damage and erosion from road surface runoff.	Design dimensions	DESIGN CONSULTANT/TANROADS	Shall be included in designs
			M23.4	Construct bridge deck expansion joints to mitigate the impacts of higher temperature	Construction of Expansion Joints	DESIGN CONSULTANT/TANROADS	Shall be included in designs
			M23.5	Use paving materials that are more resistant to expansion in extreme heat conditions	Resistant Paving Material	DESIGN CONSULTANT/TANROADS	Shall be included in designs
			M23.6	Build small-scale bridges with heat resistant materials or use coatings	Coating Material	DESIGN CONSULTANT/TANROADS	Shall be included in designs

In ensuring all project's related grievances are managed properly, there will be formulation of the Project Grievance Mechanism, Workers Grievance Redress Mechanism and GBV/SEA-SH Grievance Redress Mechanism as described in below sections.

7.5 Project Grievance Redress Mechanism

The primary responsibility of the GRM is to address all complaints and grievances that will be raised towards the project. The GRM will comprise two levels or tiers to handle grievances – first level will be at community where Mtaa - GMC will be clustered, while the next or second level will be at the TANROADS level.

7.5.1 Scope of Work of Grievance Management Committees

All committees will have similar responsibilities albeit at different levels of their function/jurisdiction. Major responsibility of the Grievance Management Committees will be:

- Represent the interests of communities in the project's zone of influence;
- Act as an entry and exit point for all grievances arising from resettlement activities
- Act as part of project monitoring and oversight committee on the corridor encroachment, construction materials vandalism and finally to sensitize the community from misusing the infrastructures.
- Monitor safety standards, labour requirements and community health issues during construction works and report to TANROADS – Project coordinator.
- Prepare progress reports and present them to the GMC during monthly meetings

The composition of grievance committee shall be as listed in the table below:

Level	Committee Members	Position in the Committee
Mtaa	Mtaa Leader	Chairperson
	Grievance Community liaison officer	Secretary
	Influential person	Member
	Religious leaders	Member
	Representatives of people with disabilities	Member
	Representatives of project contactors and consultants	Member
	Representatives from Relevant CBOs (GBV)	Member
	Representatives of Project Affected Community	Member
TANROADS	Project coordinator	Chairperson
	Grievance officer/Sociologist	Secretary
	Environmental officer	Member
District Commissioner s' Offices	District Commissioner	Chairperson

Level	Committee Members	Position in the Committee
	Representatives from various utilities (TANESCO Water and sanitation authorities, Water basin officer, Communication cables agencies,)	Member
	Representatives from TANROADS	Member
	Grievances officer	Member
	Project coordinator	Member

The 1st level committees for management of grievances shall be formed at Mtambani B and Suna Mtaa, the areas that are directly affected by the proposed project.

7.5.2 Dissemination of Committee's Resolution

The Committee's resolution status on any grievance received and discussed will be communicated to the claimant within **7 working days** of the Committee's decision.

- i. *Program Reporting Requirement:* The Grievances Management Committees will work hand in hand with the TANROADS project Communications liaison officers reporting on all matters arising and progress.
- ii. *Location:* The TANROADS - Grievances Management Committees will be housed within the project coordinator's office and provided with a separate space to work. They would undertake travel to project sites as necessary.
- iii. *Operational duration:* In terms of duration, the following shall be the key considerations:
 - The committees would need to operate till the project continues to have an interface with affected communities
 - It should remain operational even after end of the construction period as it is likely that there could be issues relating to the operational phase.
 - The duration till when such a grievance redressal system needs to be maintained post construction can be determined and can be mutually agreed between Project Coordination Unit and TANROADS upon by review of suitable indicators such as: Nature and type of grievances; received, addressed; Pending resolution; and Referred for arbitration/ court.

7.5.3 Redressal Procedure

The Grievance redressal procedure aims to take into use the existing traditional structures. However, the complainant shall have the option of directly reporting the grievance to the TANROADS level GRM, if s/he so desires. The steps involved are as given below:

STEP 1 – LOGGING AND RECORDING OF GRIEVANCE: As a first step, all complaints and grievances relating to any aspect of the project are to be properly lodged through the representative member of the Grievance Management Committee and then recorded in the Grievance Form13. The contact details of the Mtaa-GMC members will be made public to the community. Additionally, the Mtaa leader will also be available to help the complainants to channel their grievances to the committee.

Complaints that are not connected to the Project are filtered and referred to relevant local committees and claimants informed accordingly within 5 days. Some cases may just require provision of required information or clarification and may therefore not be required to be referred to Step 2.

STEP 2 – REDRESSAL AT MTA- GRIEVANCE MANAGEMENT COMMITTEE LEVEL:

The Mta/facility - GMC shall maintain a record/register of all complaints/grievances received so that these can be recorded collectively. At this step, all cases are to be heard by Mta/facility- GMC and addressed through consultations conducted in a transparent manner and aimed at resolving matters through consensus. In order to ensure transparency, all meetings aimed at resolving such complaints are conducted in places specifically designated for this purpose. Minutes of such meetings shall be kept and if the resolution proposed by the Mta/facility- GMC is accepted by the complainant, the complainant will sign the grievance form to show agreement and the grievance will subsequently be closed, otherwise Step 3 below will be followed.

STEP 3 – REDRESSAL AT TANROADS- GRIEVANCE MANAGEMENT COMMITTEE LEVEL:

The TANROADS - GMC shall maintain a record/register fresh complaints/grievances received or referrals (those failed to resolved at Mta level) so that these can be recorded collectively. At this step, all cases are to be heard by TANROADS- GMC and addressed through consultations conducted in a transparent manner and aimed at resolving matters through consensus. In order to ensure transparency, all meetings aimed at resolving such complaints are conducted in places specifically designated for this purpose. Minutes of such meetings shall be kept and if the resolution proposed by the TANROADS- GMC is accepted by the complainant, the complainant will sign the grievance form to show agreement and the grievance will subsequently be closed, otherwise Step 4 below will be followed in appeal. A period of 7 days is provided to hear and redress the grievance.

STEP 4 –REDRESSAL AT DISTRICT - GRIEVANCE MANAGEMENT COMMITTEE LEVEL:

If the Complainant does not receive any response from the Mta/facility/TANROADS GMCs within 14 days of lodging the complaint or that the Complainant is not satisfied with the response, then the issue will be appealed to the District - Grievance Management Committee (District- GMC). During the appeal to the District- GMC, all the necessary details will be attached, and the Complainant notified accordingly of the venue, date and time of when a hearing will be conducted and resolved within 14 days' time. If the resolution proposed by the District- GMC is accepted by the complainant, the complainant will sign the grievance form to show agreement and the grievance will subsequently be closed.

STEP 4 – CIVIL COURTS OPTION: If the affected person is not satisfied with the decision of the District- GMC he/she will be informed of his/her rights to take the grievance to the court of law, as a last resort. However, the Complainant will also be informed that to do so will be at their own expense, unless the court awards damages to the Complainant. The decision of the court of law will be final.

7.5.4 Grievance Log

The PIU Social Safeguards Expert will ensure that each complaint has an individual reference number, and is appropriately tracked and recorded actions are completed. The log also should contain a record of the person responsible for an individual complaint, and records dates for the following events:

- Date the complaint was reported.
- Date the Grievance Log was uploaded onto the project database.
- Date information on proposed corrective action sent to complainant (if appropriate).
- The date the complaint was closed out.
- The date response was sent to complainant.

7.5.5 Monitoring Complaints

The PIU Social Safeguards Expert will be responsible for:

- Providing the sub-project Resettlement and Compensation Committee with a weekly report detailing the number and status of complaints.
- Any outstanding issues to be addressed.
- Monthly reports, including analysis of the type of complaints, levels of complaints, and actions to reduce complaints.

7.6 Workers Grievance Redress Mechanism

7.6.1 Purpose

Purpose of this Workers GRM is to ensure that community and workers including all site personnel can voice up the concerns, grievances and suggestions without fear of punishment or retribution. The site management acknowledge the importance of establishing a responsible business model that respects and promotes fair labour conditions, equal opportunities and non-discriminatory practices for workers. As such, the site management has developed a Workers Grievance Redress Mechanism (WGRM) to allow workers to voice concerns, grievance and suggestions without fear of punishment ad retribution. This site instruction shall be in line with GRM operationalized by TANROADS and GMCs.

7.6.2 Grievance Committee and their responsibilities

The effective implementation of the WGM shall have the committee to resolve any of the voiced-up grievances. The roles and responsibilities shall be as provided below;

Table 7-2: Grievance Committee and their responsibilities

Role	Responsibility
Site Manager	- Last resort for resolving the grievance in case the Grievance Manager cannot resolve the issue. - Ensure that sufficient focus and importance is placed in thorough examination and corrective action. - Takes part in the grievance resolution process for complaints classified as medium or high and, in that Grievance, Manger cannot resolve the grievance.
Grievance Receptor	- The person receiving the grievance or complaints. This may be the direct supervisor of the complaint or other designated staff. - Responsible for notifying the Grievance Manager in timely manner (within 24 hours of receiving the complaint).
Grievance Manager	- Shall be fulfilled by the site HSE Manager, who may delegate this task to a qualified person.

	- Shall be responsible for overall management and integrity of the grievance/complaint system like receipt, examining, recording, tracking, resolving, reporting and analysis. - Shall perform the follow-up and evaluation of the worker grievance process. - Shall communicate this procedure to all workers and provide appropriate training to ensure its effective implementation. - Shall have to ensure the grievance process is transparent, culturally appropriate and clearly communicated with workers. - Shall be accountable for the overall performance in managing workers feedback during grievance management process. - Shall have to examine the grievance voiced up.
Workers, supervisors, Managers, Engineer, Administrators	- Shall have to collaborate in order to effectively resolve the grievance internally. - Report all complaints using the workers Grievance Mechanism
Subcontractors	- Both are required to cooperate with the site management in the Workers Grievance Mechanism Process implementation as needed.

7.6.3 Grievance Procedures to be adopted

The grievance mechanism shall comprise these steps;

Step 1: Receive

- All workers, including permanent and temporary workers, services providers, consultants, suppliers, and subcontractors, may submit a verbal and/or written grievance (complaint, claim and suggestion) to their direct supervisor or direct to the Grievance Manager through the following report channels and access points;

Dedicated telephone Number	XXXXXX
E-Mail Address	XXXXXXXXXX
Letter to;	HR and/or HSE
Complaint boxes to be located at Camp/site area	To be Identified (TBI)
Face to face to their direct Supervisor OR Grievance Manager	

- Workers shall have sufficient access points available within the site to make it easy to lodge a grievance in a manner convenient to them (easily accessible, in language they understand and accessible to illiterate people).
- All workers shall be informed about WGM at the time they are hired and details about how the mechanism operates should be easily accessible (e.g., through posters on notice boards)
- Upon receiving a suggestion, concern or grievance; the person receiving the grievance will:

Explain the process: The complaints shall be given 7 days timelines to complete the WGM steps and be informed on how the complaint will be handled and the type of the Consortium can, or cannot provide; and

Ensure grievance confidentiality: Details of the grievance can only be provided to those directly involved in the examination process, (e.g., namely the Grievance Manager and the Site Manager). Sensitive information will only be disclosed with the complainant knowledge and approval.

- The GRM allows accepting and addressing both individual and collective grievances. The individual or group presenting the grievance has the right to remain anonymous. In such case the grievance response will be posted at locations accessible to all employees.
- The complainants will be encouraged to submit the grievance /register through the channel of choice within the recommended timeframe of 7 days since the grievance has occurred. Forms will be available at easily accessible locations.
- When the claims are presented by phone or through the claim boxes, the person receiving the grievance or the Grievance Manager shall complete the grievance registration and acknowledgement forms. If needed the person receiving the face-to-face grievances will help the complainants to complete the form.
- When receiving forms, the complainant must make sure that all the information needed to examine and resolve the issue is provided in the form.
- All the suggestions, concerns or complaints received will be registered by the Grievance Manager in the Grievance Register within 24 hours of receipt of the grievance.
- The Grievance Manager will determine on case-by-case basis how to undertake the examination of the received suggestions, concerns or complaints.

Step 2: Assess and Assign Responsibilities

- The grievance will be classified based upon severity as low/medium/high. The level of severity is understood as the level of impact the grievance may have on the operations of the consortium if it is not appropriately addressed. The severity will therefore determine who needs to be informed and who manages the grievance.

Step 3: Examine and resolve

- The Grievance Manager will examine the grievance and its context to verify the validity of the complaint, determine its causes and develop corrective actions to minimize or avoid potential recurrence.
- In the majority of cases and within 3 – 5 business days following receipt and registration of the complaint, the Grievance Manager will a first examination to address complaints or grievances

that can be resolved quickly or easily by providing information or by addressing the issue otherwise.

- If the issue can be addressed during the first examination, the case will be closed out immediately through the Grievance Resolution form. The complainant will be required to sign the grievance resolution form.
- In case the complainant is not satisfied with the proposed resolution, if the Grievance Manager is not able to provide a quick resolution or if examination of the issue requires expertise beyond the mandate of the Grievance Manager, he will request the involvement of the General Site Manager.
- If after seven (7) days of receiving the grievance, the Grievance Manager fails to obtain a resolution, or if after the first examination of the complainant is not satisfied with the resolution, he must conduct a more detailed examination through meeting a complainant, affected parties and witnesses. This step may take up to 14 days.
- The detailed examination shall be conducted in a respectful manner, involving a complainant to the extent needed, possible witnesses and others who can provide insight into the root causes of the issue.
- In cases when additional time is needed to complete the examination, the complainant has to be provided with regular progress update. The update shall be provided verbally or in written form.
- Once the examination has been completed, the grievance Manager will document the findings and propose the option of resolving the complaint as appropriate.
- Where the requirement for the resolution exceeds the authority level of the Grievance Manager, the Site Manager together will address the grievance or will escalate the grievance for the resolution by the General Project Management.
- In case of concerns or complaints related to subcontractor's workers, the Grievance Manager will engage with subcontractor representatives to agree on the resolution and request a commitment to implementing the required actions.
- Final evaluation and resolution will be completed within 14 days.

Step 4: Respond;

- The Complainant will be informed of the resolution within two days of the grievance resolution.
- The Complainant will be provided with the filled Grievance Resolution Form detailing how the grievance was addressed. Any complainant comment on the grievance resolution will be recorded on the grievance resolution form.
- If the complainant agrees with the proposed resolution, he/she will be asked to sign on the resolution form.

- It is important that the proposed resolution is discussed with and confirmed by the Complainant rather than simply announced.
- On case-by-case basis, if required, the Grievance Manager may then engage in subsequent discussion with the complainant, verbally as well as in writing (if culturally appropriate) and monitor the effective implementation of resolution if accepted by the Complainant.

Step 5: Appeal

- In exceptional cases when a complainant cannot be satisfactorily resolved following the processes described in step 1-3, Complainant has the right to appeal against the resolution. Resource options following an appeal may include:
 - a) Involving an independent mediator agreed upon by both conflict parties to facilitate further dialogue and resolution or;
 - b) Involving a trusted, independent external party to assess the grievance and propose an impartial resolution.
- In the event that the grievance cannot be resolved upon following the process described above, the Site Management or the Complainant may proceed to submit his/her claim to the local court for resolution.

7.6.4 Grievance Recording and Documenting

- The Grievance Manager will ensure the GRM process is documented by recording all grievances in the grievance register in the chronological order.
- Also, it is the Grievance Manager's responsibility that for each grievance logged in the Grievance register, the Grievance Registration form, Acknowledgement form and Grievance resolution form are kept on file at site.

7.7 SEA-SH Grievance Mechanism

To properly address SEA/SH risks, the GM needs to be in place prior to contractors mobilizing. To ensure the GBV/SEA-SH Grievance Mechanism is functional, TANROADS shall formulate the GBV Complain Team (GCT) consisting of PIU and GBV Service Provider. GBV service provider(s) and/or community-based organizations are critical not only for supporting the project in addressing any case of SEA/SH that may arise, but also in assisting the project to proactively prevent incidences of SEA/SH.

Multiple complaint channels trusted by those who need to use them shall be established. Community consultations shall be used to identify effective channels (e.g., local community organizations, health providers, etc.). During handling of the SEA-SH cases:

- No identifiable information on the survivor shall be stored in the GM.
- The GM shall not ask for, or record, information on more than those related to the SEA/SH allegation:
- The GM shall assist SEA/SH survivors by referring them to GBV service provider(s) for support immediately after receiving a complaint directly from a survivor.

- The information in the GM must be confidential—especially when related to the identity of the complainant.

To maximize access to all appropriate services a survivor of GBV might need, a service provider should be able to actively refer survivors to other service providers, to enable the survivor to get the range of services that will provide a path to healing. Workers and local communities will be sensitized to SEA/SH risks, and the worker's responsibilities under the CoC. A range of possible disciplinary actions for violation of the CoC by workers shall be taken into account.

In resolving all cases associated with GBV/SEA/SH issues, TANROADS shall within 3- 5 days agree with the survivor on the course of action to be taken. More specifically, the following actions shall be undertaken:

- 1) Cases of GBV/SEA/SH can be reported through the general Project GRM or a separate GBV/SEA-SH GM, a GRM grievance recipient cannot reject a GBV/SEA/SH complaint. The GBV survivor has the freedom and right to report an incident to anyone. Survivor can use any avenue to report including text message, phone call, written note, or word of mouth in person to trusted colleague, member of the GMC, GBV service provider, or local CBO or NGO, local authorities;
- 2) Once a complaint is made it shall be registered immediately in a separate confidential log and acknowledged;
- 3) As soon as possible and in less than 24 hours the survivor shall be referred to the relevant GBV specialist and/or GBV service provider for timely incident reporting. Within 48-72 hours a follow up with the referral network will be undertaken to confirm survivors informed consent on their wishes to pursue sanction against the perpetrator;
- 4) A notification of this complaint to the World Bank shall be within 48 hours;
- 5) within 3-5 days confirm with the survivor the course of action and timeline for its resolution;
- 6) Meanwhile GBV Specialist/expert from TANROADS shall also refer the complaint to the GBV Complaints Team (GCT) which:
 - Reviews the case and collectively agree upon the appropriate actions to be taken and sanctions, if any.;
 - Refers the case to the police as appropriate and according to the law (mandatory reporting);
 - The GCT shall verify, investigate, and act on the complaint;
 - The GBV Survivor shall be informed on the actions taken regarding their submitted grievances;
 - Upon resolution, the GBV Specialist and GBV Service Provider advises the GCT that it has been resolved, who in turn advises the GM operator.

- The GM operator notes the resolution and closes the case.
- 7) The GBV Specialist/expert from the GCT will be the key focal point for any such grievances and concerns and will work closely with Environmental & Social Team and other PIU members in the implementation of the GBV/SEA/SH Grievance Management System
 - 8) For project workers to avoid the risks of stigmatization and rejection, workers will be allowed to seek services directly from the Consultant or TANROADS Supervisor Engineer and they will have access to the TANROADS GBV Specialist/GBV Service Provider to be engaged;
 - 9) Survivor centered measures that will be applied shall include: Ensuring that all data on GBV is kept anonymous and a high level of confidentiality is maintained; Ensuring that all records of GBV cases are filed in a secure location with limited access to ensure confidentiality. This project recognizes that it is essential to respond appropriately to a survivor's complaint by respecting the survivor's choices. This means that the survivor's rights, needs and wishes are prioritized in every decision related to the incident. The survivor of SEA/SH, who has the courage to come forward, must always be treated with dignity and respect. Every effort should be made to protect the safety and wellbeing of the survivor and any action should always be taken with the survivor's consent. These steps serve to minimize the potential for re-traumatization and further violence against the survivor

The supervising Engineer shall monitor and report on the effectiveness of the implementation of the SEA/SH measures to mitigate SEA/SH risks associated with the project. Reporting shall be done on a monthly basis

8 ENVIRONMENTAL AND SOCIAL MONITORING PLAN

8.1 General

Mitigation options and enhancement measures are meaningless without effective and consistent follow up – i.e. monitoring. EMA (URT, 2004) and the EIA Regulations (URT, 2005) define measures that have to be taken to address monitoring issues. Monitoring must include checking for effectiveness or otherwise of mitigation and enhancement measures. EMA No. 20 of 2004 defines roles for monitoring where the National Environment Management Council (NEMC) is empowered to enforce compliance to the environmental permits issued before development and follow in monitoring to ensure implementation of the Environmental Management Plans (EMP). NEMC must conduct monitoring activities in collaboration with relevant sectors and other stakeholders.

Monitoring refers to the systematic collection of data through repetitive measurements over a long period to provide information on the characteristics and functioning of environmental and social variables in specific areas over time. There are four types of monitoring (Sadler, 1996) that are also relevant to this project. These are: -

8.1.1 Baseline Monitoring

Environmental parameters are measured during the pre-project and operation periods to determine the nature and ranges of natural variations and, where possible, to establish the process of change. Baseline monitoring for this project would entail observing the types and rate of changes on the baseline conditions identified before the start of the project.

8.1.2 Impact / Effect monitoring

Involves the measurement of parameters (performance indicators) during the construction, operation and decommissioning phase to detect and quantify environmental and social change that may have occurred due to the project. This monitoring provides experience for future projects and lessons that can be used to improve methods and techniques. This monitoring would entail an analysis of the project's impact on a range of parameters for this project. For example, changes in livelihoods increased the production of goods and services intended from the project and incomes and revenue.

8.1.3 Compliance Monitoring

Typically, this is attained through periodic sampling and continuous measurement of levels of compliance with standards and thresholds, such as for waste discharge.

8.1.4 Mitigation Monitoring

This aims to assess the suitability and effectiveness of mitigation measures and programs designed to mitigate or compensate for the project's adverse effects. Monitoring for this component in this project would entail auditing the effectiveness of the mitigation measures to determine whether changes are required to improve best practices. In this chapter, a monitoring plan is proposed, and the mitigation plan and the monitoring plan together constitute the Environmental Management Plan (EMP) for the proposed development. There will be several components for monitoring that will be an integral part of the proposed development project. Some of the issues for monitoring will relate to waste management,

the potential for improved income, increased employment opportunities, revenues and the quality of the area. Other issues will relate to monitoring waste management issues, water use, etc.

8.1.5 Monitoring Frequency and Reporting

Monitoring frequency is proposed for each critical parameter depending on the likelihood and level of change over time. Some parameters take longer to show changes while others would change in a short time. E.g. monitoring parameters such as income, revenue, employment, changes in livelihoods and use of resources (water, energy) will be monitored annually to allow for change to occur.

Monitoring data should be analysed and reviewed at regular intervals and compared with the operating standards so that any necessary corrective actions are taken. The proponent must maintain records of liquid effluents, hazardous if any, sent off-site, and other parameters (e.g. use of water), fires, accidents, and ill health that may impact the environment or workers.

Environmental performance reporting (to report on the implementation of the monitoring and any emerging issues) should be prepared as follows:

1. Monthly- Part of Project Site Meeting
2. Quarterly- Compilation of Monthly Reports
3. Annual Audit- Conducted by Independent Consultant

The report should be submitted to Supervision Engineer who will then submit the copy to WB.

Records of monitoring results should be kept in an acceptable format and easily accessible, and information should be reviewed and evaluated to improve the effectiveness of the environmental protection plan. Furthermore, the results should be reported to the responsible authorities and relevant parties, including NEMC in this case.

The monitoring plan for the Jangwani Bridge project is provided in Table 8-1 hereafter.

Table 8-1: Environmental and Social Monitoring Plan for The Proposed Construction of Jangwani Bridge

Phase	Potential Impact	Parameter to Monitor	Monitoring Area	Monitoring Frequency	Measurement Unit	Responsibility	Estimated Costs (TShs)
Mobilization & Construction Phase	Loss of Aquatic Habitat	Size and Type/Species	Project site	Quarterly during construction	M3/Nos	Contractor	Part of BoQ
	Employment opportunities and Source of Income	Number of the surrounding community employed	Project area	Bi Annually	Nos	Contractor	Part of BoQ
	Solid Waste Generation of (Including spoil material, Overburden, sediments and Stripped Vegetation)	Quantities generated	Project site	Weekly	M3	Contractor	Part of BoQ
	Contamination and disruption of water source	Turbidity, TDS, Nitrates Oil, Grease, color, BOD, COD, TTS, EC, Heavy Metals, FC	Project area	Monthly	NTU, mg/L, Hazen	Contractor	Part of BoQ
	Noise Generation	Noise level	Project site	Continually	dBA	Contractor	Part of BoQ
	Air Pollution	Dust pollution (PM _{2.5} , PM ₁₀), Emissions (NO _x , SO _x , CO, CO ₂)	Project site	Continually	µg/m3, ppm,	Contractor	Part of BoQ
	Influx of People into the Area	Increased number of people, Crimes incidences, Supply of Social services	Project Area	Once every six months	Nos	Contractor	Part of BoQ
	Increased Risk of Diseases (HIV), Covid-19	Number of affected individuals & Awareness Campaigns	Project Area	Once every six months	Numbers	Contractor	Part of BoQ

Phase	Potential Impact	Parameter to Monitor	Monitoring Area	Monitoring Frequency	Measurement Unit	Responsibility	Estimated Costs (TShs)
	Health and Safety	Provisional of PPEs & Training	Project area	Continually	Number of employees	Contractor	Part of BoQ
	Traffic & Road Impacts	Road Accidents & Road signs and Traffic flow	Project area	Quarterly	Number of Accidents & Road Signs	Contractor	Part of BoQ
Operation phase	Improved Economy	Increased economic activities	Regional area	Annually	Regional GDP	Local Authorities	45,000,000
	Land and surface water pollutions due to mismanagement of solid waste	Facilities for disposal of solid wastes	Project area	monthly	Visual	TANROADS, Supervision Engineer	10,000,000
DECOMMISSIONING PHASE	Air pollution (Dust and exhaust emissions)	Dust pollution (PM _{2.5} , PM ₁₀), Emissions (NO _x , SO _x , CO, CO ₂)	Project site			TANROADS	5,000,000
	Loss of Employment	Pension Fund remittance	Project area		Number of employees registered with fund	TANROADS, Labour Office	1,000,000
	Land Pollution due to solid waste such as hazardous oil	Soil parameter (pH)	Project area		Incidences	TANROADS	16,000,000
	Workers accidents and hazards during demolition	Availability of PPEs; types of people employed with their training background; Working conditions			Incidences	TANROADS, OSHA	14,000,000

9 COST-BENEFIT ANALYSIS

9.1 General

The objective of an economic cost-benefit analysis (CBA) is to estimate the (likely) costs and benefits of the Msimbazi Upgrading Project aiming at reducing flood risks in the Lower Msimbazi Basin area in which the New Jangwani Bridge is among the project's components aiming to minimize/manage floods within Msimbazi valley. This preliminary CBA provides a first insight in the relevant impacts of the considered project alternative to society: for people, specific stakeholders, assets and ecology.

9.2 Methodology and Assumptions

9.2.1 Time Horizon and Timing of Implementation

Flood management infrastructure often has a lifetime of 30 to 100 years and climate change is a long-term phenomenon. In this feasibility study, the protective measures have been designed for a technical lifetime of 50 years. It was estimated that about 2 years will be necessary for the preparatory activities such as agreement on funding, resettlement, procurement and contracting of the works (2022-2023). The implementation (construction and supervision of the works, resettlement activities) for a number of components could start earliest in the year 2024 (Jangwani bridge, dredging, resettlement), other components (urban and city park development terraces A and G, sand traps) are planned to start in the year 2024, other terraces will follow in 2025 and most activities could be finalized around 2028. Given a technical lifespan of 50 years, this implies the year 2075 is the time horizon in the CBA; a residual value is used for the assets at the end of the period.

9.2.2 Social Discount Rate

Because people tend to value current expenditures or benefits higher than an equal benefit (or expenditure) in the future, a discount factor is used in CBAs to discount future values to today's value (and make flows over time comparable). The discount rate also reflects the opportunity costs of undertaking investments in protective measures (what would be the real return on any other alternative investment). We estimated a potential discount rate based upon four different sources/methods from literature for estimating the discount rate. These methods are i) opportunity costs of capital, ii) the view of climate economists (see Stern, 2007 and Fleurbaey, 2010), iii) social time preference based upon the Ramsey formula and iv) other CBA climate adaptation studies in Africa (e.g. HKV, 2017 which uses a real discount rate of 4.5% for Ghana). Based on a combination of these methods we have assumed a real discount rate of 5.6% in this CBA, as this rate is most comparable to the results of different methods and sources and still gives weight to impacts for future generations. In the sensitivity analysis we also show the results on outcomes of the CBA with lower or higher discount rates.

9.2.3 Climate Change

Two climate change scenarios (extreme RCP 8.5) and modest (RCP 4.5) have been modelled in the CBA model. Climate change mainly influences the extent of the rainfall, and therefore flooding and damage. The scenario with extreme climate change results in higher inundation levels over time and therefore increasing flood asset damage and indirect damages over time (period 2020-2075). Lower climate change will result in a more moderate increase in flood damages over time.

9.2.4 Socio-Economic Development and Urbanization

Two socio-economic development scenarios have been developed for the baseline scenario calculations of assets and damage. The real annual growth of Growth Domestic Product (GDP) ranges in the scenarios on average between 3% and 5% for the period until 2075. The implied real economic growth per capita rates in the scenarios affect the quality of buildings and content (quality improvement over

time) in the damage and CBA models. Basically, a higher growth of income and therefore quality of buildings (dwellings etc.) and its content, results in higher flood asset damage over time.

Basically, the climate change and socio-economic scenarios have been combined in an upper and lower bandwidth of scenarios (RCP-8.5 high growth-urbanization and RCP4.5 low growth- urbanization).

9.2.5 Business Case of Urban Development

The Consultant has developed a preliminary financial analysis for the urban development strategy (terraces with real estate development including affordable housing). A financial model has been constructed, based upon the urban development concept for the valley as described in Flood Management Strategy. In the financial model (cash-flow model) the land development costs and revenues from land sales from the perspective of a land development authority are estimated³. For land sale revenues a residual value method was used for calculation of the land sale prices of a land authority. Moreover, the construction costs and revenues from sales of real estate for the real estate developer are also modelled. For the CBA only the profits from land development and real estate development are included in the net welfare impacts.

9.3 Costs

The costs of the strategies consist of investment costs (Capex) and operating & maintenance costs (Opex). Capex are based upon the technical feasibility chapter (Bill of Quantities) in this report. Regarding investment costs, the following components are included:

- Implementation costs (construction, land development, resettlement etc.) based upon the estimations as included in the section on Technical Feasibility. The justification for the estimation of land development costs of the urban development strategy is provided in a separate subsection in this chapter on the business case of urban development;
- Indirect costs of management & supervision (overall a mark-up of 3.5% on implementation costs, design and tender document studies are not included (part of this assignment));
- Mobilisation/ demobilisation (including removal of existing assets, up to 10% for specific works components);
- Contingencies (a mark-up of 5% of construction costs).

Indirect taxes such as VAT are excluded in the cost and benefit estimations.

For Opex a general percentage of 1.5% of Capex has been assumed. The presented financial costs have been corrected to the economic costs based upon the Standard Conversion Factor (SCF) of 0.92. The SCF is the ratio or economic price value of all goods in the economy at their border price equivalent values to their domestic market price value. This factor converts financial values to economic values, as some goods are imported, and some costs (such as construction costs) have benefits in terms of (temporary) employment benefits in case of unemployment (structural imbalances on the labour market). In the table below, the Capex and annual Opex for the main project alternative are shown.

Table 9-1: Investment (CAPEX) and Operation & Maintenance (OPEX) Costs In CBA

Basin section	Intervention group	BoQ	Total (incl. Indirect costs)	Converted Capex CBA	Converted annual Opex
	mIn USD	Assumption	100%	Factor 0.92	1.5% of Capex
Lower basin	Flood protection and prevention	76	90	83	1.2
	Resilient transport infrastructure	65	77	71	1.3
	Erosion, sediment and litter control	12	14	13	0.2
	Urban greening and nature revitalization	17	20	18	0.3
	Urban development & resettlement	70	82	75	1.1
	Capacity building and institutional	16	16	15	-
	Subtotal lower basin	256	299	275	4.0
Middle & upper basin	Flood protection and prevention	5	6	5	0.1
	Resilient transport infrastructure	11	12	11	0.2
	Erosion, sediment and litter control	-	-	0	-
	Urban greening and nature revitalization	2	-	2	0.1
	Subtotal Upper & Middle Basin	18	18	20	0.4
Totals Msimbazi		274	321	295	4.4

Regarding timing of investments in this phase preliminary assumptions have been made that the overall project will be implemented in the years 2024 until 2028. Further preparations, permitting and procurement & contracting would be expected in the years 2022 and 2023. The first components to be implemented would be flood plain excavation, river dredging and construction of the new Jangwani bridge (2024-2025). Other components, such as terraces levelling, urban and city park development, re-greening etc. are to be expected in the period 2024-2028 and are accordingly phased in time for CBA cash-flow calculations.

9.4 Business Case of Urban Development

The urban development strategy developed for the lower Msimbazi Basin has the main objective to create urban space for resettlement of those households that are affected by the river measures and to develop additional commercial real estate and a city park. The concept of the City Park, as developed in the MOP, always have been focused on creating a strong public space in the heart of Dar es Salaam for its citizens. With its vast size there is room for incorporation of some areas with a commercial facilities that might generate additional revenues to the LMUP business case. In this stage both the potential commercial functions, their entrepreneurs and their potential business case are not identified yet and therefore not part of the CBA yet. The business case presented in this paragraph is therefore preliminary and addresses mainly the cost and revenues from land development for real estate (mainly residential) as foreseen on the terraces. It is proposed to detail the business case further at a later stage when more detail regarding the City park concept is available.

Urban development will result in costs and revenues for a potential land development authority (or municipality) and the developers of real estate. To capture these potential financial flows a preliminary

business case model was developed. The model focused on the land development costs and land sales (to commercial real estate developers) for a land development authority or municipality.

In the table below some key assumptions relevant for the business case regarding area ha, housing units, housing mix etc. are presented per terrace. In total 73 ha is the grand gross that could be developed for urban development on the terraces (including public space, amenities, infrastructure and real estate plots). All in all the housing mix leaves sufficient space for the need for in-kind resettlement and local demand for affordable housing as from the total 14,900 almost 3000 housing units (20%) are foreseen for low income persons or households. This should be sufficient to reserve a contingent of the foreseen affordable housing units for in-situ resettlement compensation (about 1000 housing units to be expected as part the RAP) and local demand for low-cost housing.

Table 9-2: Assumption's Business Case Urban Development Per Area

	Development area	Grand gross total urban area (ha)	Sellable land ha (plots)	Housing units	% affordable	% mid end	% high end
A	Jangwani	19.3	6.5	4,696	15%	70%	15%
B	Msimbazi Bondeni	7.7	2.6	1,796	15%	70%	15%
C	Ilala Kota	22.5	7.1	3,716	20%	65%	15%
D	Sunna	13.2	6.3	2,511	20%	70%	10%
E	Mwinyimkuu	1.3	0.9	641	35%	60%	5%
F	Mtambani	2.5	1.7	258	30%	70%	0%
G	Hananasif	2.8	1.7	609	30%	70%	0%
H	Reservation (Mkunguni)	3.7	2.3	590	30%	70%	0%
Total land development		72.9	29.1	14,817	19%	68%	12%

9.4.1 Costs and Revenues of Urban Development

The costs for the land development authority consist of acquiring land, developing land for public space and plots ready for construction and costs for utility infrastructure (water, electricity etc.), green etc. Revenues consist of sales of sellable plots to real estate developers. Based upon various sources and own estimations land development costs are assumed at USD 450,000 per ha gross area (including land acquisition), while (residual) land sale prices for residential sellable plots are calculated in the model at USD 1.7 – 4.7 million per ha of sellable plot area for developers (depending on a housing mix with 0 - 35% affordable housing and FSI for the areas between 3 and 4.5, see Alnananga & Charles, 20164). Land prices are based upon residual price calculations for each housing category. Housing sale values are estimations based on a number of studies; CFAH (2020), Progetti (2022), PWC study (PWC-World Bank, 2019)5. Construction costs per housing category are based upon CDR et al., (2021) and CFAH,

(2020)6. In table below most important sales prices, construction costs and residual land values are shown.

Table 9-3: Housing Parameters Used for Residual Land Value Calculation for 3 Housing Segments

	Affordable	Mid end	High end
Construction costs housing units (USD)	15,980	25,200	35,000
Sales price per housing unit (USD)	25,380	47,500	75,000
Compliance costs & taxes (USD)	3,553	7,125	10,500
Profit & development costs real estate developer (USD)	3,046	8,075	16,500
Residual land price (sales price per unit, USD)	2,801	7,100	13,000
Land quote in sales price	11%	15%	17%

Based on the assumptions regarding the volume and costs and price parameters of urban development, the costs and revenues are calculated in the discounted cash-flow model. Regarding phasing, the areas A –D are to be constructed earliest (and will also generate income earliest), given also the need for in kind resettlement (2023-2024). The areas E-H are phased later in the period 2025-2028. The results of the business case are presented in the table below.

Table 9-4: Present Value in 2020 of Costs, Revenues and Net Revenues, IRR of the Business Case of Land Development for Urban Development

Net Present Values & IRR		Discounted costs (USD)	Discounted revenues (USD)	Net Present Value (2022) (USD)
A	Jangwani	7,662,057	25,751,123	18,089,065
B	Msimbazi Bondeni	2,791,094	9,381,063	6,589,969
C	Ilala Kota	6,187,485	18,844,291	12,656,805
D	Sunna	4,387,606	11,627,622	7,240,016
E	Mwinyimkuu	1,088,895	2,561,958	1,473,063
F	Mtambani	396,516	1,017,041	620,525
G	Hanasif	988,653	2,646,251	1,657,598
H	Reservation (Mkunguni)	958,611	2,213,594	1,254,983
Total land development		24,460,917	74,042,942	49,582,025

Note: All costs and revenues are in constant prices of 2022. IRR= Internal Rate of Return (higher than 5% real discount rate implies development of the location is commercial viable for the relevant land development authority, lower than 5% not viable). NPV= Net Present Value of all expenses and income for a potential land development authority. NPV>1 implies the location is potential commercial viable (<1 not viable).

This preliminary business case shows that the urban development (development of the terraces) can generate land development revenues which could outweigh the costs of the land development (including public space, services and infrastructure). The preliminary expected surplus of around USD 50 million

could be used to cover (cross subsidize) other cost items in LMUP. However, it would be necessary to establish in 2022 or 2023 a program authority in order to acquire the land and create this possibility to cross subsidize other cost items in the overall plan from the (net) revenues of urban development.

Housing demand and housing mix

A number of studies have assessed the real estate market in Dar es Salaam (PWC, 2019, Progetti, 2022). The PWC study proposes for the larger central area in Dar Es Salaam a mixed housing development, but with a strong focus on mid- and high end real estate. At the same time the study is concluding that the segment for high end housing is small based upon a share of incomes above 20,000 USD per year of around 2-3%. The study of Progetti also sees a market for mixed housing, but with less focus on high end housing and more focus on the affordable and mid end housing segments. Based upon the study of PWC and own scenario analysis of population and household growth we estimate that there is space for a total uptake of housing of around 80.000-100.000 housing units per year for the whole city of Dar Es Salaam. Based upon the shares of the relevant income segments this implies that the demand of higher mid end and high end housing is small and about 1800-2200 units annually. Moreover, the Progetti report also signals that the Msimbazi area is less competitive for high end housing compared to more suburban and close to the ocean areas in Dar Es Salaam. For this reason we advise to focus the mixed housing development especially at the segments affordable and lower mid end housing (in a range of price levels of about 15,000 – 45,000 USD per unit). Therefore, affordable and lower mid end housing is assumed to be the largest categories in the housing mix and cash-flow calculations.

From **Error! Reference source not found.**, it becomes clear that the terraces (zones) A-E are most viable from a commercial point of view to develop. These locations have sufficient scale and possibilities also to develop for (lower) mid- end and some higher residential segments. Therefore, income from sales of land (residual land prices) is sufficient to cover the land development (including terrace filling) costs. The locations F, G and H are less commercial viable to develop. This is a result of the smaller size of locations for sellable land and the higher share of low cost housing and lower share for mid and high end housing possible at these locations.

It is therefore recommendable to start implementation with locations A, B, C. Locations F, G and H could be implemented at later years or kept as reserve locations.

9.5 Benefits for Society

9.5.1 Prevention of Fatalities and Injuries

Flooding of the Msimbazi Basin has resulted in significant loss of life and injuries in recent years in Dar Es Salaam (see CDR et al, 2020). In that report it is shown that the number of fatalities was between 12 and more than 40 people in recent flood events for the entire city. Due to loss of lives, a number of children lose parents and become orphans.

Table 9-5: Overview of Recent Flood Events in Dar Es Salaam, Affected People and Fatalities

Flood event	People, health or assets affected	No. fatalities
13 Oct 2020	10,000-20,000 people affected	12
18 April 2018	342 houses damaged; BRT disrupted	15
April 2014	20,000 people affected, 13 houses washed away, 600 houses inundated. 283 people were treated for waterborne diseases such as cholera.	19
Dec 2011	Over 50,000 people affected, 200 people were injured, with approximately 2,500 people missing, mostly children. About 10,000 people (approximately 2,000 families) were displaced.	43

	The flood event damaged a median value of properties per representative of 7.5 million Tsh (USD 3,200 in 2011).	
Nov-Dec 2006	10,758 people affected	NA

Sources: Red Cross, naturalhazardsanddisasters.blogspot.com/2019/07/an-insight-into-dar-es-salaam-floods.html, <https://reliefweb.int/disaster/fl-2011-000183-tza>. Anande, D.M. and Luhunga, P.M. (2019) Assessment of Socio-Economic Impacts of the December 2011 Flood Event in Dar Es Salaam, Tanzania. *Atmospheric and Climate Sciences*, 9, 421-437. World Bank (2016), *Promoting Green Urban Development in African Cities Dares salaam, Tanzania Urban Environmental Profile*.

In the short timeframe of this feasibility (and CBA) study it was not yet possible to obtain an estimation of potential future prevented fatalities and injuries at different flood events (return periods) due to the proposed upgrading project. However, it is to be expected based upon historic experience that the number of potential lives to be saved can amount to 10-40 persons per flood event depending on the character of the event. Moreover, injuries and water related diseases can be reduced because of the interventions.

9.5.2 Prevention of Direct Asset Damage

The envisaged Msimbazi upgrading project will result in the prevention of damage to assets such as buildings and infrastructure for different flood events at different return times. In order to estimate these impacts a damage model has been developed for two baseline (business as usual) scenarios (high urbanization growth- extreme climate change and low growth, moderate climate change). Based upon the hydraulic modelling, it is assumed that the project will reduce 100% of the damage from the baseline scenarios.

Regarding the avoidance of damage the model has quantified the damage in the do nothing scenario (baseline) and the projects impacts for following different types of assets: residential buildings, commercial buildings, educational facilities, health facilities, public buildings and infrastructure (roads, Jangwani bridge and Selander bridge). Damage curves have been applied to estimate the damage for the do-nothing scenarios for different flood events at different return periods (T1/2, T1, T2, T10, T50, T100).

9.5.3 Damage to Buildings

Most of the damage relates to damage to residential buildings and their content in the area. Because of income growth, it is expected that the quality (and therefore real value) of the buildings and its content will increase over time. Therefore, apart from the rise of damage due to climate change and urbanization, income and quality developments also result in increasing damage of flood events over time. Below the expected damage costs for buildings in the Lower Msimbazi Basin area in the do-nothing scenario for the high and low scenarios are presented.

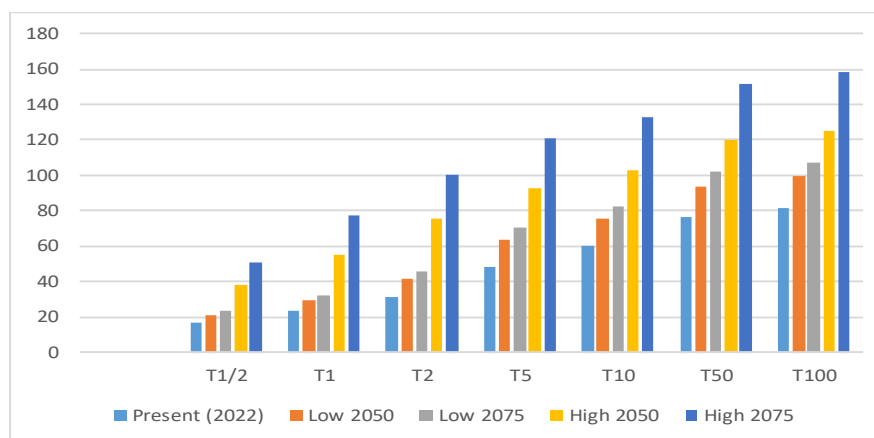


Figure 9-1: Damage to Buildings per Event in Million USD

As shown in the figure damage costs of the floods for buildings in the Lower Basin could go up to maximum USD 160 million in 2075 for a T100 event in the worst case (extreme climate change- high growth) scenario. In 2050 the bandwidth is about USD 100 million (RCP 4.5- low) up to almost USD 125 million (RCP 8.5-high) for a T100 event. More than 90% of the damage consists of damage to residential assets. But even for T1 events the damage to buildings still amounts to USD 30 million to 50 million in 2050 for this event with a probability of about once per year.

9.5.4 Damage to Infrastructure

The damage to roads only is shown in below graph and amounts to 2.8 up to 3.3 million USD in 2050 for a T100 event. For a flood event with a return time of 1 the damage is estimated at USD 0.8 million up to 1.2 million in case of an event in the year 2050.

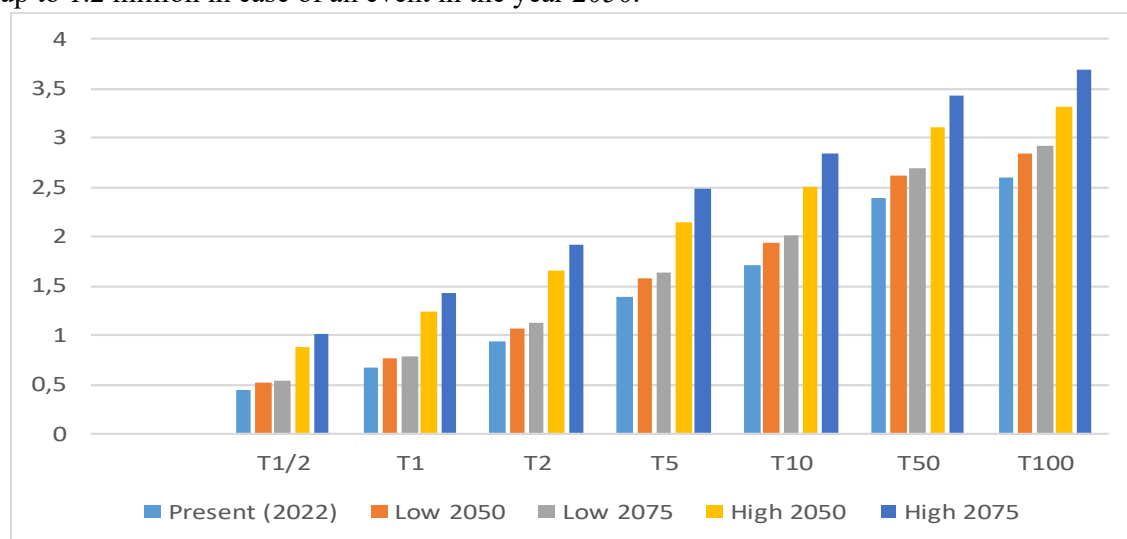


Figure 9-2: Damage to Road Infrastructure

Apart from roads, it is expected that for T50 and T100 events Selander bridge will have significant damage due to the flow velocity and inundation levels at these events. This could amount to reconstruction costs of up to USD 8.5 million for this 85 m. long bridge. For Jangwani bridge no structural damage to bridge structures is expected but significant overtopping and thus traffic disruption (costs) are foreseen (see the next paragraph).

In below table the total annual expected damage (AED) of all events for the two scenarios is presented. As can be seen in the chart the project could prevent expected annual asset damage by about USD 25 million per year in the current situation, increasing up to USD 34 million in the low scenario and 73 million annually in the high scenario for the year 2075.

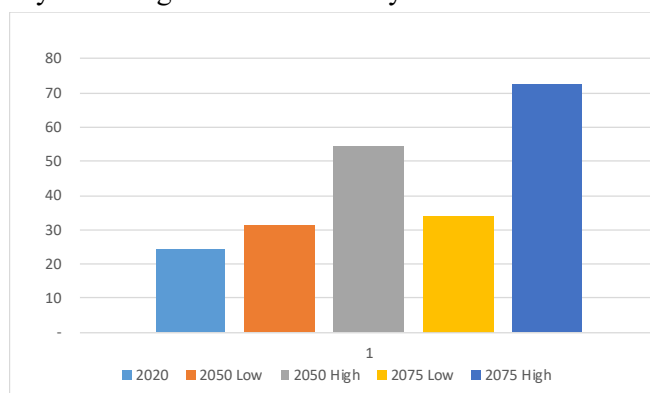


Figure 9-3: Annual Expected Asset Damage (AED) Reduction (In Million USD) by the Lower Msimbazi Upgrading Project in Low and High Scenario (2020, 2050, 2075)

9.5.5 Prevention of Economic and Livelihood Disruption

Apart from direct material damage to buildings and infrastructure, flooding causes disruption of economic activities during and just after the flood events (this is a temporary impact). Especially unprotected economic activities near the riverbanks discontinue during and just after these events.

The more extreme the event (i.e., for T10, T50 and T100 events), the higher the negative socio-economic impacts on businesses and the livelihoods of people affected. In the vulnerability report for the Middle Basin (CDR et al., 2021) it was shown that informal unprotected activities (such as informal markets, food stalls) and places catering for visitors are mostly affected by flooding. Due to the delays in survey results and short time for this CBA activity at this stage of the feasibility & design study project, it was not possible to incorporate results of any socio-economic surveys. Because of this reason, no precise estimation of forgone business profits or income (livelihoods) could be made. Therefore, we have built upon the ratio's used in the literature for indirect damages. In a number of other studies ratios are used with an average of indirect damage as percentage of direct damage of 18%. See for example: Briene et al (2002); HKV (2018) and CDR et al (2020).

In below table the annual expected indirect economic damage (AED) prevention is presented based upon these ratios.

Table 9-6: Prevention of Economic Disruption for Lower and Higher Scenario for All Return Periods, 2050, 2075 in Million USD

	2020	2050		2075	
	Million USD	Low scenario	High scenario	Low scenario	High scenario
Indirect annual economic damage reduction (AED)	4.4	5.6	9.7	6.2	13.1

9.5.6 Urban Development Benefits

The proposed urban development at the terraces can result in net revenues for the land development authority, profits for real estate developers and improved housing conditions (including comfort and

sanitation benefits) for the dwellers. In the business case of urban development the net revenues for land development and profits for real estate development were estimated. Next to these producer surplus benefits the consumer surplus of the residential consumers will improve due to the improved housing and sanitation conditions. Furthermore public facilities like outdoor recreational spaces (parks, squares and streets with trees) and commercial activities increases the attractiveness of the neighborhood. In order to estimate this benefit a Willingness to Pay (WTP) survey would be needed, which was not foreseen in this feasibility study (including cost-benefit analysis activity). Therefore, we set the residential consumer benefits as PM in below overview.

Table 9-7: Urban Development Benefits 2020-2030 in million USD (constant prices, cumulative, not discounted)

Benefits (Million USD)	2020-2030
Gross land revenues from land sales	105
Profits real estate developers	67
Consumer benefits housing	7
Totals	179

Note: costs of terraces fill, land development for urban development and temporary emergency housing are included in CAPEX for CBA.

9.5.7 Reduced Traffic Disruption

In the do-nothing scenarios, inundation levels on and around Jangwani bridge are significant in case of T5, T10, T50 and T100 events. This results in serious overtopping (more than 30 cm) of the bridge which blocks traffic during a considerable amount of 7 hours in the current situation for a T50 event up until even about 14 hours in 2050 (for T50, T100 events). This causes serious delays or rerouting of vehicles for Morogoro road. For Selander bridge no overtopping is expected in the hydro modelling results. In below graph the duration of overtopping of Jangwani bridge is shown for the high scenario in 2050 for different flood events.

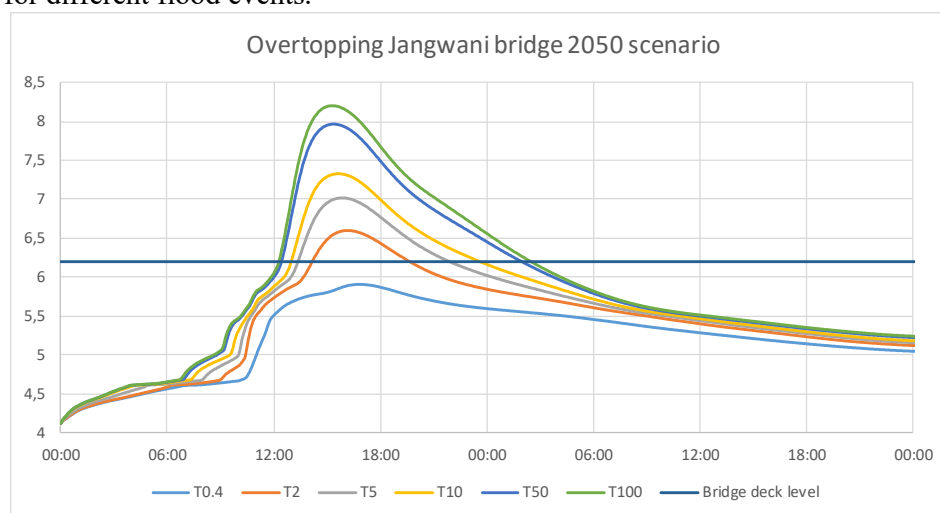


Figure 9-4: Duration of Overtopping of Jangwani Bridge Deck Level Flood Events for High Scenario (2050)

The Lower Msimbazi upgrading project includes a number of specific interventions which will reduce the overtopping of Jangwani bridge. Examples of these interventions are the heightening and widening of Jangwani bridge, flood plain excavation and dredging of the riverbed. Therefore, these interventions

will reduce the disruption of traffic during (and just after) floods due to the overtopping of the Jangwani bridge deck.

In Error! Reference source not found. the impacts in terms of traffic benefits are shown for the different return periods of flood events for the years 2050 and 2075. As can be seen these impacts are significant compared to the direct asset damage prevention. The main reason for this is that the traffic flows on Jangwani bridge are substantial and are expected to increase with 3%-4% annually (in line with the transport Integrated Spatial Plan and World Bank study (World Bank, 2019)). However, the traffic disruption is a temporary effect which only takes place for maximum of about 24 hours in the year of a flood event. Based upon the traffic intensities in 2014 (26,000 vehicles per 12 hrs), traffic flows for all years 2020-2075 have been estimated. By using the duration of inundation (overtopping) and allowing for cleaning and repair time just after the overtopping, rerouting time was estimated at 2-4 hours (depending on the event). With a value of time (VoT about 1 USD per hr in 2021, increasing over time (World Bank, 2019)) the value of lost vehicle hours was estimated for each of the events return periods.

Table 9-8: Reduced Expected Annual Traffic Disruption Costs (AED) of Flooding Lower Basin (Low And High Scenario, 2020-2075)

Reduced expected annual traffic disruption (AED) in USD	2020	2050	2075
Low scenario	0.1	6	16
high scenario	0.3	10	28

These outcomes were validated with the World Bank Group ICF study from 2019 (World Bank, 2019). In that study overall AED of flood events for 2050 for pessimistic scenario for the whole transport route network of Dar Es Salaam was estimated at USD 22 million (pessimistic climate change) and at USD 6.4 million (optimistic scenario climate change). The estimation in this study amount to about 45% respectively 90% of these values. Given the concentration of flooding on the road network and importance of Jangwani bridge and Morogoro road in the overall network estimations seem plausible.

9.5.8 Social & Environmental Impacts

These impacts will have been described in chapter 6 and are assessed in the total costs and benefits.

9.6 Overview Costs and Benefits

In below table an overview of discounted costs and benefits of the main project is presented. As can be seen, the discounted benefits from asset damage reduction (mainly residential damage for residents in the project area) are dominant. The urban development strategy adds net revenues of about USD 60 million discounted in total, while the discounted transportation benefits vary between 50 and 90 million USD (depending on the scenario).

From the overview it can be concluded that the monetized benefits to society substantially outweigh the costs in both scenarios. It should be noted that total benefits could be larger due to the potential for significant permanent ecological, health and social benefits of the upgrading project which could not be estimated and monetized due to lack of ESIA quantitative data at time of CBA.

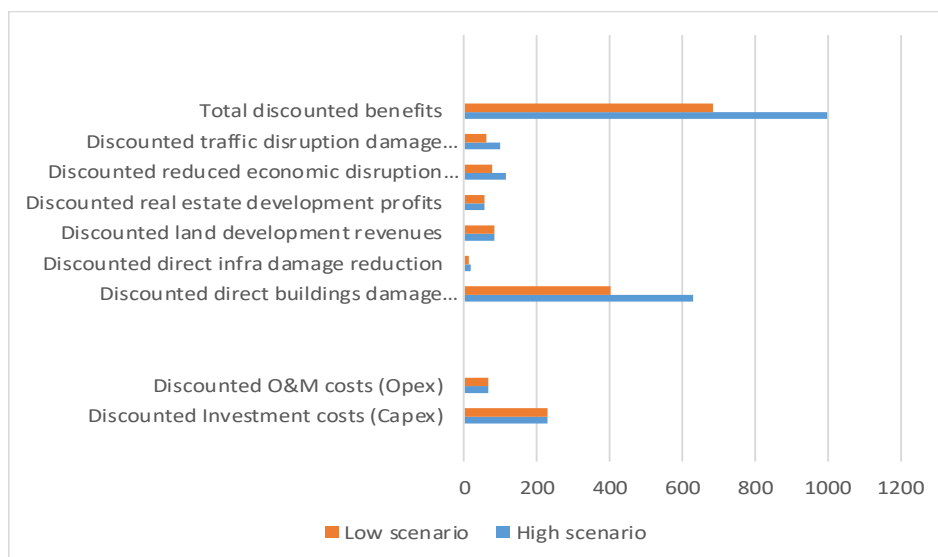


Figure 9-5: Overview of impacts of Lower Msimbazi Upgrading Project (discounted costs and benefits 2020-2075 in 2020).

9.7 Preliminary CBA Results

In **Error! Reference source not found.**, the results of the preliminary CBA are shown. The Net Present Value (NPV) presents the discounted value of all monetized benefits and costs (discounted at a real discount rate of 5%). It should be noted that intangible costs and benefits (such as life and injuries prevented, health benefits, ecological and critical infrastructures) were not included in the monetized benefits. In this respect the NPV is underestimating the total benefits, as intangibles are not included. The benefit-cost (BC) ratio is a better indicator to compare between interventions, as the NPV is sensitive to the overall size of the interventions. A BC ratio higher than 1, implies the discounted (monetized) societal benefits outweigh the discounted (monetized) costs of the interventions.

As shown in **Error! Reference source not found.**, the benefits outweigh the costs of the Lower Msimbazi Upgrading Project in both scenarios (low and high).

Table 9-9: Results of Preliminary Cost-Benefit Analysis of Lower Msimbazi Upgrading Project

	Investment costs (nominal in 2021) million USD	NPV High scenario million USD	NPV Low scenario million USD	Benefit- cost ratio high	Benefit- cost ratio low
Main project alternative	320	703	385	3.4	2.3

NPV= net Present Value. If NPV >0, project societal benefits are larger than societal costs (positive impact on net welfare). BC ratio higher than 1 implies project societal benefits are larger than societal costs (lower than 1 vice versa).

9.8 Sensitivity Analysis

The analysis was undertaken for a long timeframe (until 2075). Given the time horizon and uncertainty regarding some key parameters it is important to undertake a sensitivity analysis. In below sensitivity analysis the following key uncertainties are addressed:

- Growth of the economy and demography for Tanzania and further urbanization of Dar Es Salaam. The upper and lower bandwidth of scenarios regarding economic growth, demographic development and urbanization. All results are presented for these scenarios in the upper and lower scenarios (see before and in table below).
- The extent of future climate change. This is also already modelled and already shown in the RCP 8.5 and RCP 4.5 scenarios (see also table below).
- The level of the discount rate (in relation to social time preferences and/or future interest rates). Below CBA results are presented for a real discount rate of 3% and 7% (3% is close to the Stern rate advised for climate change).
- Actual costs of construction (CAPEX) and operation and maintenance (OPEX). Costs might be higher or lower than expected. Below we present CBA results for +/- 20% of CAPEX and OPEX.

Table 9-10: Sensitivity Analysis of Net Present Value (NPV) Results in CBA

Net present Value (NPV) in million USD	High scenario base case	Low CC & urban. scenario	High: discount rate 7.0 %	High: discount rate 4.0%	High: costs + 20%	High: cost - 20%
Main project alternative	703	385	422	1,242	643	763

For all sensitivities NPV is positive. Therefore, the project is economical feasible given the uncertainties considered. A further analysis of project alternatives and components could shed further light on more specific risks and possibilities for phasing of components or specific interventions or cost optimization.

9.9 Conclusions and Recommendations

It can be concluded that the Lower Msimbazi Upgrading Project is beneficial for society: benefits for society outweigh the costs even in a scenario with moderate climate change and low urbanization. Important benefits are saved lives and reduced injuries due to flood events, prevention of damage to buildings and infrastructure, significant urban development benefits for land development authority, residents users and real estate developers. Apart from this costs of traffic disruption due to flooding-overtopping of Jangwani bridge are overcome by the project.

The preliminary business case of the urban development component shows that the development of the terraces for real estate can generate land development revenues which could outweigh the costs of the land development (including public space, services and infrastructure). The preliminary expected surplus of around USD 50 million could be used to cover (cross subsidize) other cost items in LMUP. However, in order to grasp this opportunity it is necessary to establish a program authority for implementation of LMUP with the responsibility and mandate to acquire and prepare serviced land and organize procurement of prepared sites on the terraces to real estate developers.

At this stage of the study it was not possible to assess different project alternatives (options) or to assess the environmental and social impacts, surveys and translate these into benefits (or costs). For this reason it is advisable if some risks and benefits could be assessed in more detail at the later stage of this study

(such as the financial costs, revenues and societal benefits of the city park based upon to be developed insights in commercial city park amenities-facilities). For this reason it is advisable if some risks and benefits could be assessed in more detail at the later stage of this study (such as the financial costs, revenues and societal benefits of the city park based upon to be developed insights in commercial city park amenities-facilities). This could also result in a more detailed business case for the urban development component of the project and more specific insights into the impacts on municipal finance or other stakeholders. We recommend for the detailed design stage to look into different project alternatives, different phasing scenarios (entire project) and more detailed business case and risk assessment of the urban and city park development components.

10 DEMOBILIZATION AND DECOMMISSIONING

Demobilization and Decommissioning for this project entail activities to be conducted during closure of construction activities and dismissal of the road and bridge operations respectively.

10.1 Demobilization

Demobilization will include demolition of temporary structures, removal of temporary infrastructure, installations and equipment from workshops and campsites, rehabilitation of the workshop and stockpile yard, rehabilitation of campsite at least to the original condition, clearance of all sorts of waste including used oil, sewage, solid wastes (plastics, wood, metal, papers, etc.). Deposit all waste to the authorized dumping place, and Restoration of the borrow pits, water ponds and temporary quarry sites to a natural and useable condition, termination of temporary employments etc.

Upon completion of construction activities, the Contractor shall remove all structures forming part of his own camp and shall arrange for the disconnection of water and electricity supply, remove all pavement, drains and culverts, backfill trenches, fill in all unrequired latrine pits, soak-away pits and other sewage disposal excavation and generally restore the site to its original condition, leaving it neat and tidy to the satisfaction standard.

Other permanent structures and facilities in the camp site will be handled over to TANROADS and other authorities as per the initial agreement with the contractor. For these camps all pit latrines and septic tanks constructed to treat sewage generated from public and office toilets during construction phase will be retained. All used oils, bituminous and lubricants to be generated during construction and operation phases will be properly handled, collected and packed in the containers and disposed in an environmentally friendly manner. All dust bins and collection stations of construction and domestic wastes at the camp site and workshops will be emptied and waste shall be transported to the authorized dumping sites located in Pugu Dar es Salaam

Reinstatement shall ensure free drainage and obviate hazards by benching rock faces and grading faces in other materials. All loose materials shall be removed from rock faces to ensure that there is no danger from falling rocks. Reinstatement shall establish contours for the area such that it blends with the landscape.

On the bridge, the river shall be made free of construction materials and debris. All openings for the bridge and culverts shall be cleaned to allow free movement of water. Excess dredged materials shall be stockpiled in a safe area for use in other ongoing projects. temporary bridge as well as the scaffolds shall be removed from the site before allowing full operation of the bridge.

10.2 Decommissioning

Decommissioning of the project is not foreseen in the near future. If it is to happen it will be after 120 years of the design life of the bridge. TANROADS shall allocate funds for project decommissioning for all aspects of the decommissioning including but not limited to, all engineering, environmental assessment, permitting, construction, and mitigation activities associated with the removal of the project. A decommissioning plan that takes environmental issues into consideration shall be prepared by prior to the decommissioning works. Should it be done, decommissioning may entail change of use (functional changes) or demolition triggered by change of land use. Therefore, TANROADS shall monitor environmental impacts during and after project removal to respond to defined events during the decommissioning phase.

11 SUMMARY AND CONCLUSION

11.1 Summary

The proposed Upgrading of the Jangwani Bridge is a sub project under the Msimbazi Valley Development Project; that forms part of the Dar es Salaam Metropolitan Development Project (DMDP). The project targets developing The Msimbazi River Basin in Dar es Salaam which is a strategically important area of the city for infrastructure, mobility, commerce and ecosystem services including flood control.

The Government of Tanzania (GoT) has embarked on three major strategic programs to reduce the vulnerability of Dar es Salaam to natural hazards and the adverse impacts of climate change, and build resilience to adapt to such impacts including the impacts on transport: the Tanzania Urban Resilience Program (TURP), the Dar es Salaam Metropolitan Development Project (DMDP) and the Dar es Salaam Urban Transport Improvement Project (DUTP).

The Flood protection project is part of the Government strategy to develop its road network to support the Socio-Economic development of the country and the Dar es Salaam Region. As part of the investment; the Government intends to invest in the upgrading of the Jangwani Bridge, that currently is affected by floods whenever there is rain and severely during the heavy rain season where the road section is forced to close for many hours.

The project will be implemented by two Ministries namely the Ministry of Works and the President's Office Regional Administration and Local Government; Under the Mow; TANROAD- will implement the project while under PO-RALG TARURA will Coordinate the project.

Design of the bridge has considered sufficient openings to allow free flow of water from upstream of Msimbazi River, dredging of the river is also part of this project. Details of the project's components have been provided in chapter 2.

This ESIA is designed to help TANROADs, PORALG and LGAs manage the risks and impacts of the proposed project, and improve their environmental and social performance, through a risk and outcomes-based approach. This ESIA has ensured that all relevant National and World Bank's environmental and social requirements have been included to be adhered to in order to minimize/mitigate risks and impacts of the project.

The ESIA process has engaged various relevant stakeholders for their views on the proposed bridge project, these included DART, Kinondoni Municipal Council, Ilala City Council, AMEND, Ministry of Works and Transport, DARCOBOA, TANESCO, Tanzania Forest Services (TFS) e.t.c. Their views have been presented on chapter five of this ESIA report and shall be considered during implementation of the project.

For the collected sediment samples, the results suggest that the quality of sediment in the river bed and at the river banks is in compliance with the national standards (Tanzania Bureau of Statistics, TBS) and international guidelines (SQAGs) for all critical parameters..

Also the results for the heavy metals in the fill area samples suggest that the quality of sediment in the floodplains is in compliance with the national standards (Tanzania Bureau of Statistics) and international guidelines (SQAGs) for all critical parameters.

The sediment and water quality of tested samples from the Msimbazi catchment area are in compliance with the national standards (TBS) and international guidelines (SQAGs) for all critical parameters, it is beyond any dispute that the only way to substantially improve river water quality is to identify, implement, manage and legally enforce water quality control measures for effluents at the main sources, hence the effluents of used water in residential areas and industries.

On completion, the bridge will facilitate assured movement of the people to and from the city centre, facilitate economic growth, direct employment to the locals, transfer of skills e.t.c . Negative impacts have also been identified and assessed during mobilization, construction and operation phases of the project, these include: air pollution, noise and vibration, soil erosion, occupational safety and health, pollution from waste generated, destruction of public utilities, increased traffic congestions e.t.c as described on chapter 6. The assessment/valuation of impacts indicates a range of low to moderate/medium significance. However, all the identified negative impacts can be reduced with proper implementation of mitigation measures. Mitigation measures for the identified impacts have been outlined on table 7-1 and monitoring plan on table 8-1.

11.2 Conclusion

The Jangwani bridge upgrading activities shall have negative economic impacts resulting from traffic jams during construction. The proposed traffic management plan should be adhered to and updated according to the situation on ground. Based on the results of this sediment and water quality study it can be recommended that reuse of sediment material for the construction of terraces is safe, unless critical results will be found for PAHs and POPs. The level of toxicity that was found in the Lower Basin was relatively low compared to the national standards. Also, in casemost of the soil in the Lower Basin is polluted, it makes no sense to chemically isolate a formation of remoulded soil as the surroundings are still polluted. Therefore, chemical isolation is considered not to be required. The bank protection is to perform the stabilization function of the material. Hence, only a physical isolation function is required for the top layer of the terraces, which can be done with a passive capping layer.

A passive capping system is proposed, where the thickness of the capping layer is the governing parameter. A passive capping layer consist of neutral material, such as clean sand, clay or crushed rock debris and a thickness between 30-100 cm is sufficient for most applications.

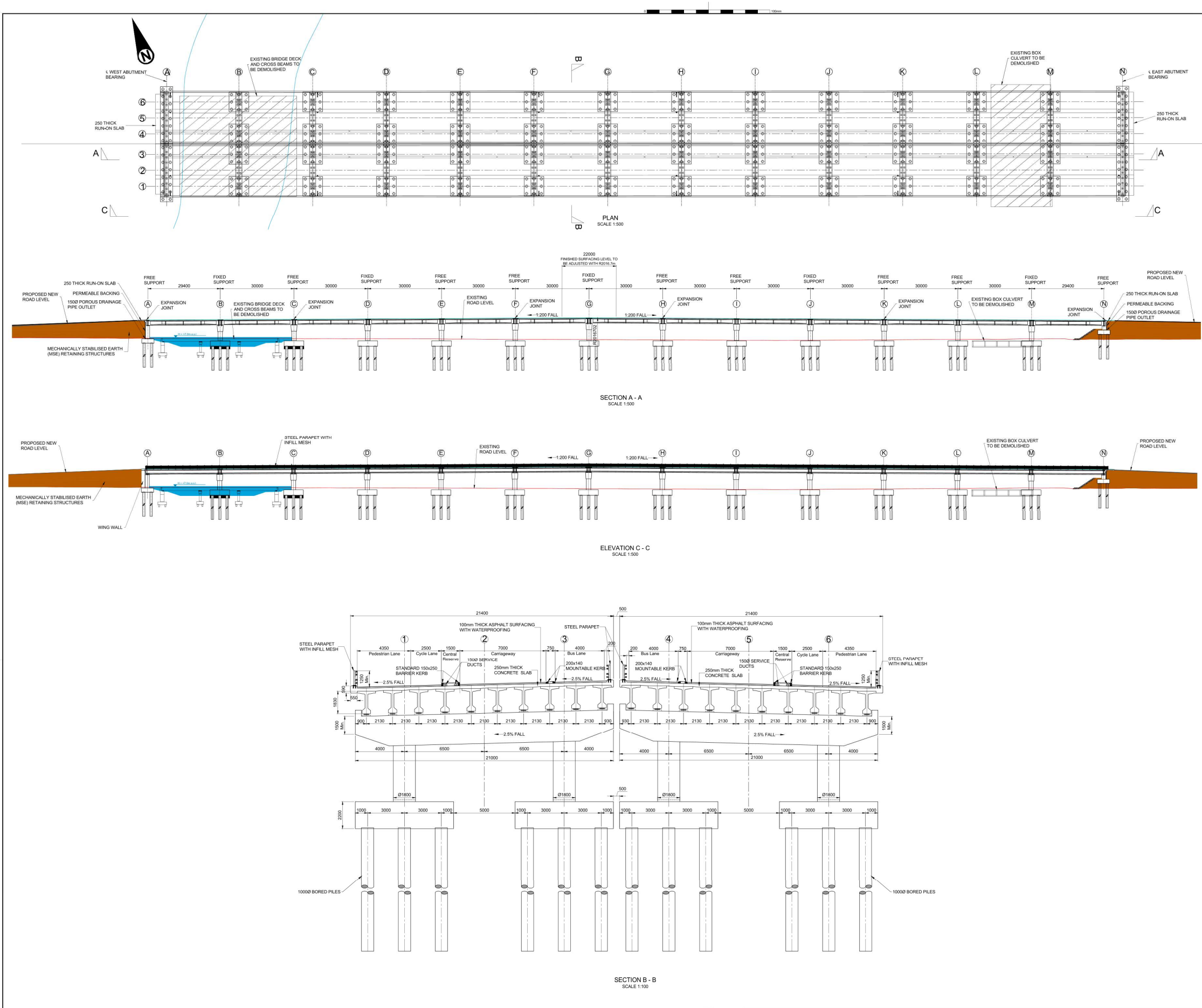
REFERENCES & BIBLIOGRAPHY

1. WWS, “Sediment Quality Assessment in The Msimbazi Valley, Dar Es Salaam”, September 2019
2. CDR International, “JANGWANI FLOOD PROTECTION PROJECT- Geotechnical Interpretation Report”, March 2021
3. CDR International, “Hydraulical and Morphological Verification Study for Improved Channel Design – TANROADS Jangwani Flood Protection Project:Phase 2”, March 2021
4. CDR International, “TANROADS Jangwani Flood Protection Project-Design Report”, November 2021
5. Deltares “Flood risk assessment and scenarios dashboard for the city of Dar es Salaam and Zanzibar city”, June 2021
6. S Gerber, V Stippel, D Henning and N Naidoo “EIA for the Proposed Surface Water Developments for Augmentation of the Western Cape Water Supply System”, February 2017

Appendices

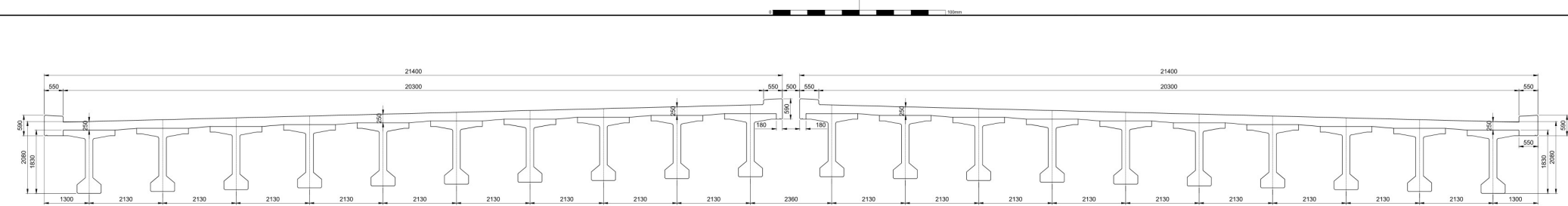
Appendix I

Project Drawings

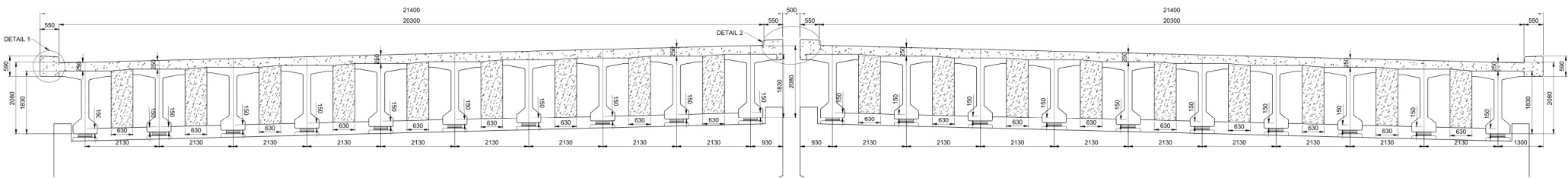


- NOTES**
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
 2. ALL LEVELS ARE IN METERS ABOVE A.S.L. UNLESS OTHERWISE NOTED.
 3. ALL DIMENSIONS ARE TO BE CHECKED AND CONFIRMED ON SITE BY THE CONTRACTOR.
 4. REFERENCE SHOULD BE MADE TO THE WORKS SPECIFICATION APPENDICES.
 5. THE CONTRACTOR IS TO BE RESPONSIBLE FOR ALL ASPECTS OF TEMPORARY WORKS INCLUDING BRACING REQUIRED FOR ANY ERECTION AND CONSTRUCTION.
 6. FINISHED EARTHWORKS/ LANDSCAPING LEVELS TO BE CONFIRMED BY THE PROJECT MANAGER/ENGINEER.
 7. THE CONTRACTOR MUST MAINTAIN TEMPORARY TRAFFIC MANAGEMENT AS SHOWN ON ROAD DESIGN TRAFFIC MANAGEMENT DRAWING FOR THE DURATION OF THE WORKS.
 - 8.

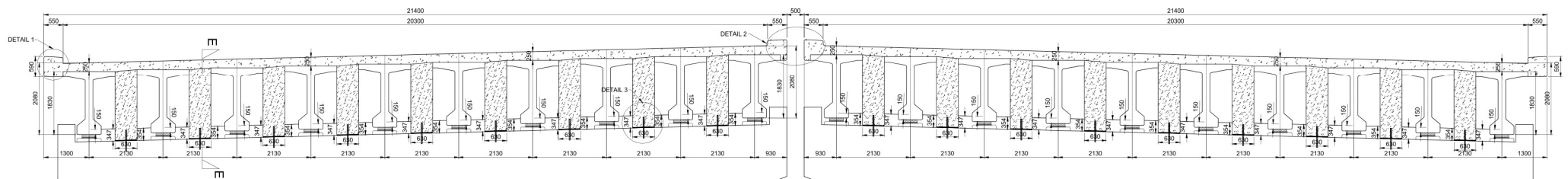
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CHKD: AO			PRELIMINARY DRAWING		
APPD: TB			EXTERNAL ISSUE		
DATE: 11/10/2021			AS-BUILT		
SUITABILITY:			FOR TENDER		
CLIENT					
CREATOR					
SCHEME NAME JANGWANI VALLEY PROJECT					
DRAWING TITLE GENERAL ARRANGEMENT					
STATUS	DRAWABILITY	UNDO LAYOUT SIZE	AO	UNITS/SCALE	mm
01	02	SCALE	AS STATED		
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B1804-08-BR-0101				B1804	
				REVISION	
				C 02	



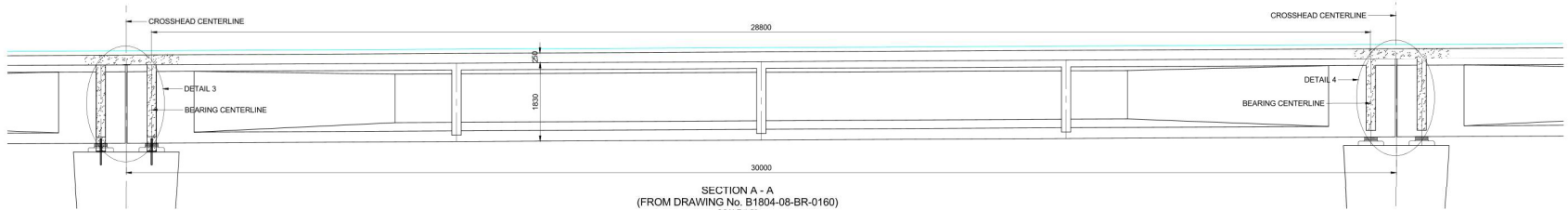
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SCALE 1:50



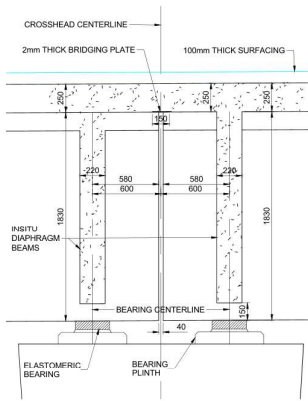
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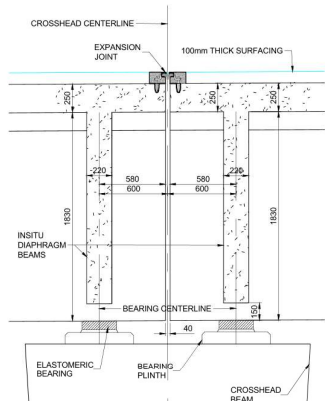
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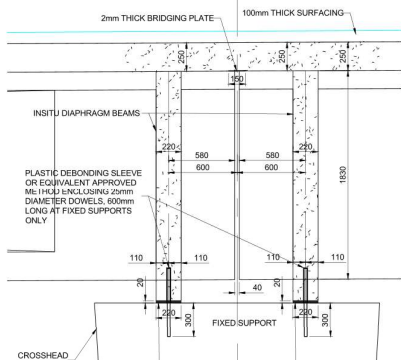
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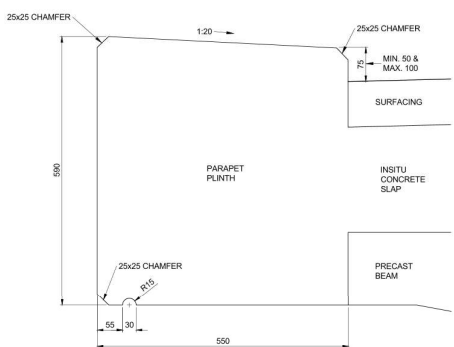
DETAIL 4
TYPICAL DIAPHRAGM BEAM DETAILS
SCALE 1:20



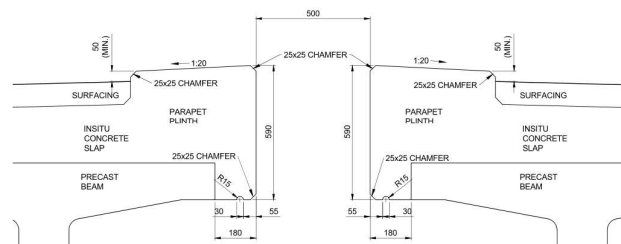
TYPICAL DIAPHRAGM BEAM & EXPANSION JOINT DETAILS
SCALE 1:20



DETAIL 4 & SECTION E - E
TYPICAL DIAPHRAGM BEAM SHEAR KEY DETAILS
SCALE 1:20



DETAIL 1
TYPICAL PARAPET PLINTH DETAILS
SCALE 1:5



DETAIL 2
PRECAST COVERING SLAB SUPPORT DETAILS
SCALE 1:10

- NOTES
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
 2. ALL LEVELS ARE IN METERS ABOVE A.S.L. UNLESS OTHERWISE NOTED.
 3. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH DRAWINGS: R1804-08-BR-0101 & B1804-08-BR-0170.
 4. THE CONTRACTOR SHALL CARRY OUT A LEVEL SURVEY OF THE PRECAST BEAMS AND SUBMIT THE SURVEY RESULTS FOR CHECKING TWO WEEKS PRIOR TO CASTING THE CONCRETE DECK. THE FINISHED DECK CONCRETE LEVELS MUST BE WITHIN 5mm OF THE DESIGN LEVELS. SHALL THE DIFFERENCE BETWEEN THE FINISHED CONCRETE LEVELS AND DESIGN LEVELS EXCEED THIS ALLOWANCE, THE CONTRACTOR NEEDS TO DEVELOP REMEDY AND SUBMIT FOR APPROVAL. THE CONTRACTOR IS RESPONSIBLE FOR ALL THE COST OF THIS REMEDIAL WORKS.
 5. CONCRETE FINISH TO BE CLASS F3 ALL EXPOSED SURFACES. CLASS 4 FINISH TOP OF SLAB TO RECEIVE WATERPROOFING SYSTEM.
 6. PERMANENT FORMWORK TO BE DESIGN BY CONTRACTOR TO SUIT SPANS.
 7. CONSTRUCTION LOADING ON THE DECK PERMANENT FORMWORK UNITS MUST NOT EXCEED 1.5kN/m² IN ADDITION TO THE WEIGHT OF THE CONCRETE AND SHALL COMPLY WITH BS5975 AND ANY MANUFACTURES REQUIREMENTS.
 8. ALL CHAMFERS SHALL BE 25mm X 25mm UNLESS OTHERWISE STATED.
 - 9.

CONCRETE CLASS AND COVER TO REINFORCEMENT TO BE AS FOLLOWS:				
STRUCTURAL ELEMENT	COMPRESSIVE STRENGTH CLASS	EXPOSURE CLASS	SURFACE	NOMINAL COVER: C _{min} C _{max} + ΔC _{dev}
DECK SLAB	50/20	XC3/4, XD3	TOP	35mm
DIAPHRAGM BEAMS	50/20	XC3/4, XD3	SOFFIT	45mm
PARAPET PLINTH	50/20	XC3/4, XD3	ALL	55mm
CROSSHEAD BEAM	50/20	XC3/4, XD3	ALL	55mm
PIERCOLUMN & ABUTMENTS	40/20	XC3/4, XD3	ALL	65mm
PILES & PILE CAPS	40/20	XD3, XS2	ALL	70mm

REV	DETAILS	CHD	APPD	DATE
DRAWN : EWG	DESIGN : ADEWG			
CHD : AD	APPD : TB			
DATE : 06/06/2021				
SUITABILITY :	FOR TENDER			



SCHEME NAME
JANGWANI VALLEY PROJECT

DRAWING TITLE
DECK OUTLINE AND DETAILS
SHEET 2 OF 2

STATUS	SUITABILITY	LONG DRAWING SIZE	SCALE	UNITS	REVISION
01	02	AS STATED	AS STATED	MM	B1804
					REVISION C 01

B1804-08-BR-0161

- NOTES
- ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
 - ALL LEVELS ARE IN METERS ABOVE A.S.L. UNLESS OTHERWISE NOTED.
 - BAR BENDING SCHEDULE FOR THIS DRAWING IS B1804-0180
 - THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH DRAWINGS: B1804-08-BR-0101, B1804-08-BR-0160, B1804-08-BR-0170 & B1804-08-BR-0180.
 - ALL CHAMFERS SHALL BE 25mm X 25mm UNLESS OTHERWISE STATED.
 - REINFORCEMENT TO BE GRADE B500, CUT AND BENT IN ACCORDANCE WITH BS8666:2000.
 - CONCRETE SHALL BE GRADE S920.
 - JOINTS TO HAVE A COMPRESSIBLE FILLER AND SEALED WITH POLYSULPHIDE.
 - UNLESS STATED OTHERWISE LAP LENGTHS SHALL BE BASED ON THE SMALLER BAR DIAMETER AND SHALL NOT BE LESS THAN:
B12 - 450mm, B16 - 560mm, B20 - 660mm & B25 - 825mm
 - SLAB ABOVE PERMANENT FORMWORK NOMINAL COVER TO REINFORCEMENT TO BE 25mm AND TOP OF SLAB 35mm UNLESS NOTED OTHERWISE.
 - THE SPACING OF THE REINFORCEMENT SHALL BE ADJUSTED LOCALLY AS REQUIRED IN PARTICULAR TO AVOID HOLES, DRAINAGE GULLIES, POCKETS, RECESSES, HOLDING DOWN BOLTS, ANCHORAGES AND INSERTS.
 - CONCRETE FINISH TO BE FORMED SURFACE CLASS F3 FOR SLAB AND PARAPET BEAM EXPOSED TO VIEW. UNFORMED SURFACES CLASS U4 FINISH SURFACES TO RECEIVE WATERPROOFING SYSTEM.
 - THE FOLLOWING ABBREVIATIONS HAVE BEEN USED:
T1 - TOP FACE OUTER LAYER
T2 - TOP FACE SECOND LAYER
B1 - BOTTOM FACE OUTER LAYER
B2 - BOTTOM FACE SECOND LAYER
NF1 - NEAR FACE OUTER LAYER
NF2 - NEAR FACE INNER LAYER
FF1 - FAR FACE OUTER LAYER
FF2 - FAR FACE INNER LAYER
ABS - ALTERNATE BARS STAGGERED
ABR - ALTERNATE BAR REVERSE
AW - ALTERNATE WITH
EF - EACH FACE
SF - SIDE FACE
CJ - CONSTRUCTION JOINT
 - THE REINFORCEMENT NOTATION USED ON THIS DRAWING IS AS FOLLOWS:

16 B20 - 01 - 300 B2
NUMBER OF BARS
TYPE AND SIZE OF BAR
BAR MARK
BAR SPACING
LOCATION

REV	DETAILS	CHKD	APPD	DATE
DRAWN: EWG		DRAWING STATUS		
DESIGN: AO/EWG		WORKING DRAWING		
CHKD: AO		PRELIMINARY DRAWING		
APPD: TB		EXTERNAL ISSUE		
DATE: 17/11/2021		AS-BUILT		
SUITABILITY:		FOR TENDER		
CLIENT				
CREATOR				
SCHEME NAME				
JANGWANI VALLEY PROJECT				
DRAWING TITLE				
DECK REINFORCEMENT DETAILS				
SHEET 2 OF 2				
STATUS	DRAWABILITY	ORIG DRAWING SIZE	AS	WORKING SIZE
03	02	SCALE	AS STATED	1:1
DRAWING NUMBER				SCHEME REFERENCE NO
B1804-08-BR-0181				B1804
				REVISION
				C 01

Appendix II

Water Quality Analysis Results

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P. O. BOX 35176
DAR ES SALAAM
E-MAIL: aru@aru.ac.tz
WEBSITE: <http://www.aru.ac.tz>

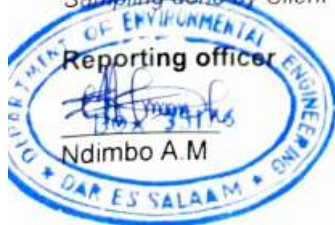
ENVIRONMENTAL ENGINEERING LABORATORY

Water Analysis Results

Client: **NANAI**
Date Received: **14 July 2023**
Source: **Water (Jangwani bridge)**

S/N	PARAMETER	Units	Up stream	Down stream
1	pH		8.41	8.34
2	Temperature	°C	25.30	25.30
3	Turbidity	NTU	93.0	95.0
4	Colour	Hazen°	498	503
5	Salinity	‰ (ppt)	1.08	1.09
6	Electric conductivity	µS/cm	2167	2172
7	Total Dissolved solids	mg/l	1084	1086
8	Nitrate –Nitrogen	mg/l	0.10	0.10
9	Ammonia-Nitrogen	mg/l	16.525	20.725
10	Phosphate	mg/l	0.36	0.47
11	Sulphate	mg/l	72.0	71.50
12	Iron	mg/l	0.195	0.299
13	Manganese	mg/l	<0.01	<0.01
14	Total suspended solids	mg/l	135.0	140.0
15	Lead	mg/l	<0.01	<0.01
16	Copper	mg/l	<0.01	<0.01
17	Zinc	mg/l	0.055	0.056
18	Cadmium	mg/l	<0.01	0.013
19	Chromium	mg/l	<0.01	<0.01
20	Nickel	mg/l	<0.01	<0.01
21	Chemical Oxygen Demand	mg/l	115.0	119.0
22	Biological Oxygen Demand	mg/l	40.0	46.0
23	Total coliform	Count/100ml	9*10 ⁵	11*10 ⁵

Sampling done by Client



Appendix III

Sediments Analysis

Results for physiochemical parameters for sediment samples from river beds, river banks and terrace locations

Parameter	Unit	Results	Standard		Remarks
			TBS	SQAGs	
pH	-	7.5 - 9.3	6.5 - 8.5	-	No standard soil pH
Temperature	°C	20.8 - 25.6	-	-	No standard soil temperature
EC	(μS/cm)	4.91 - 1994	-	-	No standard for soil EC

Parameters for Sediment Samples from River Beds and River Banks

Parameter	Unit	Results (Range)	Standard		TBS	Remarks
			SQAGs			
			TEL ¹	PEL ²		
Arsenic (As)	mg/kg	<0.004 - 0.074	7.24	41.6	1	Comply
Mercury (Hg)	mg/kg	<0.004	0.13	0.696	2	Comply
Cadmium (Cd)	mg/kg	<0.004	0.676	4.21	1	Comply
Chromium (Cr)	mg/kg	<0.02 - 5.0	52.3	160	-	Comply
Nickel (Ni)	mg/kg	<0.02 - 1.7	15.9	42.8	100	Comply
Lead (Pb)	mg/kg	<0.02 - 2.0	30.2	112	200	Comply
Chromium Hexavalent (Cr VI)	mg/kg	<0.003 - <0.012	-	-	100	Comply
Copper (Cu)	mg/kg	<0.02 - 1.2	18.7	108	200	Comply
Iron (Fe)	mg/kg	<0.04 - 1701	-	-	-	Comply
Manganese (Mn)	mg/kg	<0.02 - 16.0	-	-	1800	Comply
Zinc (Zn)	mg/kg	<0.04 - 6.0	124	271	150	Comply
Aluminium (Al)	mg/kg	<0.20 - 4050	-	-	-	Comply

TEL is the Threshold Effect Level - it represents the upper limit of the range of sediment contaminant concentrations dominated by no effect data entries. It is a minimal effect range within which the concentrations of contaminants are not considered to represent significant hazards to aquatic organisms.

PEL is the Probable Effect Level which defines the lower limit of the range of contaminant concentrations that are usually associated with adverse biological effects. Within the probable effect range, concentrations of contaminants are considered to represent significant and immediate hazards to aquatic organisms.

Exposure Risk: These metallic elements are considered systemic toxicants that are known to induce multiple organ damage, even at lower levels of exposure. They are also classified as human carcinogens.

Results for metal parameters for sediment samples from terrace locations

Parameter	Unit	Results (Range)	Standard			Remarks
			SQAGs		TBS	
			TEL	PEL		
Arsenic (As)	mg/kg	<0.004 0 0.063	7.24	41.6	1	Comply
Mercury (Hg)	mg/kg	<0.004	0.13	0.696	2	Comply
Cadmium (Cd)	mg/kg	<0.004	0.676	4.21	1	Comply
Chromium (Cr)	mg/kg	<0.02 - 33.4	52.3	160	-	Comply
Nickel (Ni)	mg/kg	<0.02 - 12.2	15.9	42.8	100	Comply
Lead (Pb)	mg/kg	<0.02 - 3.2	30.2	112	200	Comply
Chromium Hexavalent (Cr VI)	mg/kg	<0.012	-	-	100	Comply
Copper (Cu)	mg/kg	<0.02 - 7.2	18.7	108	200	Comply
Iron (Fe)	mg/kg	<0.04 - 14563	-	-	-	Comply
Manganese (Mn)	mg/kg	<0.02 - 121	-	-	1800	Comply
Zinc (Zn)	mg/kg	<0.04 - 19.32	124	271	150	Comply
Aluminium (Al)	mg/kg	<0.2 - 37713.32	-	-	-	Comply

Appendix IV

Stakeholders' Attendance

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF JANGWARI BRIDGE IN DAR ES SALAAM CITY

ATTENDANCE REGISTER FOR: MEETINGS, FOCUS GROUP DISCUSSIONS, INTERVIEWS

CONSULTANT: NORPLAN

S/N	NAME	INSTITUTION	POSITION	PHONE NO	SIGNATURE	DATE
1	KASHINDE MUSA	MOWT(W)	Ag. DSE	0766607139	<i>[Signature]</i>	06.04.2022
2	Lulikus Bigambo	MOWT(W)	PE	073331341	<i>[Signature]</i>	06.04.2022
3	Eng Leonard Sankuwa J.	MOWT(W)	Engineer	0754224437	<i>[Signature]</i>	06/04/2022
4	Eng Mushi Lanza	MOWT(W)	Engineer	0724331414	<i>[Signature]</i>	06/4/22
5	Eng Chirwa M. HIRWA	MOWT(W)	PE	0784335553	<i>[Signature]</i>	6/4/2022
6						
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TATHMINI YA ATHARI KWA MAZINGIRA NA JAMII ZITOKANAZO NA MRADI WA UENZI WA DARAJA LA JANGWANI KATIKA JUJI LA DAR ES SALAAM

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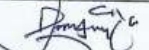
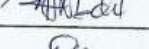
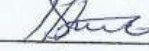
MSHAURI:..... NORPLAN

Na	JINA	TAASISI	WADHIFA	SIMU Na:	SAHITI	TAREHE
1	MICHAEL KHAMUS	TPF	STAFF OFFICE	071548623		23/03/20
2	ABDI ISSANGO	TPF	ZTO DSM	065251341		23/03/20
3	AFRICANUS SULLE	TPF	RTO-TEMEKE	065827643		23/03/20
4	MOST B. NDOZORO	TPF	TRAFFIC HQ	071848173		23/03/20
5	MUSKA MANYAMA	TPF	TRAFFIC HQ	071526879		23/3/20
6	STANLEY KYUNGWA	TPF	TRAFFIC KIKOO	071324238		23/03/20
7	NEEMA MUMUZI	TPF	TRAFFIC KIKOO	075524622		23/3/20
8	FAUSIYA NDUNGURU	TPF	TRAFFIC HQ	071957269		23/03/20
9	SABURI CHUITO	TPF	TRAFFIC HQ	0715760769		23/03/20
10	BANDOMA JAMES	CSHA	ELECTRICAL INSPECTOR	0712117505		23/03/20

TATHMINI YA ATHARI KWA MAZINGIRA NA JAMII ZITOKANAZO NA MRADI WA UJENZI WA DARAJA LA JANGWANI KATIKA JUI LA DAR ES SALAAM

MAHUDHURIO KWA AJILI YA: MIKUTANO, USHAURI NA MAHOJIANO

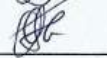
MSHAURI:..... NORPLAN

Na	JINA	TAASISI	WADHIFA	SIMU No:	SAHIHI	TAREHE
1	SATPUMIA Lema	DARCOBOA	WAZIRI KATIKA	0713-280026		28/03/20
2	KHALIFA MUSA	DARCOBOA	WAZIRI KATIKA	0787 331359		11
3	KHAMISI ABDUL	DARCOBOA	KATIKA KIROPO	0713-27769		11
4	ABDULLAH AHMAD	DARCOBOA	M/KT.	0715-300342		-11-
5	HAMISI KILIZA	DARCOBOA	MATEKA HAZINA	0715274927		11
6	NUFEMA S. MAJISA	DAR- CITY Council	WAZIRI MAZINGIRA	0759 650762		28/03/2020
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TATHMINI YA ATHARI KWA MAZINGIRA NA JAMII ZITOKANAZO NA MRADI WA UJENZI WA DARAJA LA JANGWANI KATIKA JUI LA DAR ES SALAAM

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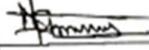
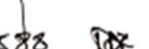
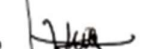
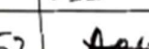
MSHAURI:..... NORPLAN

Na	JINA	TAASISI	WADHIFA	SIMU Na:	SAHIBI	TAREHE
1	NAIMI MASSAUWE	KIBUKWA WA HUDUMA ZA MISIJI	MSAIDIZI I	0757222876		24/03/22
2	Eng. J. J. J. J.	Tangio I/sic	Ag. RM	0767523602		25/03/22
3	Eng. GIFT DUGON	TANESU WAA	Ag. RM	0764694208		25/03/2022
4						
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ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF JANGWANI BRIDGE IN DAR ES SALAAM CITY

ATTENDANCE REGISTER FOR: MEETINGS, FOCUS GROUP DISCUSSIONS, INTERVIEWS

CONSULTANT:..... NORPLAN

S/No	NAME	INSTITUTION	POSITION	PHONE NO	SIGNATURE	DATE
1	SHABAN W. ABDU	S/M-IDRISA MUMUNI	M /ICITI	0763 294630		02/01/2023
2	DIDACE D KAMUGISHA	S/M-IDRISA MUMUNI	MUMUNI	0714 103545		02/01/2023
3	JUMANE Y. KAZI	BATAJI	MWANACHAMA	0786 180547		02/01/2023
4	JOSEPH J. JOHN	BODABODA	MWENYEKITI	0699518258		02/01/2023
5	JOSEPH Y. MSUMARI	BODABODA	MWANACHAMA	0717919453		02/01/2023
6	AIZEID S. DIDA	BODABODA	MUMUNI	0688882816		02/01/2023
7	INDI TASINI	BATAJI	Mwanachama	0673-685588		02/01/2023
8	ALHASI SELEMANI	BATAJI BODABODA	MWANACHAMA	0681545250		02/01/2023
9	CALVIN D. BOTIO	BATAJI	MWANACHAMA	0659394933		02/01/2023
10	Michael A. Francis.	Bodaboda	Mwanachama	0788676852		02/01/2023

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF JANGWANI BRIDGE IN DAR ES SALAAM CITY

ATTENDANCE REGISTER FOR: MEETINGS, FOCUS GROUP DISCUSSIONS, INTERVIEWS

CONSULTANT: NORPLAN

S/No	NAME	INSTITUTION	POSITION	PHONE NO	SIGNATURE	DATE
1	ARUSALIMU NUSILIMU	BASASI	M/Citama	0756-077791	[Signature]	02/01/2023
2	ZOMBO ARIKURU	Boda boda	Mwanachama	0627419004	[Signature]	02/01/2023
3	ROSHIDI/K. KAMATE	Boda boda	Mwanachama	065836667	[Signature]	02/01/2023
4	JABIR SIMON	BOMBODA	MWANACHAMA	0655231525	[Signature]	02/01/2023
5	RAMABHAN HAMU	BASASI	MWANACHAMA	0678981292	[Signature]	02/01/2023
6	SALUM HAMU	S/miaa-SUNA	M/Kili	029131774	[Signature]	02/01/2023
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TATHMINI YA ATHARI KWA MAZINGIRA NA JAMII ZITOKANAZO NA MRADI WA UJENZI WA DARAJA LA JANCWANI KATIKA JILI LA DAR ES SALAAM

MAHUDHURIO KWA AJILI YA: MIKUTANO, UISHAURI NA MAHOJIANO

MSHALIRI:.....NORPLAN

N°	JINA	TAAJISI	WADHIFA	SMU No:	SAHIBI	TARHIHI
1	ABUBAKAR W. KASUGU	MTAA WA SUNA	MWANANCHI	0787966187		01/05/2024
2	SABIR A. SIDI	"	MWANANCHI	0692770076		1/5/24
3	ANNA E. MASINGIRI	KMC MTENDASI	MTENDASI	0766424326		1/5/2024
4	PRISON	CHARLES		0752626376	PRISON	1/5/2024
5	MARY TENGANI	MTAA SUNA	MWANANCHI	0766761726		1/5/2024
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TATHMINI YA ATHARI KWIA MAZINGIRA NA JAMII ZITOKANAZO NA MEADI WA UJENZI WA DARAJA LA JANGWANI KATIKA JUI LA DAR ES SALAAM

MAHEJIRI KWA AJILI YA: MIKUTANO, UDHARI NA MAHOBIANO

MSHAURI: NORPLAN

No	JINA	TAARIFA	WADHIFA	SIMU No:	SAHIBI	TARIFE
1	ENDSIAZI GADYE	MWANU WA JUNA	MWANANCHI	0682563365	<i>[Signature]</i>	01/05/2024
2	KALISA MCHAMCHI	"	MWANANCHI	0712449375	<i>[Signature]</i>	01/05/2024
3	ZANABU ABDALLA	"	MWANANCHI	-	ZK	01/05/2024
4	FURAH KABOGLO	"	MWANANCHI	0683195197	<i>[Signature]</i>	01/05/2024
5	ASHA SALUM	"	MWANANCHI	0785932097	YS	01/05/2024
6	JOICE JOHN MAFAGA	"	MWANANCHI	0634-761665	<i>[Signature]</i>	01/05/2024
7	GILBERT MWASUNGA	"	MWANANCHI	0673793505	<i>[Signature]</i>	01/05/24
8	JIMBE ABULKA	"	MWANANCHI	0599110559	<i>[Signature]</i>	1/5/2024
9	CHITHENI MWALUKO	"	MWANANCHI	0656465285	<i>[Signature]</i>	1/5/2024
10	SALUM HAMISI ALI	m/Kiti - wana	K m c	0655811197	<i>[Signature]</i>	1/5/24

Appendix III

Stakeholders' Views

: Stakeholders' Views and Concerns

No	STAKEHOLDER	VIEWS/CONCERNS	RESPONSE
1	Ministry of Works and transport communication	The upgrade is important for the Transport sector specifically for the Dar es Salaam and the Country at large. With the upgrade of the bridge transport will be efficient even during the rainy season and also ensure the BRT if functional year road. The current situation is also expensive for the Country as during rainy season the section of the road is forced to close affecting traffic of cars that include the BRT. Cost of dredging very after rain seasons will also be minimized once the bridge was upgraded. With regard to the construction activities it was recommended that the dredged soil during construction; the quantity should be established so as it is known its quality so as to know if can be useful to the other uses; and if it is polluted to find the best way of disposal. It was also suggested to increase the length of dredging so as to control silting problems as this is the main cause of Jangwani bridge to flood. TFS as a key stakeholder should be consulted for the case of Mangroves during dredging activities to see if there are sections that may be removed so as to increase the dredging lengths. The consultations shall consider all the necessary stakeholders such as communities and ward/mtaa governments. Issues of Health and Safety during various phases of the project that include design, construction as well as operation was emphasized; both community safety and occupational safety; With regard to the bridge design, the Ministry recommended that the bridge design should be iconic so as it accommodates the development that the Government intends to undertake in the Jangwani Valley area. The Ministry also recommended that draft final design stakeholders should have an opportunity to review and comment.	A detailed study regarding the quality and quantity of the soil has been undertaken by PO-RALG TFS as a key stakeholder has been consulted and PO-RALG is also preparing a Mangrove Management Plan The design will be discussed and will involve stakeholders

2	Tanzania Traffic Police Headquarters Mikadam Khamisi- Staff Officer Abdi Issango- ZRO DSM Adrichnus Sulle-Regional Traffic Office -Temeke Mossi Ndozero -Traffic Headquarters Mussa Manyama-Traffic Headquarters Staney Kyungai -Traffic Kariakoo Station Neema Mvungi-Traffic Headquarters Faustina Ndunduru -Traffic Headquarters Saburi Chutto-Traffic Headquarters	The proposed project is accepted because it will mitigate the challenge of flooding in Jangwani area. The flooding at Jangwani has been a major source of traffic congestion for Dar es Salaam During construction phase the contractors should propose the diversion road to be used. It is important that the Traffic police are involved in establishing the alternative routes especially during rush hours When will the Proposed project start? During the construction phase will the bridge be constructed in one road way (single phase) or all roads simultaneously? TANROAD should make sure that all diversion roads should be clear and remove obstacles like arbitrary parking on the road so as to reduce traffic jam. On diversion, roads should have temporally traffic lights to control cars when there are no traffic officers. The diversion routes should be constructed and maintained before the construction phase starts. TANROAD together with Traffic should announce and encourage communities through radio stations and televisions to use diversion roads during construction phase in order to reduce jams to the construction road. The proposed diversion road should be open at any time. The Design should consider to increase the length of bridge near to Fire traffic light area, because during rainy season water will flood all the area.	Before the construction phase to take over, the diversion road will be already known and one of a proposed diversion road is Jangwani –Kigogo road. The project is already started because this is an initial stage of the project to take place. During construction stage one-way road will be constructed in single phase so as to maintain trucks to pass through in other way to reduce traffic jams Noted
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3	DARCOBOA Shifwaya Lema Khalifa Msami Khamisi Abdul Abdul Ahmad Hamisi Kiliza	The proposed project is accepted because flooding in Jangwani area is a challenge for so long and this was affecting time travelled to and from city Centre, risking commuter's life as well as significant cost of operations and maintenance. The diversion route should be constructed and maintained before the construction phase started During the construction phase it is important that trucks are not allowed at high pick hours especially trucks ferrying construction materials so as to minimize the traffic jam. After the bridge is completed, will there be changes at Fire traffic light area because there is a problem of traffic lights in that area which has also been a major source of jam; TANROADs needs to re configure and involve stakeholders. It is important for the government to encourage people to use public transportation during construction in order to reduce number cars coming to town.	Noted
4	Occupational Safety and Health Authority (OSHA) Bandoma James –Electrical inspector	Contractors should be registered to the OSHA website. Some of the workers in the project have to be attended at First aid and Safety and Health training at OSHA, there is a provision of certificate after the attendance of that training. Medical examination should compulsory be conducted to all workers. All the workers on site should be wearing appropriate PPEs depending on the nature of a work. Sanitary facilities should be standard and consider all gender e.g one toilet for 25 men and one toilet for 20 women. The sanitary facilities are either permanent or temporary and should have water at all times. Contractors should have the following documents submitted to OSHA during registration. Baseline Risk Assessment which include Traffic Plan Management, Safety plan management Policy document which used to guideline risk occurred during construction phase.	The Project implementing unit will ensure the Contractor complies and there will be frequent monitoring as well as the consultant will have a designated team to monitor safety issues

		All machines should be inspected example lift gears, crane lift. All accident should be registered to registration book for report of numbers of accidents occurred. All section should be fully equipped with first aid box and first aid post. Emergency plan should be prepared by contractors	
5	DAR ES SALAAM CITY COUNCIL NEEMA MAJJA- Environmental officer	During construction and operation, the design should consider pedestrians walk ways. All vegetation's should be protected. Climatic change should be considered during construction phase by taking an appropriate data for rain forecast from the recognized institutions Employment opportunities to the local people during construction phase All solid waste during construction phase should be disposed to the appropriate dumping places Construction of temporary toilet which will be used during construction phase to avoid pollution Maintenance of machines and filling of oil should be in proper designated area so as to prevent oils spoilage All Legal Permit should be in place. Materials for construction should be obtained from authorized dealers Responsible Municipal should be involved in monitoring all stages.	The design will consider pedestrian safety that includes walk way, signage, lights etc. The Project implementing unit will ensure the Contractor complies and there will be frequent monitoring as well as the consultant will have a designated team to monitor safety issues
6	TANESCO –ILALA Eng.J. Jahulla-Regional Engineer Eng. Gift Dawson –Regional Manager	Site should be inspected in order to realize whether there is TANESCO infrastructures which are underground or overhead. TANESCO infrastructures are categories into two types which are transmission line and distribution lines, if the project area touch or affects the transmission line consultation should be done in TANESCO head quarter because this is high voltage electricity and if is distribution line consultation should be done in Regional office. In the proposed area there is TANESCO underground infrastructures There is also an ongoing project which is installation of concrete electric poles; therefore, communication is important as we need to stop in areas which we thick form part of the project site. In case the proposed project affects any infrastructure and it requires to be reallocated, the project should incur all the cost.	Noted
7	TANZANIA FOREST SERVICES AGENCY Naima Massawe-TFS Officer	The proposed project is accepted Mangrove end of border is where the high tides takes place so it is important to conserve mangrove	Under the project; a Mangrove management plan is being prepared to ensure sustainability of the mangrove and the Indian Ocean

		Incase mangrove will be affected by the project implementation; this should be reported to TFS in order to make valuation of the area where the mangrove has been affected for further action.	
8	Dar Es Salaam City Council Genoveva Mazenge- Valuer	Awareness should be provided to all potential stakeholders, particularly local communities owning property adjacent to the proposed project. Responsible Municipals should be involved in the valuation process in case of any affected property, Double valuation should be avoided as well as double compensation. If any affected property exists, compensation should be prompt and fair. National and international compensation standards should be followed	A RAP report has been prepared to ensure all PAPs under the project that includes the PAPs affected by the upgrading of the bridge are compensated The compensation will follow Tanzania legal requirements and those of the WB There will be a system in place to ensure PAPs that have already received compensation from other projects are not compensated twice
9	AMEND	1) Provision of safe pedestrian crossing points based on pedestrian desire lines: an analysis of pedestrian catchment areas and hence pedestrian desire lines will be required to ensure that safe crossing points can be provided as close as possible to these desire lines so as to mitigate pedestrians crossing at unsafe locations. 2) Ensure step-free access for persons with disabilities: ensure ramps and dropped kerbs are provided at all key locations to allow for step free access for persons using wheelchairs or persons with other disabilities throughout. Ramp gradients and other specifications would need to be provided in line with Tanzanian and international standards 3) Mitigate use of pedestrian footpaths by motorcycle riders: at a number of locations in Dar es Salaam and other cities, Amend has noted the challenge of motorcycle riders making use of pedestrian footpaths. This leads to a high road safety risk for pedestrians. Closely spaced bollards may prevent access by motorcyclists but this also prevents access by persons in wheelchairs. To mitigate this, Amend had made use of motorcycle barriers on projects in Tanga, which allow pedestrians and wheelchair users to have access, but not motorcyclists. Use of tactile paving: consider using tactile paving at key locations such as at crossing points and places where there is a change in step to help alert persons with visual impairment to these features.	

10	Local Community adjacent to the project area	• Once the bridge is upgraded there will be minimal or no floods in the Jangwani area • The bridge should consider pedestrian walk • What is the design of the project will it be like the new Tanzanite bridge. • All people living in unsafe areas should be relocated • Government should consider payments of compensations for the affected assets in the flood prone areas • Alternative relocation sites should be near the affected areas (near situ) • Sensitization of the community on this Project and associated processes • Possibility should be sought to consider the tenants in the entitlements • The compensated areas should be protected to avoid further encroachment	Compensation will follow Tanzania legal requirements and those of the World Bank -Stakeholders engagement will be an ongoing activity
11	WAMI RUVU BASIN WATER BOARD	<u>Eng. Adria T Massawe</u> • The contractor shall have a special program for controlling waste water discharges to Msimbazi River and other water sources nearby the proposed project such as ocean. • Solid waste Management shall be controlled by embankment's wall s as to avoid any pollution the water sources • The contractor/TANROADS shall have a permit for water abstraction from any point of water source (surface water/borehole) before starting the construction activities • Before obtaining any water use permit, the basin office shall survey the area to satisfy oneself on the amount of water available for such activities	<u>TANROADS</u> We shall follow all the required procedure by Wami/Ruvu Basin Office before starting construction activities and the we shall protect all source of water from pollution activities may rise from improper management of both sold and liquid wastes.
12	SUNA MTAA 1. Anna E. Masingiri-MEO	• We need the project and we will be happy for its implementation • The recent floods reached up to Ubungo Mtaa, we suggest the bridge structure to begin at Kiyonga Mtaa	<u>TANROADS</u>

	2. Salum Hamisi Ally-Mtaa Chairperson 3. Jumbe Abdalla-Citizen 4. Enosiata Gadiye-Citizen 5. Halima Mohamedi-Citizen 6. Zainabu Abdalla-Citizen 7. Furaha Kabogo-Citizen 8. Asha Salum-Citizen 9. Joyce John Magaga-Citizen	• Contractor is required to ensure construction activities do not cause negative impacts to the human settlement and other properties near by project site • The proposed project shall consider provision of pedestrian walk ways to facilitate the movement of people and students between Mapipa Mtaa and Mzimuni Mtaa during construction and operation phase to avoid accident risk which are frequently occur • Local communities shall be involved in all project phases • We advice the proposed project to provide employment opportunities to youth from Suna Mtaa • We advice Mtaa Office to be consulted during monitoring of the implementation of the proposed project	Floods modelling was done for different rainfall intensities, the start of the bridge has been positioned to accommodate all the situations. However; the Msimbai river shall also be dredged and flood plains excavated to increase the capacity of the river. Dredging and excavation shall be implemented under different package. Employment to the local is the priority in this project, contractor will be instructed to liase with the surrounding local government offices to ensure members from the communities benefit from the project implementation.
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