UNITED REPUBLIC OF TANZANIA

MINISTRY OF TRANSPORT

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ENVIRONMENTAL IMPACT STATEMENT

FOR

THE PROPOSED FLOOD PROTECTION MEASURES FOR CENTRAL RAILWAY LINE – KILOSA TO DODOMA SECTION (174 KM) IN THE UNITED REPUBLIC OF TANZANIA

Volume I

Submitted to	**Consultant**
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STATEMENT OF COMMITMENT

Reli Assets Holding Company Ltd. (RAHCO) is committed to:

- Fully comply with applicable environment protection legislation;
- Comply with all national environmental guidelines and requirements;
- Minimise damage to the environment caused by our activities;
- Protect human health and safety in all our devours as it is stipulated in our Occupational Health and Safety Policy; and
- To implement all mitigation measures as stipulated in the Environmental Impact statement

Dr. Mussa Iddi Mgwatu
Managing Director

Executive Summary

Title and location of the project or undertaking:

Environmental Impact Statement for the Proposed Flood Protection Measures for Central Railway Line – Kilosa to Dodoma Section (174 Km) in the United Republic of Tanzania

Name of the proponent and contact:
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A brief outline and justification of the proposed project or undertaking

Due to deteriorating Tanzania Railways Limited (TRL) infrastructure and inefficient operating standards, the freight traffic carried by TRL has been declining over the years from 1.6 million tons in 2002 to 0.15 million tons in 2013. The primary reasons for the deterioration include deferred maintenance and inadequate rolling stock. In addition, the 2010 floods between Kilosa (in the Morogoro Region) and Gulwe (in the Dodoma Region) damaged part of the central railway system, halting train services between Dar es Salaam and Dodoma for more than three months. These floods have been recurring, the resent one being in January 2016. In order to meet the envisaged growth of cargo transpiration as a result of the good economic performance that has been registered over the years, the World Bank, in collaboration with Reli Assets Holding Company (RAHCO) carried out a Feasibility Study (FS) for the preparation of "Tanzania Intermodal and Rail Development Project (TIRP)" to rehabilitate the Dar es Salaam–Isaka section. In addition, the Government of the United Republic of Tanzania (URT) has prepared the "Big Results Now (BRN)" initiative, the "Transport Sector Long-Term Perspective Plan (LTPP)", the "Five Year Development Plan", as well as the "10-Year Transport Sector Investment Programme Phase 2 (TSIP2)", all with the goal of creating a competitive and reliable transport system. In all of these plans, railway transport systems are given a high priority with the aim of implementing rapid, high-impact, fixes.

The Japan International Cooperation Agency (JICA) has recognized the importance of rehabilitating the Central Railway Line based on the results of the JICA-funded

"Comprehensive Transport and Trade System Development Master Plan in Tanzania" (2011-14). The Japanese Government subsequently conducted "The Study on the Central Corridor Railway Revitalization and Energy Efficiency Project" (2012-13), which identified that the flood prone area between Kilosa and Gulwe could be the biggest bottleneck of the entire Central Railway Line, and thus recommended that flood protection measures be a candidate for Japanese assistance, which will complement the World Bank-assisted TIRP.

The proposed flood protection measures are Rerouting part of the existing railway line (25km) – this measure will involve shifting the railway line away from most flood prone areas to elevated areas; River bank protection – this will involve installation of gabions or concrete blocks to protect river banks against erosion; Channel works – this will entail river training at River Mzase and Maswala; Renewal of rails / track materials – this will involve changing the weight railway track from 60 to 80 lb for about 15km; Track rectification – this will include minor works such as replacing ballast, and sleepers, fixing connectors; Construction of temporary access road – this will be necessary to access the sites to be protected and will involve constructing a temporary road of about 96km; and Housing land development – this will used by the residents that will be relocated from Maguru Village.

In order to comply with both JICA and URT environmental requirement, JSB- EnviDep Ltd. of Dar es Salaam was commissioned to carry out Environmental and Social Impact Assessment for the proposed flood protection measures as part of the feasibility of the whole project.

A brief description of the project environment;

The major part of the project is found in Kilosa District and Mpwapwa District, which have different environmental characteristics. On one hand Kilosa District experiences climatic condition which is humid. The climate is characteristically tropical savannah (winter dry season), with a subtropical dry forest bio-zone. It experiences an average of eight months of rainfall (October – May), with mean annual rainfall ranging between 1,000 to 1,400mm in the southern flood plain, while further north (Gairo Division) has annual rainfall ranging from 800 to 1,100mm. The average annual temperature is typically 25°C in Kilosa town with extremes in March (30°C) and July (19°C). Kilosa has three distinct topography of the district varies significantly and can be divided into three zones, namely the Flood plain which ***is c***omprised of both flat and undulating plains extending to the foothills in the west, with an altitude of about 550m. It has several rivers, the major ones being the Wami and the Ruaha; the Plateau which is situated in the north of the district, with an altitude of around 1,100m, and characterised by plains and hills and is made up of moderately fertile, well-drained sandy soils; the ***Highlands which r***uns from north to south on western side of the district, with an altitude up to 2,200. Land in Kilosa can basically be divided into five: agricultural (37.5 per cent), natural pasture (33.5 per cent), Mikumi National Park (22.5 per cent), forest reserves (5.5 per cent) and urban areas, water and swamps (1 per cent). Both agriculture and livestock grazing are practised on general, village and private lands, while Mikumi National Park and forest reserves are controlled areas and state owned.

Mpwapwa District is one of the six districts in Dodoma Region. It is located 120 kms from Dodoma municipality. It lies between Latitudes 6°00" and 7°30" South of the Equator and between Longitude 35°45" and 37°00" East of Greenwich. Mpwapwa is characterised by

short rain season which starts in December and ends in April. The rainfall ranges between 600 – 700mm per annum. The average minimum temperature is 15.5^{o}C, the coolest month being August (13.8^{o}C). The average maximum temperature is 27.5^{o}C, the warmest month being November (30.2^{o}C).

The project area from Kilosa to Ihumwe where railway line passes has two sections of distinct landscape: Kilosa to Gulwe and Gulwe to Ihumwe. *Kilosa to Gulwe:* Railway line from Kilosa to Gulwe passes along the valley defined by the ranges of hills; on the left (Rubeho mountains) and on the right (Ukaguru mountains) of the railway line towards North West. The hills are composed of exposed rock and some areas of shallow depth of soil cover, the effect being observed also on the vegetation cover. *Gulwe to Ihumwe:* The section is not confined between ranges of hills but characterised by the gentle slopes towards East and South East. The gentle slopes are made up/ comprised of deep deposit of alluvial sand from North and North West.

The geology of the project area is characterised by Usagaran and Bendian of Mafic Gneiss and Garnet Gneiss rocks with some occasions of crystalline limestone. *Kilosa to Gulwe:* There are two types of soil pads within the project section – (i) Along the hills and ridges slopes, there are residual soils of medium to stiff gravelly sandy pads, shallow depths of one to two horizons, namely, the O-horizon of up to 10cm depth which overlays a bedrock in most places and along the foot of the hills/ridges and the A- horizon up to about 30cm which overlays the bedrock. (ii) Along the Valleys/Folds, swamps, Flood plains: there is loose to moderately firm deposit of alluvial sandy soils of undifferentiated horizons due to deposition made every rain season. *Gulwe to Ihumwe:* There exist loose to moderate stiff Reddish Brown Alluvial sandy soils of shallow to deep layers of horizons.

Hydrologically, the project area is located within Wami/Ruvu water basin on the eastern side of Tanzania. Wami basin extends between 5° and 7° Latitudes, South and between 36° and 39° Longitudes, East. The surface water resource in this area therefore is dominated by natural rivers. Other surface water features are man-made ponds and dams most of which having a connection with existing natural rivers. Kinyasungwe River in Dodoma region marks the major surface water feature in the upstream of the project area. It is a seasonal river originating from the arid areas of Dodoma region flowing south-east and discharge its water into Mkondoa River. Other rivers in this zone are Mzase, Sikoko, Kidibo, Maswala and Mangweta. Previous hydrological studies carried out in the project area have reported on sediment transport as water moves from upstream to downstream. Reported causes include deforestation and unsustainable agricultural practices and livestock keeping in the upstream tributaries and along some sections of the rivers. The quality of water is generally within TBS Standards. Previous hydrological studies carried out in the project area have reported on sediment transport as water moves from upstream to downstream. Reported causes include deforestation and unsustainable agricultural practices and livestock keeping in the upstream tributaries and along some sections of the rivers. Other uses includes swimming, transportation of logs during rainy season, construction activities especially blocks and bricks making, and aquatic life. Groundwater resources in the project area are evidenced by the presence of shallow wells and boreholes. Boreholes are dominant and during the study more of these were observed in the Mkondoa hydrological zone (in Kilosa) than the Kinyasungwe zone (in Dodoma).

The fish found consist mainly of small barbs (*Barbus paludinosus*), some African sharptooth catfish (*Clarias gariepinus*), tilapias (*Oreochtomis niloticus*), freshwater eels and some upside catfish (*Chiloglanis* sp). Of these, only three are migratory fish species i.e. *Labeo* sp., *Barbus paludinosus* and, *Anguilla sp,* was recorded in the area during the study. Large specimens of these fishes were found mainly in large pool areas especially at the Gulwe swamp, while the rest of the river stretch had very small sized fishes. Other aquatic animals reported include Crocodiles (*Crocodylus niloticus*) mainly in Lumuma River and monitor lizards (*Varanus niloticus*). These reptiles were however, not encountered during the survey period. During rainy season Kinyansungwe and Mkondoa Rivers receive a lot of silt through surface runoff due to severe erosion that take place in the catchment. This has always rendered the water very turbid or muddy thus threatening the aquatic life especially fish. That is why this river system is inhabited mostly by the hard fish species i.e. the catfish, tilapia and barbs that can tolerate very difficult conditions including reduced water levels, oxygen and water clarity.

Floristically, the vegetation of the proposed project site falls under two main Phytocorions which are Zambezian regional centre of endemism characterized by drier miombo woodland, patches of flood plain grassland and riparian woodland. Other phytocorion is Somali-Masai regional centre of endemism characterized by *Acacia-Commiphora* deciduous bushland, and patches of Halophytic vegetation dominated with *Tamarix nilotica* stands. Based on physiognomic characterisation within the proposed project area, seven main vegetation categories have been classified from the project area includes: *Acacia –Commiphora* deciduous bushland, Drier miombo woodland, Settlements with alien species, Cultivations, Marshland with sands, Riparian, and *Tamarix nilotica* stands**.** In the project area, one tree species has been identified growing in *Acacia – Commiphora* deciduous bushland at Kitete and Gulwe which is considered vulnerable under IUCN list. In the project area, one plant species has been identified growing in *Acacia – ommiphora* deciduous bushland vegetation type which is considered endemic. Several medicinal plants were identified.

A total of eleven species of amphibians were recorded between Kilosa and Gulwe. . None of the amphibian species observed is threatened with extinction according to International Union for Conservation of Nature (IUCN). Twenty three species of reptiles were observed at the proposed rerouting survey sections and access road between Kilosa and Gulwe. Most of the reptiles observed, belong to the Family Scincidae. Most of the species detected, except Rainbow Skink *Trachylepis margaritifer and* Blue-headed Tree Agama *Acanthocercus atricollis,* do not appear in IUCN Red List of Threatened species. 126 species of birds were recorded. All species are in Least Concern (LC) category of threat status according to IUCN except Fisher's Lovebird *Agapornis fischeri* and Tanzania Red-billed Hornbill *Tockus ruahae*. The Fishers Lovebird is Near Threatened (NT) according to IUCN while Red-billed Hornbill is not in the list. 26 species of mammals were recorded in the study area. Of these, only five species, the vervet monkey *Cerecopithecus pygerythrus,* Yellow Baboon *Papio cynocephalus,* Slender Mongoose *Herpestes sanguinea*, Four-toed Elephant Shrew *Petrodromus tetradactylus* and Mutabe Sun Squirrel *Heliosciurus mutabilis* were observed during the survey. However, most of the area that was surveyed has been disturbed in one way or another bearing in mind that rerouting and access roads will be located in the vicinity of the existing railway.

Generally speaking, the archaeology and cultural heritage of Morogoro and Dodoma regions particularly Kilosa and Mpwapwa District remains relatively unknown. The surveys

conducted at these sites during the 1980s and 1990s revealed cultural material remains including Later Stone Age (LSA) artefacts, potteries of Early Iron Age (EIA) and indicators of ancient iron smelting activities that include slag, tuyeres and furnaces. These cultural heritage properties recorded from these sites date between the 6th and 15th centuries AD. Also some of the artefacts especially potteries of TIW/Tana variants recovered from the site of Dakawa indicate an interaction between the coast and hinterland. At Mkadage for instance, one major archaeological site of early iron working was recorded. Scatters of ancient settlements were observed at Munisagara village. While few potsherds of between the 17th and 19th centuries were recorded within the relocation points, a huge scatter of the ceramic materials was recorded at point 0268109/9253800. Like Mkadage and Munisagara, Kikundi seemed to be rich in terms of archaeology. Ceramics of different age period ranging from the 8th to the 18th century were recorded at the vicinity within which the rail will be relocated. Like Mkadage and Munisagara, Kikundi seemed to be rich in terms of archaeology. Ceramics of different age period ranging from the 8th to the 18th century were recorded at the vicinity within which the rail will be relocated.

Major environmental threats that were observed include: Soil erosion - The section between Kilosa and Gulwe has been much affected with the soil erosion along the river bank attributed by the River flow patter (River meandering), the volume, speed and the constituent of the river water that strike the river banks and therefore enhance erosion.; **Siltation -** The siltation was also observed to be a major problem along the project area. The siltation affects the river dimensions, and blocks the drainage structures along the railway line. **Land/ ground instability areas (landslides, creep, etc.) -** most of the cut areas for railway passage have the landslides attributed by the nature of the rock (fragmented bedded rock) and the high angle of cut (most of the area is 90° vertically).

The ethnic makeup of the study area can be roughly divided into two, i.e. between those in Kilosa and Dodoma. In Kilosa there is a mix of ethnic groups. This fact is in line with history of this district that it was one of the areas with sisal plantations since the colonial period. As such, it attracted migrant labourers from various parts of Tanzania. For this reason, there is a multiplicity of ethnic groups in this area, namely: the Hehe, the Ha, the Sagara, the Kaguru, the Gogo, the Sukuma/Nyamwezi and the pastoralist Maasai and Mang'ati, etc. Unlike Kilosa, (where there is a multiplicity of ethnic groups) the study area in Dodoma is dominated by the one ethnic group: the Gogo. There is however other ethnic groups such as the Hehe, the Nyamwezi

Farming is the main economic activity in the study area followed by livestock keeping. Both permanent and seasonal crops are grown in Kilosa. Such crops include bananas, maize, soya beans, sunflower, simsim, onions, mangoes, sugarcane etc. in Mpwapwa on the other hand, rainfalls are uni-annual. As such farming is mainly seasonal rowing seasonal crops mainly maize, groundnuts; sunflower etc. in both Kilosa and Mpwapwa farming technology is still low. Livestock keeping is the second economic activity in the study area next to farming. It is more common in Dodoma than Kilosa because of the dry climate of Dodoma which makes farming for them only seasonal.

In the entire study area, incidences of food insecurity were reported. In the Kilosa food insecurity was attributed to the flooding of Mkondoa River which implied washing away of the crops grown in the river valley. Moreover, the declining of Mkondoa River depth due to siltation has negated the possibility of fishing activities in this river further contributing to

both food and income insecurity. In Dodoma on the other hand, and especially in Godegode, Gulwe and Kisisi, food insecurity was attributed to frequent droughts which burn off the crops before maturation.

Project stakeholders and their involvement in the EIA process;
This ESIA statement involved consultation with various stakeholders at different levels including national and District authorities, and local communities. Participatory methods including stakeholders' consultative meetings, observations, and semi - structured interviews were applied. Other relevant information was obtained through discussions with relevant informants and by reviewing available literature, documentation and studies.

Positive Expectations
- Employment opportunities to locals
- Ease transportation of people and goods
- Increase in per capita income of individuals

All issues raised by the stakeholders, regardless of their significance have been addressed.

List of developer, consultant, local planning authorities and other people and organisations consulted

The project consulted the following people and groups:

National Level
- Works, Transport and Communication
- Lands, Housing and Human Settlements
- Natural Resources and Tourism
- SUMATRA

Regional Level
- Morogoro Regional Commissioner
- Morogoro Regional Administrative Secretary
- Dodoma Regional Commissioner
- Dodoma Regional Administrative Secretary

District Level
- **Kilosa District Executive Director**
- Mpwapwa District Executive Director
- Kilosa District Officers responsible for Lands, Community Development, Natural Resources
- Mpwapwa District Officers responsible for Lands, Community Development, Natural Resources

Ward Level
- **Ward executive Officers for** Magomeni, Masanze, Kidete, Godegode, Kimagai, Gulwe wards
- Ward Development Committees for Magomeni, Masanze, Kidete, Godegode, Kimagai, Gulwe wards

Village Level

- Village Executive Officers for Munisagara Village, Muzaganza Village, Kikundi Village, Godegode Village and Gulwe Village.
- Village Environmental Committees for the Magomeni, Masanze, Kidete, Godegode, Kimagai, Gulwe wards

Individuals

Traditional healers

Results of public consultation

From the consultations the following environmental and social management issues as well as project were raised:

- Losses of natural vegetation cover and contained valuable wildlife due site clearance during flood protection measures / construction works
- Air pollution due railway line development activities
- Loss of agricultural and residential land
- Interfering with the village settlement patterns and the landscape in general
- Increase in accident events
- Increase in HIV transmission from / to new comers and local community and consequent increase in AIDS sufferers in project area
- Disturbance from construction equipment

Description of the major significant impacts

Design / Mobilisation

- ✓ Land disturbances / soil erosion at onsite and offsite location – this is considered significant considering that the area is prone to soil erosion, landslides and vegetation has been cleared in some areas
- ✓ Loss / damage / disturbance of indigenous vegetation and contained biodiversity species – There are some species within the project corridor which are listed in IUCN and CITES
- ✓ Release of oils and fuels in the aquatic environment – Release of oils and fuels into water bodies will have significant impact on the aquatic ecology
- ✓ Contamination of surface and ground water with demolition debris and other wastes – release of demolition waste into water bodies will impact the aquatic life

Construction phase

- ✓ Impaired air quality & contribution to climate change due to release of dust (including fugitive (unavoidable, residual), greenhouse gases and other noxious air pollutants – there will many equipment using fossil fuels and travelling on un-surfaced road hence release of dust and noxious gases some which have significant adverse health impacts.

Social Impacts

Site selection and Mobilisation phases

- ✓ Change or modification of population and its quality of life due to land take – some villagers at Maguru subvillage will be relocated. Other people will lose their property, land and livelihoods as a result of the project
- ✓ Construction health and safety hazards – Workers and no worker will be exposed to construction hazards such noise, vibration, accidents etc.

Construction Phase /operation

- ✓ Public HSS risks: traffic accidents, Risks of human-human transmission of diseases (STD, HIV etc.) – there will be an influx of workers from different parts of Tanzania. They will be based on site without their families. This may act as catalysis for intimate relationships with locals
- ✓ Potential loss of lives and property as a result of falling off from moving train, collision with train at road crossing as a result of increased train frequencies – this may happen if proper control of engine movements, and people movements, particularly considering that the project will result into increased train frequencies.
- ✓ Additional pressure and demands on local social services and resources (increase water users, toilet users) – increased number of people means increased demand for social services.
- ✓ Vandalism of structures / equipment, theft of materials and portable items – this is reported to be a serious problem as people vandalise the railway infrastructure in the name of scrap metals. As the scrap metal business increase so will be vulnerability to the railway infrastructure.

Positive impacts

The study identified several positive impacts that will result from the project

- ✓ Increased train frequencies and therefore smoothening passenger and cargo movement
- ✓ Protection of roads from heavy cargo as is the current practice
- ✓ Increased income to local suppliers
- ✓ Employment opportunities
- ✓ Increased income and improved or livelihoods as result of increased agricultural production, trading activities, and movement of people within the region and bordering countries
- ✓ Improved comfort of passengers as a result of increased train frequencies
- ✓ Improved quality of the landscape features and appearance of the river embankments

Alternative considered

A number of alternatives have been considered for realizing the project objectives. As a standard practice, the "No project alternative" was also considered. However, this was not considered to be preferred alternative as it will mean to continue with current inefficient railway system and continue using road to transport cargo which is a major cost on our roads. Selection of rerouting was subject to a number of factors such as severity of the erosion problem of the area, the number of people affected by the project, the cost of realising such alternative rerouting. The least cost alternative rerouting was selected. Different types of river embankment were considered these include using gabions mattress bank protect, concrete block, Branch Block Bank Protection. The choice of the type of river protection will depend on the type of erosion on a particular section.

Recommendations and plan for mitigation of the impacts/ Environmental and social management

Project Aspect / Potential Direct Impacts	Mitigation Measures/ Management Programme
DESIGN AND MOBILISATION PHASE	
Impact # 1: Land disturbances / soil erosion at onsite and offsite location	The following measures will be implemented: ▪ Implement soil erosion control and land rehabilitation measures at all project sites and offsite locations ▪ Ensure strict control of trucks, vehicles as well as equipment to operate only within the project area ▪ Limit excavations area needed for construction works, construct temporary drainage grooves and sedimentation ponds for surface runoff collection and compact the disturbed areas soon after construction. ▪ Compact the disturbed areas soon after construction. ▪ Whenever possible development activities shall be implemented when the agents of erosion (i.e. rain and wind) are not active. ▪ RAHCO will monitor areas of exposed soil during periods of heavy rainfall throughout the project development phase.
Impact # 2: Loss / damage / disturbance of indigenous vegetation and contained biodiversity species	The following measures will be implemented: ***Vegetation*** ▪ Develop and Implement a Flora and Vegetation Conservation and Soil Restoration Plan ▪ Train the workers and construction site managers in avoiding cutting of trees and bushes along the RoW and destruction of soils on large areas ***Fauna*** Examine at each section: ▪ breeding areas of special wildlife and invertebrates in water objects ▪ presence of small mammals; ▪ presence of the nests of protected birds; and ▪ whether the individual section of a big mammal falls within the construction zone. ***Mitigation of noise*** The Contractor shall implement the following measures: ▪ Maintaining machinery and equipment in good running conditions and avoiding sudden loud noise ▪ Use quiet equipment (i.e. equipment designed with noise control elements) and the proponent will ensure all vehicles have properly functioning mufflers ▪ Establish and enforce good site management ▪ Develop and observe best practice - methods of working ▪ Restrict hours of working – construction to be done during day light within the settlements ▪ Exercise efficient material handling – to minimise truck movement ▪ Define access routes to the site with the smallest number of properties in proximity ▪ Keep trucks and vehicle movements to a minimum possible
Impact # 3: Depletion at point source	RAHCO shall ▪ Ensure that the construction materials such as sand, gravel, natural stones, and ballast are procured from registered quarry and sand mining firms. ▪ impress the Contractor to avoid over procurement of construction materials ▪ impress the Contractor to avoid wastage, damage or loss (through run-off, wind, etc.) of materials at the construction site

Impact # 4: Impaired air quality & contribution to climate change due to release of dust, greenhouse gases and other noxious air pollutants	The following measures will be implemented: ▪ Use of best practice management techniques during extraction, loading and transporting raw materials. ▪ Use efficient trucks and vehicles ▪ Train driver training to minimize emissions (e.g. prevention of over revving, shut off engines when vehicles not in use). ▪ Regular (monthly) servicing of engines ▪ Avoiding idling of engines ▪ Ensure efficient equipment operations and maintenance measures to minimize emissions. ▪ Institute proper planning of transportation of materials to ensure that vehicle fills are increased in order to reduce the number of trips done or the number of vehicles on the road.
Impact # 5: Release of oils and fuels in the aquatic environment	The following measure: ▪ Fuels and lubricants shall be stored only at designated areas. ▪ Storage of fuel and lubricants shall be kept at least 30m from the edge of the surface waters e.g. rivers ▪ Refuelling and lubrication of equipment shall be restricted to areas at least 30m away from the edge of the surface waters ▪ All routine equipment maintenance shall be done at least 30 meter away from the edge of the rivers and recover and dispose of wastes in an appropriate manner ▪ Fixed fuel dispensing locations will be provided with secondary containment to capture fuel from leaks, drips, and overfills ▪ A supply of sorbent and barrier materials sufficient to allow the rapid containment and recovery of spills shall be maintained at construction site ▪ All equipment shall be free of leaks prior to use on the Project and prior to entering or working in or near the water bodies ▪ Conduct regular maintenance and inspections of the equipment to reduce the potential for spills or leaks ▪ Rubber-tired vehicles (trucks) shall refuel at commercial fuel stations. Tracked machinery (e.g. backhoes, bulldozers) shall be refuelled and lubricated on the construction site

Impact # 6: Contamination of surface waters with demolition debris and soils	The following mitigation measures shall be implemented: ▪ Prevent the generation of hazardous waste; ▪ Where elimination is not possible apply means and techniques to reduce the quantity of hazardous waste generated; ▪ Minimize amount of waste for disposal by recycling, reuse and/or recovery. This includes the recovery of energy which may be available from the waste. ▪ Treat waste to stabilize, immobilize, contain or destroy hazardous properties. ▪ Dispose of residues with minimum environmental impact. ▪ Appropriately contain, isolate and store hazardous waste for which no acceptable treatment or disposal option is currently available. Other specific measures that will be implemented are: ***Inert Construction Materials:*** These materials shall be used for construction of embankments, acoustic barriers or as filling materials on rural roads **Non-hazardous Waste:** ▪ Concrete waste will be disposed in similar manner as inert wastes ▪ Metal waste shall be disposed separately for reuse and recycling ***Hazardous Waste:*** ▪ Hazardous wastes will be collected and transported to Dar es Salaam for their final disposal in approved disposal sites ▪ Uncontrolled incineration will not be allowed ▪ Before removal of wastes from the site, the quantity (volume) and size of wastes; the name of waste collector/disposal agent and the name of the place of their final disposal/measure shall be specified. This issue shall be controlled by site manager ▪ The technical personnel shall be trained and informed about the appropriate regulations for handling hazardous waste i.e. Environment Management (Hazardous Waste Control and Management) Regulations, 2008 ▪ After demolition the place shall be restored to the pre-construction state
CONSTRUCTION PHASE	

Impact # 7: Land disturbances / soil erosion	In addition to mitigation measures listed under impact # 1 following measures will also be implemented: ▪ RAHCO shall make land management and soil erosion control a requirement in the bidding document ▪ RAHCO shall develop management plans for its existing quarry sites, and new sources of construction materials ▪ Contractors will be required to control soil erosion and rehabilitate disturbed land ▪ RAHCO shall provide oversight supervision and monitoring during and after project implementation ▪ Contractor shall identify erosion prone areas, identify permanent erosion control measures (applicable for a particular site) and plan construction works and sites to limit quantity of material likely to be eroded and transported into the nearby rivers. ▪ Deliberately, the Contractor will cover exposed soils with grass and other appropriate species as soon as possible and temporarily will bind exposed soil and redirect flows from heavy runoff areas that threaten to erode or result in substantial surface runoff to adjacent water courses. ***Topsoil removal, disposal and piling*** ▪ First of all the topsoil and then subsoil shall be cut and piled (stocked) separately on specially selected area for their purposeful use ▪ The stocked topsoil shall not be mixed up with unfertile soils, stones, etc. It should be prevented from washing to preserve the structure, fertility and seeds base of the topsoil. ▪ Topsoil will be stored in the form of stockpiles having the height up to 2 m and slope inclination up to 30-35^{o} ▪ Erosion of stockpile surface shall be provided through compacting surfaces to the level having no threat of development of anaerobic processes ▪ The Contractor shall stop topsoil removal and stocking operations if topsoil is saturated with water ▪ Stocked soil shall be protected from washing, therefore, it is necessary to arrange drainage [system] in the bottom of the storage. ▪ Stocking of removed topsoil outside the RoW, shall be avoided as far as possible. If this is not possible appropriate sites shall be identified and used in accordance with the current Tanzania Laws (e.g. Village Land Act, 1999)

Impact # 7: Continue	***Erosion control*** Following erosion control measures shall be implemented: ▪ Arrangement of berms, stone mounds and gabions will be required at the cut slopes and in the bottom of the slopes. ▪ Cut topsoil shall not be used for construction of berms within the RoW. ▪ At the location of cult slopes and ravine crossings where the excavation works are to be carried out, water collecting and conveyance canals shall be built to regulate the flows of surface waters. ▪ At the ends of water conveyance canals the settlers shall be arranged (pits, sand sacks) to prevent damage of areas adjacent to RoW with water. ▪ Phyto-amelioration measures shall be implemented to stabilize the edges of slopes and cut slopes if required. ▪ It is particularly important to protect the removed and stocked topsoil from erosion processes – as follow. ✓ Stocked topsoil shall be drained. ✓ To control erosion processes at the edge of the cut slope, phyto-amelioration measures shall be implemented on the slope. ✓ For regulation of surface waters, berms and water canals shall be arranged at the edge of the slope that will be connected to natural water courses to avoid development of lateral erosion. ***Soil reinstatement measures*** ▪ After completion of excavation works and laying the rails the soil reinstatement activities shall be implemented in the areas adjacent to the embankment. ▪ The reinstatement works shall be carried out in favourable meteorological (dry) conditions and in the shortest possible time. ▪ During implementation of soil reinstatement works mechanical and physical-chemical characteristics of soils shall be taken into account. ▪ Soils shall be reinstated at least to its initial state for the purpose of observation of the principles of environmental safety and preservation of the recreational value of landscapes.
Impact # 7: Continue	▪ Reinstatement works to be carried out within the framework soil quality management; therefore the following will be required: ✓ preservation of landscapes and their recreational value; ✓ reinstatement-conservation of the areas modified as a result of construction activities to their initial visual-aesthetic state as much as possible; ✓ the construction shall not cause negative impact on the environment of the railway route and the RoW; ✓ implementation of slope stabilization and designing activities at the crossings of the railway with ravines; ✓ reinstatement of the private land parcels located in the vicinity of the railway bypass to their initial state, conservation of their fertility and natural characteristics; ✓ implementation of erosion control measures along and in the vicinity of the railway. Other mitigation measure include: ▪ ***Training of workers and construction site managers*** to avoid, along other impacts, destruction-trampling and mechanical damage of soils by construction machinery in the areas adjacent to the construction sites.
Impact # 8: Impaired air quality & contribution to climate change due to release of dust (including fugitive (unavoidable, residual), greenhouse gases and other noxious air pollutants	Mitigation measures listed under Impact # 4 apply.

Impact # 9: Impaired land and water qualities and contained resources from discharge of pollutants (wastes, oily substances etc.)	In addition to mitigation listed under Impact # 5 and Impact # 6 , the Contractor and RAHCO shall implement following additional measures: ▪ Develop and implement project – specific Waste Management Procedure / Plan (i) identify what type of solid or liquid wastes and categories of wastes the project will generate or handle (biodegradable / organic wastes; packaging materials; non-biodegradable (metallic, plastic), and hazardous wastes i.e. fuels, oils, lubricants, vehicle / machinery fluids etc.);(ii) identify ways to reduce the volume of waste by reusing or recycling initiatives (iii) establish technological interventions to capture and removal unwanted materials and sand before entering the water ways i.e. bar screens, sand traps and grit chambers. The following are specific waste management procedures to be implemented: ▪ During earthworks, i.e. excavation, digging pits, quarrying, etc. Contractor shall ensure the top soil is pilled aside at one place, then after finishing the earthwork the top soil shall be used to fill any bare land surfaces around the site. ▪ Plastic and glass bottles (about 9kg per day) shall be collected into litter bins, and transported to plastic recyclers. ▪ At completion of each day, site shall be left clean and tidy; debris, scrap and spill materials removed. ▪ Biodegradable waste of about 900kg per day consisting of mainly paper, etc. from offices and open workshop will be disposed by burying ▪ Batteries will be sent to YUASA in Dar es Salaam for recycling ▪ No waste oil will be disposed at the site during construction. Fuel, oils and lubricants (300kg per day) on average from construction machinery and equipment from maintenance workshops, fuelling points etc. will be collected for use in furnaces ▪ Demolition debris will be used during construction as construction aids or distributed to community project and filling of rural roads. Following specific measures shall be implemented where applicable: ***Inert Construction Materials:*** measures listed under impact # 6 apply

Impact # 9: continue	The Contractor and RAHCO shall implement following additional measures to mitigate water pollution from vehicle related activities: ▪ vehicle fuelling stations (in case of their existence at the construction stage) shall be embanked to prevent spread of fuel and pollution of the surrounding area in case of accidental spills; ▪ vehicle wash areas within the garages shall be embanked. For wastewater treatment a primitive treatment facility in the form of concrete covered two-step ditches to prevent discharge of untreated waters in ravines and rivers; ▪ washing of vehicles in river and other surface water object shall not be allowed; ▪ layers of soil polluted by fuel and lubricants spilled from construction machinery shall be removed and transported to the place agreed with the Vice President's Office (VPO), Division of Environment (DoE), Department Natural Resources in advance; ▪ when painting metal constructions, especially metal bridges, tin or other covers shall be placed under the sections to be painted to avoid spill of paints into the surface water objects; ▪ Crossing of the planned railway with water bodies shall be designed in a manner to avoid penetration of pollutants in water bodies. Other wastes ▪ places for toilets within the construction camps shall be selected with consideration of the groundwater levels. ▪ Cesspools shall be covered with cement solution to avoid pollution of groundwater with faeces. ▪ Cesspools shall be emptied on a regular basis in accordance with the number of workers living in the construction camp. ▪ construction waste shall be piled at a distance of at least 50 m from the riverbeds of rivers and ravines prior to disposal to the specially allocated dumpsites; ▪ temporary barriers shall be arranged at the small ravines and gullies to avoid movement of increased volumes of solid materials from the RoW to large ravines and rivers at the construction stage; ▪ the design of shall ensure protection of the groundwater and the river water from pollution

Impact # 9: Continue	**Non-hazardous Waste - *mitigation measures listed under impact # 6 apply*** ▪ Construction camps will be provided with toilet / shower facilities connected to a regularly empting septic tank; ▪ Special waste bins and waste collection system will be introduced to ensure disposal of wastes at landfills; ▪ The concrete wastewater will be collected, processed through a sedimentation tank and neutralized, usually with gaseous CO_2, before their disposal; ▪ Vegetation wastes generated from site clearance during construction can be left on the site only in exceptional cases. They will be transported to the suitable waste management facility; ***Hazardous Waste – mitigation measures listed under impact # 6 apply*** ▪ Reserves of potential polluters will be stored on special insulating bedding and fenced by a berm made of the similar material to retain the polluter in an amount of 10% more than stored. ▪ During operation all stationary construction machinery operating on diesel and petrol will be equipped with a special container to collect leaking fuel for disposal. ▪ Main equipment and vehicles will be fuelled on special insulating bedding wherever possible. ▪ A special attention will be paid to prevention of fuel spills. Special collectors will be installed at the points of potential leakage. Absorbents will be used as well. Fuel will be transported by specially designed fuel trucks. ▪ Collection, treatment and transportation of waste wastes generate at the construction site will be implemented in accordance with the general plan of waste management. ▪ Wastes shall be collected on a daily basis. Waste bins labelled with special signs will be placed on specially allocated points for collection and further disposal of wastes.
Impact # 10: Temporary disturbances / flight of aquatic fauna from noise emission	In addition to mitigation listed under Impact # 2, the Contractor and RAHCO shall implement following additional measures: ▪ During the construction phase small supporting enterprises, construction camps, parking and maintenance areas shall be arranged at a considerable distance from the settlements. ▪ Where possible alternative methods of drilling and explosion; e.g. so-called “shields” to drill tunnels will be used, or at worst drilling-explosion shall be carried out using minimal explosive charge. ▪ If protected species are found, special measures to minimize their disturbance during reproduction and breeding periods will be develop and implemented; ▪ Arrange fences to prevent animals from falling into the trenches. Before filling the trenches make sure that there is no animal there. In general, it will be sufficient to place wooden boards in trenches that will be used by animals for escaping; ▪ Keep old trees near the RoW during the construction works; ▪ After completion of construction works the water courses and forest strips shall be recovered, topsoil shall be reinstated and re-cultivated, shrubbery shall be planted along the RoW. Pipes laid in gorges will play the role of so-called “Green Bridges” for animals.
SOCIAL IMPACTS	
SITE SELECTION AND MOBILISATION PHASES	

Impact # 11 Destruction of archaeological and cultural heritage resources	▪ During implementation of eartheworks at the project sites and adjacent areas permanent inspection/monitoring of the archaeologist shall be done ▪ The results of inspection will be reflected in the construction progress report ▪ If cultural / archeological heritage is discovered or the grounds for assuming its existence are revealed during construction works, RAHCO (or/and its Contractor) is legally bound to stop the activities that bear the risk of damaging cultural heritage and inform in writing the Director of Archeology and Cultural Resources in the Division of Antiquities, Ministry of Natural Resources and Tourism . The Director has to verify the discovered cultural heritage or the grounds for supposing the discovery and inform RAHCO 9or /and its Contractor) about the verification results in writing no later than in 2 weeks after receipt of the notification.
Impact # 12: Change or modification of population and its quality of life due to land take	In order to mitigate impact associated with land take and land use change RAHCO shall implement the following measures, before project implementation begins; ▪ The Project Affected People will be compensated as proposed in the Resettlement Action Plan (RAP) ▪ Ensure user participation at the planning, design, and implementation stages of the project. Consultations with. ▪ Ensure women and other vulnerable groups are not disadvantaged by the project. ▪ Encourage the PAPs to join Village Community Bank (VICOBA) as a way of protecting their money. ***Loss of land and property*** ▪ To minimize the negative effects of the relocation of affected communities RAHCO shall develop a Resettlement and Compensation Plan. RAHCO has developed a preliminary Project Resettlement Framework containing possible mitigation measures ▪ Consultations with the PAPs on the developed relocation program shall be continuously be made. Information on timeframe of the relocation program should be provides. In addition, railway staff should be trained on relocation program if appropriate. ▪ Consultations should be conducted not only with the people that are subject of displacement but also with the host community members. The affected community members should be involved in the decision-making process related to the resettlement process: compensation packages, resettlement assistance, suitability of proposed resettlement sites and the proposed timing. ▪ In terms of mitigation and reduction of negative impacts from disruption of social relationships and networks while considering resettlement opportunities priority should be given to those areas where the possible resettlement of the whole community / settlement exists. ▪ To address in a timely manner specific concerns that will be raised during the resettlement process Grievance Mechanism should be established at an early stage as possible.
CONSTRUCTION PHASE	

Impact 13: Construction health and safety hazards	In order to mitigate these impacts RAHCO should oblige construction company through contractual terms to conduct the following activities: ▪ To develop and implement *Public health and Safety and Construction Health and Safety Plans - these should* address the dust and noise issues. ▪ Where possible erect special fences; provide adequate sheeting of vehicle, ensure loads up until tipping point when moving around the site; use of dust filters on fixed plant and machinery. ▪ The workers they should provided with and require to wear protective special masks especially those workers who are involved in the implementation of dust generating works. ▪ Where possible noise barriers, such as temporary walls or piles of excavated material, between noisy activities and noise-sensitive receivers should be constructed. ▪ Where possible avoid conduction works during night-time ▪ Use special quiet equipment, such as silenced and enclosed air compressors and properly working mufflers on all engines. ▪ Develop and implement Grievance Mechanism through which local residents and workers could bring their concerns on the noise and dust caused to the construction. Additional measures include: ▪ Avoid and minimize the pollution and ensure environmental safety of workers and the population all construction equipment is maintained in good running conditions. ▪ Develop and implement Construction Site Management Plan: which will regular watering of relevant sites, especially in dry and windy weather, regular washing of construction machinery and their wheels and use of closed waste containers to ensure additional protection from unpleasant smell ▪ Use of diesel engines in closed spaces shall be restricted within depots and maintenance areas, exhaust mufflers shall be installed on internal boilers and proper ventilation of closed spaces shall be ensured.
Impact # 14: Temporary disruption of socioeconomic activities	During construction the Contractor shall implement the following measures to mitigate disruption of other socioeconomic activities: ▪ Establish and enforce good site management to limit the construction activities as close as possible to the construction site ▪ Develop and observe best practice - methods of working – e.g. avoid unnecessary noise ▪ Restrict hours of working during day light; ▪ Exercise efficient material handling to minimise vehicle movement ▪ Define access routes to the site, and try to avoid the large port area ▪ Keep trucks and vehicle movements to a minimum possible
Impact # 15: Loss of aesthetics due to haphazard disposal of demolition waste	▪ Mitigation measures listed under Impacts # 6 & 9 apply
Impact # 16: Nuisance and disturbances from noise / vibrations (exceeding allowable level for people comfort) due to construction activities	▪ Mitigation measures listed under Impact # 10 apply

Impact # 17: Occupational Health and Security and Safety (HSS) risks	In order to mitigate Occupational and Health safety Hazards the Contractor and RAHCO shall implement the following measures: ▪ Avoid use of faulty equipment, tools and risk practices: Standards and operations and equipment: lifting, electrical isolation / installation, working at heights, manual handling, fitness for work, hand tools, housekeeping, building and office, vehicle and driving, hazardous substances etc. ▪ Employ trained /qualified and competent Personnel. ▪ Provide appropriate equipment and working condition. ▪ Provide PPEs (to workers and visitors) and enforce their use. ▪ Put in place fall-prevention systems for people working at elevated sites. ▪ Install Signage: post warning signs with appropriate text (local language) and graphics. ▪ Observe standard working hours (8 hours per day) ▪ Secure equipment properly and demarcate any hazardous areas. ▪ Enforce best code of practices at the work place: Observe internationally acceptable Performance Standards on health/safety requirements. ▪ Institute procedures and guidelines, work procedures, inspections and maintenance system, ▪ Implement in-house health and safety manual /guidelines ▪ Avoid inadequacies in water and sanitation provisions ▪ The demolition and construction work shall be contracted to class one contractor to avoid unnecessary health risks. ▪ OSHA guidelines on workers safety shall be implemented ▪ Raise awareness on construction hazards to construction workers. ▪ Use water sprinklers to suppress dust during construction ▪ Post warning signs with appropriate text (local language) and graphics. ▪ Workers Code of Conduct with the Community Liaison Plan will be developed and implemented – this will provide rules of conduct while conflict situations; emphasizing cultural characteristics of the local communities if migrants from different cultures enter the area shall be developed. Moreover, workers should be trained in order to ensure that they behave according to the developed Workers Code of Conduct.
Impact # 18: Public HSS risks: traffic accidents, Risks of human-human transmission of diseases (STD, HIV, etc.) Infections from putrescible wastes with disease pathogens	In order to mitigate public health and safety hazards, the Contractor and RAHCO shall implement the following measures: ▪ Cooperate with local Civil Society Organizations (CSOs)/public health offices in programmes for reduction/eradication of the diseases and establish worker's health protection procedures (e.g. make available free condoms to workers) ▪ Enforce surveillance measures e.g. yellow fever vaccination, potential Ebola infection etc. ▪ Enforce speed limit for vehicles ▪ The construction area shall be isolated with special fences from the settled areas; clear signs should be posted at the entrance to the construction area to ensure that community members will avoid entrance of this area and will be more cautious when passing the construction site Other measures include: ▪ *Public Health and Safety Plan* shall be developed and implemented to mitigate the impacts of the movement of heavy equipment on existing local roads. ▪ *Construction Traffic Management Plan* shall be developed which will allow re-routing of the truck traffic from residential streets or using local roads with fewest homes for transportation of construction materials. ▪ Develop and implement a Grievance Mechanism to facilitate early notifications of any concern from the public

Impact # 19: Vandalism of structures / equipment, theft of materials and portable items	In order to mitigate vandalism tendencies, during construction phase, the Contractor shall ▪ strengthen security system ▪ Strengthen patrol overall project sites and routes
RAILWAY OPERATION	
Impact # 20: Release of oils and fuels in the aquatic environment	In order to protect the receiving environment against oils and fuels during operation TRL shall implement the following measure: ▪ Fuels and lubricants shall be stored only at designated areas. ▪ Storage of fuel and lubricants shall be kept at least 30m from the edge of the surface waters e.g. rivers ▪ Refuelling and lubrication of equipment shall be restricted to areas at least 30m away from the edge of the surface waters ▪ Perform all routine equipment maintenance at least 30 meter away from the edge of the rivers and recover and dispose of wastes in an appropriate manner. ▪ Fixed fuel dispensing locations will be provided with secondary containment to capture fuel from leaks, drips, and overfills. ▪ A supply of sorbent and barrier materials sufficient to allow the rapid containment and recovery of spills shall be maintained at construction site ▪ Conduct regular maintenance and inspections of the locomotives to reduce the potential for spills or leaks.
Impact # 21: Impairment of local air quality	Mitigation measures listed under Impact # 4 & 8 apply Other mitigation measures include: ▪ Proper maintenance of trains, rails and wheels; ▪ Speed of trains may be restricted when passing the sensitive areas; ▪ Supporting structures may be constructed along the railway track which will play a role of acoustic screens.
Impact # 22: Occupational and Public health and safety	In addition to mitigation measures under impact # 17, TRL shall implement the following measures to reduce risks of worker accidents during rail operations: ▪ Develop and implement a *Safety Program* in accordance with the international norms. ▪ Ensure that every manager and worker receives training before they perform any work on the line, and are provided refresher training at least every year thereafter. This applies to temporary workers as well. ▪ Train workers in personal track safety procedures ▪ Block train traffic on lines where maintenance is occurring (green zone working) or if blocking the line is not possible use an automatic warning system ▪ Segregation of stabling, marshalling and maintenance areas from running lines. ▪ Railway workers should schedule rest periods at regular intervals and during the night to the extent feasible, to maximize the effectiveness of rest breaks and in accordance with international standards and good practices for work time in order to avoid fatigue of workers and accidents invoked by this.

Impact # 23: Potential loss of lives and property as a result of falling off from moving train, collision with train at road crossing as a result of increased train frequencies	To avoid, minimize and control the risks associated with railway operation including railway crossings the RAHCO and TRL shall implement the following measures: ▪ Use of bridges or tunnels is recommended. ▪ If level crossings are unavoidable, signals shall be installed and their regular inspection/maintenance provided. ▪ Increase the security at all railway stations ▪ Continuously provide awareness campaign to inform passengers on the dangers of boarding or disembarking train while the train is moving. ▪ TRL will develop and implement a *Safety Program* in accordance with the international norms. Underpasses or level crossings should be developed based on the consultations with the public and representatives of local government. ▪ Post visible warning signs at potential points of entry to track areas. ▪ Fencing or other barriers should be installed at station ends and other locations to prevent access to tracks by unauthorized persons. ▪ Stations should be designed in such a way to ensure that the authorized route is safe, clearly indicated and easy to use. ▪ In addition awareness raising campaign should be conducted in the area for the local public to provide them relevant information and increase their awareness on the risks of trespassing.
Impact # 24: Additional pressure and demands on local social services and resources (increase water users, toilet users)	RAHCO shall implement the following measures ▪ Ensure there enough toilets and washrooms at all stations ▪ Ensure availability of clean water at all stations ▪ Construct passenger waiting room ▪ Provide areas for canteen operation
Impact # 25: Vandalism of structures / equipment, theft of materials and portable items	In order to mitigate vandalism tendencies RAHCO shall implement the following measures: ▪ Strengthen patrol of the railway infrastructure ▪ Work with village leadership to get their cooperation to guard the infrastructure ▪ Strengthen community outreach and Corporate Socio Responsibility programmes
NATURAL, ACCIDENTAL AND ANTHROPOGENIC EVENTS	
Impact # 26: Physical damage of project structures and disruption of railway operations and schedules due to natural causes	This project is aimed at mitigating recurrent flood risk as such efforts should be made to implement it In order to protect the environment from natural or accidental events RAHCO shall implement the following mitigation measures: ▪ RAHCO should develop a disaster management program. The main tasks of this programme are: ✓ Introduction and systematic use of methods for analyzing, evaluating and predicting the risks of disasters in practice; ✓ Improve the management and coordination activities for the reduction of disaster risk and increase the resilience of sites of critical infrastructure; ✓ Establishment of an early warning system and notification of disasters; ✓ Improving the quality of management, organization and technical provision of the single rescue system; ✓ Development of systems for seismic surveys and monitoring of water basins and rivers; ✓ Improving the system for training of managerial staff for disaster response; ✓ Public education using modern technologies and media to form a culture of safe life activity.

Impact # 27: Impairment of environmental quality due to accidental events	RAHCO in collaboration with TRL shall implement the following measures: ▪ Carry out continuous research and monitoring to determine the reasons for and reduce the risk of freight train derailment – e.g. the probability that a train will be involved in a derailment is a function of the quality of track, the length of train, and exposure in terms of distance travelled etc. ▪ Implement rail operational safety procedures aimed at reducing the likelihood of train collisions, such as a positive train control (PTC) system. ▪ Conduct regular inspection and maintenance of rail lines and facilities to ensure track stability and integrity in accordance with national and international safety standards. ▪ Implement an overall safety management program that is equivalent to internationally recognized railway safety operations. E.g. the Safety Management System published by the Safety Management in Railways group of the International Union of Railways (IUR). **Accidents related to the transportation of dangerous goods** ▪ TRL should develop and implement a system for the proper screening, acceptance and transport of dangerous goods. ▪ RAHCO should develop spill prevention and control, and emergency preparedness and response plans and ensure its implementation. ***Vegetation*** ▪ TRL and RAHCO should develop and implement a system to rehabilitate areas of damaged vegetation as a result of railway accidents (oil spills, destruction of the soil horizon, etc.) along with implementation of the Emergency Response Plan. ▪ Conduct regular training of the relevant employees for preparedness and timely and effective response to emergency situations.
Impact # 28: Impairment of railway operations as a result of flooding of Gombe Dam	RAHCO shall continuously liaise with operator of the Gombe Dam to ensure that the dam is effectively managed to ensure it does not flood beyond its boundaries
Social Impacts	
Impact # 29: Increased train frequencies and therefore smoothen passenger and cargo movement	In order to enhance the benefits that will result from the implementation of this project TRL and RAHCO shall ▪ Invest in other infrastructure and operational requirements such as procuring more wagons and more engines, improving welfare of workers etc.
Impact # 30: Protection of roads from heavy cargo as is the current practice	In order to improve the usage of railway system to transport cargo instead of roads the following mitigation measure should be considered: ▪ Tanzania should make it mandatory to transport heavy cargo with railway system instead of using road
Impact # 31: Increased income to local suppliers	In order to enhance the benefits that may result from procurement of construction materials and other services from local business people the following measures may be implemented: ▪ RAHCO and TRL will develop a plan aiming at providing opportunities for procurement contracts with local companies in the context of all areas of service requirement during construction and operation
Impact # 32: Employment opportunities	In order to enhance the employment benefits the following measures may be implemented: ▪ RAHCO and TRL will develop and implement a Local Workforce Recruitment Plan aiming at providing opportunities for employment of local workforce. ▪ Information with regard to construction recruitment will be comprehensively and timely communicated to the local community members by contractors.

Impact # 33: Increased income and improved or livelihoods as result of increased agricultural production, trading activities, and movement of people within the region and bordering countries	Measures under Impact # 29 will apply
Impact # 34: Improved comfort of passengers as a result of increased train frequencies	Measures under Impact # 29 will apply
Impact # 35: Improved quality of the landscape features and appearance of the river embankments	▪ River embankment protection will be implemented as planned
Impact # 36: Improved flood management emanating from proper operation of the Gombe Dam	▪ Mitigation measures under Impacts # 28 apply
DECOMMISSIONING	
Impact # 37: Environmental degradation due to haphazard disposal of wastes	▪ Mitigation measures under Impacts #6 and 9 apply
Impact # 38: Loss of employment	In order to minimise the impacts that may result from un-employment the following measures shall be implemented: ▪ RAHCO and TRL shall prepare their workers to be employed elsewhere through regular and periodic training ▪ Ensuring that all employees are members of the Social Security Fund. The employer shall ensure that the company contributions are paid to respective Social Security Fund.
Impact # 39: Loss of income to government	In order to mitigate the impacts on loss of government revenue as a result of decommissioning the railway system (though very unlikely) ▪ The government to develop other transport sectors to compensate for the loss
Impact # 40: Destruction of road infrastructure as the cargo will revert back to current transport system	In order to mitigate the impacts on roads as a result of decommissioning the railway system (though very unlikely) ▪ The government to strictly enforce maximum allowable axle load

Proposed monitoring and auditing

In order to ensure that the proposed mitigation measures are implemented and are effective a monitoring plan has been proposed. This shows the parameters to be monitored, areas for monitoring, frequency of monitoring, target level, responsibility and estimated costs for carrying out the monitoring. The estimated costs are about Tsh 21,000,000 (one off expenditure) and Tsh 134,400,000 per year. In order to ensure that the mitigation measures

are implemented, and are working, RAHCO shall designate an Environmental Control Officer, his/her main task will be to monitor the implementation of the project. RAHCO shall conduct environmental audit of the project as provided in the EMA Act Cap 191.

Resource evaluation or cost benefit analysis

A cost and benefit analysis has been conducted. The project costs have been looked upon in terms of capital expenditures; operating and maintenance costs; staff costs; operations material costs; and Environment, health and other social costs. While the benefits have been assessed in terms of Better operations of the Central railway line; Better servicing and maintenance of the railway line facilities; Protection of road network by transporting the majority of cargo via railway line; Efficient and cheap cargo transportation costs to business people; Increased use of the Dar es Salaam Project by neighbouring land locked countries; Protection of environment and health; and Provision of other social benefits e.g. easy movement of agricultural goods and people. It is estimated that Tsh. 167,000,000 (one off) and Tsh 245,000,000 per year will be used toimplement the mitigation measures. Based on the analysis it has been concluded that the expected benefits outweigh the costs of implementation of the project.

Decommissioning

The EIS has proposed a preliminary decommissioning plan of the scheme. The plan elaborates on different phases of decommissioning starting with pre-decommissioning inventory and identifying relevant institutions for permitting and handling of decommission wastes such as scrap metals and other waste. This preliminary plan will be subject for finalization and approval by designated authority one year before the project decommissioning.

Conclusion

The implementation of proposed flood protection measures for the Central Railway Line will result into both negative and positive impacts. There is no impact that has been considered to be irreversible. Most of the impacts can be mitigated. However, there will be a number of people that will be impacted by the project. RAHCO has developed a preliminary Compensation and Relocation Plan to gauge the extent of affected people and their property. A comprehensive Relocation and Compensation Action Plan shall be developed before the project starts.

LEAD CONSULTANTS

Expert	Responsibility	Signature
Prof. Jamidu Katima	Team Leader and Environmental Management Specialist	
Ms. Saada K. Juma	Environmental and Social Management Framework Specialist	
Eng. Gastory Leonard	Water Resources Management / Irrigation Specialist	
Ms. Mwajuma Nuru	Sociologist	

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ABBREVIATIONS AND ACRONYMS

AD	Anno Domini
ADF	Average Daily Flow
AIDS	Acquired Immunodeficiency Syndrome
APHA	American Public Health Association
AWWA	American Water Works Association
BOD	Biological Oxygen Demand
BP	World Bank Procedures
BRN	Big Results Now
^{o}C	Degree Celsius
CFU	Colony-forming unit
CITES	Convention on International Trade in Endangered Species
CO	Carbon Monoxide
CO2	Carbon Dioxide
COD	Chemical Oxygen Demand
CR	Critically Endangered
dBA	Decibel Absolute
DBH	Diameter at breast height
DC	Direct current
DO	Dissolved Oxygen
E	Endangered
EA	Environmental Audit
EAT	Environmental Appeals Tribunal
EC	Electrical Conductivity
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMA	Environmental Management Act
EMP	Environmental Monitoring Plan
ESIA	Environmental and Social Impact Assessment
ESMaP	Environmental and Social Management Plan
ESMoP	Environmental and Social Monitoring Plan
EW	Extinct in the Wild
Ex	Extinct
FS	Feasibility Study
FTEA	Flora of Tropical East Africa
GDP	Growth Domestic Product
GHG	Greenhouse gas
GIIP	Good International Industry Practice
GoT	Government of Tanzania
GP	World Bank General Procedures
GPS	Global Positioning System
h	Hour
HIV	Human Immunodeficiency Virus
H_2SO_4	Sulphuric Acid
HNO_3	Nitric Acid
IFC	International Finance Corporation
ILO	International Labour Organisation
IP	Indigenous People

IUCN	International Union for Conservation of Nature,
JICA	Japan International Cooperation Agency
KDC	Kilosa District Council
km	Kilometre
lbs	Pounds
LC	Least Concern
LEAP	List of East African Plant
LGA	Local Government Authority
LTPP	Transport Sector Long-Term Perspective Plan
m^3	Cubic Meter
mg/l	Milligrams per litre
mg/lCaC03	Milligrams calcium carbonate per litre (a measure of hardness)
MoT	Ministry of Transport
mm	Millimetres
MoT	Ministry of Transport
NEMC	National Environment Management Council
NEP	National Environmental Policy
NGOs	Non-Government Organisations
NO2	Nitrogen Dioxide
NSGRP	National Strategy for Growth & Reduction of Poverty
NT	Near Threatened
NTU	Nephelometric Turbidity Units
ODS	Ozone Depleting Substances
OP	World Bank Operational Policy
OSHA	Occupational Health and Safety Agency
PCB	PolyChlorinated Biphenyls
pH	Potential of hydrogen (A measure of acidity or alkalinity of water soluble substances)
PPE	Personal Protective Equipment
PtCo/1	Platinum-Cobalt per litre (a measure of colour)
PVC	Polyvinyl Chloride
RAHCO	Reli Assets Holding Company
RCP	Resettlement and Compensation Plan
RMS	Root mean square
RoW	Right of Way
S	South
STDs	Sexually Transmitted Diseases
SUMATRA	Surface and Marine Transport Regulatory Author
TAC	Technical Advisory Committee
TBS	Tanzania Bureau of Standard
TDS	Total Dissolved Solids
TIRP	Tanzania Intermodal and Rail Development Project
TSIP2	Transport Sector Investment Programme Phase 2
ToR	Terms of Reference
TRC	Tanzania Railway Corporation
TRL	Tanzania Railway Limited
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change

URT	United Republic of Tanzania
VU	Vulnerable
VEO	Village Executive Officer
WEF	Water Environment Federation
WQ	Water quality
µS/cm	Micro-Siemens per centimeter (a measure of conductivity)
WRBWO	WAMI/RUVU Basin Water Office

ACKNOWLEGMENTS

The successful preparation of this Environmental and Social Impact Assessment of the Flood Protection Measures for the Central Railway Line Kilosa – Dodoma Section would not have been possible without full participation, commitment and hard work of various stakeholders.

At the outset, I am grateful to the Japan International Cooperation Agency (JICA) for extending financial support that has enabled this study to take place. The Kilosa and Mpwapwa District Executive Directors all District Council Officers in both districts for sharing their technical inputs, views, providing data on biophysical and socioeconomic of the District and for their availability in all public meetings.

I wish to thank Ministries of Works, Transport and Communication; President's Office (Regional Administration and Local Government); Vice Presidents Office (Division of Environment) for their support and inputs during the study.

I wish to thank l Regulatory Authorities (i.e. Surface and Marine Transport Regulatory Author (SUMATRA); Occupational Health and Safety Agency (OSHA), Parastatal Organisations such as Tanzania Railways Limited (TRL); and Local Government Authorities (Kilosa District Council and Mpwapwa District Council); Gulwe Ward, Msagali Ward, Igandu Ward; Mkadage Village, Munisagara Village, Muzaganza Village, Mwasa Village and Kidete Village all in Kilosa District and Godegode Village, Kimagai Village in Mpwapwa.

I am particularly indebted to the team of consultants from JICA Study Team and JSB-EnviDep Ltd of Dar es Salaam for guiding and facilitating the exercise of carrying out this study.

Lastly, but not least, I would like to express my sincere gratitude to the Vice President's Office the National Environment Management Council (NEMC) for their technical inputs, cooperation and guidance during the whole period of undertaking this ESIA study.

Dr. Mussa Iddi Mgwatu
Managing Director

1. GENERAL BACKGROUND TO THE STUDY

1.1.INTRODUCTION

Tanzania has achieved a steady Growth Domestic Product (GDP) of around 7% per year since 2000, resulting in a rapid growth in transport demand, as seen in an increase in cargo throughput at Dar es Salaam Port at an average annual rate of 11% during 2006–12. It is anticipated that the Tanzanian economy will continue to grow at a comparable rate in the medium- to long-term, and that the transport demand will quadruple within the next two decades. In order to meet this rapidly increasing demand, the development of domestic and regional transport infrastructure is a pressing issue that must be dealt with. Due to deteriorating railway infrastructure and inefficient operating standards, however, the freight traffic carried by Tanzania Railways Limited (TRL) declined substantially, from 1.6 million tons in 2002 (carried by the former Tanzania Railways Corporation (TRC)) to 0.15 million tons in 2013. The primary reasons for the deterioration include deferred maintenance and inadequate rolling stock. In addition, the 2010 floods between Kilosa (in the Morogoro Region) and Gulwe (in the Dodoma Region) damaged part of the central railway system, halting train services between Dar es Salaam and Dodoma for more than three months.

Under these circumstances, the World Bank, in collaboration with Reli Assets Holding Company (RAHCO) carried out a Feasibility Study (FS) for the preparation of "Tanzania Intermodal and Rail Development Project (TIRP)" to rehabilitate the Dar es Salaam–Isaka section (this study was completed in March 2013). In addition, the Government of the United Republic of Tanzania (URT) has prepared the "Big Results Now (BRN)" initiative (which is part of the larger strategy for realizing the National Development Vision 2025), the "Transport Sector Long-Term Perspective Plan (LTPP)", the "Five Year Development Plan", as well as the "10-Year Transport Sector Investment Programme Phase 2 (TSIP2)", all with the goal of creating a competitive and reliable transport system. In all of these plans, railway transport systems are given a high priority with the aim of implementing rapid, high-impact, fixes.

The Japan International Cooperation Agency (JICA) has recognized the importance of rehabilitating the Central Railway Line based on the results of the JICA-funded "Comprehensive Transport and Trade System Development Master Plan in Tanzania" (2011-14). The Japanese Government subsequently conducted "The Study on the Central Corridor Railway Revitalization and Energy Efficiency Project" (2012-13), which identified that the flood prone area between Kilosa and Gulwe could be the biggest bottleneck of the entire Central Railway Line, and thus recommended that flood protection measures be a candidate for Japanese assistance, which will complement the World Bank-assisted TIRP.

In light of the Government of Tanzania (GoT)'s programs and already-completed studies, then Ministry of Transport (MoT) of the GOT and JICA discussed the implementation of a study on flood protection measures for the Central Railway Line to evaluate technical, operational, economical, financial, environmental and social elements, under the framework of a feasibility study (FS). Based on the agreements for this Preparatory Survey, JICA has commissioned a joint venture of PADECO Co., Ltd., Nippon Koei Co., Ltd., Japan International Consultants for Transportation Co., Ltd., and Fukken Engineering Co., Ltd. (the "JICA Study Team") to conduct the survey. PADECO Co. Ltd. Sub-Contracted JSB-EnviDep

Ltd. of Dar es Salaam to carry out the Environmental and Social Impact Assessment (ESIA) for the project. The ESIA study took place between 01 May 2015 and 15th January 2016.

1.2. RATIONALE OF THE PROJECT

Development is related at improving the welfare of a society through appropriate social, political and economic conditions. The expected outcomes are quantitative and qualitative improvements in **human capital** (e.g. income and education levels) as well as **physical capital** such infrastructures (utilities, transport, telecommunications). Irrespective of the relative importance of physical versus human capital, development cannot occur without both as infrastructures cannot remain effective without proper operations and maintenance while economic activities cannot take place without an infrastructure base.

Because of its intensive use of infrastructures, the transport sector is an important component of the economy and a common tool used for development. A relation between the quantity and quality of transport infrastructure and the level of economic development is apparent. High density transport infrastructure and highly connected networks are commonly associated with high levels of development. When transport systems are efficient, they provide **economic and social opportunities and benefits** that result in positive multipliers effects such as better accessibility to markets, employment and additional investments. When transport systems are deficient in terms of capacity or reliability, they can have an economic cost such as **reduced or missed opportunities and lower quality of life**.

At the aggregate level, efficient transportation reduces costs in many economic sectors, while inefficient transportation increases these costs. In addition, the impacts of transportation are not always intended and can have unforeseen or unintended consequences. Transport carries an important social and environmental load, which cannot be neglected. Assessing the economic importance of transportation requires a categorization of the types of impacts it conveys. These involve core (the physical characteristics of transportation), operational and geographical dimensions:

- **Core**. The most fundamental impacts of transportation relate to the physical capacity to convey passengers and goods and the associated costs to support this mobility. This involves the setting of routes enabling new or existing interactions between economic entities.
- **Operational**. Improvement in the time performance, notably in terms of reliability, as well as reduced loss or damage. This implies a better utilization level of existing transportation assets benefiting its users as passengers and freight are conveyed more rapidly and with fewer delays.
- **Geographical**. Access to a wider market base where economies of scale in production, distribution and consumption can be improved. Increases in productivity from the access to a larger and more diverse base of inputs (raw materials, parts, energy or labour) and broader markets for diverse outputs (intermediate and finished goods). Another important geographical impact concerns the influence of transport on the location of activities.

The above assessment the importance of an efficient and well functioning railway system cannot be over emphasised.

1.3. RATIONALE OF THE ESIA STUDY

Railway line construction projects are known to cause both positive and negative environmental and social impacts such as vegetation clearance, excavation, use of natural resources, improved cargo and human transportation, increased market access etc. The sustainability of railway transportation system, therefore, depends on taking into consideration of environmental and social effects, among other things, from construction through to operation.

The First Schedule of the Environmental Impact Assessment (EIA) and Audit Regulations, 2005, made under Regulation 6 (1), categorizes this project as a Type A - Project requiring a mandatory EIA; that is, the project is likely to have significant adverse environmental impacts and that in-depth study is required to determine the scale, extent and significance of the impacts and to identify appropriate mitigation measures. According to the "List of Projects Requiring EIA (Mandatory List)" in the First Schedule, item 9 (iii): "Construction of new or expansion to existing railway lines" falls under this category.

RAHCO commissioned JSB EnviDep Ltd. of Dar es Salaam to carry out the ESIA study. In fulfilment of the ESIA procedure, the ESIA Team undertook a scoping study prior to preparation of the ESIA report, as per Environmental Impact Assessment and Audit Regulations. The scoping report and Terms of Reference (ToR) (APPENDIX 1) were approved by the National Environment Management Council (NEMC), vide a letter with Ref. NEMC/HQ/EIA/11/0157/Vol I/4 of 27th August 2015 (see APPENDIX 2).

1.4. SCOPE AND OBJECTIVES OF ESIA STUDY

1.4.1. Scope of ESIA

The scope of the ESIA was in accordance with the Terms of Reference provided and the EIA and Audit Regulations 2005, Part IV and V which stipulates the steps to be followed to carry out EIA and also it provides the contents of the EIA reports. The ESIA scope therefore, largely covered the following areas:

(a) Establishment of Baseline Conditions of the following aspects:
- Environmental setting (climate, topography, geology, hydrology, ecology, water resources, sensitive areas, baseline noise levels, air quality and soil quality measurements etc.),
- Socio-economic activities in the surrounding areas (land use, human settlements, economic activities, institutional aspects, water demand and use, health and safety, public amenities, etc.),
- Infrastructural conditions (roads, water supplies, drainage systems, power supplies, etc.).

(b) Description of the proposed project

(c) Description of legal, policy and administration framework:
- Focusing on the relevant national environmental laws, regulations and by-laws and other laws and policies focusing on allied activities relative to the project in question.

(d) Interactive approach was adopted for the immediate neighbourhood in discussing relevant issues including among others:
- Land use aspects,
- Neighbourhood issues,
- Project acceptability,
- Social, cultural and economic aspects,

(e) Identification of environmental and social impact, their significance and mitigation measures: Physical impacts, Biological impacts, Social impacts Legal Compliance.
(f) Development of environmental management and monitoring plan outlines.

The scope covered various activities related to; construction works of the proposed development which included ground preparation, construction / relocation of the railway line, operation of the railway line and decommissioning of the same.

1.4.2. General objectives of carrying out ESIA

Part IV of the EIA and EA Regulations of 2005 provides the general objectives for conducting the EIA, namely:

- To ensure that environmental considerations are explicitly addressed and incorporated into the development decision making process;
- To anticipate and avoid, minimise or offset the adverse significant biophysical, social and relevant effects of developmental proposal;
- To protect the productivity and capacity of natural systems and ecological processes which maintain their functions;
- To promote development that is sustainable and optimises resources use and management opportunities;
- To establish impacts that are likely to affect the environment before a decision is made to authorise the project; and
- To enable information exchange, notification and consultations between stakeholders.

1.4.3. Objectives of this study

The objectives of carrying out this study were
- to identify the potential environmental and social impacts associated with the implementation of flood protect measures;
- to evaluate the significance of these impacts;
- to propose methods for mitigating the significant impacts;
- to develop an environmental and social management plan that will guide the project from design to operation; and
- to develop an environmental and social monitoring plan that will be used to assess efficacy of the proposed mitigation measures.

1.5. ESIA Process

In Tanzania, the Environmental and Social Impact Assessment (ESIA) is undertaken according to specific procedures, as determined by the Environmental Management Act, Cap.

191. Main steps and actors are stipulated in the Environmental Impact Assessment and Audit Regulations, 2005, while the Environmental (Registration of Environmental Experts) Regulations, 2005 require ESIAs to be undertaken by certified and registered EIA experts or firms. The ESIA process for the Flood Protection Measures for the Central Railway Line, reflected in Figure 1, involved the following steps:

1. **Application for EIA Certificate and Project Registration**
   Project was registered at NEMC in May 2015.

2. **Screening**
   NEMC screening decision was that a full EIA should be undertaken.

3. **Scoping and ToR**
   Scoping was done between May and June 2015. NEMC approved the scoping and TOR vide letter Ref NEMC/HQ/EIA/11/0157/Vol I/4 of 27th August 2015. The approved ToR is shown in Appendix 2.

4. **Public Participation**
   Was initiated by JSB-EnviDep Ltd. during scoping (May 2015) and was further carried out by JSB through detailed baseline survey and Resettlement and Compensation Plan (RCP) plan survey (presented in a standalone report) which were conducted between November – December 2015.

5. **Impact Assessment**
   JICA Study Team subcontracted JSB-EnviDep ltd. of Dar es Salaam to carry out this Environmental and Social Impact Assessment (ESIA).

   The preparation of ESIA study report followed approval of the ToR, to identify likely impacts, assess and evaluate their severity and magnitude and proposed mitigation measures to minimize potential negative impacts and enhance positive benefits. This ESIA report has been prepared according to contents and format prescribed by the EIA regulations and includes an environmental management plan, a monitoring plan and a non-technical executive summary in English and Kiswahili. The following steps will follow after RAHCO submits the EIS:

6. **Disclosure**
   According to JICA requirement the EIS contents were disclosed to the public between 22nd and 24th February 2016. No major issue was raised, see Appendix 7 for the minutes.

7. **Review**
   The EIS shall be reviewed by a cross-sectoral Technical Advisory Committee (TAC)[1] at national level (and at Local Government Authority (LGA) as appropriate). Prior to TAC meeting with RAHCO / Consultant a site visit will be conducted to verify

[1] The TAC is composed of not less than 12 multi-disciplinary specialists from sectors responsible for environment and resource management, those that are currently the focus for investment and relevant research institutions. TAC is crucial in enhancing required technical credibility, institutional and interagency coordination, accountability and transparency in deciding the fate of a project.

information provided in the EIS. The public[2] is notified of the EIS to present their views and comments and these are collected by NEMC for the TAC consideration.

8. **Environmental decision of the Minister –** NEMC shall submit a report of the EIS review to the Minister responsible for environment to give a decision based on NEMC recommendations and advice from Director of Environment. The outcome of the review can be "EIS approval", "EIS approval subject to specified conditions" or "EIS not approved". For the latter two cases RAHCO shall be issued with a decision letter signed by the Minister while for approved EIS, RAHCO shall be issued an EIA Certificate in Form No. 3.

9. Appeals– Any person who is aggrieved (both RAHCO and the affected or interested parties) have the right to appeal. If there is dissatisfaction of any decision reached, he/she has the right to appeal to the Environmental Appeals Tribunal (EAT) within 30 days after the date of the decision. If not satisfied by EAT decision or order, the aggrieved my appeal to the High Court.

10. Project implementation – This is to be conducted by RAHCO (and contractors) according to the terms and conditions of approval guided by the environmental management plans.

11. Monitoring and auditing – RAHCO and the government (NEMC in consultation with sector Ministry, department, agency or institution) have the responsibility to undertake monitoring. This includes verification of impacts, adherence to approve plans, mitigation measures and general compliance of terms and conditions. Environmental audits shall be undertaken to provide feedback on the EIA process and effectiveness of the management plan.

12. **Decommissioning –** This is the end of the project life. RAHCO shall prepare and submit to NEMC a decommissioning report indicating its commitment to rehabilitating the site.

[2]Public hearing as part of the review process may be necessary whenever a strong public concern over the undertaking has been raised and impacts are far reaching.

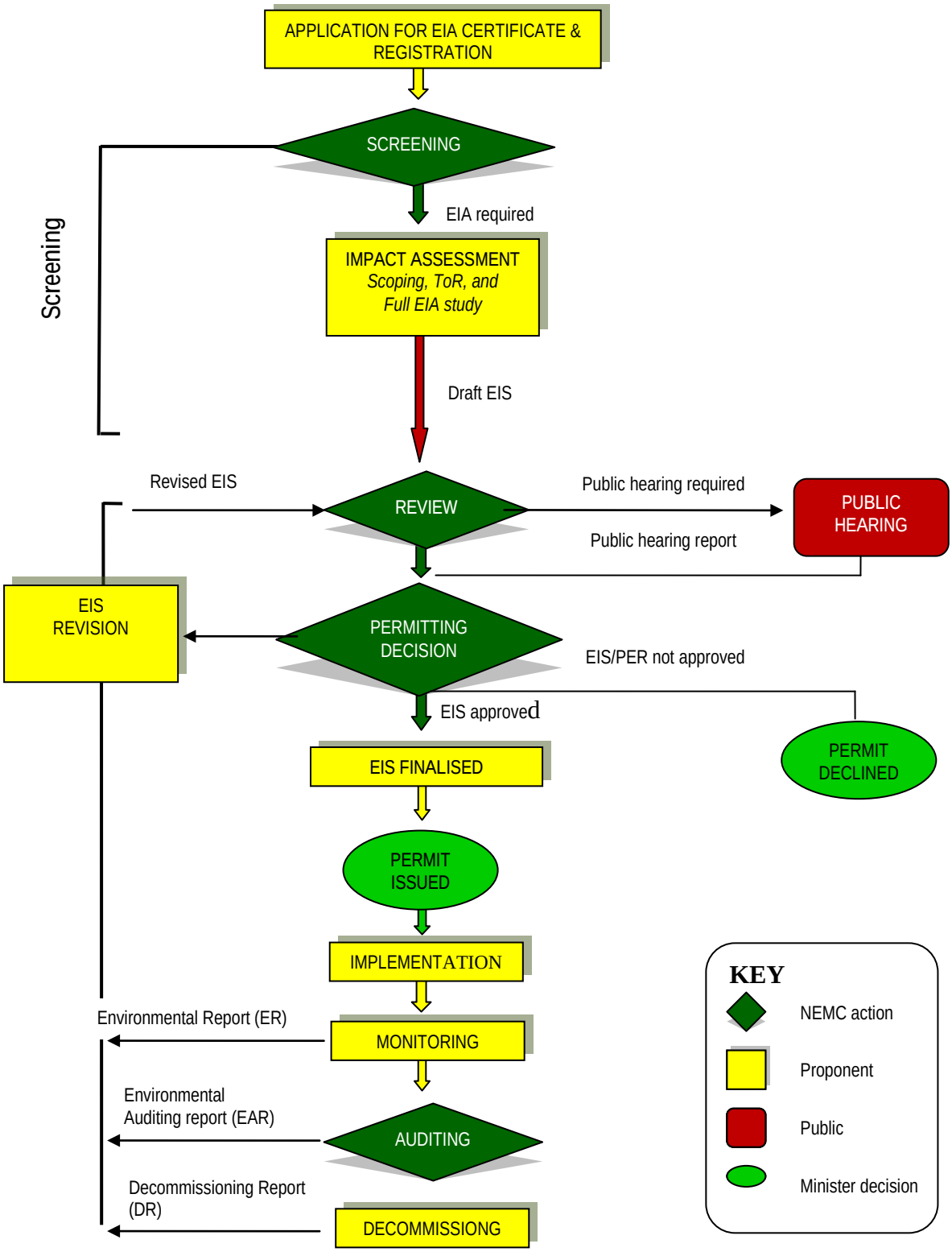


Figure 1: Main steps in the EIA process in Tanzania

1.6.METHODOLOGY OF CARRYING OUT ESIA

1.6.1. Study Team

The study was carried out by the team of experts shown in Table 1 (Their CVs can be found in the Scoping Report).

Table 1: Study Team

Expert	Responsibility
Prof. Jamidu Katima	Team Leader and Environmental Management Specialist
Ms. Saada K. Juma	Assistant Team Leader and Environmental and Social Management Specialist
Ms. Mwajuma Nuru	Socio-Economic Assistant
Eng. Gastory Leonard	Water Resources Management Specialist
Dr. Ben Benno	Ecology Specialist
Dr. Anthony Nahonyo	Wildlife Specialist
Eng. Francis Mutabazi	Soil Expert
Dr. Elgidius Ichumbakii	Archaeology and Cultural Heritage Specialist
Mr. Frank Mbago	Plant Specialist
Mr Pastory Mugisha	Sociologist

1.6.2. General Overview

The study followed the guidelines provided in the Environment Impact Assessment and Audit Regulations G.N. 349 of 2005. The study was done partly as (i) a desktop study involving review of literature and documents related to the projects, technical meetings with the project design team and project proponent (ii) field survey of the project sites, namely Kilosa District Council and Mpwapwa District Council; Gulwe Ward, Msagali Ward, Igandu Ward; Mkadage Village, Munisagara Village, Muzaganza Village, Mwasa Village and Kidete Village all in Kilosa District and Godegode Village, Kimagai Village in Mpwapwa; to gather information and data on various environmental and social aspects of the project site as well as consultations with key stakeholders (iii) stakeholders consultations both at local level (i.e. project area) and national level (iv) analysis of data using mainly expert judgement (v) compilation of reports (vi) presentation of the report to the Technical Advisory Committee). The study adopted the following approach, to identify, collect and analyse information:

- ***Baseline data and stakeholders involvement***

Extending the activities that were started by the study including involvement of key stakeholders and collecting baseline data on both natural and built environment including

socio-economic conditions of the proposed project area, mainly from secondary sources and site visits. The consulted stakeholders and their signatures are presented in Volume II. A summary of issues raised by stakeholders is presented in Chapter 5 the details of which are found in APPENDIX 4.

- ***Impact Assessment***

Impact Assessment was done by superimposing project facilities onto the existing environmental conditions of the project site. This involved analysing the data for identification, prediction and evaluation of foreseeable impacts, both beneficial and adverse, of the proposed investment using checklists, simple matrices and expert judgement; and reference to standards and guidelines.

The impact assessment included three principal components or steps, the identifying the impacts, evaluating the significance, and proposing mitigation measures, preparation of Environmental Management and Monitoring Plans and consolidation of the findings in the Environmental Impact Statement. These steps are briefly described below.

1.6.3. **Impact Identification and Evaluation Criteria**

For each impact, the EXTENT (spatial scale), MAGNITUDE and DURATION (time scale) is described. These criteria are used to ascertain the SIGNIFICANCE of the impact, firstly in the case of no mitigation and then with the most effective mitigation measure(s) in place. The mitigations represent the full range of plausible and pragmatic measures. The Project Proponent is committed to see these measures are implemented.

The Table 2 -Table 6 below show the scale used to assess these variables, and define each of the rating categories.[3]

Table 2: Criteria for rating of severity of Impacts

Criteria	Category	Description
Extent or spatial influence of impact	Regional	Beyond a 5 km radius of the candidate site.
	Local	Within a 5 km radius of the candidate site.
	Site specific	On site or within 100 m of the candidate site.
Magnitude of impact (at the indicated spatial scale)	High	Natural and/ or social functions and/ or processes are severely altered
	Medium	Natural and/ or social functions and/ or processes are notably altered
	Low	Natural and/ or social functions and/ or processes are slightly altered
	Very Low	Natural and/ or social functions and/ or processes are negligibly altered
	Zero	Natural and/ or social functions and/ or processes remain unaltered
Duration of impact	Construction period	Up to 2 years
	Short Term	Up to 5 years after construction
	Medium Term	5-15 years after construction
	Long Term	More than 15 years after construction

[3] http://www.eskom.co.za/content/Tutuka%20Brine%20Evaporation_Ann%20C%20Assessment%20methodology.pdf

The SIGNIFICANCE of an impact is derived by taking into account the temporal and spatial scales and magnitude. The means of arriving at the different significance ratings is explained in Table 3.

Table 3: Definition of significance ratings

Significance rating	Level of Criteria Required
High	• High magnitude with a regional extent and long term duration • High magnitude with either a regional extent and medium term duration or a local extent and long term duration • Medium magnitude with a regional extent and long term duration
Medium	• High magnitude with a local extent and medium term duration • High magnitude with a regional extent and construction period or a site specific extent and long term duration • High magnitude with either a local extent and construction period duration or a site specific extent and medium term duration • Medium magnitude with any combination of extent and duration except site specific and construction period or regional and long term • Low magnitude with a regional extent and long term duration
Low	• High magnitude with a site specific extent and construction period duration • Medium magnitude with a site specific extent and construction period duration • Low magnitude with any combination of extent and duration except site specific and construction period or regional and long term • Very low magnitude with a regional extent and long term duration
Very Low	• Low magnitude with a site specific extent and construction period duration • Very low magnitude with any combination of extent and duration except regional and long term
Neutral	• Zero magnitude with any combination of extent and duration

Once the significance of an impact has been determined, the PROBABILITY of this impact occurring as well as the CONFIDENCE in the assessment of the impact was determined using the rating systems outlined in Table 4 and Table 5, respectively. Lastly, the REVERSIBILITY of the impact is estimated using the rating system outlined in Table 6.

Table 4: Definition of probability ratings

Probability Ratings	Criteria
Definite	Estimated greater than 95 % chance of the impact occurring.
Probable	Estimated 5 to 95 % chance of the impact occurring.
Unlikely	Estimated less than 5 % chance of the impact occurring.

Table 5: Definition of confidence ratings

Confidence Ratings	Criteria
Certain	Wealth of information on and sound understanding of the environmental factors potentially influencing the impact.
Sure	Reasonable amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact.
Unsure	Limited useful information on and understanding of the environmental factors potentially influencing this impact.

Table 6: Definition of reversibility ratings

Reversibility Ratings	Criteria
Irreversible	The activity will lead to an impact that is in all practical terms permanent.
Reversible	The impact is reversible within 2 years after the cause or stress is removed.

Presences of human settlement features in villages along the project corridor create the possibility for cumulative effects. The assessment also considers the contribution to local and national environmental and socio-economic issues as well as global environmental issues of air quality.

1.6.4. **Mitigation Measures and Management Controls**

Identifying and proposing mitigation measures that aim at eliminating or minimising the potential negative impacts and promote positive ones using expert judgment.

a) ESMaP and ESMoP - Preparing the Management and Monitoring Plans for ease of reference and follow ups during project implementation.

b) Preparation of the EIS - Presenting the information which involved writing the Environmental Impact Statement (EIS).

1.6.5. **Criteria for Selecting Monitoring Frequency**

The amount and frequency of monitoring will be determined by the data needed to determine risk, quantitative status, and where necessary to support the design and assessment of a program of measures. In general, more frequent monitoring would be preferred (particularly when data is immediately needed to influence ongoing activities e.g. during mobilization and construction phase). Six months and annual monitoring would in general be the minimum acceptable standard particularly when the changes will take time to be noticed and when assessing the efficacy of the mitigation measures.

1.7. **REPORT STRUCTURE**

This report is organized in twelve chapters. Chapter 1 gives a general background to the study; Chapter 2 deals with the project background and description; Chapter 3 gives a description of policy, administrative and legal framework within which the project will operate; and Chapter 4 presents the baseline or existing conditions of the project site. Chapter 5 presents the findings of the Stakeholders' consultation and public participation.

Chapter 6 presents the assessment of impacts and identification of alternatives for the project and project operations. The chapter presents an assessment of aspects of the project that can cause environmental and socio-economic impacts. The chapter also determines the scale of the impacts and evaluate the significance of each in terms of defined criteria. Sources of both negative and positive impact are presented. This is followed by impact quantification. Mitigation measures are provided for impacts considered significant.

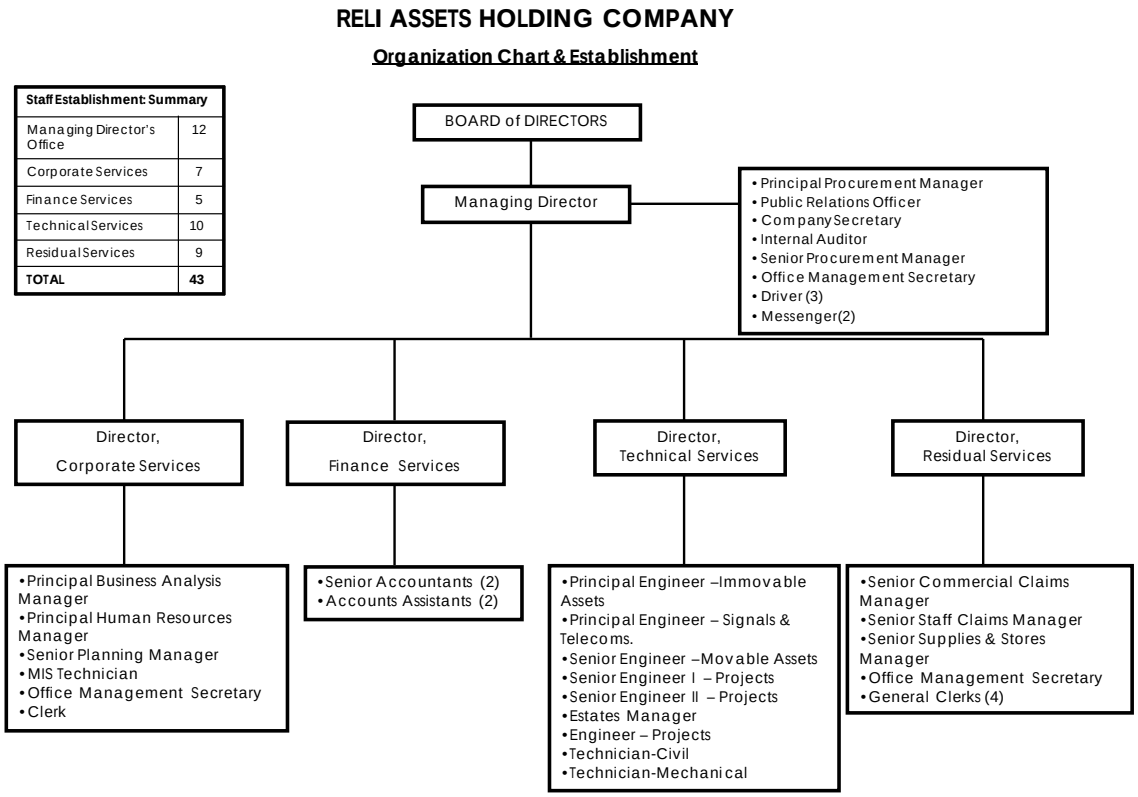
Chapter 7 gives details of mitigation measures which are summarised in Chapter 8 as Environment and Social Management programme (ESMaP). Chapter 9 presents the Environment and Social Monitoring Programme (ESMoP). Chapter 10 discusses cost benefit analysis while Chapter 11 presents an initial decommissioning plan. Chapter 12 provides conclusions and recommendations of the project.

2. PROJECT BACKGROUND AND DESCRIPTION

2.1. PROJECT PROPONENT AND HISTORY

2.1.1. Project Proponent

RAHCO was formed under the Railway Act No.4 of 2002 and became operational in September 2007, principally as a landlord of railway infrastructure on behalf of the government. RAHCO is governed by the Board of Directors and its day-to-day management is entrusted to the Managing Director. It has four departments: (i) Corporate Services, (ii) Finance Services, (iii) Technical Services, and (iv) Residual Services (Figure 2). While there are 43 established positions, the number of payroll staff at RAHCO is 46, of which 13 are in the Managing Director's Office, 13 in the Corporate Services, 6 in the Finance Services, 9 in the Technical Services, and 5 in the Residual Services, as of December 2015. There is only one office of RAHCO, which is located in Dar es Salaam.



Source: RAHCO

Figure 2: Organizational Structure of RAHCO

The main roles and functions of RAHCO are:

(i) to secure the provision of or to provide infrastructure;
(ii) to enter into agreement with other entities in order to secure the provision of rail transport services whether by means of concession, joint venture, public/private partnerships or other means; and
(iii) to delegate its own function of providing rail transport services to one or more railway operators.

2.1.2. Project History

Tanzania has achieved a steady Growth Domestic Product (GDP) of around 7% per year since 2000, resulting in a rapid growth in transport demand, as seen in an increase in cargo throughput at Dar es Salaam Port at an average annual rate of 11% during 2006–12. It is anticipated that the Tanzanian economy will continue to grow at a comparable rate in the medium- to long-term, and that the transport demand will quadruple within the next two decades. In order to meet this rapidly increasing demand, the development of domestic and regional transport infrastructure is a pressing issue that must be dealt with. Due to deteriorating railway infrastructure and inefficient operating standards, however, the freight traffic carried by Tanzania Railways Limited (TRL) declined substantially, from 1.6 million tons in 2002 (carried by the former Tanzania Railways Corporation (TRC)) to 0.15 million tons in 2013. The primary reasons for the deterioration include deferred maintenance and inadequate rolling stock. In addition, the 2010 floods between Kilosa (in the Morogoro Region) and Gulwe (in the Dodoma Region) damaged part of the central railway system, halting train services between Dar es Salaam and Dodoma for more than three months.

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2.1.3. Project Rationale and Sustainability

Rationale

One of the key factors that play a pivotal role in a country's economic growth is the presence of a reliable and efficient transportation system, this is mainly due to the fact that a well-developed transportation system provides adequate access countrywide which in turn is a necessary condition for the efficient operation of agriculture, manufacturing, retail, labour and housing markets. Transportation is a critical factor in the economic growth and development. It is a wealth creating industry on its own. Inadequate transportation limits a nation's ability to utilise its natural resources, distributes foods and other finished goods, integrate the manufacturing and agriculture sectors and supply education, medical and other infrastructural facilities. Of all transport mode railway transportation systems stands out to be a backbone of all world economies. As such when the railway system is not working properly it exerts pressure on road infrastructure with significant financial and environmental consequences. Because of frequent flooding coupled with other factors the Central Railway System has not been operating efficiently since 2009 when TRC/TRL registered a decline in the performance of freight and passenger traffic, as well as locomotive availability, and a rise in the number of accidents during the period 2003 to 2008.

Freight traffic declined by 70% from 1,442,713 tonnes transported in 2003 to 431,485 tonnes transported in 2008. The number of passengers declined from 683,681 in 2003 to 458,819 in 2008. Average train speeds declined from 30 to 27.3 km/hr on passenger trains and 15.9 to 13.3 km/hr on freight transport during the same period. Similarly, mainline locomotive availability declined from 59 locomotives in 2003 to 38.8 locomotives in 2008 and the number of broken rails incidences increased from 259 in 2003 to 316 in 2008 (RAHCO, 2009).

In order to reverse this situation, RAHCO is preparing Tanzania Intermodal and Rail Development Project (TIRP) aimed at improving the performance of Tanzania Railways Limited (TRL) (management and operational) in carrying out intermodal transport services along the Central Corridor and hence increase its market share within the transport sector as well as improve its financial self-sustainability. This Flood Protection Measures Project is an essential component for the success of this project.

Sustainability

The existing railway system was built in 19……. Except for the frequent floods which hamper its operation the railway has been working effectively until when its reliability started to decline in 2003. The cargo transported which is the main stay of any railway system worldwide also started falling. It is anticipated that with increased reliability, and current government commitment to revert to railway as the main means of transporting heavy cargo the project 's sustainability is certain.

2.2. PROJECT LOCATION AND ACCESSIBILITY

2.2.1. Location

The project area is located between Kilosa (at 283km) and Dodoma (at 457km) on the Central Railway Line, and surrounding areas, see Figure 3. Hydrologically, the project area is located within Wami/Ruvu water basin on the eastern side of Tanzania. The Wami basin extends between 5° and 7° Latitudes, South and between 36° and 39° Longitudes, East.

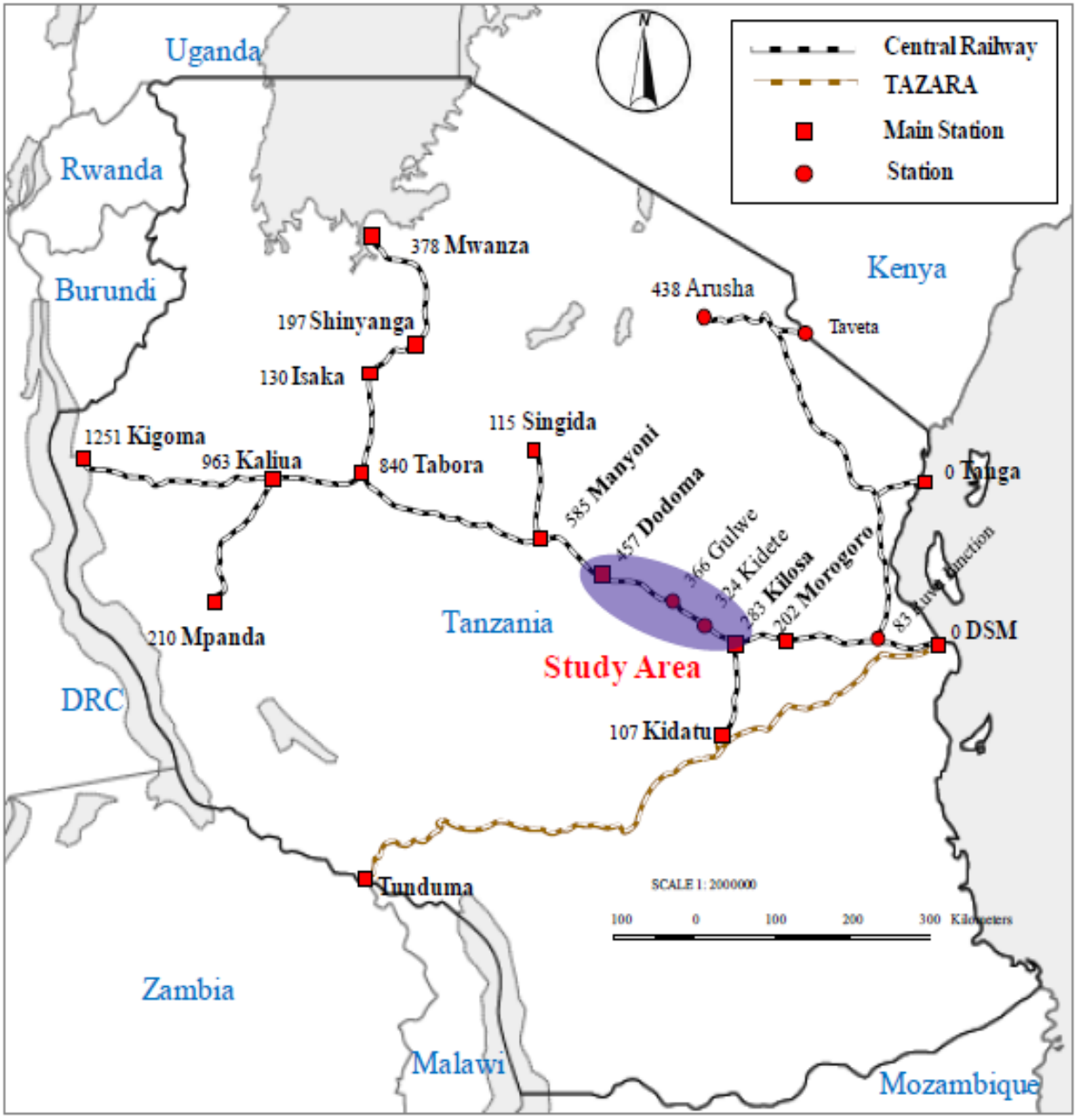

Figure 3: Location map of the project area
Source: JICA Study Team Project documents

Figure 4 shows the actual project corridor

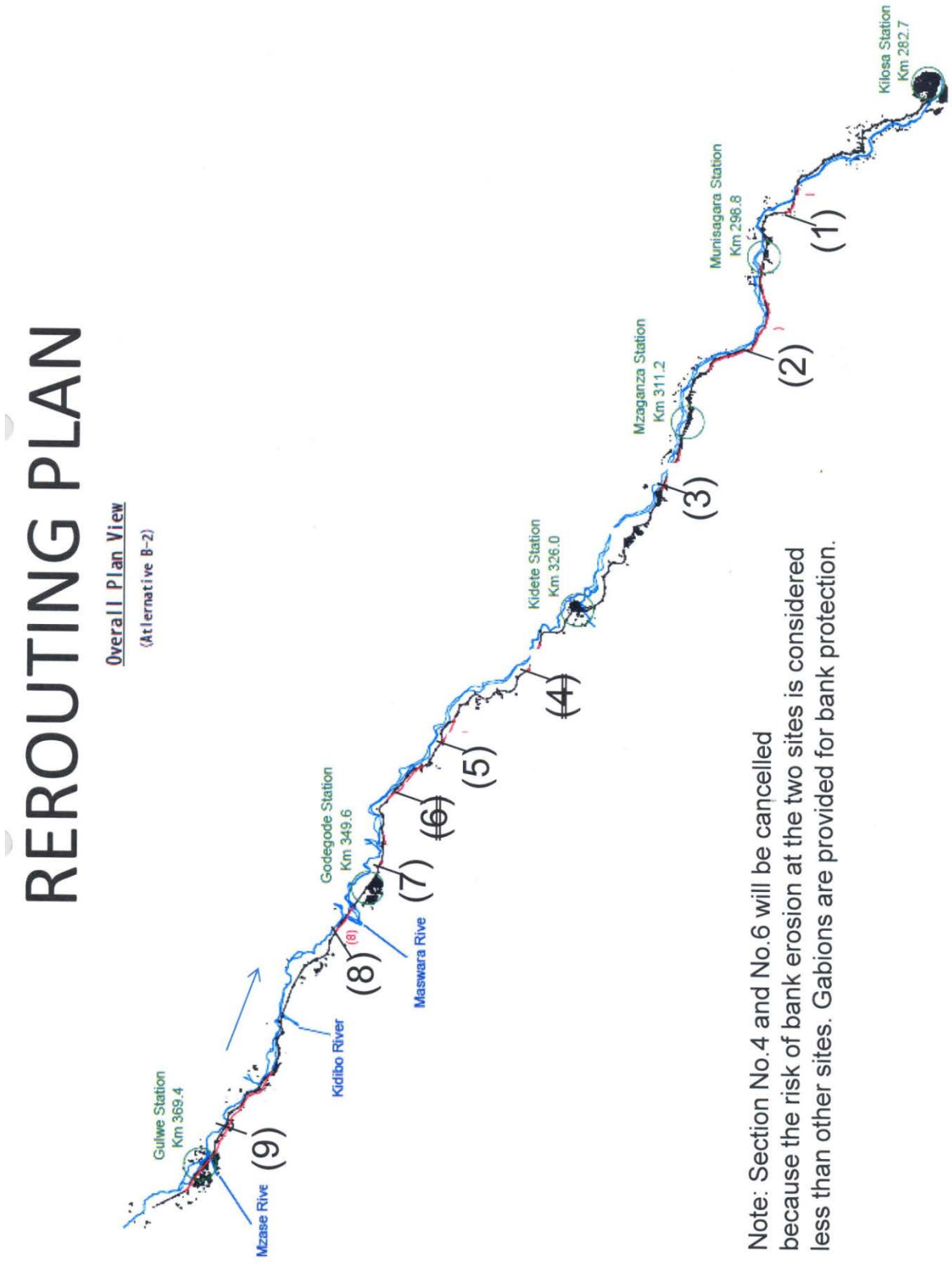

Figure 4: Actual project route

Source: JICA Study Team Project documents

2.2.2. Accessibility

The project sites can be easily accessed by either railway running from Dar es Salaam to Kigoma and Mwanza, or by road.

2.3. PROJECT SCOPE

2.3.1. Project Components

The project has 7 main components, namely

a) Rerouting;
b) River bank protection works;
c) Channel works;
d) Renewal of rails / track materials;
e) Track rictification;
f) Construction of temporary access road; and
g) Housing land development

2.3.1. Details of the Main Project Components

The project area covers a 60 meters wide corridor along the central railway line from Kilosa Station to Km 371.6 near Gulwe station, a total distance 88.9 km. The details of each project component is provided below.

Rerouting

This component covers area that the horizontal distance from bank shoulder to the existing rail is less than 110m, extent of river bank erosion is very progressive and band height at subject of erosion is higher than 3.0m. The total length of rerouted sections is 25km (see **Error! Reference source not found.**). The available of alternative for such areas is to relocate the rail track to an area of high risk. Figure 4 shows the total rerouting plan and Figure 5 - Figure 18 show the entire project depicting different intervention measures.

Table 7: Length of rerouted sections

Section	Re-Setting Kilo* (km)		Length (km)	
	Start	End	Existing section	Rerouted section
1	293.7	295.5	1,804	1,860
2	302.0	308.0	5,994	5,991
3	313.3	316.0	2,764	2,775
5	337.3	339.2	1,913	1,766
7	346.2	348.0	1,760	1,862
8	351.0	352.8	1,801	1,815
9	362.4	371.6	9,154	9,066
Total			25,190	25,134

Table 8: Coordinates of the selected route

Railway Section to be Relocated

Starting point	Ending point	Length	Length after relocation	
※the points show the calculated km post on the existing track.				
Alternative B-2 (Figure 19)				
293750.000	295481.600	1731.600	1822.019	1
302000.000	307958.014	5958.014	5957.469	2
313284.446	316048.057	2763.611	2777.164	3
				4
337296.458	339209.541	1913.083	1765.704	5
				6
346243.248	348003.696	1760.448	1862.533	7
351048.323	352800.000	1751.677	1766.087	8
362428.807	371553.379	9124.572	9038.674	9
Total		25003.005	24989.650	

River bank protection

River bank protection will be implemented on all sections identified to be prone to very serious and progressive erosion. Bank protection will mainly be done by installing gabions (see Figure 20) or concrete blocks. The sections that will be subjected to bank protection are shown in **Error! Reference source not found.**.

Table 9: River bank protection sections

Item	Station	Section Length (m)	Station	Section Length (m)
Section 1	km297.4 - km 298.15	750	km 297.45 - km 298.11	710
Section 2	km 298.5 - km 299.0	500	km 298.42 - km 298.99	450
Section 3	km 300.2 - km 300.45	250	km 299.75 - km 300.45	700
Section 4	km 302.85 - km 303.41	300	km 300.88 - km 301.38	550
Section 5	km 303.1 - km 303.45	350	km 302.08 km 303.48	1,380
Section 6	km 304.1 - km 304.5	350	km 304.14 - km 304.67	500
Section 7	km 306.0 - km 306.5	500	km 305.96 - km 306.60	650
Section 8	km 308.6 - km 310.1	1,500	km 308.96 - km 309.48	570
Section 9-1	km 310.2 - km 312.0	1,800	km 311.15 - km 311.71	580
Section 9-2	km 312.0 - km 314.2	2,200	km 312.60 - km 313.37	770
Section 10	km 315.2 - km 316.9	1,700	km 315.32 - km 317.04	1,720
Section 11-1			km 328.29 - km 328.52	330
Section 11-2	km 330.1 - km 330.6	500	km 329.98 - km 331.03	1,100
Section 11-3			km 331.62 - km 332.40	830
Section 12	km 339.7 - km 340.2	500	km 339.92 - km 340.32	420
Section 13	km 341.6 - km 342.8	1,200	km 341.43 - km 343.20	1,760
Section 14	km 343.2 - km 344.7	1,500	km 343.20 - km 343.88	800
Section 15	km 345.0 - km 345.25	250	km 344.92 - km 345.23	230
Section 16			km 359	230
Total		**14,150**		**14,280**

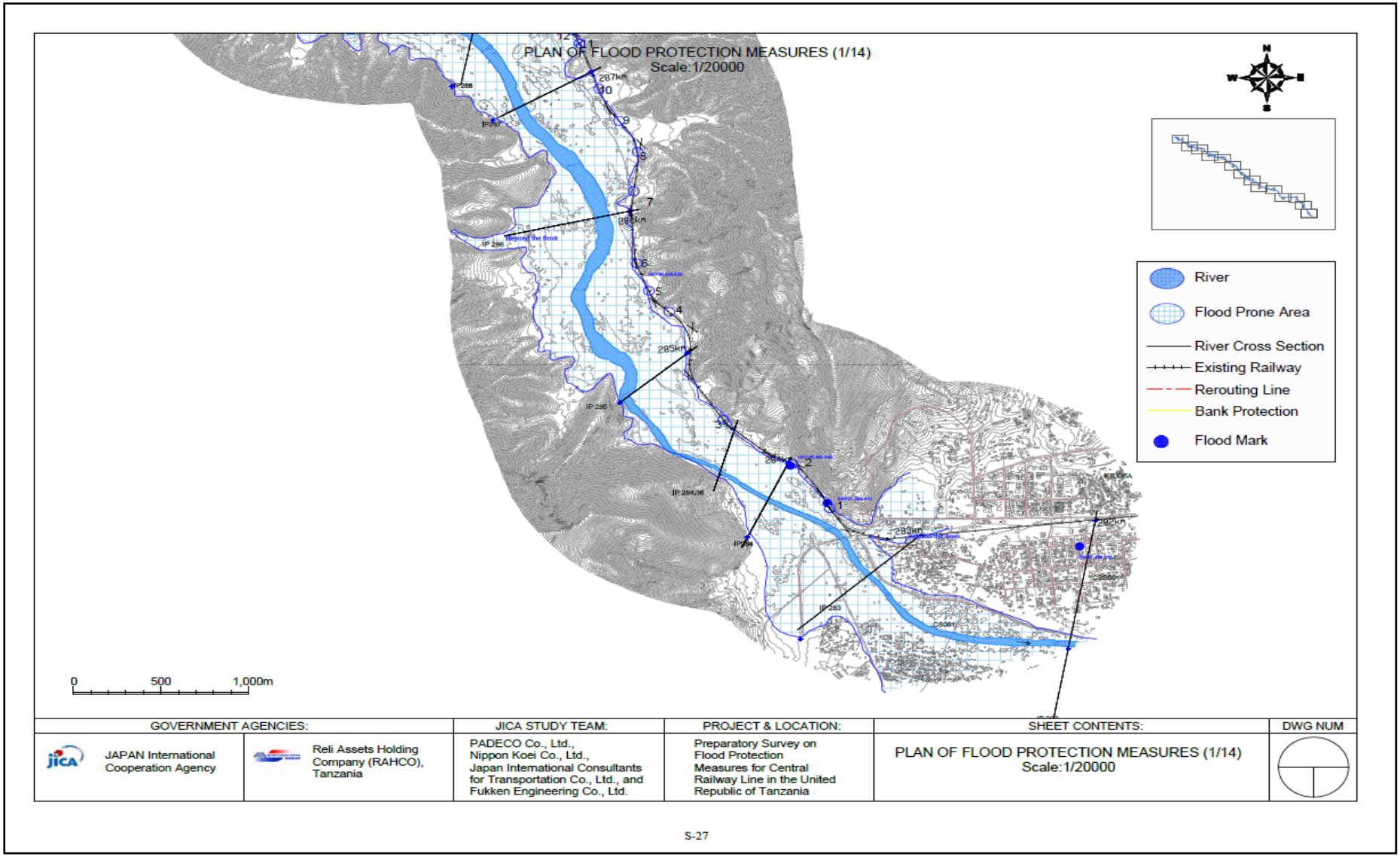

Figure 5: Project layout – Section 1

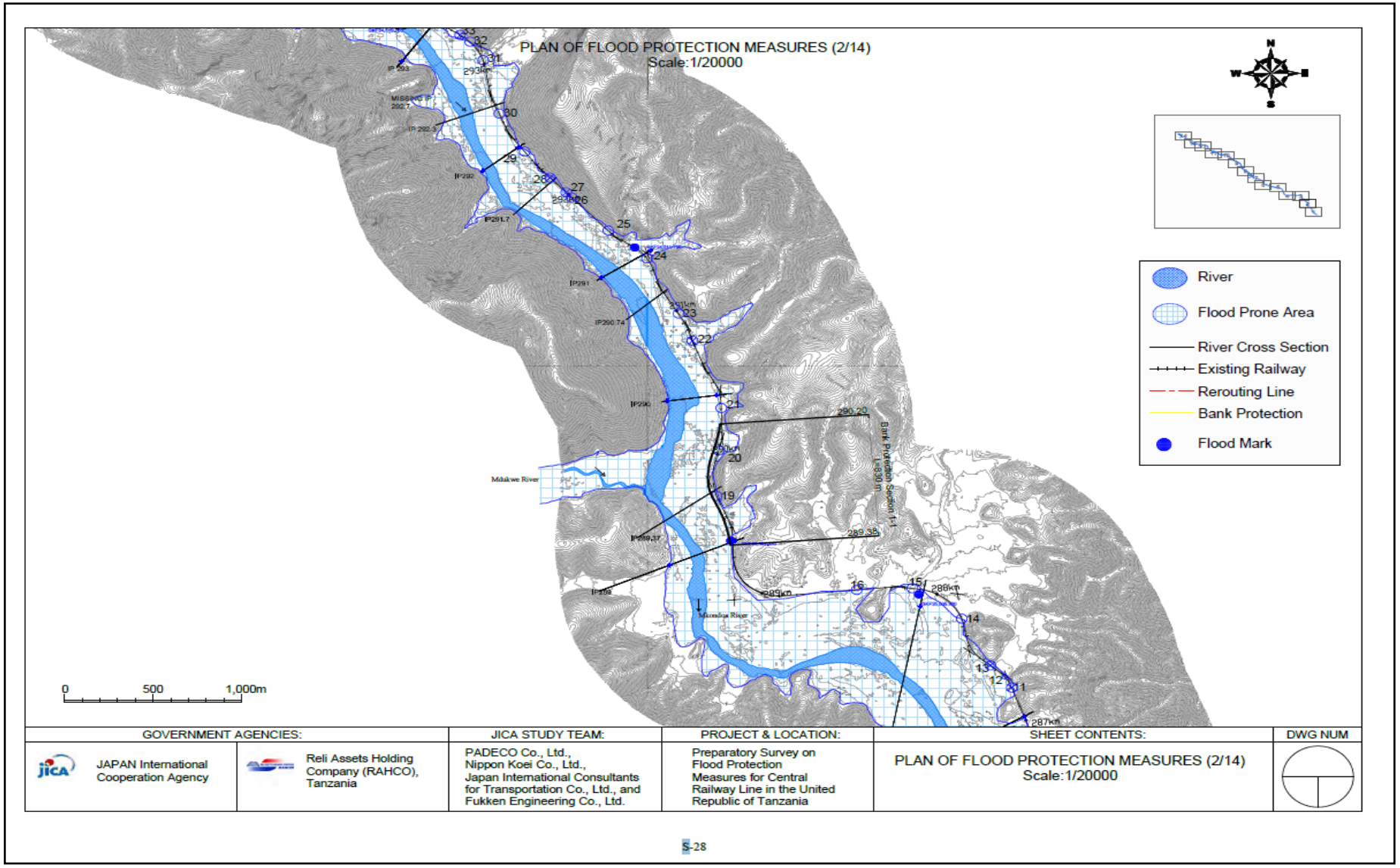

Figure 6: Project layout – Section 2

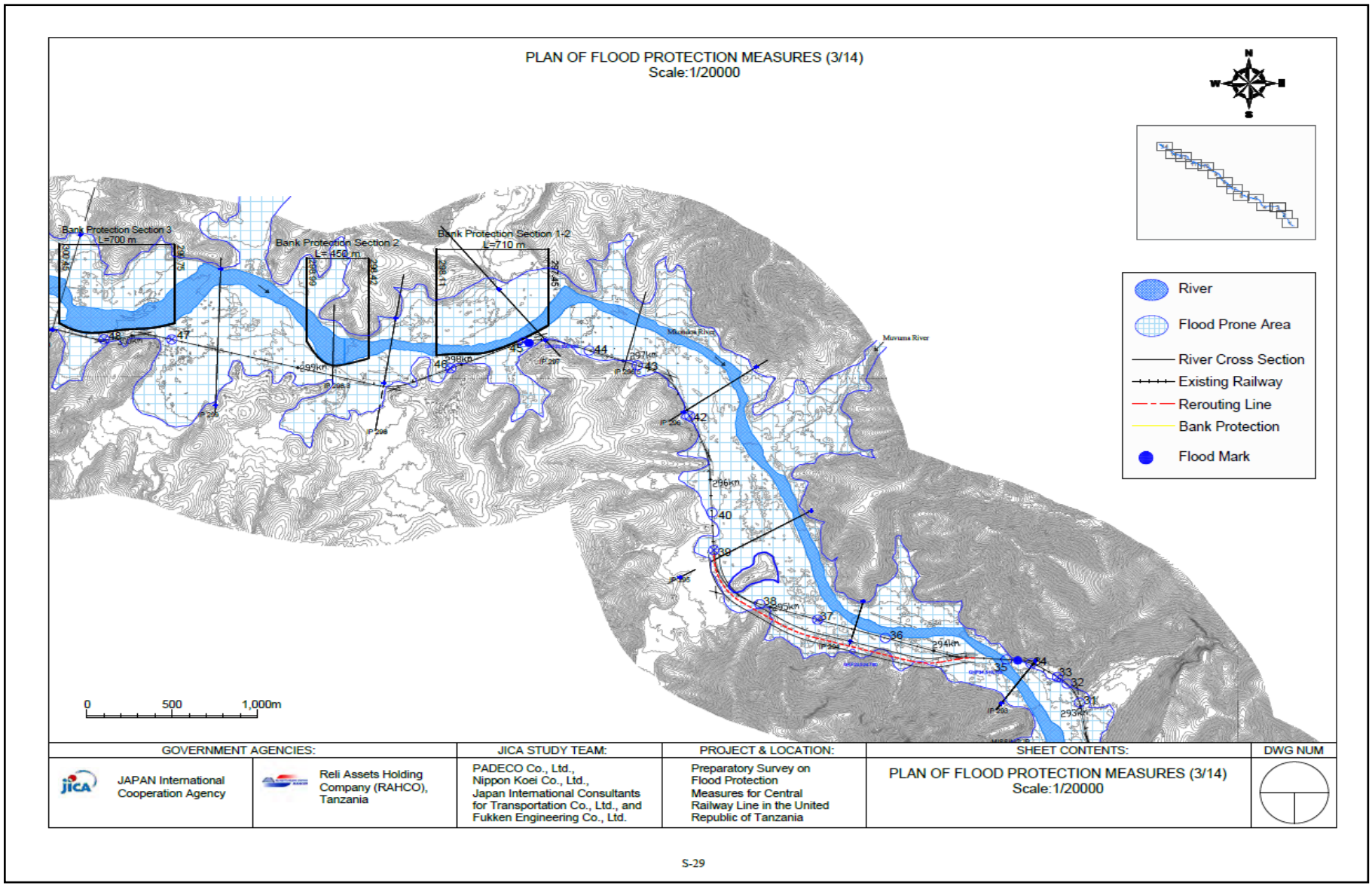

Figure 7: Project layout – Section 3

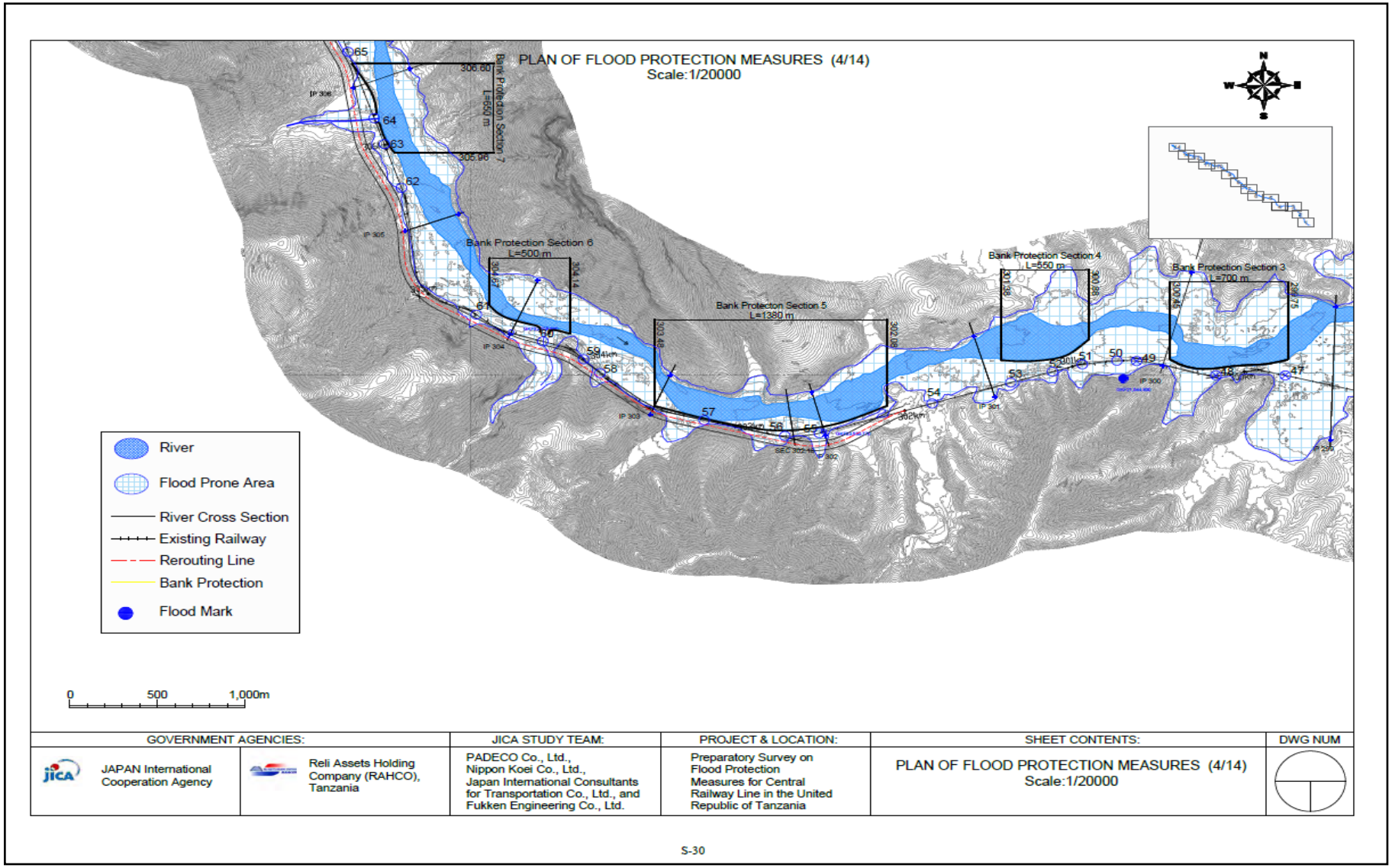

Figure 8: Project layout – Section 4

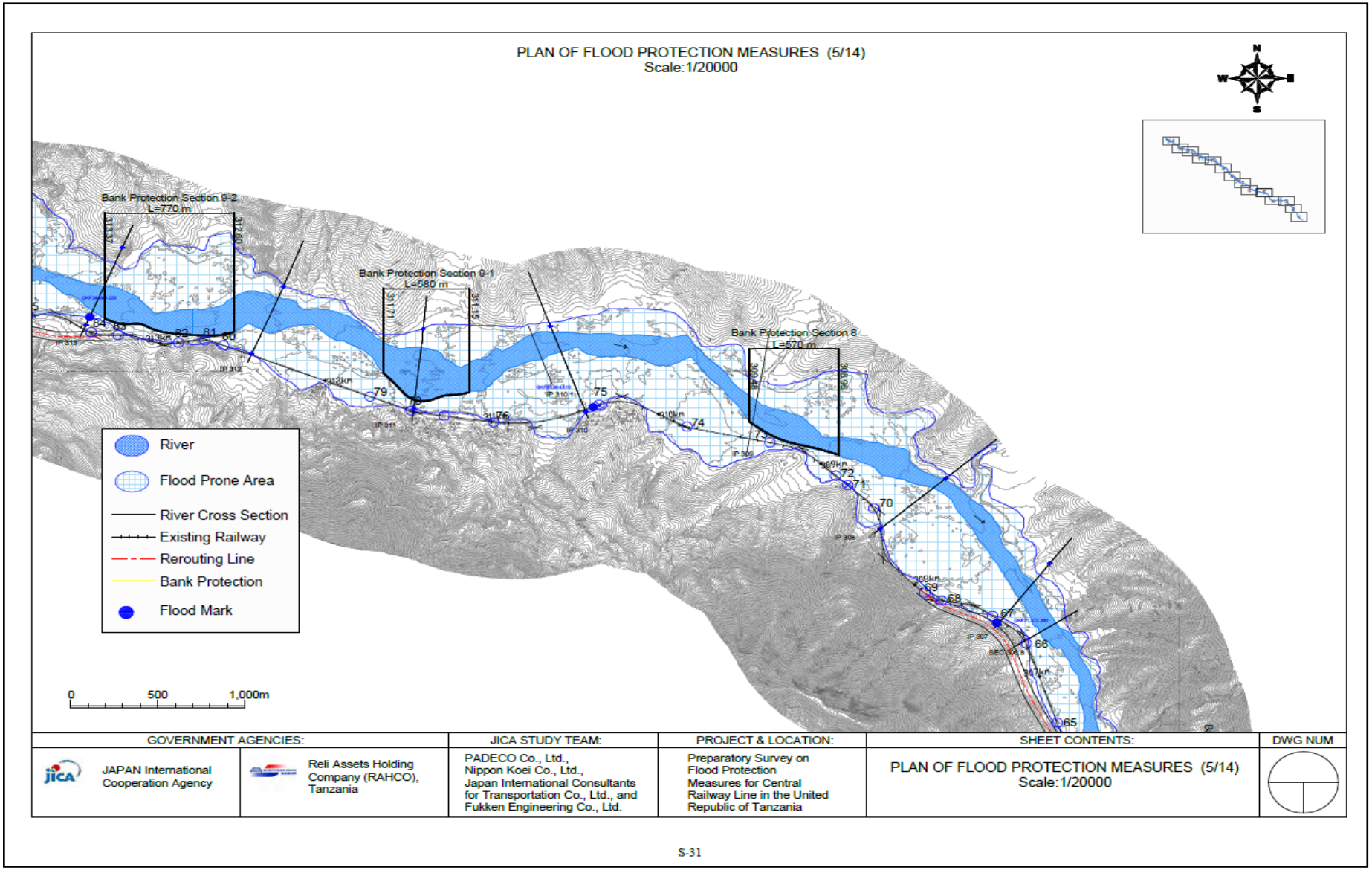

Figure 9: Project layout – Section 5

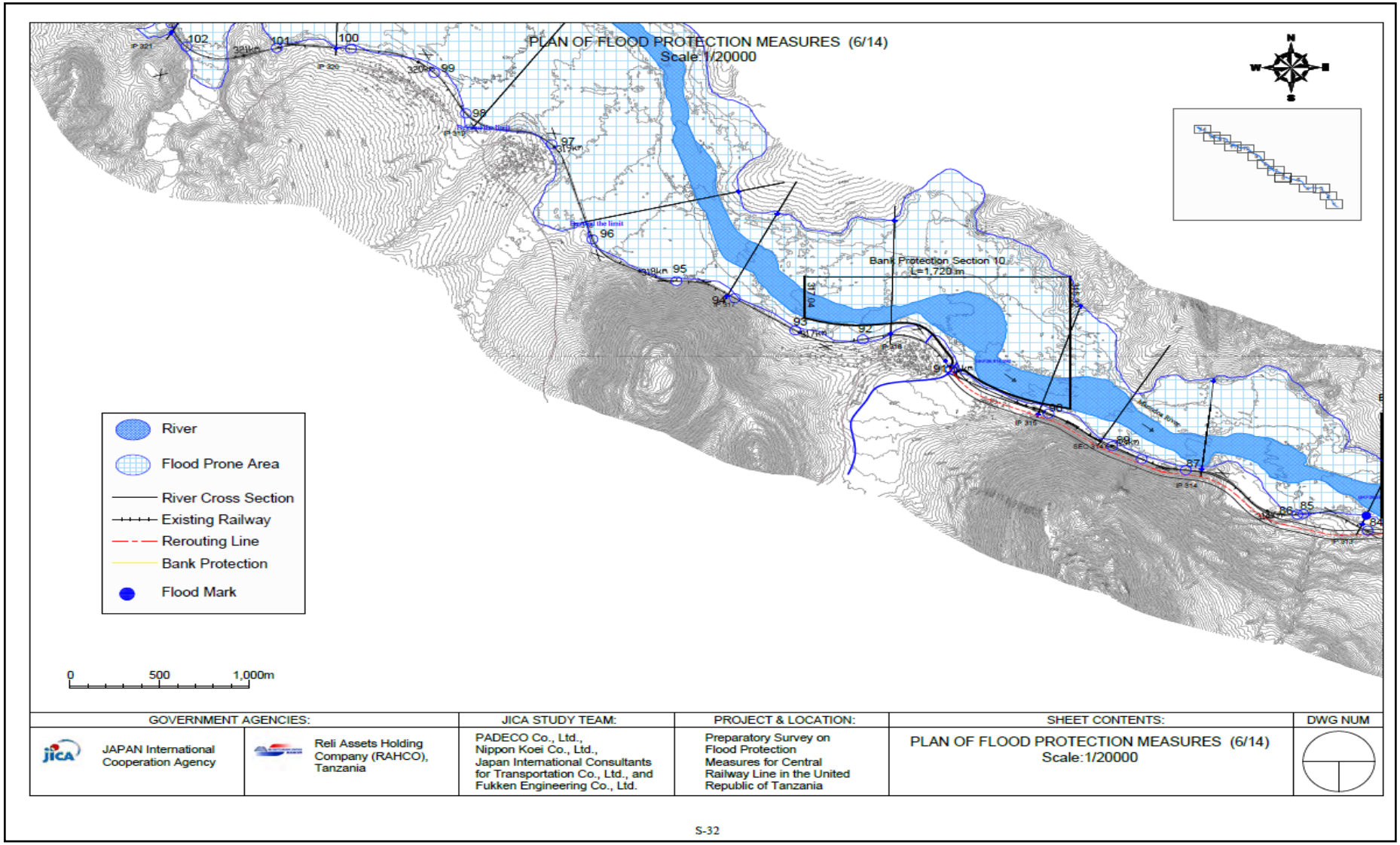

Figure 10: Project layout – Section 6

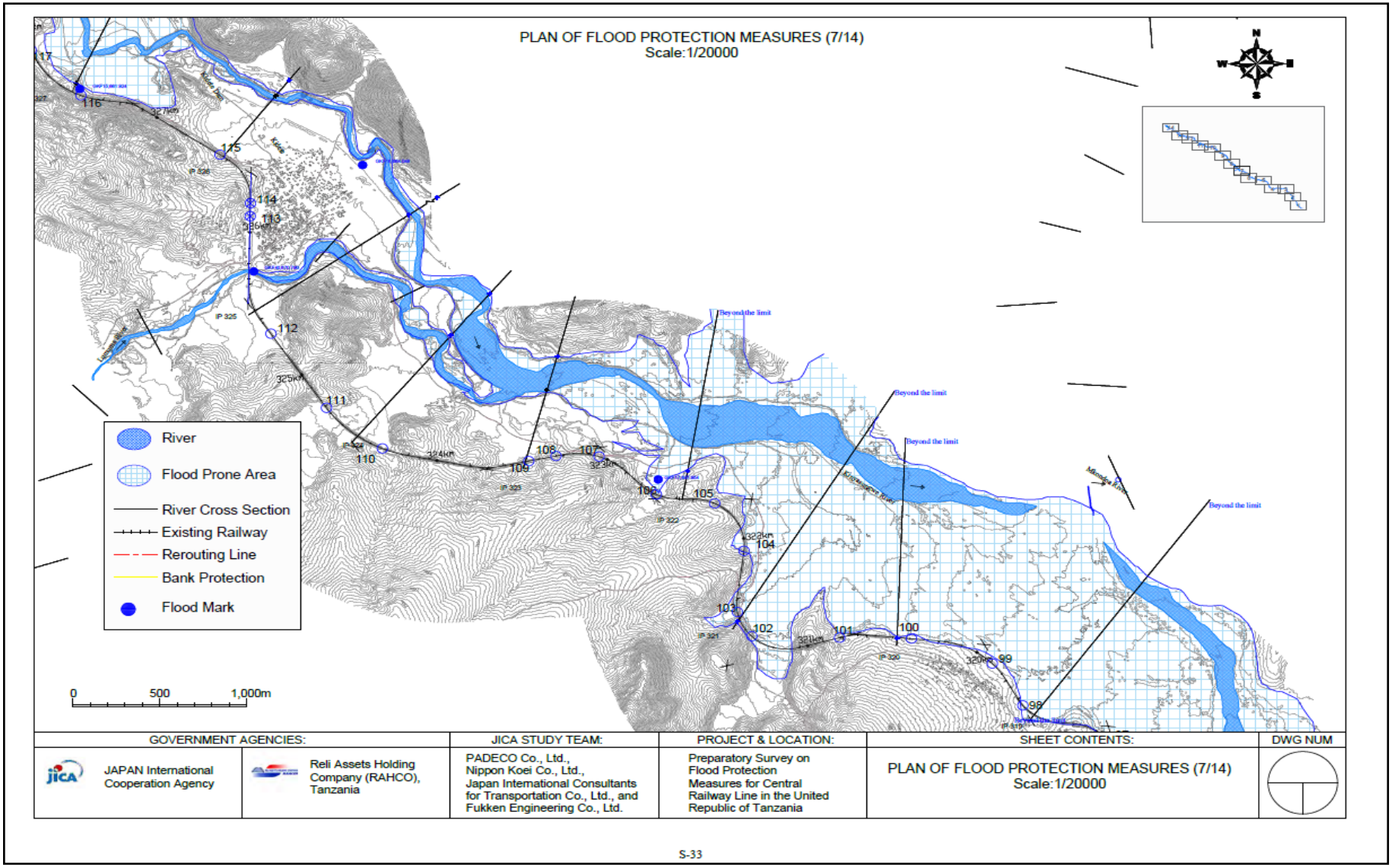

Figure 11: Project layout – Section 7

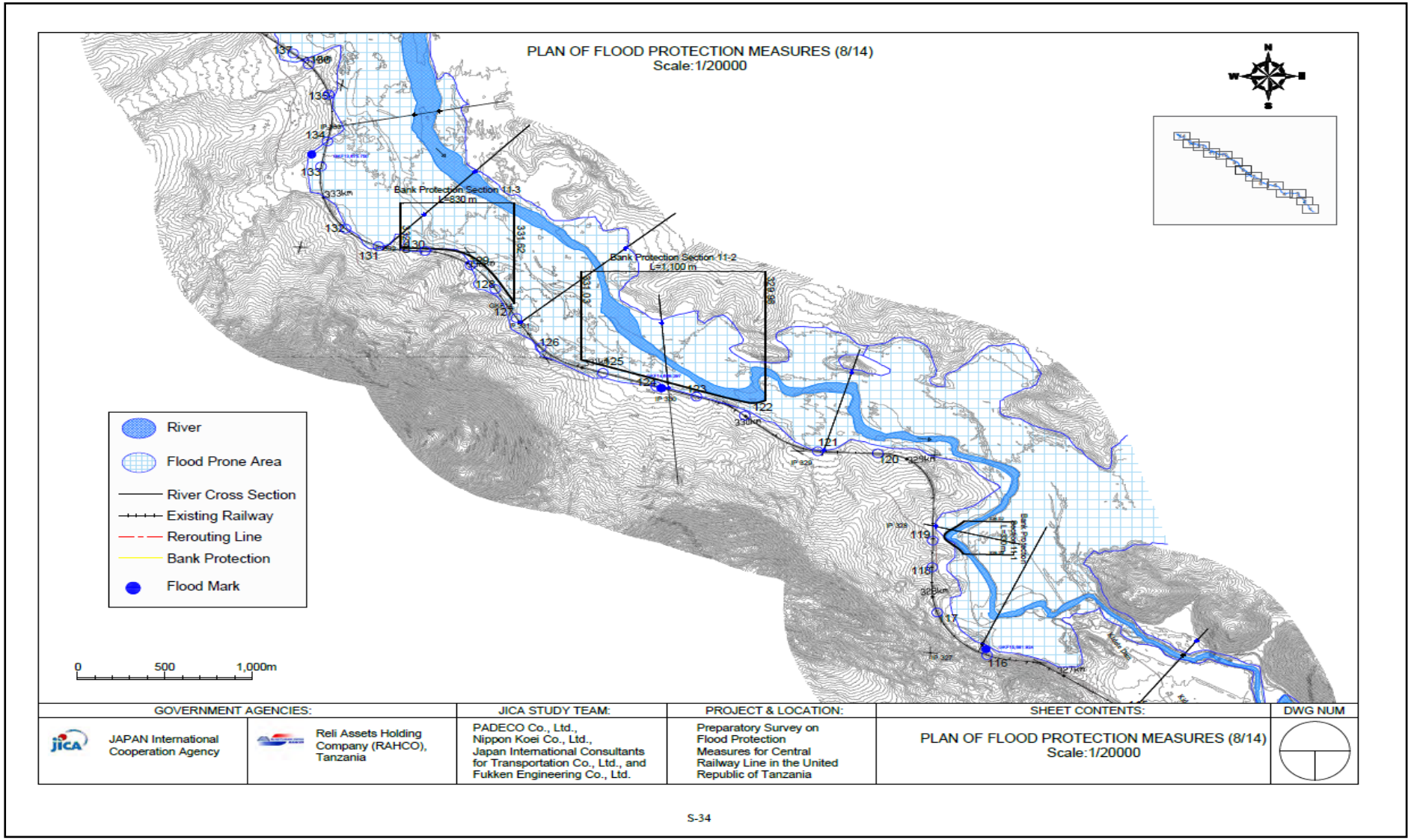

Figure 12: Project layout – Section 8

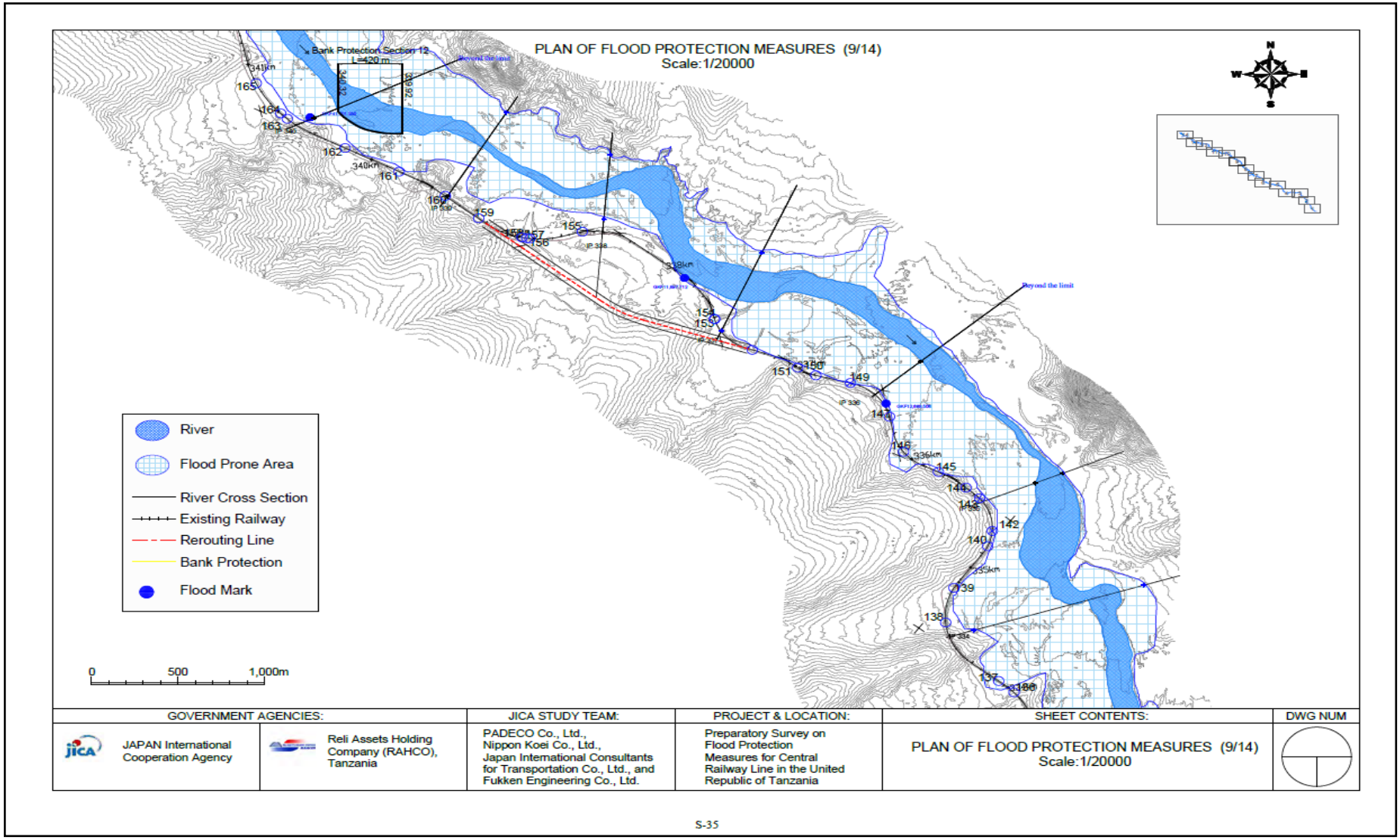

Figure 13: Project layout – Section 9

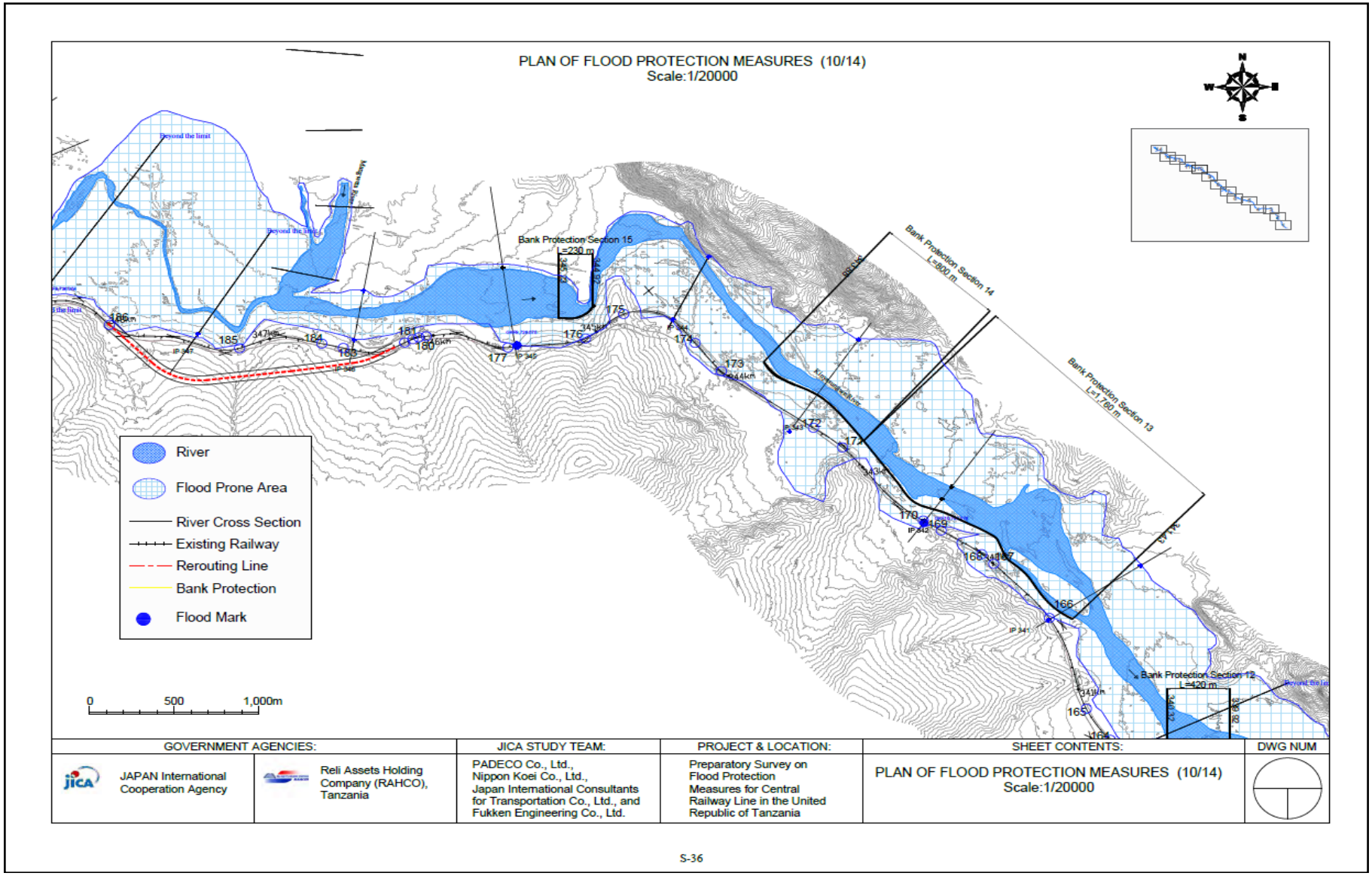

Figure 14: Project layout – Section 10

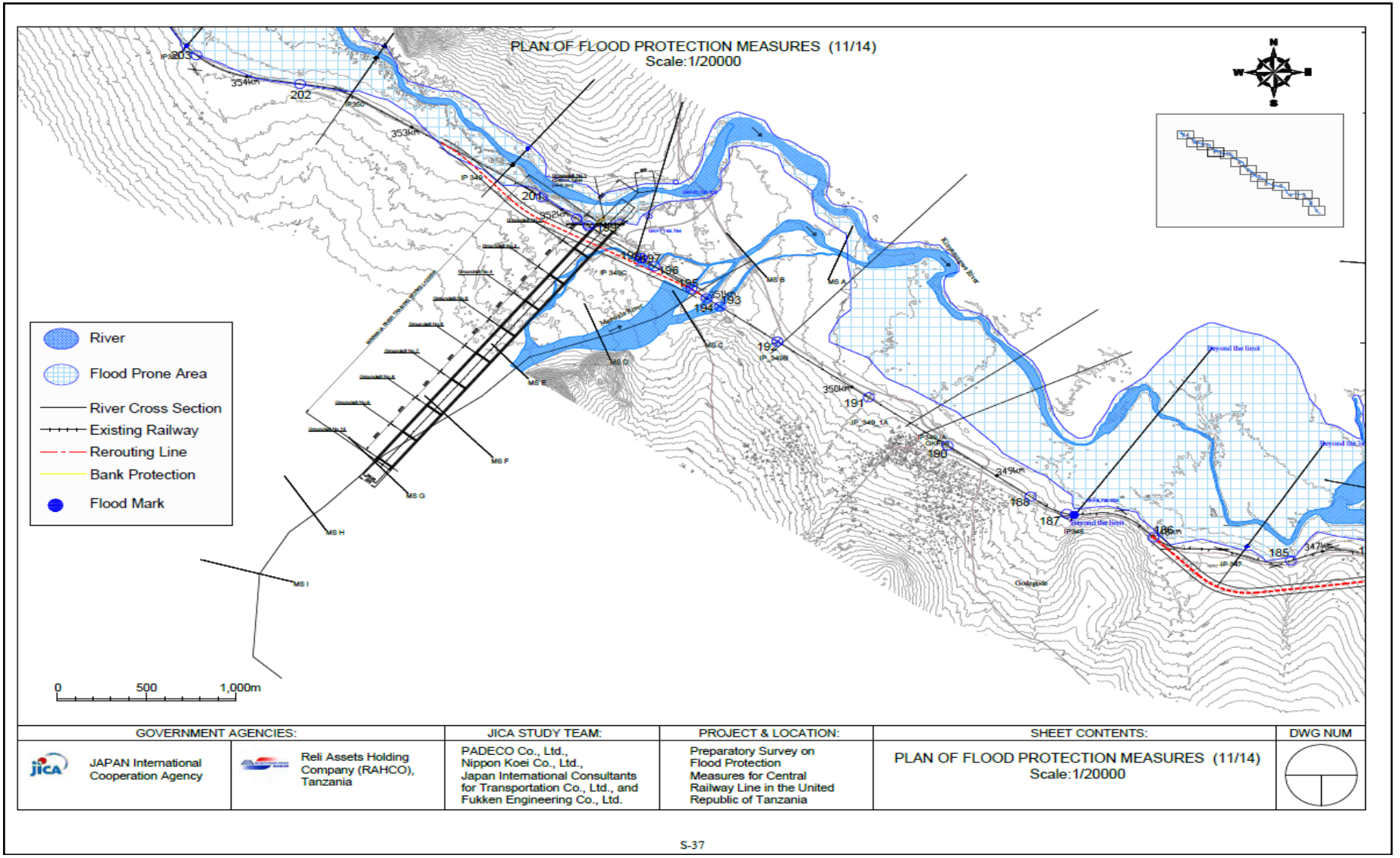

Figure 15: Project layout – Section 11

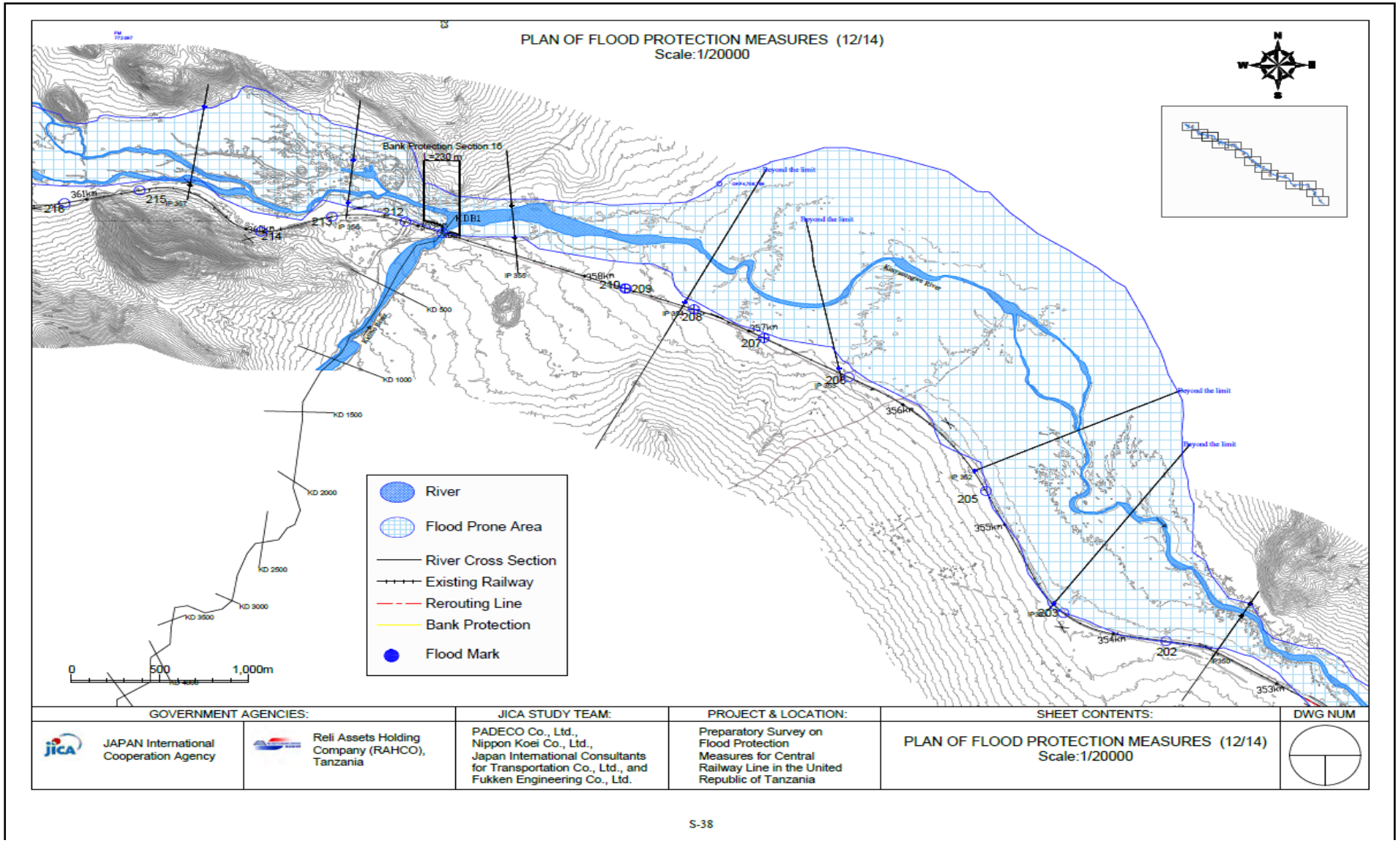

Figure 16: Project layout – Section 12

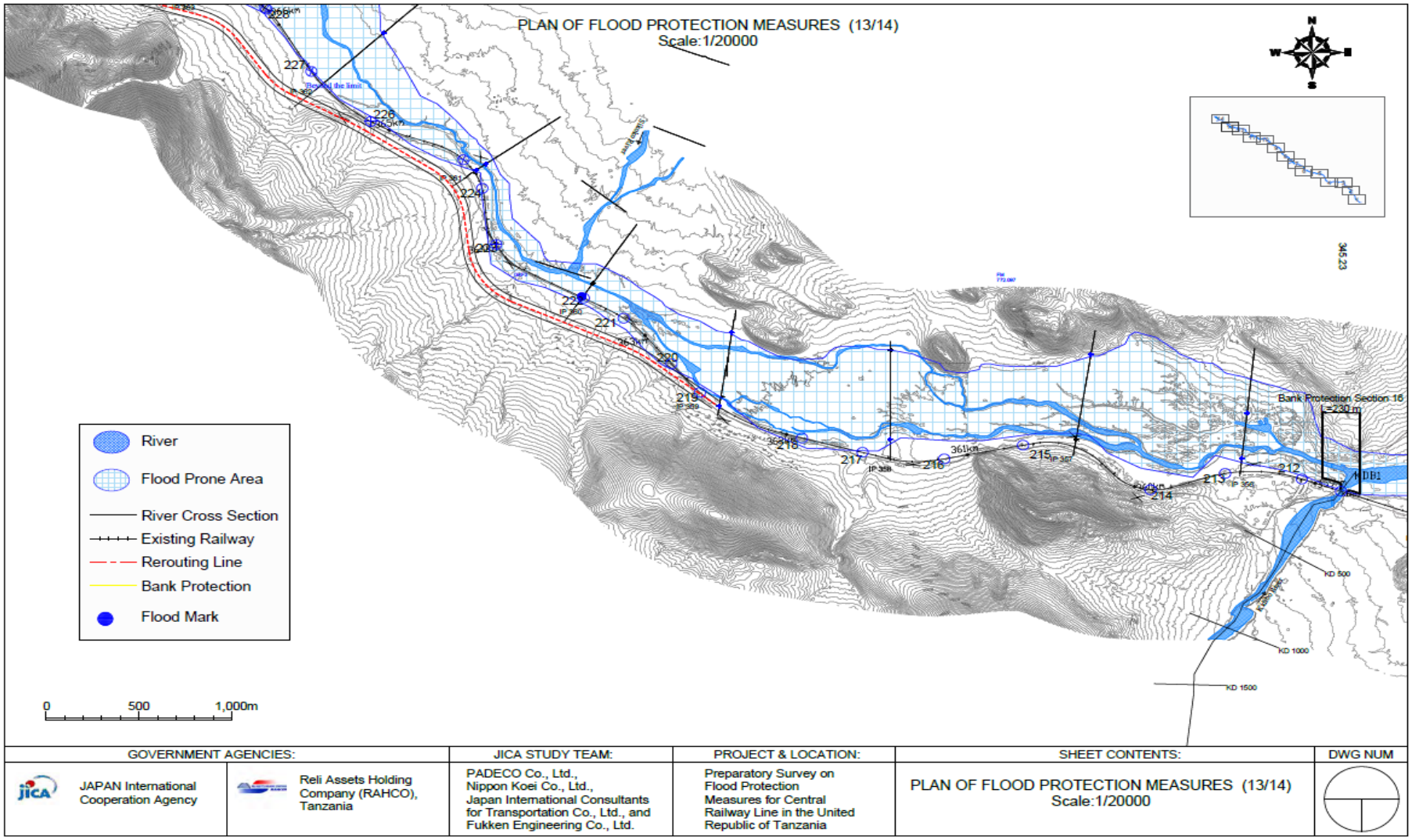

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Figure 17: Project layout – Section 13

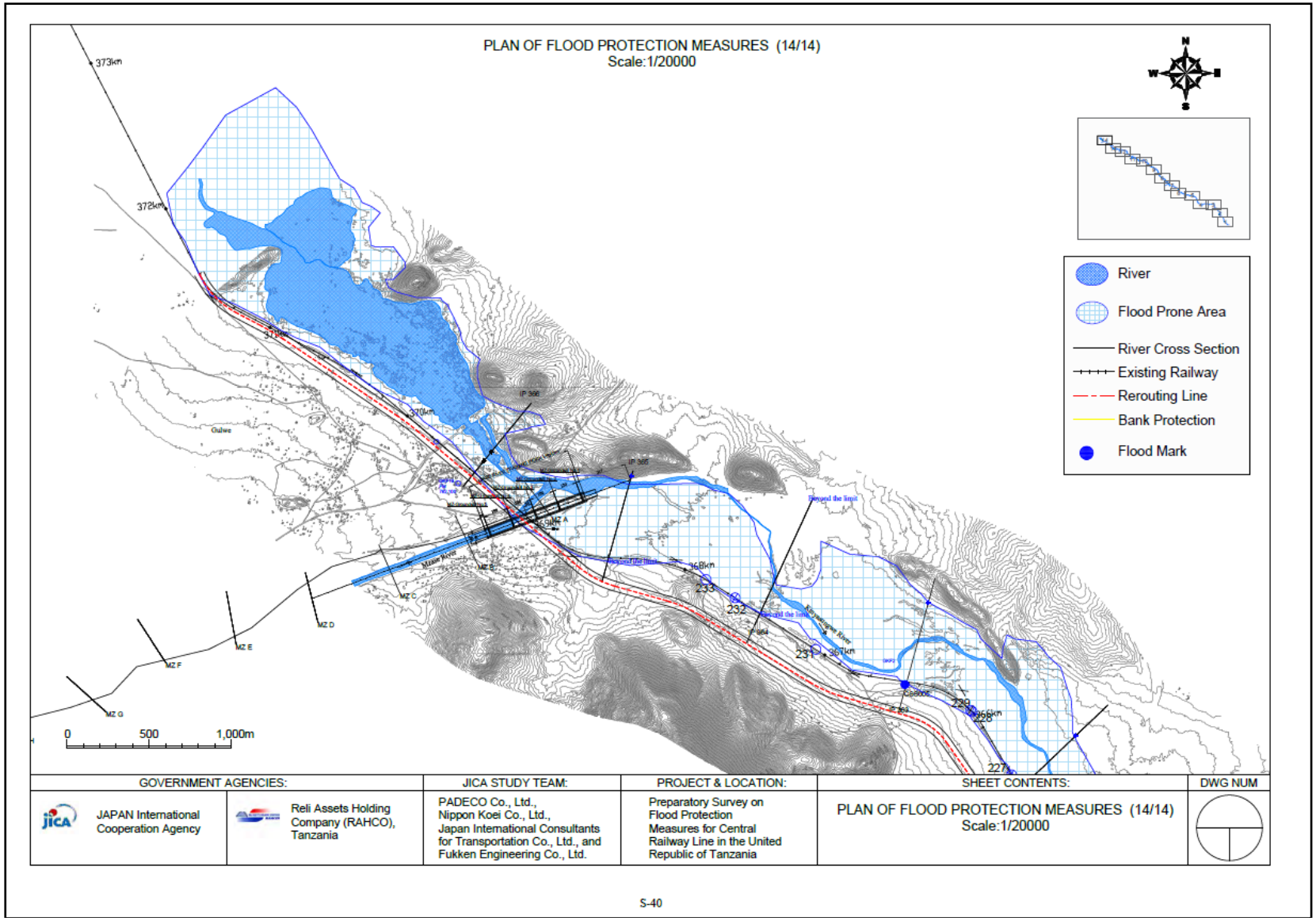


Figure 18: Project layout – Section 14

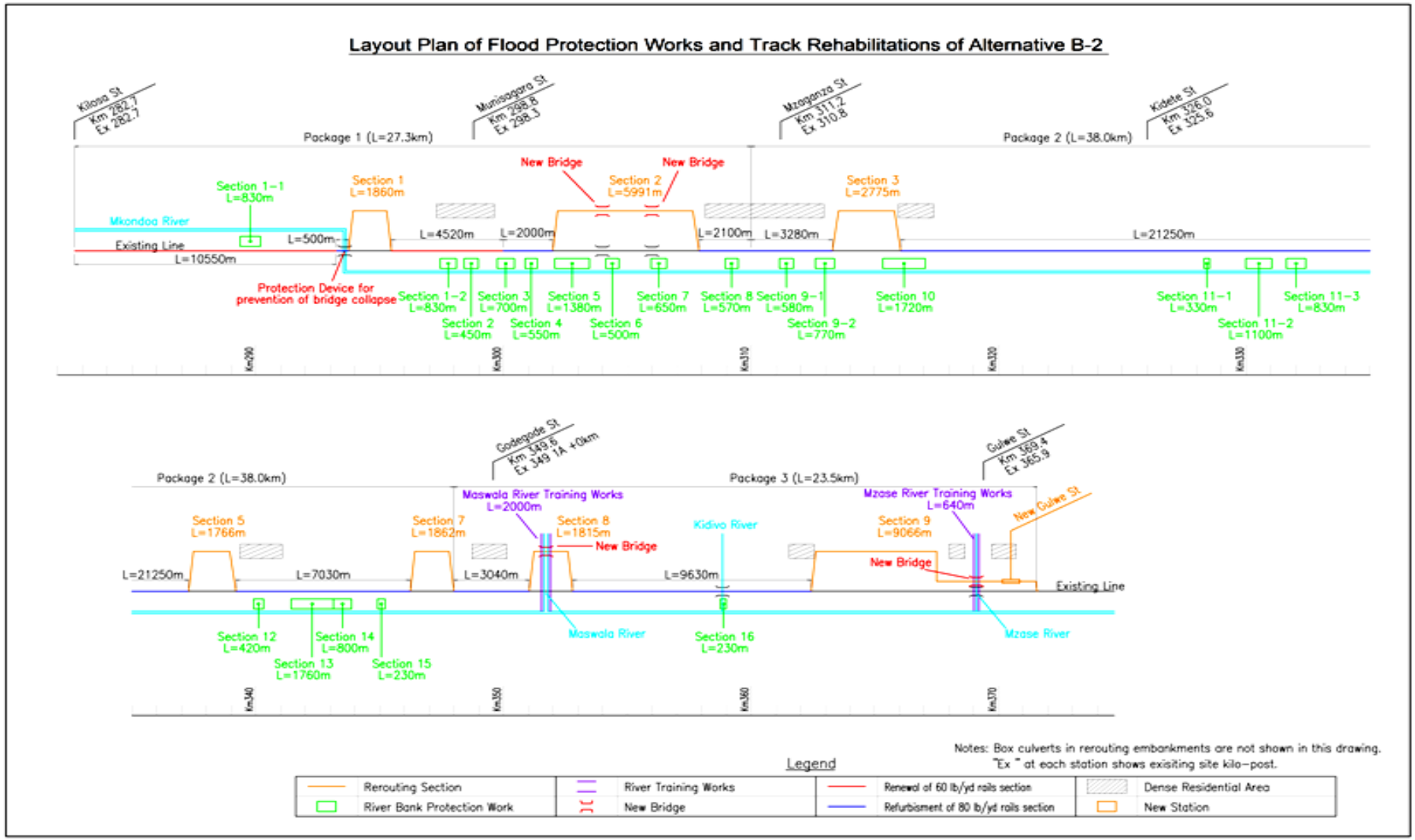


Figure 19: Layout plan of flood protection works and track rehabilitation of alternative B-2

Source: JICA study team

Alternative B-2 will involve:

(a) the bank protection works to protect against serious erosion along the mainstream of the Mkondoa/ Kinyasungwe River are provided (a total of 15.11 km in length at 20 sites);
(b) River training works in the Maswala River stretching 2,000m long with construction of check dam (1 no.) and ground sill (9 nos.) is planned; and
(c) River training works in the Mzase River stretching 660m long with construction of ground sill (6 nos.) is planned.

A summary of the construction works is tabulated as follows:

Table 10: Summary of Construction Works

Work Items	Package 1	Package 2	Package 3	Total
Railway rerouting construction works	7.8	6.4	11.0	25.2
Bank protection for main stream	6.34	8.54	0.23	15.11
Tributary River Training Work			2.64	2.64
Temporary road	25.5	40.1	34.5	100.1
Installation of track	7.8	6.4	11.0	25.2
Renewal of 60lb/yd rails by 80lb/yd rails	15.0			15.0
Refurbishment of 80lb/yd rails section	4.6	31.6	12.6	48.8
Relocation of Gulwe Station			1-lump	1-lump

Source: JICA Study Team

The attached Appendix 3 abstracted from DF/R shows the plan and profile of 7 rerouting sections, and planning bank protection of Alternative B-2 together with the existing line, and assumed river bank erosion areas. Flood protection measures were prepared following the basic concept of (i) rerouting of the existing line to higher ground (above the design high water levels) in high-risk areas, and (ii) river bank protection in other area.

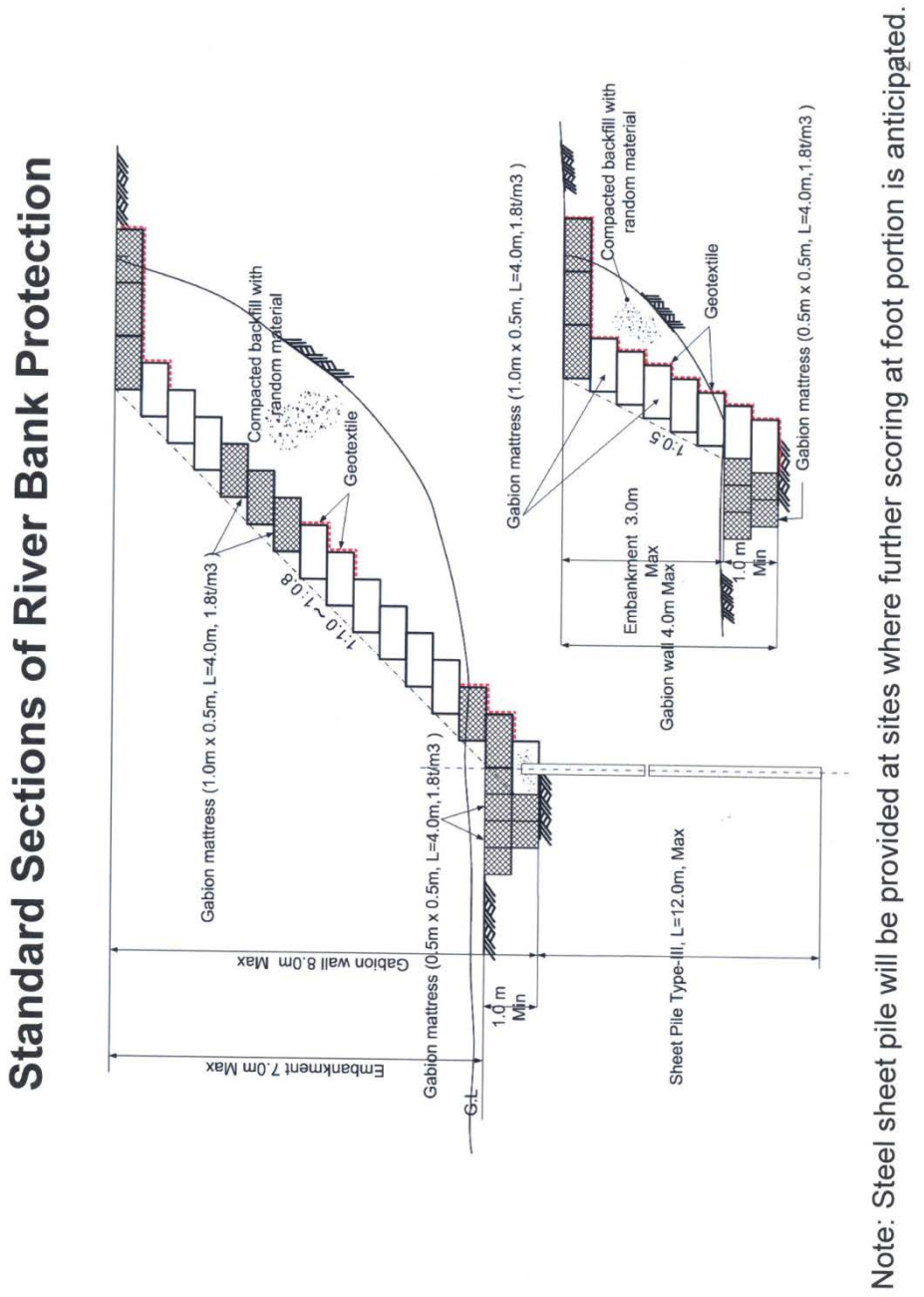
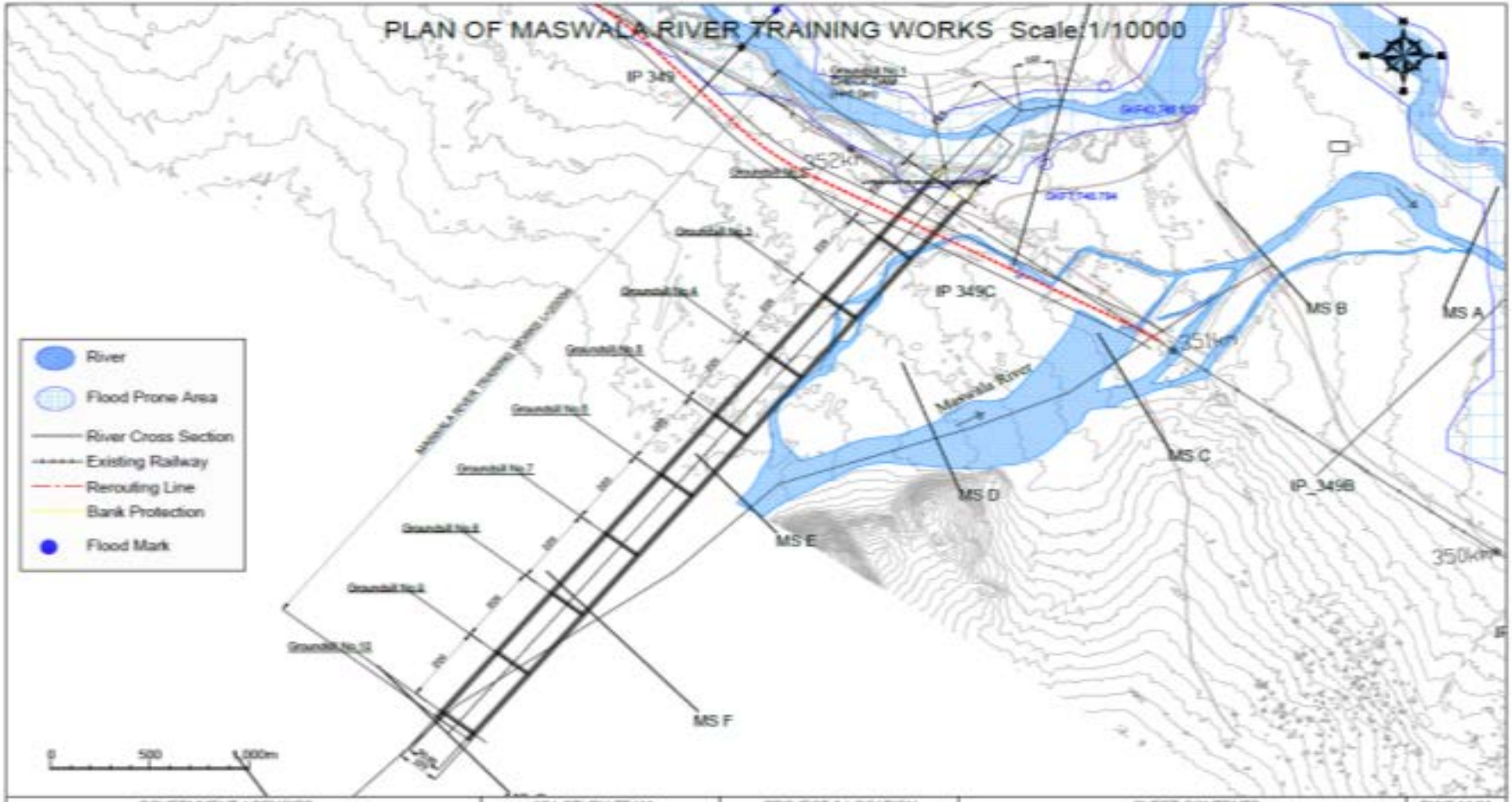


Figure 20: River bank protection

Channel works

Channelling will be done on two rivers to mitigate sedimentation tendencies, by stabilizing the river channel and preventing riverbed and bank erosion. The Maswala (Figure 21) and Mzase Figure 22) Rivers have been identified by the JICA Study Team to be of the highest priority, because these rivers have the active sediment discharge and affect the railway operation remarkably, and hence are target for channel works.


PLAN OF MASWALA RIVER TRAINING WORKS Scale:1/10000
IP 349
IP 349C
IP_349B
MS A
MS B
MS C
MS D
MS E
MS F
Maswala River
River
Flood Prone Area
River Cross Section
Existing Railway
Rerouting Line
Bank Protection
Flood Mark
0
500
1,000m
GOVERNMENT AGENCIES:
JAPAN International Cooperation Agency
Reli Assets Holding Company (RAHCO), Tanzania
JICA STUDY TEAM:
PADECO Co., Ltd., Nippon Koei Co., Ltd., Japan International Consultants for Transportation Co., Ltd., and Fukken Engineering Co., Ltd.
PROJECT & LOCATION:
Preparatory Survey on Flood Protection Measures for Central Railway Line in the United Republic of Tanzania
SHEET CONTENTS:
PLAN OF MASWALA RIVER TRAINING WORKS
Scale:1/10000
DWG NUM

5-6

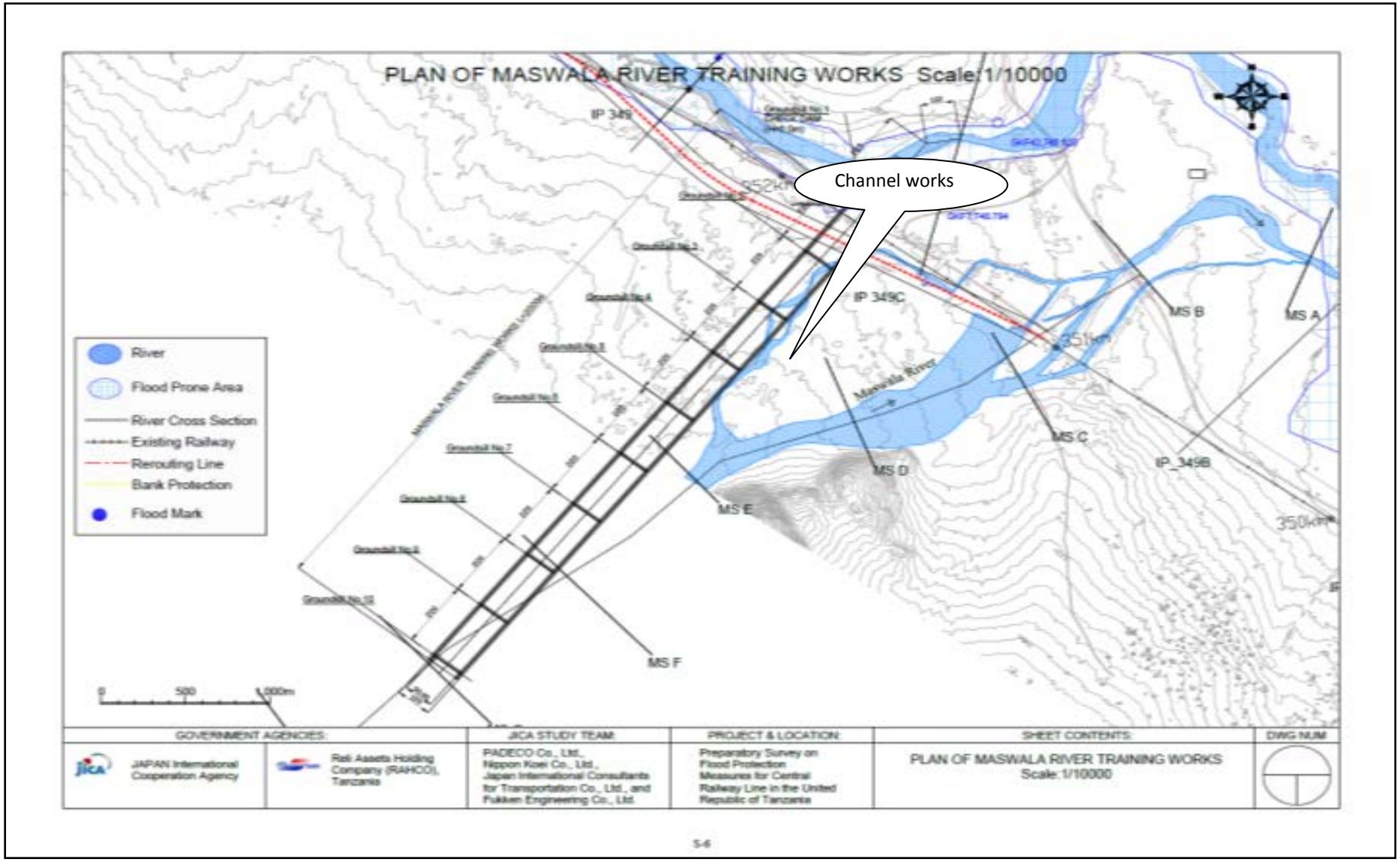


Figure 21: Proposed channel works at Maswala River

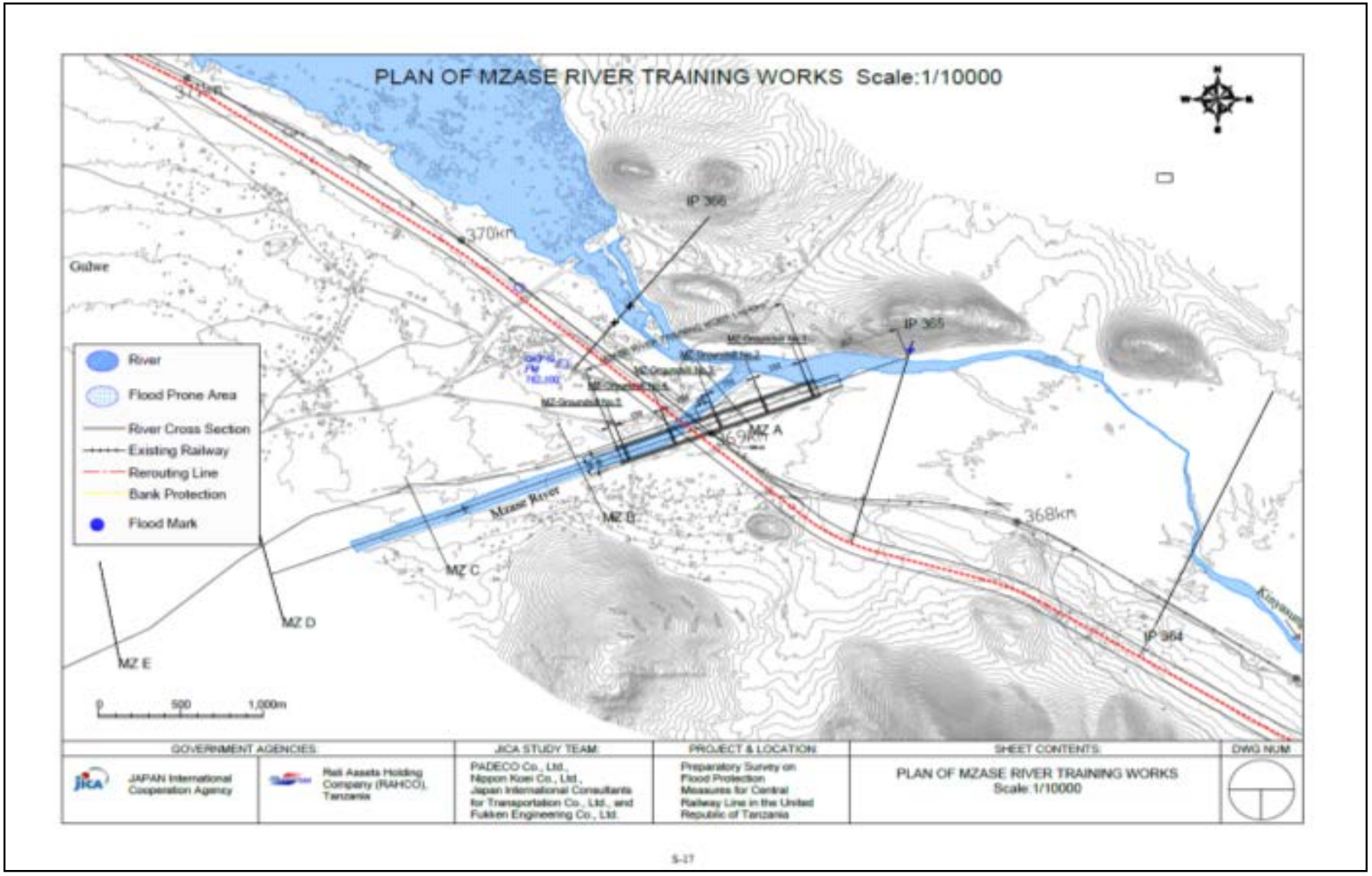


Figure 22: Proposed channel works at Mzase River

Renewal of rails / track materials

Renewal of rails / track materials

This will involve track materials for renewal of 60 lbs/yard rails by 80 lbs/yard rails. This will cover about 15 km. Table 11 shows the sections that will be subjected to this activity.

Table 11: Location of renewal

	Re-Setting Kilo (km)	Distance (km)	Explanation of the location
60lb Rail 1 Start	282.7	10.6	Kilosa station
60lb Rail 1 End	293.3		before the existing bridge at Mkondoa River
60lb Rail 2 Start	295.5	4.4	end of the rerouting section 1
60lb Rail 2 End	299.9		after Munisagara Station
Total	-	15.0	-

Renewal: replacement of the existing 60lb/yd rail to 80lb/yd rail

Track rictification

This activity will involving small repair works that will include change of ballast, packing ballast under sleepers, change of signals, fixing of connectors, replacing of sleepers etc. This will cover sections totalling 48km in length.

Construction of temporary access road

The project site is located around 50 km south of highway B129 between Dar es Salaam and Dodoma. Bifurcated unpaved regional roads (4-6 m width) are connected to Kilosa, Kidete, Godegode, and Gulwe Stations. Kidete Station is located in the middle of a construction site. These roads are available for transportation of construction machines, equipment, and materials.

As most of the construction area does not have roads along the Kilosa–Gulwe section, (i) main access roads along with the rivers from station to station, (ii) branch roads connecting to construction sites, and (iii) branch roads connecting to construction sites at tributaries from stations will be required. The access roads from Kilosa, Kidete, Godegode, and Gulwe Stations are designed to pass though the construction sites along with the railway line. The access road will cover a distance of 96km. Figure 23 shows a layout of a typical access road section, while Figure 24 shows a typical cross section of the proposed access road.

After completing the Project, the access roads will be closed down.

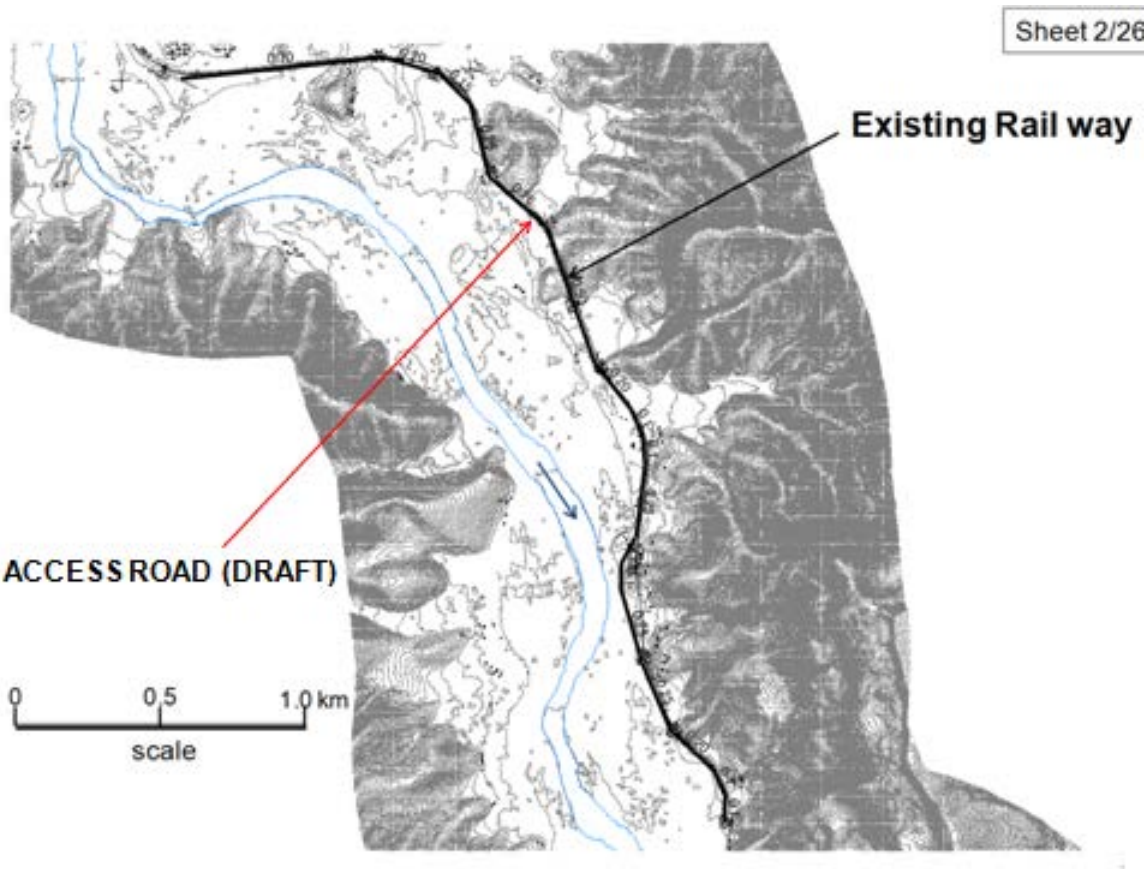


Figure 23: Typical section of the proposed access road

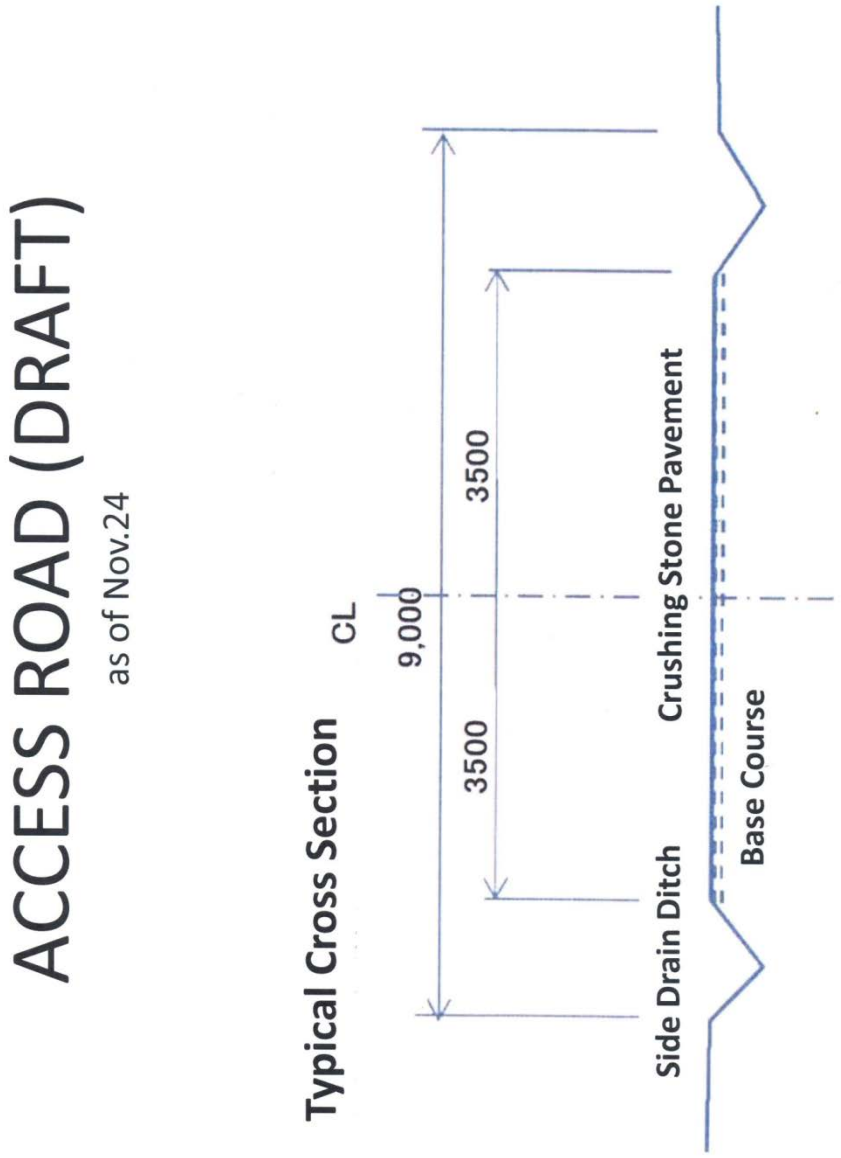


Figure 24: Typical cross section design for the access road

Housing land development

The objective of this component is to provide alternative housing land for the affected community of the Maguru subvillage in Kikundi village (km 315-316). The housing land will be developed within the village land at the slope of the hill adjacent to the affected area (Figure 25). The size will be 200m x 50m =1 ha, equivalent to the area of the affected community. The area is located at the slope of the hill covered by vegetation (see Plate 1). Some houses already exist around the area (see Plate 2).

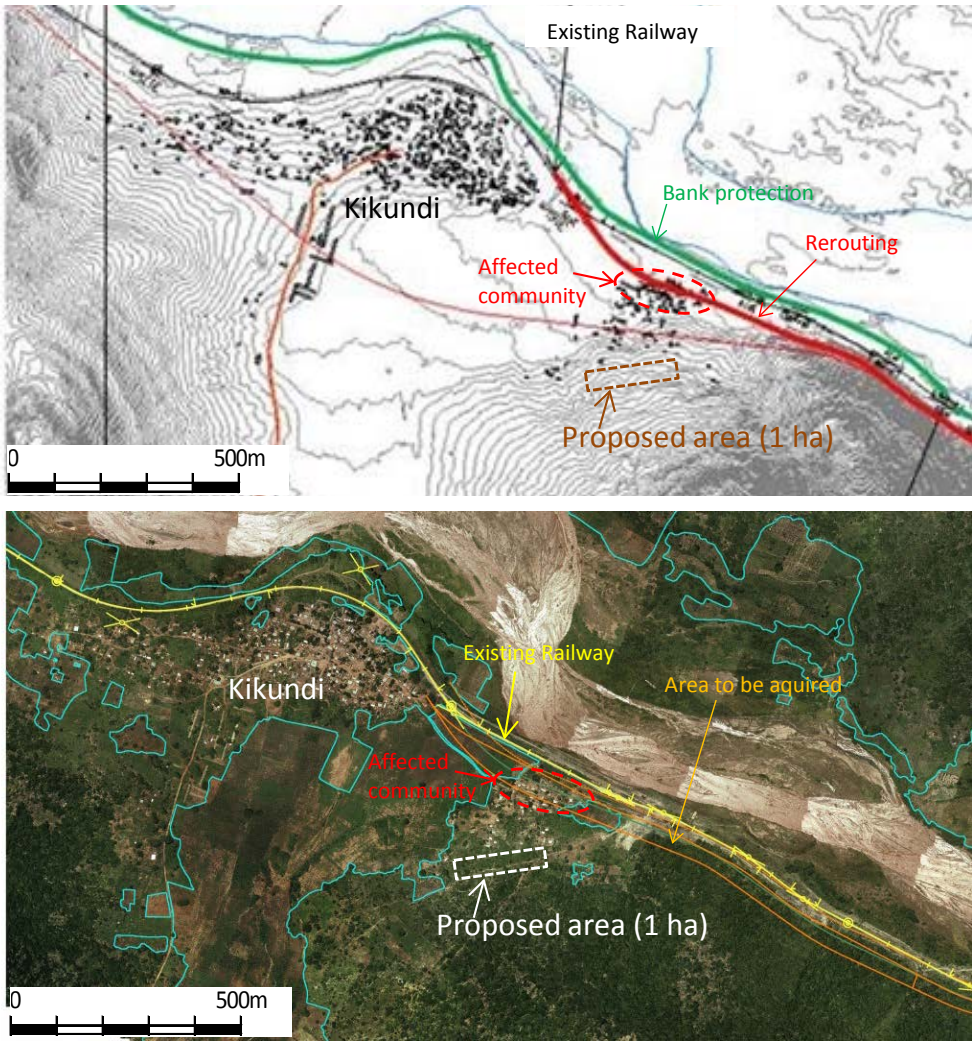


Figure 25: Location of the affected community and the proposed area for the development

Plate 1: Condition of the proposed area


Plate 2: Condition of the affected community (Maguru subvillage)

The following activities will be done:

- After clearing the vegetation, the slope is levelled by excavating and spreading the excavated soil.
- The levelled land is compacted and rainwater drainages are installed.
- One well with hand pump is installed.

Temporary camp site

Site selection: The camp will established at Maguru sub-village because of the following reasons:

a) The site will be almost in the middle of the project (i.e. 54km from Gulwe and 33km from Kilosa). Based on a maximum travel time of 1 hour from the camp to the construction site, this site seem appropriate as majority of construction works will be within 30km;
b) As discussed above, this sub-village will be relocated;
c) This site will result into low environmental footprint as the site is already degraded, see Plate 2; and
d) The site is accessible, even though the access roads need to be upgraded.

The camp will occupy approximately 0.1km2 and will accommodate about 360 people. The project is expected to recruit casual workers from the villagers close the construction section this will minimise the number of people needed to be accommodated at the camp. Other provisions include a utility zone, dedicated to power supply; temporary trash storage, wastewater treatment and potable water treatment/storage area, a worker support area consisting of first aid facility and service station with above ground storage tanks for construction vehicles and equipment fuelling and maintenance, dining facilities and a material laydown and maintenance area.

The camp would be secured and guarded. Water demand for the camp is approximated at $111m^3$ per day and would be brought on site by bourses from Mpwapwa Urban Water and Sanitation Authority. Water would be stored on site in tanks for camp use. The camp will generate about $95m^3$ of wastewater per day which would be treated in a temporary mechanical wastewater treatment plant. Effluent from treatment facility will be used to suppress dust on temporary construction roads.

Power needs will be met, if feasible, through a substation connecting to the power line that would be along the railway line with backup generator or will be supplied solely by the generators.

All construction workers would be trained in cultural and biological resources sensitivity protection to mitigate intentional or unintentional harm to the same. The training would include description of different biological and cultural components found in the area and their importance and procedures to follow to report /conserve them when the encounter them.

2.4. PROJECT ACTIVITIES

The proposed project will be implemented in different phases including the pre-construction phase, construction phase, demobilization, operation phase, and decommissioning phase. The following subsections outline the overall project activities under each phase.

2.4.1. Site Selection Phase

The specific site selection of the railway line will be confirmed after the engineering survey has been concluded for different options

2.4.2. Pre- Construction Phase

This is the current phase being implemented by JICA Study Team. The main activities being conducted at different stages include:

- Topographical survey;
- Geotechnical investigations;
- Detailed hydrological and sediment investigation and analysis for the river basin between Kilosa and Igandu, determine hydraulics parameters for structural design of flood protection works;
- Environmental and Social Impact Assessment (ESIA); and
- Acquisition of various permits/certificates (i.e. building permits).

2.4.3. Mobilisation Phase

- ***Site preparation***

This will involve site clearance, whose extent will differ from one flood protection measure to another measure. For example site clearance for relocation of railway line will require relative large area to be cleared compared to track elevation. The actual area that will be impacted will be covered in the EIS.

- ***Mobilization of construction materials and equipment***

The main materials and machinery that will be needed for the construction works of the proposed project and operations include but not limited to types listed in

Table 12: Estimated[4] Types, Source and Quantities of Materials Required

Type of materials	Quantity	Potential Source	Distance from the Source, km
Civil Works			
Filling materials	≈524,000 m^3	Msolwa Borrow pit	Varying distances depending on area of the project
Sand	≈17,000 m^3	Msolwa Borrow pit	Varying distances depending on area of the project
Ballast	≈54,200 m^3	Tura Quarry	Varying distances depending on area of the project
Installation of rails, fastenings and sleepers	≈25.0 km	Dar es Salaam / imported	Varying distances depending on area of the project
Renewal of 60lb/yd rails by 80lb/yd rails	≈15.0 km	Dar es Salaam / imported	Varying distances depending on area of the project
Refurbishment of 80lb/yd rails section	≈48.8 km	Dar es Salaam / imported	Varying distances depending on area of the project
Cement	≈20,900 tonnes	Morogoro, Dodoma, Dar es Salaam	Varying distances depending on area of the project
Timber	≈10,700 m3	Dar es Salaam / imported	Varying distances depending on area of the project
Steel bars	≈3,200 tonnes	Dar es Salaam / imported	Varying distances depending on area of the project

Table 13: Type, Source and Quantities of Material of Bank Protection (overall)

Type	Unit	Quantities	Source	Note
Gabion	m^3 m^3	102,100 141,000 (Maswala & Mzase Rivers)	・Wire: To be imported ・Boulders: From vicinity of construction site and/or designated quarry site of RAHCO	
Geotextile	m^2	170,100	To be imported	
Excavation	m^3	66,600	-	
Embankment (Backfill)	m^3 m^3	124,100 157,100 (Maswala & Mzase Rivers)	・Excavated material along rerouting section and/or from riverbed of mainstream/tributaries	It is assumed that excavated material will be fully utilized.

[4] Actual quantities when BoQ are prepared

Type	Unit	Quantities	Source	Note
Steel sheet pile	m^2	36,500	To be Imported	
Concrete	m^3 m^3	2,300 14,000 (Maswala & Mzase Rivers)	・Aggregates: From vicinity of construction site and/or designated quarry site of RAHCO ・Cement: From domestic market – Dar es Salaam, Dodoma or Morogoro	It will be free whether a contractor installs batching/aggregate plants for producing concrete.

Note: Information above is based on the conventional construction method.
Source: JICA Study Team

Table 14: Types, Source and Quantities of Machinery Required by the Proposed Project

Type of Machinery	Number	Potential Source
Bulldozer	30	Contractor
Backhole	30	Contractor
Wheel Loader	15	Contractor
Dump truck	300	Contractor
Truck with Crane	15	Contractor
Vehicles	300	Contractor
Generator	18	Contractor
Welder	15	Contractor
Vibration Hammer	5	Contractor
Batcher Plant	3	Contractor

- ***Transportation***

Building materials and equipment will be moved from Dar es Salaam and some from Dodoma as indicated in Table 14. They shall be transported using existing roads/railway.

- ***Storage***

Most of the materials and the equipment shall be stored on the temporary construction camp. Except for some of the materials especially those obtained locally i.e. sand, ballast, filling materials will be used immediately after delivery.

- ***Personnel***

Although the number of people to be employed is not yet established, it expected that the construction phase will employ about 2500 people. However, after construction the project will be managed by existing workforce in RAHCO.

- ***Local supplies and services (food, medical attention and fuel)***

Workers will be getting their food from nearby villages. Health treatment will be from District Hospitals. Arrangements to transport the sick to Hospital will be in place. This will be supplemented by First Aid facility.

- ***Water***

Mkondoa River (downstream of KM350) and Kinyasungwe River (upstream of KM350), which yield recurrent floods, causing damages to rail track and embankments, are the major water bodies in the project area. There are also other small rivers and streams. Water for

construction activities will be drawn from these water bodies. Operation activities will not demand water.

- ***Power***

The power will be supplied from generators.

2.4.4. Construction Phase

Construction phase will involve construction of new rail alignments and implementing flood protection measures as summarized in Table 15 and Table 17.

Table 15: Activities for construction of new line (rerouting) strengthened by flood protection works

No.	Construction activities	Approx. Location (km)	Length (km)
1	**Rerouting of track alignment** (Construction of a new line) including: • Filling of embankment (4m in average height) • Drainage ditches along embankment • Cutting of soil/rock • Bridges and culverts • Track installation	293.7 – 295.5 (293.3 – 295.0)	1.9 (1.7)
		302.0 – 308.0 (301.5 – 307.5)	6.0 (6.0)
		313.3 – 316.0 (312.8 – 315.6)	2.8 (2.8)
		337.3 – 339.2 (336.8 – 338.7)	1.8 (1.9)
		346.2 – 348.0 (345.7 – 347.5)	1.9 (1.8)
		351.0 – 352.8 (349B+0.5 – 349.4)	1.8 (-)
		362.4 – 371.6 (359.0 – 368.1)	9.1 (9.1)
2	**Riverbank Protection at present location** including: • Steel pile driving • Excavation and backfilling • Gabion installation (including geotextile) • Steel pile driving (L=6.0m) • Providing cap concrete (at the top of gabion)	289.1-289.9 (288.7-289.5)	0.83
		297.5-298.1 (297.0-297.6)	0.71
		298.4-299.0 (297.9-298.5)	0.45
		299.8-300.5 (299.3-300.0)	0.70
		300.9-301.4 (300.4-300.9)	0.55
		302.1-303.5 (301.6-303.0)	1.38
		304.2-304.7 (303.7-304.2)	0.50
		306.0-306.6 (305.5-306.1)	0.65
		309.0-309.5 (308.5-309.0)	0.57
		311.2-311.7 (310.7-311.2)	0.58
		312.6-313.4 (312.2-312.9)	0.77
		315.3-317.1 (314.8-316.6)	1.72
		328.3-328.6 (327.8-328.1)	0.33
		330.0-331.1 (329.5-330.6)	1.10
		331.7-332.4 (331.1-331.9)	0.83
		340.0-340.4 (339.5-339.9)	0.42
		341.5-343.2 (341.0-342.7)	1.76
		343.2-343.9 (342.7-343.2)	0.80
		345.0-345.3 (344.5-344.8)	0.23
		355.2-355.5 (351.8-352.0)	0.23

Values of location and length are based on calculation.
Values in ( ) shows field kilometre gage and the existing railway length

Table 16: Activities for track works

No.	Construction activities	Approx. Location (km)	Length (km)
1	Renewal of 60lb/yd rails by 80lb/yd rails Procurement of track materials	282.7 – 293.3 (282.2 – 292.9) 295.5 – 299.9 (295.0 – 299.4)	10.6 (10.2) 4.4 (4.4)
2	Refurbishment of 80lb/yd rails section (Supply and tamping of ballast, and track rectification)	Sections other than the rerouting sections and the sections with renewal of 60lb/yd rails by 80lb/yd rails	48.8

Values of location and length are based on calculation.
Values in ( ) shows field kilometre gage and the existing railway length.

Table 17: Activities for construction of flood protection measures

Name of Tributary	Major Works	Feature	Work Quantities
Maswala	• River training works - Channelization L=2,000m, W=90m - Ground sill : 10 nos. (220m of interval) L=90m, H=2.4m Including embankment and bank protection works - Check dam : 1 no. L=122m, H=11.5m Including sub dam and bank protection works	- A new channel will be created to safely discharge flood water of the Maswala River with construction of ground sill and check dam.	- Concrete:17,800 m^3 - Embankment: 13,200 m^3 - Gabion: 28,700 m^3 - Steel sheet piles: 14,900 m
Mzase	• River training works - Ground sill : 5 nos. L=40m, H=2.4m Including embankment and bank protection works	-The existing river course of the Mzase will be straightened to smoothly connect with the Kinyasungwe mainstream by channelization as well as construction of ground sills.	- Concrete: 2,100 m^3 - Embankment: 20,100 m^3 - Gabion: 9,100 m^3 - Steel sheet piles: 4,800 m^3

Table 18: Number of Culverts along the Rerouting Sections

No. of Rerouting Section	Start* (km)	End* (km)	Total Distance (km)	Size (Inner dimension of barrel) and numbers of location				Total nos.
				1.0m x 1.0m	1.5m x 1.5m	2.0m x 2.0m	3.0m x 3.0m	
1	293.714	295.518	1.860	2	1	3	0	9
2	301.964	307.958	5.991	2	2	9	2	15
3	313.284	316.048	2.775	0	2	3	2	7
5	337.296	339.210	1.766	0	2	0	2	4
7	346.243	348.004	1.862	0	0	2	1	3
8	351.024	352.825	1.815	2	3	0	0	5
9	362.409	371.563	9.066	3	3	17	2	25
Total			**25.135**	**9**	**13**	**34**	**9**	**65**

Note: *, Revised kilometerage along existing railway
Source: JICA Study Team

2.4.5. Demobilisation Phase

Demobilization of temporary structures will be done for proper restoration of the site by:

- Removing all temporary structures (contractors' and engineers' campsites and workshops);
- Transporting used timber, iron sheets, metals, and rubble away from the site;
- Landscaping (reclaiming, re-contouring and restoring of disturbed areas);
- All waste, refuse materials and equipment being removed by the contractor at the end of construction; and
- Backfilling of pits and quarries with clean and/ or granular material, levelling or sloping and if necessary re-vegetating the site.

2.4.6. Operation Phase

The activities that are expected to be done during the operation phase will include:

- Running of the constructed railway;
- Occupational health and safety management;
- Housekeeping of building structures and facilities; and
- Overall maintenance of the railway structures and facilities.

2.4.7. Decommissioning Phase

Structural design lifespan of railway civil structures is between 40 to 80 years. Decommissioning activities will be determined after completion of preliminary design of the proposed project.

2.4.8. Project Management Procedures

a. Waste management procedures

The project is expected to generate wastes during all phases of the project as sown in Table 19.

Table 19: Summary of wastes produced and management Procedures[5]

Type of waste	Sources/ Example	Amount	Remarks
Overburden materials (mainly soils, grass and shrubs)	Mobilization	≈800 tonnes	Avoid unnecessary excavation of land Stockpile and store most of overburden produced for site rehabilitation Use the rest of overburden materials for land reclamation activities in the locality
	Construction	≈9,000 tonnes	
Solid wastes (mainly organic waste from canteen and camp)	Mobilization	≈80 kg per days	Organic waste to be buried Develop and implement a site waste management plan to minimize environmental damage from development and operation activities
	Construction	≈900 kg per day	
	Operation	≈ No solid waste will be generated by the project, except for would be passengers	

[5] The figure are estimated. They will be modified as more data becomes available.

Type of waste	Sources/ Example	Amount	Remarks
Liquid wastes (from canteen and toilets)	Mobilization	≈20000 litres per day	Establish onsite sanitary facilities (i.e. flush toilets and bathing facilities) and adequate treatment facilities (i.e. septic tanks and soak away pits) at the campsite. Construct temporary toilets at construction sites
	Construction	≈60 m^3 per day	
	Operation	No waste water will be generated by the project, except for would be passengers	
Hazardous wastes (mail spent oils, batteries and scrap metals)	Mobilization	≈80 kg per day	Secondary containment measures in areas where fuels, oils and lubricants are stored and loaded or unloaded shall be installed All hazardous materials and chemicals will be handled in accordance with their Materials Safety Data Sheets held on site. Scrap metals will be sent to smelters and used batteries will be sent to battery dealers/recyclers in Dar es Salaam. Spent oils will be used in furnaces
	Construction	≈300 kg per day	
	Operation	No hazardous waste will be generated by the project, except for would be passengers	

b. Health and Safety Plan

RAHCO shall protect the health and safety of its employees and those of its contractors and neighbouring communities, to ensure that all activities are conducted in accordance with current industry norms and applicable local legislation, and in a manner that protects the environment and people's health.

Adhere to safety and health best practices, such as:

- Provision of protective gear to workers and other site visitors such as helmets, Industrial boots/shoes, Gloves, and reflectors will be mandatory;
- Report and keep records of all accidents/incidents during construction period; and
- There will be signs showing that works are in progress and precautions to be taken.

c. Accident Prevention and Management Plan

The project shall be implemented in compliance to labour laws in Tanzania, in particular, the Occupational Health and Safety Act (2003). Clauses to protect the health and safety of workers shall be included in the contract documents for implementation stage. The following will be included:

- Developing and adhering to adequate safety policy and procedure of the works and construction sites;
- Use of safety gear (PPE) by all employees and any person visiting the construction site;

- Ensuring that the construction site is always held under safety and security;
- Keep safe working environment on site, put clear signs and instructions to be followed; and
- Ensure good housekeeping for the construction site and always prevent scattering of construction debris around the site.

d. Security Measures

RAHCO shall use its own security staff or hire

e. Monitoring/maintenance

Environmental monitoring programs shall be put in place to address all activities that have been identified to have potentially significant impacts on the environment during construction and operation of the project. Environmental monitoring activities will be based on direct or indirect indicators of effluents and resource use applicable to the project. Monitoring will be conducted by trained individuals following monitoring and record keeping procedures and using proper calibrated and maintained equipment. Monitoring data will be analysed and reviewed at regular intervals and compared with the operating standard so that any necessary corrective actions can be taken.

2.5. PROJECT EIA BOUNDARIES

2.5.1. Core Area

Core area includes the Kilosa, and Mpwapwa Districts. Where the project will be implemented.

2.5.2. Area of Influence

Area of influence of the project includes all areas extending beyond the immediate boundary of the project site. These include the all regions using the railway, whole of Tanzania, the neighbouring countries that will be using the rail to transport their cargo.

3. POLICY, LEGAL AND INSTITUTIONAL ASPECTS

3.1. INTRODUCTION

Flood Protection measures for the Central Railway Line are expected to cause various environmental and social impacts at all phases i.e. site preparation, mobilization, and construction and operation. These impacts need to be mitigated to ensure that the project activities are done in compliance with national policies, legal and administrative framework, at the same time not at the detriment of environment and human health. This chapter discusses Tanzania national and sectoral policies, legislation and institutional framework, as well as international convections and agreements, which are relevant to the proposed project.

3.2. NEED FOR ENVIRONMENTAL IMPACT ASSESSMENT

Environment Impact Assessment is an important planning tool which is used to facilitate and promote sustainable development by integrating environmental conservation and management in the decision-making process. As such, most sector policies and legislation have incorporated the requirement for undertaking ESIA in the designing and implementing development activities in their respective sectors as discussed in the following sections.

3.3. RELEVANT POLICIES

3.3.1. Environment

In this section relevant national policies are discussed. The section provides guidance on what need to be done by the project Proponent to comply with the same.

National Environmental Policy (1997)
The National Environmental Policy (NEP) is the overarching policy that sets broad goals for environmental protection and committing Tanzania to sustainable development of its natural resources. The policy advocates that all projects should be subjected to EIA before they are constructed.

The policy provides the framework for the formulation of plans, programmes and guidelines for the achievement of sustainable development. The key objectives of the policy are to:

- Ensure sustainability, security and equity in the use of resources;
- Prevent and control degradation of land, water, vegetation and air resources;
- Conserve and enhance the natural and manmade heritage; and
- Raise awareness and promote public participation; enhance international cooperation on the environmental agenda.

The policy promotes the use of the ‘polluter pays principle’ and the use of the ‘precautionary principle’ (i.e. it recognises that it is better to be roughly right in time, than to be precisely right too late). The policy also advocates the use of other relevant approaches in environmental management such as economic instruments, environmental standards, indicators and legislation.

Relevant sections of the policy are:

a) Sections 26 and 27, deals with land tenure issues. The policy requires that clear land ownership should be ensured to ensure sustainable use of land resources and to avoid conflicts.
b) Sections 28 and 29: requires that technologies used should be those that generate no or low waste or protect environment, use resources efficiently are less polluting etc.
c) Sections 31- 33: advocates for biodiversity conservation.
d) Section 46: recognises the agricultural sector as key to poverty eradication and for promotion of sound environmental management practices to ensure the agriculture is sustainable.
e) Section 48 (c): advocates for technologies that use water efficiently, provides wastewater treatment;
f) 56 (f): states that workers' health shall be adequately protected from environmental health hazards.

The project proponent shall observe the above and other relevant provisions of the policy during design, construction and operation of this project.

3.3.2. Occupational / Public Health and Safety Issues

National Health Policy (URT, 2003)
The Health Policy is aimed at improving the health status of all people wherever they are, in urban and rural areas, by reducing mobility and mortality and raising life expectancy. Good health, i.e. physical mental and social wellbeing, is a major resource and economic development. Relevant section of the policy include Part IV which deals with primary health care in which the policy advocates for community involvement and provision of health education in order to prevent occurrences of disease. Part V elaborates of health service delivery structure from national to village level. The project is expected to contribute significantly to the objectives of this policy as it will enhance accessibility.

The National HIV/AIDS Policy 2001
The policy is intended to raise the level of awareness of HIV/AIDS as a major development crisis that affects all sectors. Important sections of the policy include Chapter 4 deals with the rights of people living with HIV/AIDS; and Chapter 5 which deals with prevention of HIV/AIDS. Mitigation of HIV/AIDS will be important during mobilisation and construction phase as these will involve a sizable number of workers staying away from their families.

3.3.3. Community Wellbeing

National Human Settlement Policy (2000)
The policy advocates for the development of human shelter that are sustainable and provisions of adequate shelter to all income groups. Although there are no specific provisions on people who have been relocated, the overall objective of the policy is to ensure that all people, including those that will be relocated, have shelter.

Community Development Policy (1997)
This policy is intended to put in place measures that will enable communities to realise their potential through wise utilisation of natural resources. Although there are many sections which are relevant to the project, sections 15 and 16 elaborate on the objectives of the policy. Since land is a resource that is mainly depended upon by local communities for their development, losing land may have severe consequences on community development.

Section 3 elaborates on roles of different stakeholders in bringing about community development, from national to family level. Section 4 is also discussing main actors. This project shall ensure that those who will lose land will be adequately compensated so as not to permanently impair their development.

3.3.4. Use of Natural Resources (Land, Water, Energy Etc.)

The National Land Policy (1997)
The objective of the policy is to promote and ensure a secure land tenure system, to encourage the optimal use of land resources, and to facilitate broad-based social and economic development without upsetting or endangering the ecological balance of environment. Chapter 4 of the policy elaborates on land tenure and land administration. The policy recognises that land has value as such it has to be compensated when it changes land ownership and that land cannot be taken without following legal process. It requires payment of disturbance allowance, transport allowance, loss of profits or accommodation, reduce problems, among others. The policy requires users to protect sensitive lands. The provision of this policy will guide the development of this project.

National Water Policy (2002)
The objective of the policy for Water Resources Management is to develop a comprehensive framework for promoting the optimal, sustainable and equitable development and use of water resources. The specific objectives of the water resources Management, which are relevant to this project, are:

- To have in place appropriate principles and procedures for managing the quality and conservation of water resources, as well as improve and protect the ecological systems and wetlands.
- To have water resources with an acceptable quality- Particularly the policy promotes the use of "The "polluter pays" principle as a means of protecting the water quality.
- To have in place water management system, which protects the environment, ecological system and biodiversity?
- To have an effective institutional framework for effective management of water resources.

In order to manage effectively the water resources the policy advocates for integrated water resources management and hence puts the river basin as the planning units for water resources utilisation. Chapter 4 provides policy statements for water resources management, among them are pollution control, water conservation, water resources planning and management.

Although this project will not use significant amount of water, it has potential to impact on the quality water resources. River training may create ecological problems, particularly on areas that have been diverted. Therefore river training shall be limited to areas where it is absolutely necessary to do so. Pollution of water resource will be avoided during the entire project cycle.

3.3.5. Transport Matters

National Transport Policy (2003)
This policy aims at developing an efficient, reliable, effective and fully integrated transport infrastructure and operations. Section 2.2 recognises the important role of a railway system in

socioeconomic development of any nation. Section 7.6.3 provides strategies for enhancing smooth operations provides strategies to enhance smooth operations of the railways services in the country. Section 8.1.2 and 8.2.2 elaborate the importance of integrated transport system with railway network for efficient of transit goods. This project will contribute considerably towards the objectives of the policy.

3.4.RELEVANT ACTS

The following are relevant sectoral and cross–sectoral Acts/Laws which provide directives on how projects should be implemented in relation to concerned environmental and socio-economic settings. The project develop shall follow relevant provisions of the Acts.

3.4.1. Environment

Environmental Management Act, Cap 191
The Environmental Management Act (EMA) Cap 191 imposes obligation on the project developer:

- As land user and occupier to protect, improve and nourish the land and using it in an environmentally sustainable manner (Section 72)
- To abstain from discharging any hazardous substance, chemicals, oils or their mixtures into waters or into any segment of the environment (Section 110)
- To comply with environmental quality standards (section 141)
- As a corporate body to comply with license conditions including the EIA certificate (Section 201)
- To control, manage and dispose, in a sound manner, waste including litter, liquid, gaseous and hazardous waste (Part IX).

The Environment Impact Assessment and Audit Regulations, G.N. No. 349 ***(2005)***
The National EIA & Audit Regulations (2005) provides guidance on how the Environmental Impact Assessment should be carried out. Of relevant to this study, is Part IV of the Regulations. Section 12-17, which prescribes the procedure to be followed in carrying out the environmental assessment, and Part V which gives the format of the environmental impact statement. The First Schedule of the Regulations, which lists all projects that require mandatory EIAs. Construction or new expansion to existing railway lines falls under this category.

Environmental Management (Air Quality Standards) Regulations (2007)
These Regulations require the project proponent:

- To comply with minimum air quality standards (Part III, Section 7)
- To abstain from releasing hazardous substances, chemicals, materials or gases into the environment (Part II Section 8)
- To register with NEMC if his operations do not meeting minimum air quality standards (Part IV, Section 14)
- To report any incident or accident that contravenes minimum air quality standard within seven days (Part V, Section 28).

Environmental Management (Hazardous Waste Control and Management) Regulations (2009)
These Regulations require the project proponent who is handling hazardous substances:

- To comply with principles of environment and sustainable development relevant to hazardous waste management i.e. the precautionary principle; polluter pays principle; and the producer extended responsibility (Part II, Section 4).
- To minimize the waste generated by adopting cleaner production principles (Part II, Section 5)
- To safeguard the environment from the adverse effects of hazardous wastes and to inform the relevant authority on any activity and phenomenon resulting from hazardous waste that is likely to adversely affect the public health and environment (Part II Section 6)
- To abstain from packing or storing wastes in a container or package, unless the container or package in which that waste is to be contained, packed or stored is UN approved container that is capable of containing or storing the waste in an environmentally sound manner without any risks to human health and the environment (Part III Section 9).
- To ensure that the hazardous waste are labelled in accordance with sub-regulation (1) (f) (Part III, section 10).
- To ensure hazardous materials, chemicals, waste are handled and stored in a manner that ensures safety to the environment and human health (Part III, Section 11).
- To ensure that people transporting hazardous chemicals, materials and waste into and outside Tanzania have a valid Prior Informed Consent for such movement issued by the Director of Environment (Part III, Section 16).
- Abstain from transporting biomedical waste without a valid permit issued by the relevant department or unit in the Ministry responsible for health in consultation with the Director of Environment (Part V, Section 34)
- To abstain from disposing of any pesticide or toxic substance other than at designated site or plant approved the Director of Environment (Part VI, Section 40).
- To abstain from disposing of any radioactive substance or waste other than at a designated site or plant approved by the Tanzania Atomic Energy Agency (Part VII, Section 43).

Environmental (Solid Waste Management) Regulations, (2009)

These Regulations require the project proponent who is handling wastes:

- To comply with principles of environment and sustainable development relevant to waste management i.e. the precautionary principle; polluter pays principle; and the producer extended responsibility (Part I, Section 4).
- To minimize the waste generated by adopting cleaner production principles (Part I, Section 5)
- To safeguard the environment from the adverse effects of wastes and to inform the relevant authority on any activity and phenomenon resulting from hazardous waste that is likely to adversely affect the public health and environment (Part I Section 6)
- To obtain relevant permit to transport wastes (Part III, Section 9)
- To provide approved waste receptacles by Council or local government authority (Part IV, Section 15)
- To respect waste collection times (Part IV, Section 16)
- To abstain from disposing hazardous waste, chemicals and materials into municipal waste receptacles (Part IV, Section 17)
- To ensure plastic wastes are separated from non-plastic waste (Part VI, Section 35)
- To control litter in public places (Part VII, Section 45)

Water quality standards Regulations (2007)

These Regulations require the project proponent:

- To comply with water quality standards that may be prescribed by the National Environmental Standards Committee.
- To protect water sources and ground water (Part III, Section 5).
- To abstain from discharging hazardous waste, materials chemicals into water body (Part III, Section 6)
- To keep recommended distances from water sources to a pollution source (Part III, Section 16)

Environmental management (Soil quality standards) Regulations (2007)
These Regulations require the project proponent:
- To comply with soil quality standards that may be prescribed by the National Environmental Standards Committee (Part II, Section 5).
- To abstain from polluting soils (Part III, Section 15)
- To abstain from discharging hazardous, waste, materials and chemicals on soils (Part III, Section 16)

Environmental management (Quality Standards for Control of Noise and Vibration Pollution) Regulations (2011)
These Regulations require the project proponent 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 (Part III, Section 6).
- Use the best practicable means to ensure that the emission of noise from that machinery, facility or premises does not exceed the permissible noise levels as specified in Schedule 1 (Part V, Section 8).

Environmental Management (Fees and Charges) Regulations (2009)
These Regulations require the project proponent to pay prescribe fees and charges that NEMC is mandated to impose on the developer.

3.4.2. Occupational / Public Health and Safety Issues

Occupational Health and Safety Act No. 5 of 2003
This Act requires the project proponent to:
- Designate a health representative whose duties are prescribed in the Act (Part II, Sections 11 and 12).
- Establish a health and safety Committee whose functions are prescribed in the Act (Part II, Sections 13 and 14).
- Register the work place with the Chief Inspector (Part III, Section 15).
- Ensure pre-placement and periodic occupational medical examination for fitness for employment and for employees carried out by a qualified occupational health physician (Part IV, Section 24).
- To ensure that all machines with moving parts are securely fenced unless they are safe by position or construction (Part IV, Sections 25 – 27).
- To ensure hoist and lifts are safe (Part IV, Section 35)
- To ensure hoist, and lifts do not exceed their carrying capacity (Part IV, Section 36)

HIV and AIDS (Prevention and Control) Act No. 28 (2008)
This Act requires the project proponent to:

- Promote public awareness on causes, modes of transmission, consequences, prevention and control of HIV and AIDS (Part II, Section 4)
- Design and implement gender and disability responsive HIV and AIDS plans in its respective area (Part II Section 6)
- In consultation with the Ministry shall establish and coordinate a workplace programme on HIV and AIDS for employees under his control and such programme shall include provision of gender responsive HIV and AIDS education, distribution of condoms and support to people living with HIV and AIDS (Part III, Section 9)
- observe confidentiality in the handling of all medical information and documents, particularly the identity and status of persons living with HIV and AIDS (Part V, Section 17)
- Not formulate a policy, enact any law or act in a manner that discriminates directly or by its implication persons living with HIV and AIDS, orphans or their families (Part VII, Section 28).
- Not deny any person employment opportunity to a person with HIV and AIDS (Part VII, Section 30).

Fire and Rescue Services Act, Cap 427

This Act requires the project proponent to:

- Provide and maintain fire escape (Part IV, Section 22).
- To designate a Fire Protect Manager whose duties are prescribed in the Act (Part IV, Section 24).

The Fire and Rescue Force Act, 2007 (No.14 of 2007) Regulations

These sets fire levy schemes. However, the regulations do not specifically mention Railway facility, but there are several sections, because of diversity of operations of the railway system, which directly apply to the project e.g.

Tanzania Commission for AIDS Act, Cap. 379 (2001)

The Act establishes the Commission with a mandate to spearhead the fight against AIDS epidemic in Tanzania. It formulates policies and guidelines for the response and coordinates activities related to the management of HIV/AIDS. The Project Proponent will collaborate with the Commission on issues related to prevention and control HIV/AIDS.

Industrial and Consumer Chemicals (Management and Control) Act No. 3 of 2003

The Act provides for the management and control of the production, importation, transportation, exportation, storage, dealing and disposal of chemicals. Since TRL will be storing and transporting chemicals, this Act is relevant. The Project Proponent is required to do the following:

- Register the chemical storage or warehouse with Registrar of Chemicals (the Chief Government Chemist) (Part III, Section 18)
- Apply for certificate for storage and transportation of chemicals (Part III, Section 29)
- Ensure chemicals are properly labelled (Part IV, Section 42)
- Refrain from transporting chemical wastes without proper approvals (Part IV, Section 43)
- Refrain from disposing chemical wastes without proper approvals (Part IV, Section 44)
- Prevent accidents involving chemicals (Part IV, Section 45)
- Have a system of managing chemical spills (Pat IV, Section 46)

3.4.3. Labour Relations

Employment and Labour Relations Act No 6 of 2004
This Act guarantees fundamental labour rights and establishes basic employment standards. Part II of the Act prohibits child labour, prohibits discrimination in employment (in terms of gender, pregnancy, marital status or family responsibility, disability, HIV/AIDS and age), and gives right to employees to join association and trade unions. Part III provides for employment standards including employers to be given contracts, working hours etc. Part X provides general provisions.

Works Compensation Act No. 20 of 2008
This Act requires the project proponent to:
- To pay contribute into Workers Compensation Fund (Part II, Section 5);
- Furnish the Director General of the Workers Compensation Fund with information on business being carried out (Part VIII, Section 71);
- Keep record of all earnings (Part VIII, Section 72);
- Display workers rights (Part VIII, Section 77);
- Inform injured personnel on compensation procedures (Part VIII, Section 78);

3.4.4. Use of Natural Resources (Land, Water, Energy Etc.)

The Village Land Act Cap 114 (1999)
This Act seeks to control land use and clarify issues pertaining to ownership of land and land-based resources, transactions on land and land administration. The Act requires the Project Proponent to do the following:
- To compensate pay family and promptly to people who have lost their land or property (Part II)
- To follow procedures for transferring part of village land to general land (Part III)
- To follow guidelines on use of hazard land (Part III, Section 6)
- To follow proper procedures for obtaining Village Land by recognising the administration structure of the Village land (Part IV)

Water Resources Management Act No. 11 of 2009
This Act requires the project proponent to:
- Refrain from conducting activities near water sources (Part VI, Section 34)
- Prevent water pollution (Part VI, Section 39)
- Control emergency pollution incidences (Part VI, Section 41)

The Forest Act No. 10 of 2002
The main objective of this Act is to provide for the Management of forests. It requires the project proponent to conduct an Environmental and Social Impact Assessment for projects that are to be conducted through a forest of any kind.

Antiquities Act of 1964 (Act No. 10 of 1964 Cap 550)
The legal protection of Tanzania cultural heritage resources is effected through Antiquities Act of 1964 (Act No. 10 of 1964 Cap 550) which is the principal legislation and the Antiquities (Amendment) Act of 1979 (Act No. 20 of 1979) as well as Rules and Regulations of 1981, 1991, 1995 and 2002. The legislation offers general protection to objects or structures, which are of archaeological, palaentological, historic, architectural, artistic, ethnological or scientific interest.

3.4.5. Transport Matters

The Surface and Marine Transport Regulatory Authority Act Cap 413 (2001)
This Act establishes a regulatory authority in relation to the surface and marine transport sectors, and to provide for its operation. The Act Requires the Project Proponent to do the following:

- To ensure that he has a valid licence from SUMATRA for transportation business (Part II, Section 6)
- To use fairs and rates set by SUMATRA (Part III, Section 16)
- To understand the existing mechanism for handling Consumer complaints (Part VI)
- To adhere to rules and regulations set by SUMATRA (Part VII, Section 38)
- To pay appropriate fees to SUMATRA (Part VIII, Section 14)

The Tanzania Railways Corporation Act Cap 170
This Act establishes the Tanzania railway Corporation which is mandated to operate the rolling stock for the public carriage of passengers or goods. The Client is the owner of the assets that are used by the Tanzania Railway Corporation, as such they have to work together to realise the objectives of the project.

The Railways (Licensing Of Railway Operators) Regulations, 2006
The Regulations requires any operator to have a license in order to carry out the following activities (a) Passenger train service (b) Freight train service (c) Operation and maintenance of rail infrastructure (Part II, Section 6).

The Tanzania Railways Civil Engineering Manual (1998)
This manual provides general instructions on what should be done in case of accidents. Chapter 15 provides general instructions to different people, provides guidance on Immediate Actions Required at the Site of Accidents or Obstructions, Protection of the Track at the Site of Accidents; Fire Precautions; Employee Responsibilities; Power to Enter upon Non-Railway Land; Pilferage from Damaged Wagons; Restoration of Traffic; Provision for Staff; Records and Reporting; Watchmen and Precautions Before and During Rains. This manual therefore covers major components of accident preparedness and response. Details of the manual are presented in Part III of Volume II.

TANROADS
TANROADS is an Executive Agency under the Ministry of Works, Transport and Communication, established under section 3(1) of the Executive Agency Act Cap245. The Agency is responsible for the maintenance and development of the trunk and regional road network in Tanzania Mainland. TANROADS is the responsible authority to authorize transportation of heavy loads using trunk roads.

3.4.6. Construction Matters

The Contractors Registration Act (Amendments) of No. 15 of 2008

3.4.7. Administrative Issues

Regional and District Act No 9, 1997
Although there is no section in this Act that is directly related to the Project, it does mandate the Regional, District and Local Governments to manage all national affairs including the environmental management. The EMA, Cap. 191 Section 34 confers roles to the Regional Secretariat to coordinate all environmental matters within a region and, through the Regional Environment Management Expert, to advise LGAs on implementation and enforcement of EMA requirements. As such, the Project Proponent shall work closely with Local Authorities to ensure the activities of the project are carried out without significantly impacting the environment and the rights of the Project Affected Persons are family and promptly compensated.

Local Government Act (District and Urban Authorities) of 1982 and its amendment i.e. Local Government Laws (Miscellaneous Amendments) Act, No. 13 (2006)
This Act provides for detailed responsibility for urban and district councils in the administration of their day-to-day activities. EIA is pointed out as one of the activities to be managed by both district and urban authorities. The Local Authorities have powers to charge fees on some services, have powers to enact by-laws etc. The Project Proponent shall work closely with Local Government to ensure the activities of the project are carried out without significantly impacting the environment.

3.4.8. Development Policies and Strategies

The Tanzania Development Vision 2025
The National Vision 2025 foresees the alleviation of widespread poverty through improved socio-economic opportunities, good governance, transparency and improved public sector performance. These objectives not only deal with economic issues, but also include social challenges such as education, health, the environment and increasing involvement of the people in working for their own development. The thrust of these objectives is to enhance smooth transportation of people and goods which is essential for socioeconomic development. In other words with a properly and efficiently operated railway network the objectives of the Vision 2025 cannot be attained.

National Strategy for Growth & Reduction of Poverty (2000)
The NSGRP strategy is viewed as an instrument for channelling national efforts towards broadly agreed objectives and specific inputs and outputs. The poverty reduction strategy is to large extent, an integral part of ongoing macro-economic and structural reforms. Achieving the target of accelerated growth will require significant efforts by different stakeholders to enhance productivity and increase investment in both human and physical capital. The rehabilitation efficient rail network will creating more direct and indirect employment opportunities, conveyance of goods and people, increase access to markets of agricultural produce, it is expected to increase trading opportunities and hence will significantly contribute to the objectives of the NSGRP.

The Road Act No. 13 of 2007
This Act requires the project proponent to:
Protect 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". (Part V, Section 33 – (1)). In particular the construction of the access road shall observe provisions of the Road Act.

Table 20 shows a summary of necessary permits that need to be processed before the project takes off.

Table 20: Requires environmental and social permits

SN	Issue	Law / Regulation	Deadline	Approving Authority	Responsibility
Pre-construction					
1	Environmental Compliance	EMA Capp 191 EIA & EA Regulations G.N. 349 (2005)	Before project begins	National Environment Management Council	RAHCO
2	Felling of Trees	Forest Act No 2 (2002)	Before starting of project	Relevant authority depending on the type of forest	RAHCO
3	Transportation of heavy cargo	TANROADS	Before transport heavy cargo using trunk roads	TANROAD	RAHCO
4	Environmental Certificate to Opening a new quarry	EMA Capp 191 EIA & EA Regulations G.N. 349 (2005)	Before opening a new quarry	NEMC	RAHCO
Construction					
5	Works Permit	Occupational Health and Safety Act No. 5 of 2003	Before construction begins	Occupation Health and safety Agency	RAHCO
Operation					
6	Transportation of chemicals	Consumer and Industrial Chemicals Act No 3 (2003)	Before transporting chemicals	Government Chemist Laboratory	TRL
7	Transportation of waste	Environmental (Solid Waste Management) Regulations, (2009)	Before transporting solid waste	NEMC	TRL

3.4.9. International Conventions

United Nations Framework Convention on Climate Change (1992)

The objective of UNFCCC is to stabilize the concentration of greenhouse gas (GHG) in the atmosphere, at a level that allows ecosystems to adapt naturally and protects food production and economic development. The project shall use fossil fuels during construction. Since Tanzania is a Party to the UNFCCC the Project Proponent shall endeavour to minimise the generation of greenhouse gases (GHG).

ILO Convention: C138 Minimum Age Convention, 1973

The United Republic of Tanzania ratified the Convention on 16:12:1998. It prohibits Child labour. The Project Proponent shall ensure no child is employed in the project activities.

ILO Convention: C182 Worst Forms of Child Labour Convention, 1999
Ratified by United Republic of Tanzania on 12:09:2001; The Project Proponent shall ensure no child is employed in the project activities.

Convention on Biological Diversity (Rio de Janeiro Convention) (1992)
This Convention, which calls for the sustainable use of biological diversity, was ratified by Tanzania in 1996. Tanzania is a country with rich diversity. The Project Proponent shall ensure that no endemic or threatened species in the project corridor that will be impacted. Furthermore, best practices of flora and fauna protection will be observed by contactors.

International Finance Corporation's (IFC) Sustainability Framework
The Sustainability Framework consists of: The Policy on Environmental and Social Sustainability, which defines IFC's commitments to environmental and social sustainability. The Performance Standards, which define clients' responsibilities for managing their environmental and social risks. The Access to Information Policy, which articulates IFC's commitment to transparency. The Performance Standards consist of the following: Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts Performance Standard 2: Labour and Working Conditions Performance Standard 3: Resource Efficiency and Pollution Prevention Performance Standard 4: Community Health, Safety, and Security. This ESIA has been prepared by considering the provisions of this framework.

Convention on International Trade in Endangered Species (CITES) (1973)
CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora, also known as the Washington Convention) is a multilateral treaty to protect endangered plants and animals. It was drafted as a result of a resolution adopted in 1963 at a meeting of members of the International Union for Conservation of Nature (IUCN). Tanzania ratified it in 09/12/2004. The Project Proponent will cooperate with designated authority to make sure that no trading in endangered species throughout the project phase.

Montreal Protocol on the Substances Depleting the Ozone Layer (1987)
The Montreal Protocol on Substances that Deplete the Ozone Layer (a protocol to the Vienna Convention for the Protection of the Ozone Layer) is an international treaty designed to protect the ozone layer by phasing out the production of numerous substances that are responsible for ozone depletion. Tanzania accessed this protocol on 07.04.1993 and has ratified several of its amendments. While RAHCO will ensure no ODS are used in its activities e.g. in refrigerators, Air Conditioners etc., it will cooperate with designated authority to make sure that ODS are not imported in the country illegally.

ILO C148 Working Environment (Air Pollution, Noise and Vibration) Convention (1977)
This Convention, ratified by Tanzania in 1984, provides the framework for ensuring a safe working environment for workers. The implementation of project will ensure that it prevents the exposure of its workers and the public from any occupational hazards by providing appropriate security and safety equipment.

3.4.10. World Bank Environmental and Social Policy Safeguard

This EIA has been designed so that all investments under this contract will comply with all the Environmental laws of the United Republic of Tanzania and the Environmental and Social Safeguard Policies of the World Bank.

The World Bank Safeguard Policies are;

1. Environmental Assessment (OP4.01, BP 4.01, GP 4.01)
2. Natural Habitats (OP 4.04, BP 4.04, GP 4.04)
3. Forestry (OP 4.36, GP 4.36)
4. Pest Management (OP 4.09)
5. Physical Cultural Resources (OP 4.11)
6. Indigenous Peoples (OP 4.10)
7. Involuntary Resettlement (OP/BP 4.12)
8. Safety of Dams (OP 4.37, BP 4.37)
9. Projects on International Waters (OP 7.50, BP 7.50, GP 7.50)
10. Projects in Disputed Areas (OP 7.60, BP 7.60, GP 7.60)

In light of the type and location of the project vis-à-vis the baseline data presented in Chapter 4 against the requirements of the Bank Safeguard policies, the following Bank operational policies will apply.

OP 4.01 (Environmental Assessment)

The Bank requires environmental assessment (EA) of projects proposed for Bank support to ensure that they are environmentally sound and sustainable, and thus to improve decision making. EA is a process whose breadth, depth, and type of analysis depend on the nature, scale, and potential environmental impact of the proposed project. EA evaluates a project's potential environmental risks and impacts in its area of influence; examines project alternatives; identifies ways of improving project selection, sitting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation. EA takes into account the natural environment (air, water and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples and physical cultural resources); and trans-boundary and global environmental aspects. The borrower is responsible for carrying out the EA and the Bank advises the borrower on the Bank's EA requirements. The Bank classifies the proposed project into three major categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts.

Category A: The proposed project is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works.

Category B: The proposed project's potential adverse environmental impacts on human population or environmentally important areas-including wetlands, forests, grasslands, or other natural habitats- are less adverse than those of "Category A" projects. These impacts are site specific; few if any of them are irreversible; and in most cases mitigation measures can be designed more readily than Category A projects.

Category C: The proposed project is likely to have minimal or no adverse environmental impacts.

OP 4.04 (Natural Habitat)

The conservation of natural habitats, like other measures that protect and enhance the environment, is essential for long-term sustainable development. The Bank therefore supports the protection, maintenance, and rehabilitation of natural habitats and their functions in its economic and sector work, project financing, and policy dialogue. The Bank supports, and expects borrowers to apply, a precautionary approach to natural resource management to ensure opportunities for environmentally sustainable development. The Bank promotes and supports natural habitat conservation and improved land use by financing projects designed to integrate into national and regional development the conservation of natural habitats and the maintenance of ecological functions. Furthermore, the Bank promotes the rehabilitation of degraded natural habitats. The Bank does not support projects that involve the significant conversion or degradation of critical natural habitats.

OP 4.10 – (Indigenous Peoples)

This policy contributes to the Bank's mission of poverty reduction and sustainable development by ensuring that the development process fully respects the dignity, human rights, economies, and cultures of Indigenous Peoples. For all projects that are proposed for Bank financing and affect Indigenous Peoples, the Bank requires the borrower to engage in a process of free, prior, and informed consultation. The Bank provides project financing only where free, prior, and informed consultation results in broad community support to the project by the affected Indigenous Peoples. Such Bank-financed projects include measures to (a) avoid potentially adverse effects on the Indigenous Peoples' communities; or (b) when avoidance is not feasible, minimize, mitigate, or compensate for such effects. Bank-financed projects are also designed to ensure that the Indigenous Peoples receive social and economic benefits that are culturally appropriate and gender and inter-generationally inclusive.

The Bank recognizes that the identities and cultures of Indigenous Peoples are inextricably linked to the lands on which they live and the natural resources on which they depend. These distinct circumstances expose Indigenous Peoples to different types of risks and levels of impacts from development projects, including loss of identity, culture, and customary livelihoods, as well as exposure to disease. Gender and intergenerational issues among Indigenous Peoples also is complex. As social groups with identities that are often distinct from dominant groups in their national societies, Indigenous Peoples are frequently among the most marginalized and vulnerable segments of the population. As a result, their economic, social, and legal status often limits their capacity to defend their interests in and rights to lands, territories, and other productive resources, and/or restricts their ability to participate in and benefit from development. At the same time, the Bank recognizes that Indigenous Peoples play a vital role in sustainable development and that their rights are increasingly being addressed under both domestic and international law.

OP 4.12 – (Involuntary Resettlement)

Bank's experience indicates that involuntary resettlement under development projects, if unmitigated, often gives rise to severe economic, social, and environmental risks: production systems are dismantled; people face impoverishment when their productive assets or income sources are lost; people are relocated to environments where their productive skills may be less applicable and the competition for resources greater; community institutions and social networks are weakened; kin groups are dispersed; and cultural identity, traditional authority,

and the potential for mutual help are diminished or lost. This policy includes safeguards to address and mitigate these impoverishment risks.

Implication of WB Policy: In view of subprojects nature, the overall project is classified as a Category 'B' as applied in the original project and the safeguard policy OP/BP 4.01 has been triggered to ensure that the sub project design and implementation is focused on reducing adverse impacts and enhancing positive impacts. In Tanzania's Context only the Hadzabe Tribe is considered Indigenous. The project will not reach areas where Indigenous People (IP) live and therefore OP/BP4.10 is not triggered. The project will impact some community properties; therefore OP/B4.12 has been triggered. This has necessitated development of the Resettlement and Compensation Plan.

3.4.11. IFC Environmental, Health and Safety (EHS) Guidelines[6]

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). 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 are meant to 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, assimilative capacity of the environment, and other project factors, are taken into account. The applicability of specific technical recommendations will be based on the professional opinion of qualified and experienced persons. This EIA has been in line IFC EHS guidelines.

3.4.12. JICA's Guidelines on Environmental and Social Safeguards

JICA is expected to provide lending support in this project. So, relevant standards and policies on environmental and social safeguards are applicable to this project.

JICA has prepared "Guidelines for Environmental and Social Considerations, April 2010" as the referential guidelines for environmental and social considerations. The objectives of the guidelines are to encourage Project proponents etc. to have appropriate consideration for environmental and social impacts, as well as to ensure that JICA's support for, and examination of, environmental and social considerations are conducted accordingly. The guidelines outline JICA's responsibilities and procedures, along with its requirements for project proponents etc., in order to facilitate the achievement of these objectives. In doing so, JICA endeavours to ensure transparency, predictability, and accountability in its support by considering environmental and social issues.

According to the guidelines, JICA classifies development projects into four categories with regards to the extent of environmental and social impacts, and taking into account the outlines, scale, site and other conditions. The four categories are as follows:

a) Category A. Proposed projects are likely to have significant adverse impacts on the environment and society.

[6] www.ifc.org/.../our approach/risk management/ehsguidelines (accessed on 11 March 2015)

b) Category B. Proposed projects are classified as Category B if their potential adverse impacts on the environment and society are less adverse than those of "Category A" projects.
c) Category C. Proposed projects are classified as Category C if they are likely to have minimal or little adverse impact on the environment and society.
d) Category FI. A proposed project is classified as Category FI if it satisfies all of the followings:
    - JICA's funding of the project is provided to a financial intermediary or executing agency;
    - The selection and appraisal of the components is substantially undertaken by such an institution only after JICA's approval of the funding, so that the components cannot be specified prior to JICA's approval of funding (or project appraisal); and
    - Those components are expected to have a potential impact on the environment

Over a certain period of time, JICA confirms with project proponents etc. the results of monitoring the items that have significant environmental impacts. This is done in order to confirm that project proponents etc. are undertaking environmental and social considerations for projects that fall under Categories A, B, and FI.

3.5. INSTITUTIONAL FRAMEWORK

This section presents a list of national and local authorities and institutions involved in reviewing and approving projects as well as issuing permits and other management functions pertaining to the project. The Tanzania Environmental Management Act, Cap. 191 (2004) is the principal Act that establishes and sets out roles and responsibilities for institutions and bodies for management of environment issues of concern. EMA supersede other Acts in this regard with the exception of the National Constitution. EIA Regulation identifies different functions and assigns responsibilities to all parties involved in the ESIA process of any proposed development undertaken for which ESIA is obligatory. Authorities relevant to the proposed project and their roles are shown in Table 20.

Table 21: Key Institutions in the Flood Protection Measures - Project

Level	Institution	Role and Responsibility	Remarks
National level	Vice President's Office (Division of Environment)	• Oversees policy, planning and implementation on environmental matters; • Advises Government on all environmental issues; • Coordinates lead ministries in environmental management; • Coordinates broad based environmental projects; • Facilitates civil society involvement.	According to National Environmental Policy, 1997.
	Ministry of Works, Transport and Communication	• Facilitating the development of transport infrastructure	According to Transport Policy, 2003
	Ministry of Land and Urban Development	• Issuing of Right of Occupancy; • Land use planning; • Valuation and compensation	According to the National Land Policy, 1997.
	National Environment Management Council (NEMC)	• Advisor to the Government on all environmental matters; • Enforce pollution control and perform the technical arbitration role in the undertaking of Environmental Audit and EIAs.	According to National Environmental Policy, 1997; National Environment Management Act Cap 191
	Surface and Marine Transport Regulatory Authority (SUMATRA)	• Advisor to the Government on all marine and surface transport matters; • Enforce safety standards in marine and surface transportation; • Sets fares	According to National Transport Policy, 2003; Tanzania Railway Corporation Act Cap 170; Surface and Marine Transport Regulatory Authority Cap 413
	Non-Government Organisations (NGOs)	• These are not part of the legal framework but are important stakeholders.	
Regional Level	Environmental Policy Committee	• Facilitate District, Ward and Village committees on the environment	According to National Environmental Policy, 1997; National Environment Management Act Cap 191
District Level	District Commissioner's Office	• General administration of the District; • Security matters	Regional and District Act No 9, 1997 Local Government Act 1982;
	District Executive Director and functional Departments	• Expertise in other sectors, e.g., Planning, Water, Health, Agriculture, Community Development, Natural Resources, etc. • Socio-economic development of the District; • Extension services	Village Land Act 1997; National health Policy, 2003; National HIV/AIDS Policy; National Human Settlement Policy 2000; Community Development Policy, 1997
	District Council	• Oversee performance of the District development plans; • Oversee resources and environmental management;	National Environment Management Act Cap 191

Level	Institution	Role and Responsibility	Remarks
Local level	Land Allocation Committee	• Land approval	Village Land Act, 1997; Land Act 1997
	Councillors	• To oversee overall performance of the development plans of the Ward	Local Government Act 1982; Community Development Policy 1997
	Ward Executive Office	• General administration issues • Socio-economic development of the ward • Extension Services	Local Government Act 1982; Community Development Policy 1997
	Ward Environmental Committees	• Coordinating and advising on environmental policy implementation obstacles; • Promoting environmental awareness; • Information generation, assembly and dissemination	According to National Environmental Policy, 1997.
	Councils (Ward and streets)	• Oversee performance of the administrative organs of the Ward/streets; • Oversee performance of the Environmental Committees (within their jurisdictions).	According to National Environmental Policy, 1997.

4. ENVIRONMETAL AND SOCIO-ECONOMIC BASELINE

4.1. INTRODUCTION

This chapter provides a description of relevant environmental, economic and social characteristics of the project core area (site specific), and areas in the immediate vicinity of the project; as well as broad description of the area of influence i.e. Kilosa and Mpwapwa Districts. The level of details in the various sections depends on the interactions between the project activities and the particular environmental or socio-economic aspect. Information provided in this chapter will be superimposed on to the project concept and components for impact identification, evaluation and development of mitigation measures.

4.2. SITE DESCRIPTION (Project Core Areas)

4.2.1. Location and Accessibility

For location and accessibility make reference to section 2.2

4.2.2. Biophysical features of the general area

Kilosa

Kilosa District is located at an elevation of 604m above sea level. The district lies between 6°S and 8°S and 36°30'E and 38°E. It borders Tanga Region to the north and Morogoro District to the east. In the south, it is bordered by Kilombero District and part of Iringa Region (KDC, 2000). Kilosa District comprises mostly flat lowlands that cover the whole of the eastern pat called Mkata Plains.

Physical characteristics

Climate

Kilosa District experiences climatic condition which is humid. The climate is characteristically tropical savannah (winter dry season), with a subtropical dry forest bio-zone.[7]

- Rainfall

Kilosa District experiences an average of eight months of rainfall (October – May), with the highest levels between February and March. The rainfall distribution is bimodal in good years, with short rains (October – January), followed by long rains (mid-February – May). Mean annual rainfall ranges between 1,000 to 1,400mm in the southern flood plain, while further north (Gairo Division) has annual rainfall ranging from 800 to 1,100mm.

- Temperature

The average annual temperature is typically 25°C in Kilosa town with extremes in March (30°C) and July (19°C).

Humidity

Humidity ranges from 54% to 94 % for Morogoro Region.

[7] http://www.chinci.com/travel/pax/q/157402/Kilosa+District/TZ/Tanzania/0/

Wind characteristics
Generally, in Kilosa District, winds are mostly of a North Easterly direction.

Average wise wind speed was higher in 2005 as compared to lower speed in 2011.

Table 22: Wind-force (km/h) per Month (January 2005 - December 2011)[8]

	Months											
Years	***Jan***	***Feb.***	***Mar***	***Apr***	***May***	***June***	***July***	***Aug***	***Sep***	***Oct***	***Nov***	***Dec***
2005	10.4	12.2	6.4	3.7	2.6	4.7	5.3	8.4	12.6	11.9	16.9	20.3
2006	17.1	13.0	5.6	2.3	1.4	1.5	3.4	3.8	6.0	8.3	5.2	7.2
2007	8.3	6.5	3.8	1.6	0.9	1.2	2.2	4.9	6.7	7.8	10.7	11.7
2008	9.1	7.3	3.5	1.0	0.6	0.9	2.5	4.1	6.3	5.7	10.2	13.2
2009	13.5	6.1	5.5	0.4	0.7	1.4	2.3	4.7	6.7	7.3	8.8	9.7
2010	8.8	8.2	11.0	1.3	0.7	1.5	3.5	5.8	8.2	9.8	12.1	10.1
2011	10.0	5.8	3.8	0.2	1.0	0.9	0.5	1.4	4.3	6.1	6.9	5.5

Visibility
At Kilosa, visibility ranges from 2km in the mornings to about 10km in the night[9].

Topography, geology and soil condition
The topography of the district varies significantly and can be divided into three zones:

Flood plain
Comprises both flat and undulating plains extending to the foothills in the west, with an altitude of about 550m. It has several rivers, the major ones being the Wami and the Ruaha. The central parts are mainly occupied by pastoralist communities especially Maasai and Sukuma. The soils are poorly drained, black cracking clays in the central parts, and subject to seasonal flooding. In the peripheral western part, sediment fans are of black fertile soils, making them suitable for a range of crops, such as maize, cotton and sisal (KDC 2010).

Plateau:
Situated in the north of the district, with an altitude of around 1,100m, it is characterised by plains and hills and is made up of moderately fertile, well-drained sandy soils. Although these soils are highly erodible, the area is intensively used for maize production and livestock keeping (KDC, 2010). .

Highland:
Runs from north to south on western side of the district, with an altitude up to 2,200. It is part of the Eastern Arc mountain range that runs from Kenya down through Tanzania and is represented in Kilosa by three mountains: Kaguru, Rubeho and Vidunda (KDC, 2010).

Land Uses in Kilosa District
Land in Kilosa can basically be divided into five: agricultural (37.5 per cent), natural pasture (33.5 per cent), Mikumi National Park (22.5 per cent), forest reserves (5.5 per cent) and urban areas, water and swamps (1 per cent) (KDC, 2010). Both agriculture and livestock grazing are practised on general, village and private lands, while Mikumi National Park and forest reserves are controlled areas and state owned. There are a few village forests established from general lands and are included in the pasture land category.

[8]http://www.weatheronline.co.uk
[9]http://www.worldweatheronline.com/Kilosa-Kwa-Mpepo-weather/Iringa/TZ.aspx

Mpwapwa District

Mpwapwa District is one of the six districts in Dodoma Region. It is located 120 kms from Dodoma Regional Headquarters. It lies between Latitudes 6°00" and 7°30" South of the Equator and between Longitude 35°45" and 37°00" East of Greenwich.

It borders Kilosa District on the eastern part, Kongwa District on the Northern part, Chamwino District on the western area and Kilolo District on the southern part. The District covers a total area of 7,379 square Kilometres (18.1% of total area of Dodoma Region).

Physical characteristics

Climate

- Rainfall

Short rain season starts December to April ranging between 600 – 700mm per annum.

- Temperature

The average minimum temperature is 15.5^{o}C, the coolest month being August (13.8^{o}C). The average maximum temperature is 27.5^{o}C, the warmest month being November (30.2^{o}C).

Humidity
Average humidity is ranges between 54% - 70%

Visibility:
At Mpwapwa, visibility is about 150km.

Air Quality
Along the project area there are no major sources of air pollutions. Air quality was measured using an Outdoor Potable Air Monitor (Aeroqual Series 200) (see Figure 26). This device uses different sensors for different pollutant, i.e. sensors are swapped to allow the measurement of all target pollutants. Table 23 shows a summary of average concentrations of target pollutants.

Noise and vibration levels
Along the project area there are no major sources of air noise and vibrations except noise and vibrations from a passing train. Noise and Vibrations were made at Kilosa Station for two consecutive nights 4th December 2015 and 05th December 2015. Noise was measure by Laserliner Model (see Figure 27). This device is sometime called 'an exponentially averaging sound level meter' because the AC (alternating current) signal from the microphone is converted into DC (direct current) by a RMS (root mean square) circuit. A basic sound level meter device consists of microphone, filters, amplifier, squaring device, etc. Filters inside the device alter the frequency spectrum of the noise signals that passes through it. The microphone in the sound level meter converts the noise signals to electrical signals, which can be read by the sound level meter. The meter displays the sound level in decibels (dB), which is a logarithmic unit of sound intensity. 'HI' and 'LO' in the meter's display indicates whether the noise level is high or low, respectively with regards to the threshold level.

Figure 26: Potable Outdoor air Monitor

Figure 27: Potable Noise Monitor

Figure 28: Potable Vibration Monitor

While vibration was measured using a Vibration data collector Series STD 510 (see Figure 28). Our interest was to measure ground borne vibrations from railway tracks. A train generates vibrations which are transmitted through the track to the ground, resulting in vibration. Buildings located near surface trains are subjected to surface train-induced vibrations. The vibrations measured at the foundation slab of buildings serve as the base excitation for the building. The amplitude of vibrations depends on several factors, such as roughness of wheels and rails, dynamic properties of a train, a vehicle speed, characteristics of a railway track, a soil damping and a propagation of waves thought the soil. Vibration measurements were performed on the building foundation slab as well as in open fields adjacent to the building. Field measurements were carried out at Kilosa Station. A Vibration data collector Series STD 510 was used 5 meters from the middle of the railway track and on the foundation of the Kilosa Station Office.

Table 23 shows a summary of average concentrations of target pollutants. Noise and Vibrations are presented in Table 24.

Table 23: Air quality along the project route (01 – 05 December 2015)

DATE	TIME LOCATION	MAXIMUM READING			MINIMUM READING			AVERAGE			RECOMMENDED AIR QUALITY STANDARD		
		LEL (%)	NO2 (ppm)	CO (ppm)	LEL (%)	NO2 (ppm)	CO (ppm)	LEL (%)	NO2 (ppm)	CO (ppm)	LEL (%)	NO2 (ppm)	CO (ppm)
01/12/15	Kilosa Station	**0.0**	**0.0**	**8.0**	**0.0**	**0.0**	**2.0**	**0.0**	**0.0**	**5.0**	**0.25 at 20^{o}C For methane**	**53 (EPA)**	**35 (EPA)**
02/12/15	Munisagara Station	**0.0**	**0.0**	**3.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.5**			
03/12/15	Kidete Station	**0.0**	**0.0**	**5.0**	**0.0**	**0.0**	**3.0**	**0.0**	**0.0**	**4.0**			
04/12/15	Godegode Station	**0.0**	**0.1**	**12.0**	**0.0**	**0.0**	**4.0**	**0.0**	**0.05**	**8.0**			
05/12/15	Gulwe Station	**0.0**	**0.1**	**14.0**	**0.0**	**0.0**	**6.0**	**0.0**	**0.05**	**10.0**			

NB: the air quality on a particular day depends on the activities within the port.

Table 24: Sound Level (dBA) at Kilosa Station (4th December – 5th December 2015)

Time: 01:00 - 03.00hrs and 05:00 – 06:00 hrs

Location	Noise Level (dBA)
Kilosa Station	
With no passenger shouting	40.2 – 44.2
With Passenger Talking/ Shouting/laughing	55 - 61
Approaching Train without whistling	65 - 66
With Train Whistle	84
Stationary Train	65 - 66
Train Moving away from the station	65 - 66

Table 25: Vibrations Level (dBA) at Kilosa Station (4th December – 5th December 2015)

Time: 01:00 - 03.00hrs and 05:00 – 06:00 hrs

Location	Station Foundation (mm/s)	Open Field Close to Station Office (mm/s)
Kilosa Station		
No Train	0	0
Approaching Train	4.0	8.3
Stationary Train	0.5	2.4
Train Moving away from the station	3.5	6.5

4.2.3. Biophysical features of the project area

4.2.3.1. Land Topography of the Project Area

The project area from Kilosa to Ihumwe where railway line passes has two sections of distinct landscape: Kilosa to Gulwe and Gulwe to Ihumwe.

Kilosa to Gulwe: Railway line from Kilosa to Gulwe passes along the valley defined by the ranges of hills; on the left (Rubeho mountains) and on the right (Ukaguru mountains) of the railway line towards North West. The area is characterised by hills of moderate to very steep slopes (varying from 2.6% to 23% as measured in habitable areas-in the villages). The hills are composed of exposed rock and some areas of shallow depth of soil cover, the effect being observed also on the vegetation cover.

Gulwe to Ihumwe: The section is not confined between ranges of hills but characterised by the gentle slopes towards East and South East. The gentle slopes are made up/ comprised of deep deposit of alluvial SAND from North and North West.

It was also observed (using Digital Elevation Model and the site visit) that Kilosa is at lower altitude and altitude increases towards Dodoma (Ihumwe).

The project area also composed of swaps and flood plain. The railway line crosses some of the flood plains and swamps as observed from Kilosa to Ihumwe.

4.2.3.2. Geomorphology (Geology and Soils) of the Project Area

The soil survey and investigations were conducted during the field survey 31 May – 6th June 2015). The investigations included visual observation of surface as well as digging up the pits to examine horizons and taking soil samples for further laboratory testing.

The study found out that the geology of the project area is characterised by Usagaran and Bendian of Mafic Gneiss and Garnet Gneiss rocks with some occasions of crystalline limestone. The soil distribution was observed to follow the observed topographical nature of the project area from Kilosa to Dodoma (Ihumwe):

a) *Kilosa to Gulwe:* There are two types of soil pads within the project section – (i) Along the hills and ridges slopes, there are residual soils of medium to stiff gravelly SAND pads, shallow depths of one to two horizons, namely, the O-horizon of up to 10cm depth which overlays a bedrock in most places and along the foot of the hills/ridges and the A- horizon up to about 30cm which overlays the bedrock. (ii) Along the Valleys/Folds, swamps, Flood plains: there is loose to moderately firm deposit of alluvial SAND soils of undifferentiated horizons due to deposition made every rain season. The loose to moderately firm Sand is normally characterized by low nutrients (low fertility), high infiltration (low water holding capacity); and
b) *Gulwe to Ihumwe:* There exist loose to moderate stiff Reddish Brown Alluvial SAND soils of shallow to deep layers of horizons.

Plate 3: Mafic Gneiss observed at Muzaganza Village (9259091, 0256445) (photo taken on 9/06/2015)

Plate 4: Limestone observed at Godegode Village (9276944, 0229246) (photo taken on10/06/2015)

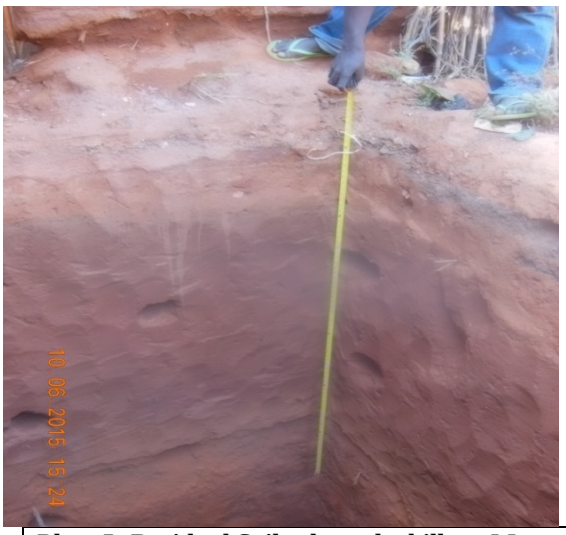


Plate 5: Residual Soils along the hills at Muzaganza Village (9258627, 0257504) (photo taken on 9/06/2015)

Plate 6: Alluvial Soils at Godegode Village (9277101, 0229848) (photo taken on 10/06/2015)

4.2.3.3. Water resources and Hydrology of the Project area

Hydrologically, the project area is located within Wami/Ruvu water basin on the eastern side of Tanzania. The Wami basin extends between 5° and 7° Latitudes, South and between 36° and 39° Longitudes, East. Figure 29 shows the Wami/Ruvu basin which comprises of the catchments of Wami, Ruvu and coastal rivers that are jointly administered as a unit by the Ministry of Water.

The hydrological study included include direct observation of the water resources in the project area, stakeholders' consultations, collection of grab samples of water, onsite analysis of water samples, laboratory analysis of water samples, documentary review and desk work for the report compilation.

Figure 29: Location map showing Wami/Ruvu Basin wherein the study area is found

Water Sampling

Water samples were collected from rivers and boreholes between 7th and 13th June 2015 (Dry Season) and between 30th November 2015 and 8th December 2015 (Wet Season). Standard WQ grab sample procedures for nutrients and heavy metals were followed in the sampling locations as described in the Standard Method for the Examination of Water & Wastewater (APHA/AWWA/WEF, as reported in Lenore *et al.*, 1999): using a water sampler with extendable arm to enable taking samples away from the river bank. All samples for nutrients and heavy metals were appropriately fixed and stored in cool boxes before being shipped to the laboratory for analysis. Samples for heavy metals were fixed using 5 drops of concentrated HNO_3 in one litre sample while samples for nutrients were fixed using 5 drops of concentrated H_2SO_4 in one litre sample as described in the standard methods (Lenore *et al*., 1999). Before taking samples, the sampler was rinsed with distilled water then with the sample. A total of 10 samples were collected: 4 samples along Mkondoa River, 1 from Mdukwi River, 2 from Isima River and 1 from Kinyasungwe River where water was flowing during the field work. 2 other samples were collected from boreholes that exist in study area.

Onsite analysis of water samples
Onsite analysis was carried out for pH, Temperature, Dissolved Oxygen (DO), Electrical Conductivity (EC) and Total Dissolved Solids (TDS) immediately after sampling. While DO was analyzed using portable DO Meter, the other parameters (pH, temperature, EC and TDS) were analyzed using HI991301 pH/EC/TDS Meter (HANNA Instrument).

Laboratory analysis of collected samples
The samples were analyzed at the Water Quality Laboratory of the Department of Water Resources Engineering, College of Engineering and Technology, University of Dar Es Salaam. The samples were analyzed in accordance with the standard methods for examination of water and wastewater of American Public Health Association (1992).[10] Table 26 shows the parameters that were analysed.

Table 26: List of parameters analyzed in the laboratory for the collected samples

Category	Parameters
Physical	Turbidity, Colour, Total suspended solids, Total hardness and Total alkalinity
Chemical	Chlorides, Sulphate, Ortho – Phosphate, Nitrate, Nitrite, Ammonium, Fluorides, Bicarbonates, Carbonates, Aluminium, Sodium, Potassium, Magnesium, Calcium, Iron, Manganese, Copper, Arsenic, Lead, Zinc, Cyanide, Cadmium and Chromium
Bacteriological	Faecal Coliforms and Total Coliforms

Documentary Review
Literature documents were used as a source of secondary data and information to supplement missing ones that are crucial for the baseline activity.

Desk Works
Basically this was an office work which involved compilation of baseline data and information, evaluation of laboratory results and report compilation. The desk work was accomplished with the aid of computer and associated accessories and programmes.

Surface Water Resources

General Classification
The project area is found within Wami/Ruvu basin which comprises of the catchments of Wami, Ruvu and coastal rivers. Specifically, it is found within Wami River sub-basin which originates from Eastern Arc Mountain ranges of Tanzania and extends from the semi-arid Dodoma region to the humid inland swamps in the Morogoro Region to the coastal zone of Indian Ocean. Of the six hydrological zones of Wami River sub-basin, the study area is located in Kinyasungwe and Mkondoa zones (Figure 30) which, as far as the study area is concerned, form the upstream and downstream ends respectively. The surface water resource in this area therefore is dominated by natural rivers. Other surface water features are man-made ponds and dams most of which having a connection with existing natural rivers.

[10] American Public Health Association 18 R.E. Edition 1992

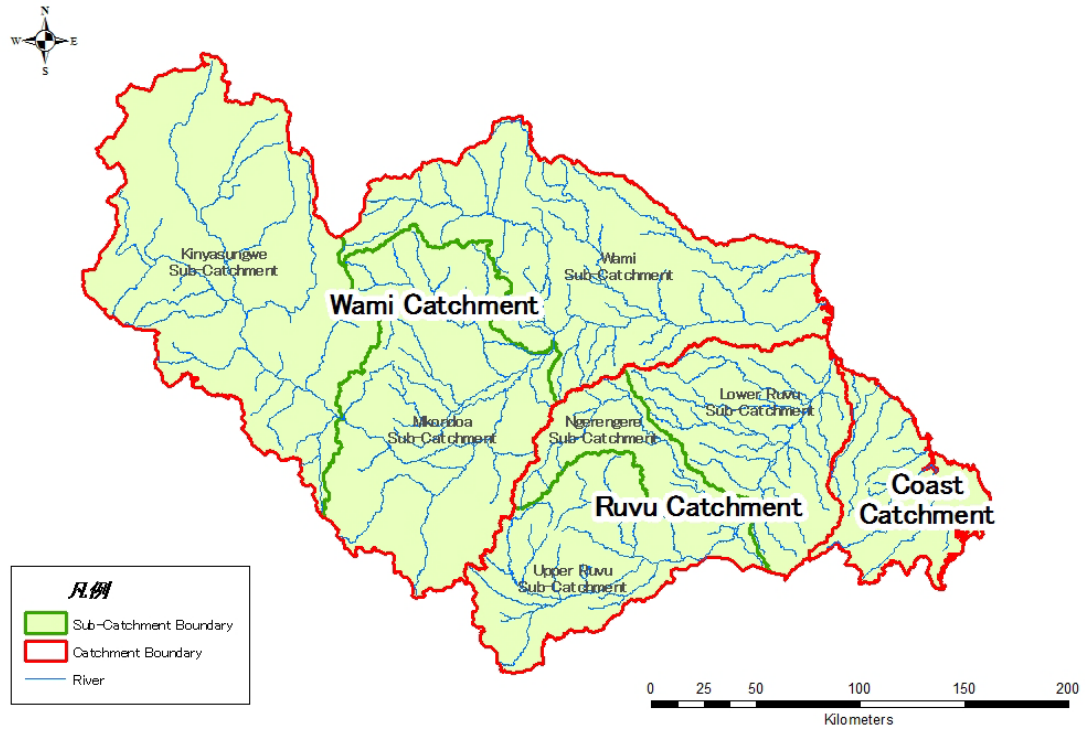


Figure 30: Map of Wami Ruvu Basin showing Kinyasungwe and Mkondoa hydrological zones wherein the project area is located

Rivers in the Study Area

Kinyasungwe River in Dodoma region marks the major surface water feature in the upstream of the study area (**Plate 7**). It is a seasonal river originating from the arid areas of Dodoma region flowing south-east and discharge its water into Mkondoa River. As stated earlier, the catchment of Kinyasungwe River forms one of the six hydrological zones in Wami River sub-basin. Other rivers in this zone are Mzase, Sikoko, Kidibo, Maswala and Mangweta. During the study all rivers in this zone, including Kinyasungwe, were observed to have no water flow.

Junction between Kinyasungwe and Mzase rivers in Gulwe village (Photo taken on 11/06/2015)

Plate 7: Sections of rivers in Kinyasungwe hydrological zone in the project area

Mkondoa River on the other hand is the main valley which drains the downstream of the study area. It is a perennial river originating from Ukaguru Mountains which are found within Kilosa District of Morogoro region, which form part of Eastern Arc Forest habitat. The Mkondoa river catchment forms another zone among the six hydrological zones of the Wami

River sub-basin. The zone contributes the highest volume of flows to the sub-basin and its rivers (including Lumuma, Muvuma/Isima and Mdukwi – Plate 8) are mostly perennial. The Mkondoa River is used as a water source, source of water for irrigation, small scale fishing and drinking water for both domestic and wild animals.

Junction between Mkondoa and Muvuma rivers at Munisagara village (Photo taken on 09/06/2015)

A section of Mkondoa river at Muzaganza village (Photo taken 09/06/2015)

A section of Mkondoa river at Mkadage, Kilosa (Photo taken on 08/06/2015)

Plate 8: Sections of rivers in Mkondoa hydrological zone in the project area

Hydrology Characteristics

Rainfall and Runoff Characteristics

Average annual rainfall across the Wami sub-basin is estimated to be 550–750 mm in the highlands near Dodoma, 900–1000 mm in the middle areas near Dakawa and 900–1000 mm at the river's estuary. Most areas of the Wami sub-basin experience marked differences in rainfall between wet and dry seasons. Although there is some inter-annual variation in timing of rainfall, dry periods typically occur from July to October and wet periods from November to December (*vuli* rains) and from March to June (*masika* rains) (WRBWO 2007b). Literature entails that in the Uluguru Mountains, the origin of many rivers in the Wami River sub-basin, considerable vegetation changes have been observed between 1995 and 2000 (Yanda *et al.*, 2007). The disappearance of vegetal cover has lead to increased surface runoff and flash floods and reduced infiltration, ultimately resulting in reduced base flows in rivers including the rivers in the project area.

Considering the timing of the study, no surface runoff was observed in the project area due to minimum flow in rivers. In other rivers especially the area from Ihumwa to Gulwe, no flow

was observed in rivers at all. However, the impacts of storm water runoff were vividly observed in the project are and they were in the form of sand deposits as a result of overland transport of sediments, rills and gullies as a result of erosion as well as degradation of the river banks due to erosion. According to information gathered from local people in the project area, increased storm water runoff and it effects is linked with decreased vegetation cover as a result of anthropogenic activities especially unsustainable livestock keeping and agricultural activities upstream, along the rivers stretch and banks. Most affected rivers are Kinyasungwe, Mzase and Mkondoa as shown in Plate 9.

Soil erosion along Mkondoa river at Mkadage (Photo taken on 08/06/2015)

Soil deposits along Mkondoa river at Muzaganza (Photo taken on 09/06/2015)

Plate 9: Typical storm water runoff indicators in the project area

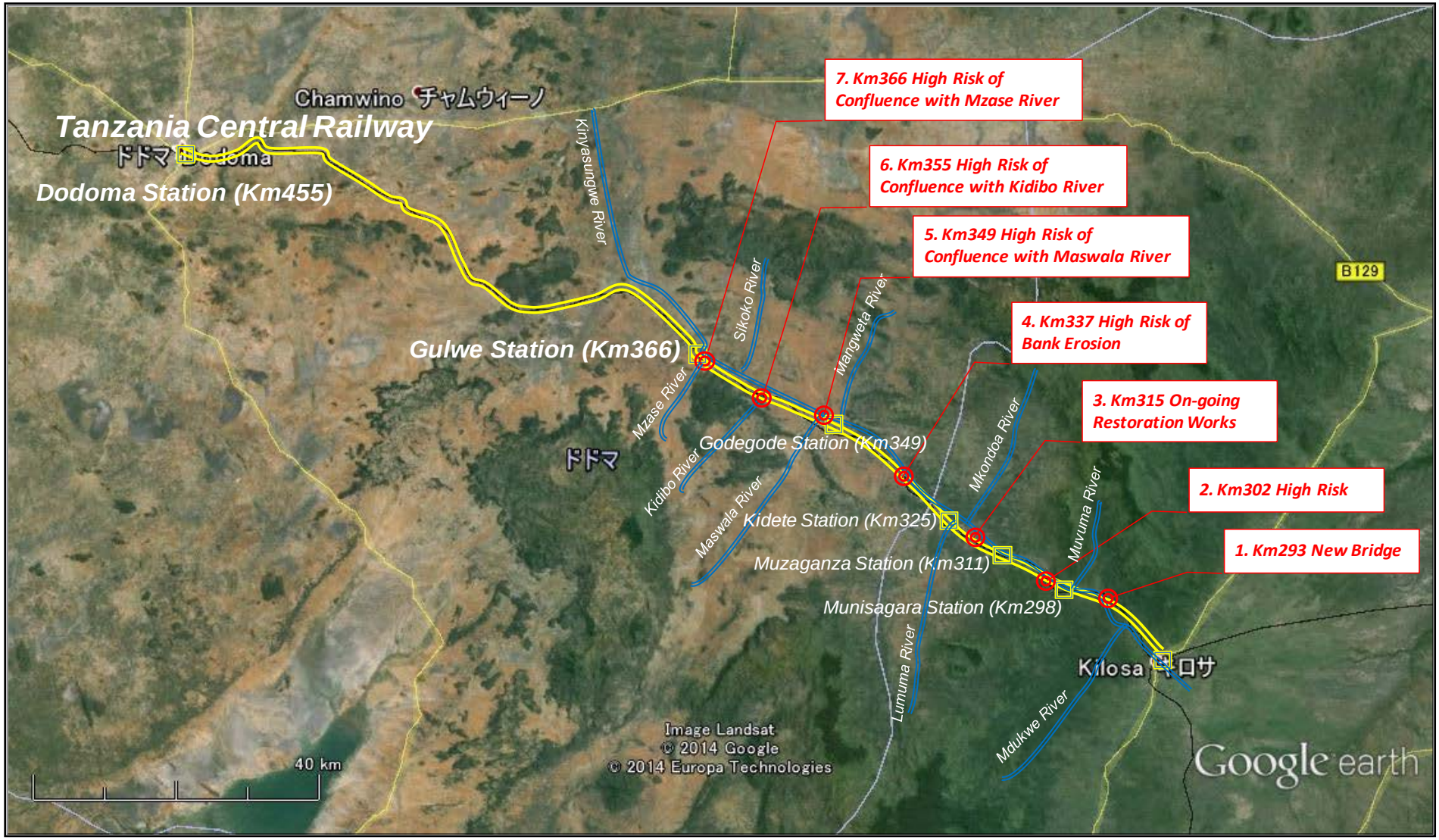


Figure 31: Google earth imagery view of the rivers in the project area (Source: JICA team - Report)

Flow Characteristics

Both spatial and temporal variations in river flows are experienced in the project area. Spatially, the rivers in the upstream zone of the project area; embracing Kinyasungwe, Mzase, Sikoko, Kidibo, Maswala and Mangweta; regardless of their size, are predominantly seasonal and typically flows only between November and May. Besides, rivers in the downstream zone dominated by Mkondoa River and its tributaries (Lumuma, Muvuma/Isima and Mdukwi) are perennials and contribute the highest volume of flows in the project area. Temporarily, the wet and dry seasons affects the availability of surface water in the project area and its vicinity, thus impacting the hydrology. Many rivers are intermittent and ephemeral during the dry season and experience high flows during periods of heavy rainfall. Long-term average monthly flows from select sites in the Wami-River sub-basin suggest that the sub-basin experiences a transition pattern of intra-annual flow variation between the bimodal (two peak periods) regime in the north and the unimodal (single peak period) regime in the south. All sites have a defined peak during the long rains and a second smaller peak in larger catchments during the short rains. The lowest flow periods of the year are typically in October (which corresponds to the hottest temperatures, highest evaporation rates and lowest precipitation) for all sites whilst low or no flow periods extend longer for seasonal rivers like the Kinyasungwe (WRBWO 2008a).

Table 27: Sources and flow characteristics of rivers in the project area

River	Source/Catchment	Flow	Average Daily Flow - ADF (m^3/s)
Kinyasungwe	Arid areas of Dodoma	Seasonal	No record
Mzase	Arid areas of Dodoma	Seasonal	Not gauged
Sikoko	Arid areas of Dodoma	Seasonal	Not gauged
Kidibo	Arid areas of Dodoma	Seasonal	Not gauged
Maswala	Arid areas of Dodoma	Seasonal	Not gauged
Mangweta	Arid areas of Dodoma	Seasonal	Not gauged
Lumuma	Rubeho Mountains	Seasonal	No record
Muvuma	Rubeho Mountains	Perennial	Not gauged
Mdukwi	Rubeho Mountains	Perennial	[11]4.58
Mkondoa	Ukaguru Mountains	Perennial	[12]10.15

Source: URT 2013

Sediments Transportation

Previous hydrological studies carried out in the project area have reported on sediment transport as water moves from upstream to downstream. Reported causes include deforestation and unsustainable agricultural practices and livestock keeping in the upstream tributaries and along some sections of the rivers. This has disturbed the perennial vegetation along riverbanks leaves them prone to accelerated erosion especially during high flows and slumping and where there is no bedrock control. Erosion of the bank is exemplified by the wandering behaviour of the river channels. This often leads to channel widening or migration, the loss of riparian habitat and/or crop land, and the contribution of sediment within the channel. Excessive sediment can have a negative effect on aquatic habitat, and depending on the magnitude of sediment deposition can contribute to a positive feedback cycle that promotes channel widening, further bank erosion, and increased sedimentation.

During the study sediment transport was observed all along the rivers of Kinyasungwe and Mkondoa rivers. They were in the form of bed load (along the bottom of a waterway which

[11] This is the ADF of Mkondoa River at Kilosa as reported by the Forestry and Beekeeping Division, 2005
[12] This is the ADF of Mdukwi River at Mdukwi as reported by the Forestry and Beekeeping Division, 2005

depend more on river flow), suspended load and sediments as well as the wash load (that remain permanently in suspension; depend on supply and responsible to turbidity increase in the water). The area which has the most remarkable sediment discharges were observed in the section between Kidete and Gulwe involving Kinyasungwe and Mzase rivers. Along Kinyasungwe and Mzase rivers, the sediments in the active channels were observed to be alluvial and dominated by sand bars (70-80% of the channel) with grain sizes range from silt to gravel. The bed materials in the Mkondoa River on the other hand are largely sand size deposits with silt and clay size sediments occur on riverbanks.

Man-made Dams

One (1) man-made dam exists within the study area as observed during the study. It is commonly known as Gombe dam located in Kidete village, Kilosa district, at about 0.4 km from the nearest point to the railway line (Plate 10). The dam is established across Kinyasungwe River thereby retaining water to cater for flood control as well as water storage for various multiple uses including domestic consumption. According to local people in Kidete village, the dam does experience frequent destruction by heavy rains which damage the embankment. During the study the dam was not operational as it was under rehabilitation following destruction by heavy rains.

Plate 10: Sections of Gombe Dam in Kidete Village. The dam is under rehabilitation (09/06/2015).

Man-made Ponds

These are basically small bodies of standing water made by people to meet specific purposes. Typically they contain shallow water and surrounded by marsh and natural vegetation in their immediate vicinity. In the project area these ponds were observed in the vicinity of the natural rivers thereby having an internal ecological relationship or in low land areas to accumulate storm water runoff during rainy season. Most of these ponds are used for livestock watering points and small scale irrigation agriculture.

Surface Water Quality

Table 28 shows the characteristic quality for the onsite measurement which analyzed the physical parameters of the rivers which had water flow during the study. The measurement entails that the concentration of all tested parameters are within the typical values recommended for rivers which is in line with Kemikimba 2006. Beside, the collected samples have been taken for further analysis to the Water Quality Laboratory of the Department of Water Resources Engineering, College of Engineering and Technology, University of Dar es Salaam.

Table 28: Results of onsite analysis of river water samples from the project area

Borehole Source	Coordinates	Averages				
		pH	Temperature	EC	TDS	DO
Mkondoa River at Mkadage	272977 m E 9250109 m S	8.27	27.40°C	340µS/cm	180Mg/L	7.22 mg/l
Mdukwi River at Mkadage	272842 m E 9249106 m S	7.75	23.10°C	180µS/cm	90Mg/L	8.78 mg/l
Mkondoa River at Munisagara	269773 m E 9254099 m S	7.93	26.80 °C	210µS/cm	130Mg/L	7.42 mg/l
Muvuma River at Munisagara	268769 m E 9254796 m S	7.46	19.10 °C	10µS/cm	10mg/L	7.94 mg/l
Typical (TBS)[13]		6.5 – 8.5	25 – 35	<2000	<1000	> 6.0 mg/l

The results for both sampling periods are shown in Table 29 (Dry Season) and Table 30 (Wet Season).

Table 29: Water Quality – From the First sampling Period (7th – 13th June 2015)

PARAMETERS	UNITS	Sample						TZ. STD[14]
		SI	S2	S3	S4	S5	S6	
Physical Parameters								
Turbidity	NTU	2.35	120	8.00	101	10.20	1.15	30
Colour	PtCo/1	9.40	300	18.60	286	26.40	7.20	50
Total Suspended Solids	mg/l	10	90	15	100	20	10	1000
Total Hardness	mg/ICaC03	360	440	212	85	40	255	600
Total Alkalinity	mg/ICaC03	230	280	148	70	45	298	N.M.
Chemical analysis								
Chlorides	mg/l	88.64	66.48	65.45	45.00	18.50	160	250
Sulphates	mg/l	71.20	24.00	10.0	28.20	12.0	84.20	400
Ortho-Phosphate	mg/l	0.04	0.02	Nil	0.02	Nil	0.05	N.M
Nitrate	mg/l	2.10	2.0	0.60	2.0	0.80	3.90	30
Nitrite	mg/l	0.10	0.05	Nil	0.06	Nil	0.10	N.M.
Ammonium	mg/l	0.10	0.01	Nil	0.01	Nil	0.50	0.50
Fluorides	mg/l	Nil	Nil	Nil	Nil	Nil	Nil	1.5 -8.0
Bi-carbonates	mg/l	160	65	25	7S	40	210	N.M.
Carbonates	mg/l	Nil	Nil	Nil	Nil	Nil	Nil	N.M.
Aluminium	Mg/l	0.01	Nil	Nil	Nil	Nil	Nil	0.30
Sodium	mg/l	40.00	12.00	2.00	10.30	2.S0	30	250
Potassium	mg/l	8.48	21.36	9.41	5.25	1.40	17.50	200
Magnesium	mg/l	12.47	23.24	10.47	6.0	0.60	21.40	150
Calcium	mg/l	33.64	16.82	50.46	10.50	2.80	36.20	300
Iron	mg/l	0.21	1.90	0.11	0.04	0.01	0.20	0.30
Manganese	mg/I	0.08	0.05	Nil	Nil	Nil	0.04	0.10
Copper	mg/l	Nil	Nil	Nil	0.10	0.10	0.30	1.5
Arsenic	mg/l	Nil	Nil	Nil	Nil	Nil	Nil	0.05
Lead	mg/l	Nil	Nil	Nil	Nil	Nil	Nil	0.10

[13] Environmental Management (Water Quality Standard) Regulations 2007
[14] Environmental Management (Water Quality Standard) Regulations 2007

PARAMETERS	UNITS	Sample						TZ. STD[14]
		SI	S2	S3	S4	S5	S6	
Zinc	mg/l	0.10	0.23	0.07	0.40	Nil	0.10	5
Cyanide	mg/I	Nil	Nil	Nil	Nil	Nil	Nil	0.10
Cadmium	mg/l	Nil	Nil	Nil	Nil	Nil	Nil	0.05
Chromium	mg/l	Nil	Nil	Nil	Nil	Nil	Nil	0.05
Bacteriological analysis								
Faecal Coliform	No/100	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Total coliform	No/100	Nil	Nil	Nil	Nil	Nil	Nil	Nil

KEY: SAMPLE IDENTIFICATION SI = MKADAGE BOREHOLE
S2 = MKONDOA RIVER - MKADAGE S3 = MDUKWI RIVER – MKADAGE; S3 = MKONDOA RIVER - MUNISAGARA S4 = ISIMA RIVER - MUNISAGARA S6=V1KUNDIBOREHOLE

It can be seen than all parameters were below Tanzania Standards except for Iron in Mkadage Bore Hole.

Table 30: Water Quality – From the Second Sampling Period (30th November 2015 – 8th December 2015)

PARAMETERS	UNITS	Sample				TZ. STD
		S1	S2	S3	S4	
Physical Parameters						
Turbidity	NTU	1060	19.20	708	368	30
Colour	PtCo/l	1700	45	1260	810	50
pH	-	7.97	7.80	7.60	7.45	6.5 – 8.5
Electrical Conductivity	µS/Cm	710	138	520	490	2000
Total Suspended Solids	mg/l	410	100	280	200	1000
Total Dissolved Solids	mg/l	360	90	300	280	NIL
Total Hardness	mg/l $CaCO_3$	280	65	150	140	600
Total Alkalinity	mg/l $CaCO_3$	250	60	120	110	N.M.
Chemical analysis						
Chlorides	mg/l	85.10	19.50	60.0	56.50	250
Sulphates	mg/l	62.0	15.40	48.20	40.0	400
Ortho-Phosphate	mg/l	0.05	Nil	0.02	0.03	N.M.
Nitrate	mg/l	1.65	0.03	0.09	0.06	30
Nitrite	mg/l	0.80	Nil	0.02	Nil	N.M.
Ammonium	mg/l	Nil	Nil	Nil	Nil	0.50
Fluorides	mg/l	0.07	Nil	Nil	Nil	1.5 – 8.0
Bi-carbonates	mg/l	260	60	130	120	N.M.
Carbonates	mg/l	Nil	Nil	Nil	Nil	N.M.
Aluminium	mg/l	Nil	Nil	Nil	Nil	0.30
Sodium	mg/l	32.0	10.50	21.20	18.60	250
Potassium	mg/l	25.40	6.40	16.60	16.80	200
Magnesium	mg/l	29.0	10.20	18.0	15.0	150
Calcium	mg/l	43.50	15.0	26.0	24.60	300
Iron	mg/l	0.18	0.10	0.07	0.08	0.30
Manganese	mg/l	0.03	Nil	Nil	Nil	0.10
Copper	mg/l	Nil	Nil	Nil	Nil	1.5
Arsenic	mg/l	Nil	Nil	Nil	Nil	0.05
Lead	mg/l	Nil	Nil	Nil	Nil	0.10
Zinc	mg/l	Nil	Nil	Nil	Nil	5
Cyanide	mg/l	Nil	Nil	Nil	Nil	0.10

PARAMETERS	UNITS	Sample				TZ. STD
		S1	S2	S3	S4	
Cadmium	mg/l	Nil	Nil	Nil	Nil	0.05
Chromium	mg/l	Nil	Nil	Nil	Nil	0.05
Bacteriological analysis						
Faecal Coliform	No/100 mls	Nil	Nil	Nil	Nil	Nil
Total coliform	No/100 mls	30	Nil	40	20	Nil

KEY: SAMPLE IDENTIFICATION
S1 = Mkondoa River at Munisagara Village; S2 = Isima/Muvuma River at Munisagara Village; S3 = Mkondoa River at Muzaganza Village; S4 = Kinyasungwe River at Gulwe Village

It can be seen than the following parameters were above Tanzania Standards for the respective sample area:

- Turbidity of all samples except S2 (i.e. Isima/Muvuma River at Munisagara Village)
- Colour of all samples except S2
- Total Coliform Except for S2

Generally, the measurement and analysis showed the following:

- **Physical Quality**: while all tested parameters for Mdukwi and Muvuma Rivers are within the typical/recommended values, Mkondoa River indicated the high values of turbidity and colour which tends to increase downstream. This might be due to sediments' transport as a result of upstream deforestation and unsustainable agricultural practices along the river banks.

- **Chemical Quality**: all tested parameters from all Rivers (Mkondoa, Mdukwi and Muvuma) are within the typical/recommended values. Besides, there might be an influence of sampling period i.e. dry season whereby most rivers experience none to minimum flow and no runoff from upstream and surrounding environment as observed during EIA study. According to the Wami Basin Situation Analysis under IUCN Eastern and Southern Africa Programme (2010) and an Environmental Flow Assessment Phase II in the Wami River Basin carried out by GLOWS – FIU (2014), the basin – especially Mkondoa and Kinyasungwe Rivers – tend to experience high concentration of nutrients i.e. phosphate and ammonia. The major factors affecting the nutrient levels in the basin are nutrient sources and natural variations in stream flow. During rainy seasons nutrients can be easily washed from land and human settlements into rivers. The dominant source of nitrogen and phosphorus in the Wami River Basin is most likely agriculture in which agricultural nutrient sources such as manure and fertilizer, combined with agricultural acreage, would have the greatest impact on the trends in flow-adjusted nutrient concentrations

- **Biological Quality:** Samples from all rivers (Mkondoa, Mdukwi and Muvuma) showed no faecal contamination. Again, there might be an influence of dry season sampling where no runoff is experienced from upstream and surrounding/settlement areas, hence no faecal bacterial contamination. According to the Wami Basin Situation Analysis under IUCN Eastern and Southern Africa Programme (2010), some rivers in the basin experiences faecal coliform contamination with bacteria ranging from 350 to 50,000 CFU/100mL.

Surface water use in the project area

According to site observation and information captured from local people in the project area, surface water sources especially rivers play a very significant role in water supply. Critical times are during dry seasons which affect water availability; accessibility and quality thus influence competition among multiple uses. The typical water uses during this times includes domestic consumption; irrigation agriculture; livestock drinking and fishing as elaborated in the paragraphs below. Other uses includes swimming, transportation of logs during rainy season, construction activities especially blocks and bricks making, and aquatic life.

Domestic consumption: Include drinking, cooking, washing, cleaning and bathing. Water is abstracted directly from a river or by making a pond within a dry river bed or in its vicinity to get more clear water (Plate 11). Typical abstractions means involve fetching of water using buckets and gallons for use at households.

Irrigation agriculture: Surface irrigation dominates in the project area. Specifically furrow surface irrigation. Water is abstracted in two ways; (1) by by-passing a portion of river flow at an elevated section for downstream gravitational irrigation (2) by pumping of water from a river to an irrigation field. A typical system comprises of a pond which accumulates water from a river by gravity, a fuel pump which drive water from a pond to the conveyance system (i.e. horse pipe) and a furrow system that receive water and supply to the irrigation fields (Plate 11). Irrigation agriculture was massively observed in a section between Gulwe and Munisagara villages.

Water for Livestock: Drinking water for livestock in the project area is in the form of direct entrance into the rivers when there is flow, or through created ponds, or through shallow wells and wood dishes (Plate 11).

Small Scale Fishing: Normally for domestic consumption. It is done using lines and hooks and small sardine nets. However, the seasonality nature of some rivers limits the carrying out of this activity.

A typical pond within Mkondoa river channel created for fetching domestic water in Muzaganza village (Photo taken on 09/06/2015)

More deeper ponds within Kinyasungwe river channel created for fetching domestic water in Godegode village (Photo taken on 10/06/2015)

Surface furrow irrigation extracting water from Mkondoa river in Muzaganza village(Photo taken on 09/06/2015)

Water pumping from Mkondoa river for supply into irrigation fields in Kikundi village (Photo taken on 10/06/2015)

Livestock drinking water direct from Mkondoa river in Munisagara village (Photo taken on 09/06/2015)

Fetching water from shallow well for drinking livestock in Msagati village (Photo taken on 12/06/2015)

Plate 11: Sections of typical water uses in the project area

Groundwater Resources

General Classification

The aquifers in Wami/Ruvu basin, wherein the project area is located, are divided into 13 aquifers. For the assessment of development potential of groundwater, these 13 aquifers are re-categorized into nine aquifers in consideration of distribution of aquifers, geology of the aquifers and availability of data as shown in Figure 32. The proposed project area for implementation of measures to protect the central i.e. Kinyasungwe and Mkondoa catchments, accommodates various categories of aquifers characterized by Composite metamorphic crust domain, Meta-igneous and sedimentary rocks, Migmatite and Granite as well as Alluvial deposits and Fluvial deposits.

According to JICA report of 2013 on water resources management and development in Wami/Ruvu basin, in all of Sub-Catchments, it is confirmed that the development potential of groundwater is less than the recharge amount and the ceiling amount of development potential of groundwater as summarized in Table 31 and Figure 33. It is, therefore, concluded that an appropriateness of the development potential of groundwater is verified in terms of sustainability of groundwater resources.

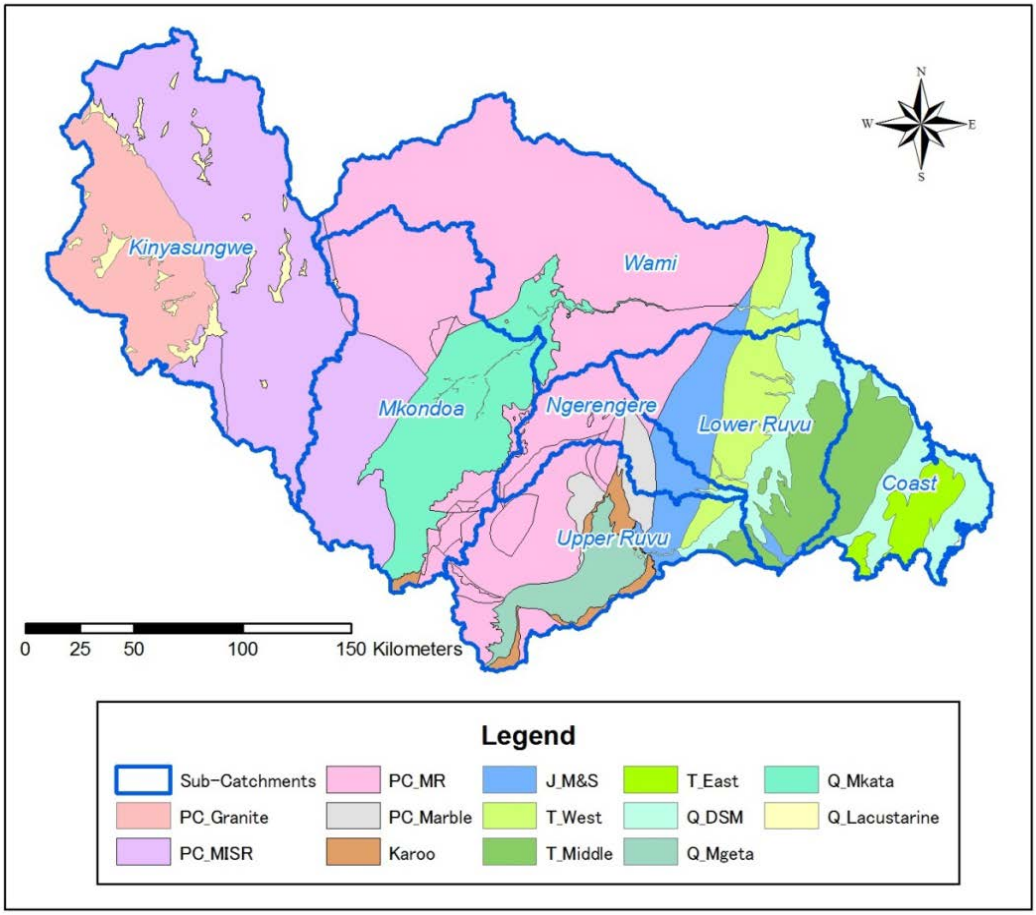


Figure 32: Map of Wami Ruvu Basin showing the groundwater aquifers

Source: URT, 2013[15]

Table 31: Development Potential of Groundwater, Ceiling Amount of Development Potential of Groundwater and Recharge Amount of Sub-Catchment in Wami/Ruvu Basin

Sub-Catchment	Area (km^2)	Recharge Amount (MCM/year)	Ceiling Amount of Development Potential of Groundwater (MCM/year)	Development Potential of Groundwater (MCM/year)	Development Potential of Groundwater /Recharge Amount (%)
Kinyasungwe	16,509	478.47	279.43	129.37	27.0
Mkondoa	12,964	1,042.00	643.45	178.79	17.2
Wami	14,270	827.95	496.42	169.12	20.4
Upper Ruvu	7,623	439.10	270.65	102.02	23.2
Ngerengere	2,913	343.73	201.76	26.98	7.8
Lower Ruvu	7,253	717.15	464.04	282.74	39.4
Coast	4,763	424.22	303.88	250.32	59.0
Wami/Ruvu	**66,295**	**4,272.62**	**2,659.63**	**1,139.34**	**26.7**

Source: Source: URT 2013

[15] United Republic of Tanzania, Ministry of Water 2012/2013 Annual Basin Hydrological report

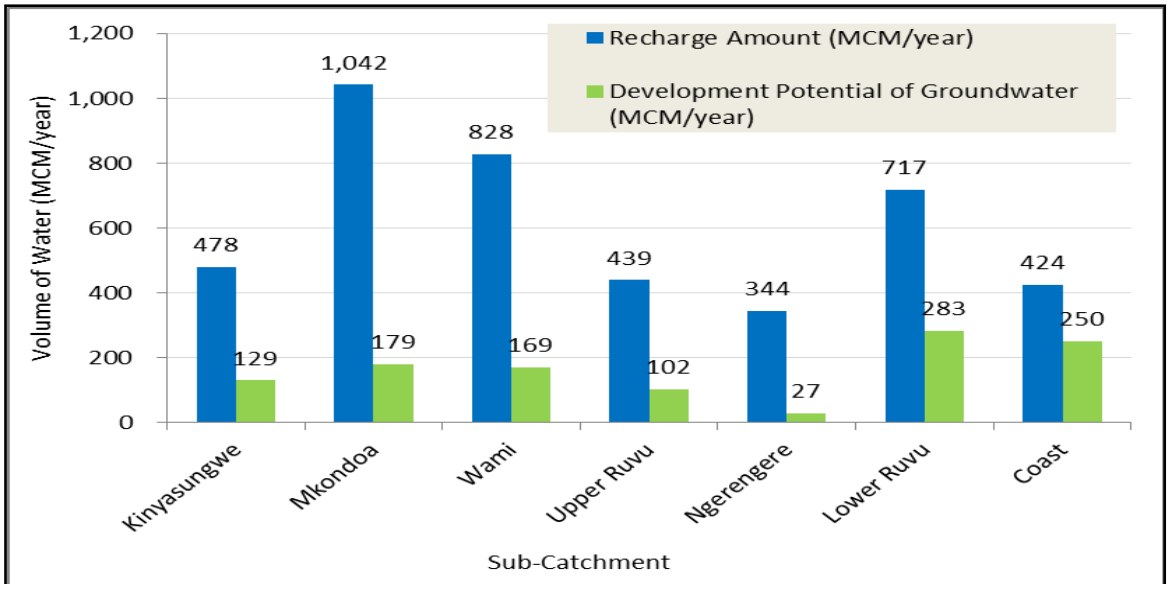


Figure 33: Development Potential of Groundwater and Recharge Amount of Sub-Catchment in Wami/Ruvu Basin

Source: Source: URT 2013

Groundwater abstraction and use in the project area

Groundwater resources in the project area are evidenced by the presence of shallow wells and boreholes. Boreholes are dominant and during the study more of these were observed in the Mkondoa hydrological zone (in Kilosa) than the Kinyasungwe zone (in Dodoma). These facilities are established for and used by local communities to meet their water demands in addition to the surface water sources. Basically, water from the ground reservoir is abstracted through hand pumping via a PVC pipe casing. According to information gathered from local people in the project area the depth of these boreholes ranges from 12 – 24m below the ground surface. Some of these boreholes are defunct mainly due to pump damage/failure. Table 32 shows an inventory of boreholes and Plate 12 and Plate 13 show typical boreholes found within the project area. On contrast, development and use of shallow wells is not a well established in the project area. Only one shallow well was observed in Muzaganza village and 11 in Msagali village (Plate 13). The typical ground water uses (as observed and informed by local people in the project area) are the domestic undertakings including drinking, cooking, washing, cleaning and bathing. Other rare uses are irrigation agriculture (observed in Kikundi village) and livestock drinking (observed in Msagali village – refer Plate 8).

Table 32: Inventory of borehole and shallow wells in the project area

Village/Mtaa	Operational Borehole	Defunct Borehole	Shallow Wells
Mkadage	2	2	0
Munisagara	2	2	0
Muzaganza	0	5	1
Kikundi	3	2	0
Godegode	0	3	0
Gulwe	0	0	0
Msagali	0	0	11
Igandu	0	0	0
Kikombo	2	1	0
Ihumwa	No record	No record	0

Source – Filed assessment

Munisagara village (Photo taken on 09/06//2015)

Kikundi village (Photo taken on 12/06/2015)

Plate 12: Typical boreholes observed in the project area

Muzaganza village (Photo taken on 09/06/2015)

Msagali village (Photo taken on 12/06/2015)

Plate 13: Typical shallow wells observed in the project area

Groundwater Quality

According to onsite analysis of the physical parameters of sampled borehole water, it was observed that water quality from boreholes is not uniform and can be slightly saline in some places. However, the analysis entails that most parameters monitored are within acceptable stands as they reflect the typical values (Table 33). Besides, it should be noted that more laboratory work is on progress and their complete analysis will be presented in the EIS report. This analysis, is concentrating on characteristic parameters i.e. physical, chemical and micro-bacteriological will provide a more detailed picture of the baseline conditions in the project area.

Table 33: Results of onsite analysis of boreholes samples from the project area

Borehole Source	Coordinates	Averages			
		pH	Temperature	EC	TDS
Mkadage Mtaa	273464 m E 9248807 m S	7.26	27.5°C	570µS/cm	290Mg/L
Kikundi Village	253209 m E 9259755 m S	7.34	27.10°C	1450µS/cm	720Mg/L
Typical (TBS)[16]		6.5 – 8.5	25 – 35	<2000	<1000

[16] Environmental Management (Water Quality Standard) Regulations 2007

4.2.3.4. Aquatic ecology of the project area

The survey of aquatic ecology was done through literature review, site observation (7^{th} – 13^{th} June 2015 (Dry Season) and 30^{th} November 2015 – 8^{th} December 2015 (Wet Season) and interviews with fisher folks within the area.

Study methodology

The information was collected through carrying out experimental fishing and through interviewing the locals who reside within the project area. Experimental fishing in most places was carried out using a SAMUS75 electro-shocker and a small beach seine and some gill nets were deployed only at the Gulwe swamp (Plate 14). The fish caught in the nets were identified right there in the field using field guide of Bernacsek (1980) Eccles (1992), and Skeleton (2001).

Interviews with locals was for collecting information on the number of fishers in their communities and the type of fish species caught and to establish if fishing was a significant economic activity in their locations. Other information collected was on the presence of other aquatic animals in the respective areas.

Plate 14: Electro shocking and drag fishing methods

Results

General overview

Interviews with the locals revealed that the area contains very few fish species. Fishing is occasionally carried out mostly during rainy season during which fish are probably washed downstream when the water reservoirs such as Bahi and Hombolo upstream over spill. This study revealed that big sized fishes were caught mostly in the swamp at Gulwe where it was also reported that 50 catfishes of around 8kg each had been caught in early December 2015. Other sections of the river system had very small sized fish consisting mainly of the small barbs, catfishes and tilapias. During rainy seasons the water in the river was very muddy such that the conditions cannot support fish life because the mud will clog the breathing organs (gills) of the fishes. Therefore, no fish were caught in some of the areas that were sampled (Table 35).

Observation during 7^{th} – 13^{th} June 2015 survey

No test fishing was done, since most rivers were dry. The information below was reported by villagers in those areas:

Table 34: Summary of observation during dry season survey

Village	Type of fish
Mkadage village 37M0273827E, 9248320S:	Less than 20 persons catch fish using gillnets and hooks and line. The fish caught include kambale, ngogo, dagaa , mbalafu, and ningu during December rains. Besides fish, other aquatic animals include Otters, monitor lizards and Crocodiles found only in Mdukwi River.
Munisagara Village 37M026052E; 9254218S:	The occasional fishers catch fish using gill nets of mesh size 1.5 inch and hooks and line. Fishing is mainly done around October to November when water starts to recede. The river is full between March and April. Fish caught include Mbalafu, Ningu, Kambale, dagaa, pelage Other aquatic animals include: Monitor lizards, otter, snake (python).
Muzaganza 370257866E; 9258630S:	Fishes caught include ngogo, pelage and ningwi. Other animals such as Otters, and terrapins are sometime present when water is flowing.
Kikundi village, Kidete, 37M253145E, 9260548S:	There are less than 26 fishers in the village. The fishes caught: Kambale, ngogo, and pelege. Nyakitwange river brings water from Mtera dam which meets Mkondoa river at Mwasa village, Kidete. Other aquatic animals found include: Monitor lizard, Python, and other water snakes.
Godegode village 37M 229752E; 9278080S:	Fishers use gill nets 2.5-3inch to catch fish trapped in pools. Fishes caught include Kambale and perege. Kibakwe river crosses the railway line at 37M 228901E; 9277749N. Railway erosion is temporarily protected by gabions (expanded wire reinforcement of concrete basement).
Gulwe:37M213717E; 9286560S -	Fishing is carried out in remnant swamps on Kinyansungwi river but Mzase river originating from Ota has no fish at all because it only a drainage channel collecting rain water. Several fishers including small children who use mosquito nets and 2"gill nets to catch kambale, perege, Dagaa and uduvi (Plate 19). Upstream of Gulwe there is Bali dam, which when it opens during rainy season, even eels are caught. Other aquatic animals include frogs, terrapins, monitor lizards and snakes.
Msagali 37M 213617E, 9286654S	Fishes caught include Kambale, Perege during rainy season. Also Monitor lizards area present
Igandu 37M 183161E, 9296390S	The river channel was dry but it was reported that when it rains the water overflows over the railway line.
Ihumwa 36M819581, 9316885S	A visit to Ihumwa river valley revealed that the river is seasonal which floods during rainy season

It may therefore be concluded that:

a) The project area consists of some aquatic habitats mainly a perennial flowing river i.e. Mkondoa and a seasonal river Kinyansungwi. There are also various small natural lakes e.g. (Nzuhe, Gombo) as well as several manmade lakes (Dams) Hombolo and Msagali, pools and swamps in various sections along these two rivers.
b) Various rivers both perennial and seasonal join onto these two main rivers. During the rainy season these other rivers bring to the main course more water and some fauna especially fish from over-spilled dams upstream thus making available some other fish species e.g. eels that are otherwise not found in the main river course during the other time of the year. Other fish species such as "ningwi" and ngogo are also known to perform seasonal spawning migrations during rainy season.
c) Even during dry season several pools and swamps (at Gulwe) along Kinyansungwi River are still being exploited for fish.
d) The flow of Kinyansungwi river is very much affected by water abstraction/diversion for irrigating onion farms, such that some farming is conducted in the dried up main river channel (Plate 15) in most areas during dry season

Plate 15: An irrigation canal and onion nursery plots (10/06/2015)

Most of the rehabilitation will take place close to the two main rivers Mkondoa and Kinyansungwi except at Godegode where it will take place across the seasonal Kibakwe River (Plate 16).

Plate 16: The seasonal (now dry) Kibakwe River crossing the railway line at Godegode (10/06/2015)

Most villagers had the opinion that if dams are constructed along the river they will help to control floods. In addition the dams will create an environment where fish will breed and support some fishery and able to provide some protein food. A very big dam was still under construction at Kidete (Plate 17).

Plate 17: Dam still under construction at Kidete (10//06/2015)

Observation during 30th November 2015 – 8th December 2015

Experimental Fishing results

Very few fishes (see Table 35) were caught through experimental fishing. Among those fishes caught including the sharptooth African catfish (*Clarias gariepinus*), barbs (*Barbus paludinosus*), and Nile tilapia (*Oreochromis niloticus*). However, interviews with the locals had revealed that there exists some other species including a minnow *Labeo* sp and freshwater eels *Anguilla sp*. which together with *Barbus paludinosus* also are known to perform such migrations. Usually riverine fish species will perform spawning migration going into flood plains to spawn during rainy season. Although there are many areas in the study area that get flooded, many of these cannot retain flood water for quite long and therefore cannot be utilized by the fishes as spawning grounds. The Gulwe swamps however, are such suitable area because a large part of the area becomes inundated for a longer time during rainy season (Plate 18). During the December visit a large area of more than 2km long by more than 500m wide was inundated. This area is likely to get bigger when more rains come in January through April. That is why even during dry season there were still some fish in swamp. These fish may have been trapped in the swamp while the water receded fast.

Plate 18: The Gulwe swamp

Table 35: Number of fish catches

Site Coordinates	Site Description	Common name	Species	Quantity
6.76154°S 36.93250°E Munisagara bridge, start point of No1	Shallow water less than 0.5, , river valley 50m wide River banks with typha and phragmites	catfish barb	*Clarias gariepinus* *Barbus paludinosus* *Chiloglanis sp*	1 5
Muzaganza 6.74496°S 36.89801°E Munisagara Bank protection site	Shallow water less than 0.3m, channel 80m wide	Nile tilapia barb	*Oreochromis niloticus* *Barbus paludinosus*	3 2
6.74342°S 36.90722°E Munisagara Site for construction Gabion	Shallow water near the river bank less than 0.5 m, *Cyperus* sedges and some phragmites	*Barb*	*Barbus paludinosus*	4
6.706881°S 36.82801°E	River banks with Typha and phragmites	Barb catfish	*B. paludinosus* *C. gariepinus*	6 2

Site Coordinates	Site Description	Common name	Species	Quantity
6.70124°S 36.80683°E NW of Muzaganza station Gabion work on route 2	Shallow water less than 0.5m Cyperus sedges	*Barb* *catfish*	*B. paludinosus* *C. gariepinus*	3 6
6.72749°S 36.84301°E near the bridge at 305.7km	Shallow water near the river bank, less than 0.5m deep, middle channel dry, channel about 100m width, fringing phragmites and Cyperus sedges	None	None	None
6.73981°S 36.85115°E near the bridge at 300km	River 50m wide Bank with typha and phragmites Water very turbid	None	None	None
6.74225°S 36.88851°E near the bridge at 298.5k	Wide river channel about 80m Sedges, water very shallow less than 30cm but turbid	No fish	None	None
6.699258°S 36.792491°E at 312 km	Wide river channel about 50m wide, shallow water less than 30cm, water confined to near the bank, some sedges	African sharptooth catfish Barb Tilapia	*C. gariepinus* *B. paludinosus* *O. niloticus*	2 4 3
6.69187°S 36.774757°E about 500m east from Kikundi village	River channel 50m wide, typha and phragmites and mat of oxalis fodifolia	Catfish barb	*C. gariepinus* *B. paludinosus*	
6.685247°S, 36.761224°E Kikundi (Magulu), at 316 km	River channel 80m wide, middle channel dry, water diverted into canal for irrigation	Barb	*B. paludinosus* *Chiloglanis* sp	
6.64737°S 36.70588°E At the bridge Lumuma river, near Kidete, on road to be improved	50m wide, deep dry river channel,	No fish	None	None
6.63195°S 36.69513°E east of road railway crossing, Northwest of Kidete	Steep river banks, river channel 30m wide, water very turbid muddy	No fish	None	None
6.57814°S 36.64693°E At 337.2k; route no 5	Very turbid waters, muddy	No fish	None	None

Interviews

Interviews conducted in June and December with villagers in Mkadage, Munisagara, Muzaganza, Kikundi (Magulu), Kidete and Gulwe villages and at the Mpwapwa District Council offices revealed that in the project area there are more than 100 occasional fishers

scattered in various villages in the project area, who use various types of fishing gear to catch fish (Table 36). Much of the fishing activities are carried out at the Gulwe swamp (Plate 19)

Plate 19: Fishing activities at Gulwe Swamps

Table 36: Fishing intensity in the project area

	Village	Interviewee	No of fishers	Fishing gear	Fish species	Fishing period
1	Mkadage	Salum Mkopi	20	gillnets and hooks and line	Kambale, ngogo, dagaa, Mbalafu, and ningu	December
2	Munisagara	Joseph Petro	<10	Gill nets (1.5") hook and line	Mbalafu, Ningu, Kambale, dagaa, pelege	October and November
3	Muzaganza	Maneno Gelesimoto	<10	Gill nets, hook and line	ngogo, pelage and ningwi	Nov - Dec
4	Kikundi	Mashaka Katana	26	Gillnets hook and line	Kambale, ngogo, and pelege	December
5	Godegode	Said	<10	Gill nets and hook and line	Kambale, perege	December
6	Mpwapwa district Council	Moshi	Not known	Gill nets, mosquito nets, small drag seine nets	Catfish, tilapia, dagaa	February to April
7	Gulwe	Athuman Rashid	>30	Mosquito nets, and 2"gill nets	kambale, perege, Dagaa and uduvi	November to July


Plate 20: Some of the fishes found in the Kinyansungwi (Gulwe swamp) and Mkondoa rivers

Other aquatic animals

No other aquatic organisms were observed during the study except fishes. However, interviews with the locals revealed the presence of other aquatic animals in the river system. These other animals include otters, terrapins, monitor lizards (Plate 21), snakes and crocodiles. The crocodiles are found only in Mdukwi River which joins Mkondoa River.

Plate 21: Monitor lizard

Aquatic Fauna of ecological importance

Of the aquatic fauna species either observed or known to exist in the project area, none of them is said to be under the various categories (Vulnerable, Threatened, Endangered Rare or critically endangered) of the CITES. However, there were some fishes that are known to perform annual spawning migrations in order to complete their life cycles. These include the small barbs *Barbus paludinosus*, the minnows *Labeo* sp and freshwater eels. None of these two species are of any economic significance in the project area. Usually potamodromous species would migrate upstream into floodplain areas for the purpose of spawning. The profile of especially Kinyansungwi river and to a small extent Mkondoa river are such that their river banks are short while their beds are filled with sand and silt which allows the water to flood easily into the surrounding areas during the rainy season. Because of these conditions, potamodromous species can always access some flood plains for spawning. However, the terrain of many such flooded areas may not allow the water to stay for prolonged periods of time to create favourable spawning areas. In the proposed project area,

the Gulwe swamps stands out as the most suitable flood plain site for fish spawning. That is why big sized fish could be found in the swamps even during the dry season because water may have retracted very fast after the rainy season leaving the young fish trapped in the swamp.

4.2.3.5. **Flora of the project area**

The survey of flora was done through literature review, site observation (7^{th} – 13^{th} June 2015 (Dry Season) and 30^{th} November 2015 – 8^{th} December 2015 (Wet Season), interviews with locals and transect walk.

Description of the study area

Floristically, the vegetation of the proposed project site falls under two main Phytocorions which are Zambezian regional centre of endemism characterized by drier miombo woodland, patches of flood plain grassland and riparian woodland. Other phytocorion is Somali-Masai regional centre of endemism characterized by *Acacia-Commiphora* deciduous bushland, and patches of Halophytic vegetation dominated with *Tamarix nilotica* stands.

Methodology

During initial survey which was done during dry season, the methodology used to gather data was mainly literature review; field observation which involved transect walk mainly along the existing railway line and interview with key informants.

During the rainy season, the survey was based on both qualitative and quantitative method where qualitative method used on listing plant species occurring within the vegetation surrounding the project area as well as identification and mapping of key plant species. Quantitative method used to establish sample plots within the classified vegetation type for determination of tree density and species diversity.

Nested sample plots of 20m x 20m, 5m x5m and 1m x1m were established in each vegetation type. In each plot, trees with DBH over 10cm were identified, counted and their measurements on diameter and height taken for determination of average DHB and density. For small plot of 5m x 5m all shrubs were identified and counted for determination of density of shrub layer. Species diversity and regeneration were determined in small quadrants of 1m x 1m. Numbers of sample plots in each vegetation type were determined according to the size of the area ranging between 3-5 plots per unit.

Plant species were identified direct in the field by botanist with the aid of books on Flora of Tropical East Africa published series (FTEA).

An existing two documents of CITES list (Convention on International Trade an Endangered Species of Wild Fauna and Flora) and the IUCN Red List of Threatened plant species, have been used to identify those plant species which falls in any of its categories and appendices respectively. A data base of List of East African Plant species (LEAP Master-1996) were used to identify endemic and rare plant species occurring in the project area.

For those plant species which could not be easily identified in the field, herbarium specimens were collected, pressed in the field using a pair of plant press, dried and carried to the herbarium of the University of Dar es Salaam for further identification and documentation through preservation in the herbarium, for future references.

Motorbike and trolley were used to reach various points in the project area, digital camera was used to take photographs for further illustrations and a pair of GPS used for marking sample plots and various important points especially the ones where key plant species identified as well as vegetation types classified.

SURVEY FINDINGS

Observation during dry season

Field survey and interviews

Floristically, the vegetation of the proposed project site falls under two Phytocorions of Zambezian regional centre of endemism which are characterized by drier miombo woodland, patches of flood plain grassland and riparian woodland. Other phytocorion is Somali-Masai regional centre of endemism characterized by Acacia-*Commiphora* deciduous bushland, and *Tamarix nilotica* stands.

From the initial survey conducted throughout the entire proposed project areas, it has been noted that the foot prints of the project area falls in an areas covered with a diverse of both natural and manmade vegetation categories. It was also noted that the natural vegetation in the project area harbours the lives of some plant species with biological significance such as CITES listed, Rare, building materials and medicinal plants. So far six (6) main vegetation types that have been found in the project area include: settlements with alien species, Cultivations, Marshland, Riparian, *Acacia-Commiphora* deciduous bushland, Drier miombo woodland and *Tamarix nilotica* stands as listed as shown in Figure 34.

Three CITES listed tree species *Milicia excelsa* (Mvule), *Afzelia quanzensis* (Mkongo) and *Dalbergia melanoxylon* (Mpingo) have been identified. Also a timber tree species *Albizia versicolor* (Mkenge) has been identified.

An interview with two traditional healers conducted in the project area shows that the natural vegetation harbours a number of medicinal plants for treating various diseases within the surrounding villages. A detailed survey of the project corridor is envisaged.

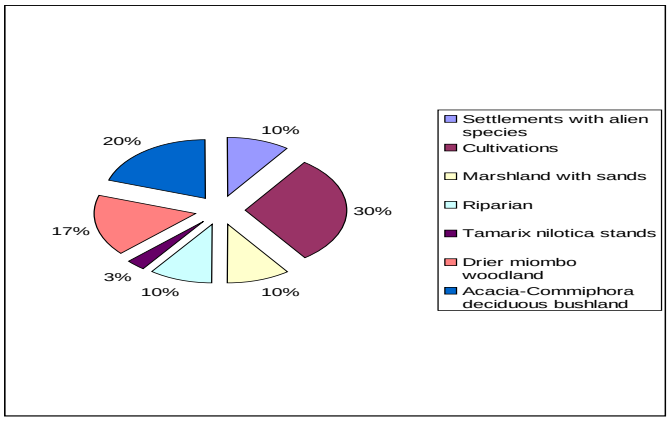


Figure 34: Vegetation types classified in the project area and their estimated percentage cover

Table 37: Distribution of the vegetation categories in the project area from Kilosa to Ihumwa-Dodoma along the existing railway line corridor

Sn	Section	Vegetation type
1	Kilosa-Mkadage	Riparian, Drier miombo woodland Settlements with alien species, Cultivations and Marshland with sands
2	Mkadage-Munisagara	Riparian, Drier miombo woodland Settlements with alien species, Cultivations and Marshland with sands
3	Munisagara-Muzaganza	Cultivations, Settlements with alien species, Drier miombo woodland and Marshland with sands
4	Muzaganza- Kikundi	Cultivations, Riparian, *Acacia-Commiphora* deciduous bushland Settlements with alien species, and Marshland with sands
5	Kikundi-Kidete	Cultivations, *Acacia-Commiphora* deciduous bushland Settlements with alien species, and Marshland with sands
6	Kidete-Godegode	*Acacia-Commiphora* deciduous, bushland *Tamarix nilotica* stands, Settlements with alien species, Cultivation and Marshland with sands
7	Godegode-Gulwe	*Acacia-Commiphora* deciduous bushland, *Tamarix nilotica* stands, Settlements with alien species, Cultivation and Marshland with sands
8	Gulwe-Msagali	*Acacia-Commiphora* deciduous bushland *Tamarix nilotica* stands, Settlements with alien species, Cultivation and Marshland with sands
9	Msagali-Igandu	Settlements with alien species, *Acacia-Commiphora* deciduous bushland Cultivation *Tamarix nilotica* stands, and Marshland with sands
10	Igandu-Chamwino	Settlements with alien species, *Acacia-Commiphora* deciduous bushland *Tamarix nilotica* stands, Cultivation and Marshland with sands
12	Chamwino-Ihumwa	Settlements with alien species, Cultivation and Marshland with sands
13	Ihumwa-Dodoma	Settlements with alien species, Cultivation and Marshland with sands

Plate 22 to Plate 29 show pictures of dominant species in the project area

Plate 22: Traditional healers showing medicinal plant at Munisagara and Gulwe villages (09/06/2015)

Plate 23: Mvule(*Milicia excelsa*) one of the CITES listed timber tree species growing at the riparian vegetation at Mkadange village (08/06/2015)

Plate 24: *Acacia-Commiphora* deciduous bushland vegetation type (11/06/2015)

Plate 25: Marshland with sands vegetation type at Munisagara village. The tall giant grass on the left is *Phragmites mauritianus*(Matete-Swahili) (09/06/2015)

Plate 26: Settlements with alien species. Behind (left) tree with white- cream flowers is an exotic tree *Plumeria lubra* planted at the village (09/06/2015)

Plate 27: Cultivation vegetation type along the railway line and along the river bank at Kikundi village (10/06/2015)

Plate 28: Riparian vegetation at Mkadange village near Kilosa. The tall dominant tree is *Acacia polyacantha* (Mgunga maji-Swahili) (08/06/2015)

Plate 29: *Tamarix nilotica* stand vegetation type occurring between Gulwe and Godegode and Gulwe sections (11/06/2015)

Observation during wet season

Vegetation categories classified in the study area

Based on physiognomic characterisation within the proposed project area, seven main vegetation categories have been classified from the project area includes: *Acacia –Commiphora* deciduous bushland, Drier miombo woodland, Settlements with alien species, Cultivations, Marshland with sands, Riparian, and *Tamarix nilotica* stands**.** The spatial distribution of each vegetation unit is as portrayed in Table 38 and Table 39; and Figure 35 while their detailed descriptions are presented below.

Table 38: List of vegetation categories classified in the project area

S/N	Vegetation type	Estimated % cover
1	*Tamarix nilotica* stands	3%
2	Riparian	6 %
3	Settlements with alien species	10%
4	Marshland with sands	10%
5	Drier miombo woodland	17%
6	*Acacia-Commiphora* deciduous bushland	24%
7	Cultivations	30%

Table 39: Distribution of the vegetation categories in the proposed rerouting plan

Section	Name	Vegetation type
1	Mkadage-Munisagara	Riparian, Drier miombo woodland Settlements with alien species, Cultivations and Marshland with sands
2	Munisagara-Muzaganza	Cultivations, Settlements with alien species, Drier miombo woodland and Marshland with sands
3	Muzaganza, Magulu, Kikundi & Kidete	Cultivations, Riparian, *Acacia-Commiphora* deciduous bushland Settlements with alien species, and Marshland with sands
5	Kidete-Godegode	*Acacia-Commiphora* deciduous bushland *Tamarix nilotica* stands, Settlements with alien species, & Cultivation
7	Godegode Maswala river & Gulwe	*Acacia-Commiphora* deciduous bushland, *Tamarix nilotica* stands, Settlements with alien species, Cultivation and Marshland with sands
8	Godegode –Gulwe	*Acacia-Commiphora* deciduous bushland Cultivation & Settlements with alien species,
9	Gulwe- Kimara village	*Acacia-Commiphora* deciduous bushland Cultivation & Settlements with alien species

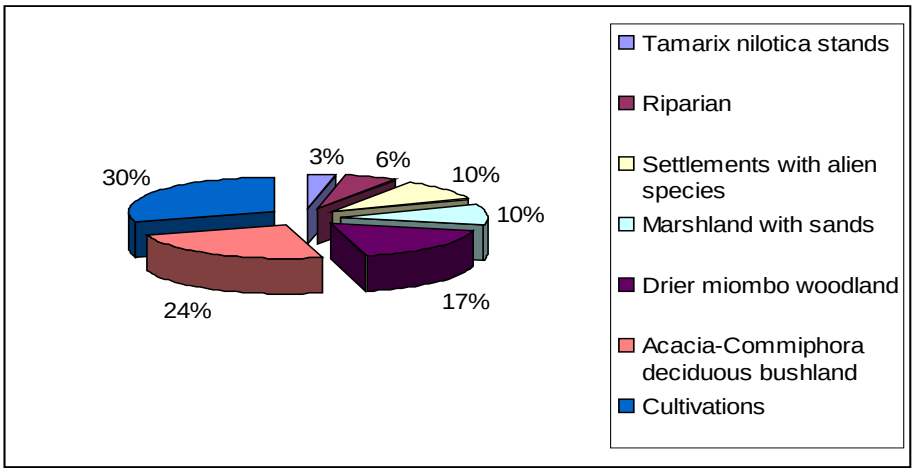


Figure 35: Vegetation types classified in the project area and their estimated percentage cover

Acacia –Commiphora deciduous bushland

This vegetation type is dominated by two genera of tree species *Acacia* and *Commiphora* with shrubs and scattered patches of grasses. *Adansonia digitata, Delonix elata, Strophanthus eminii, Cordyla densiflora, Euphorbia candelabrum* and *Sterculia africana becomes* an emergent scattered tree species. Canopy height ranges between 5-9m tall. Common *Acacia* species are *A. senegal, A.tortilis, A. brevispica* and *A. nigrescens.* Dominant *Commiphora* species are *C. ugogensis, C.eminii* and *C. africana.* The ground layer is dominated with herbaceous species of *Asparagus falcatus, Cissus rotundifolia, C. quadrangularis* and *Dischoriste hildebrandtii*

In the project area this vegetation category occupies the second largest cover 24% and it supports the lives of an IUCN threatened tree species *Cordyla densiflora* and CITES listed timber tree species *Afzelia quanzensis*-Mkongo in Swahili name.

Part of this vegetation category will be cleared during the project implementation especially on areas where the new railway line will be diverged from wetland to dry land. Also the construction of an access road for hauling materials during the project implementation will involve clearing of some part of this vegetation as shown on Plate 30.

However this vegetation type is locally and regionally common and the threatened and CITES listed tree species are well distributed to other areas where the project activities will not reach. Therefore, the project activities will have less impact onto this vegetation category as long as the proposed mitigation measures are well implemented.

Plate 30: *Acacia- Commiphora* deciduous bushland vegetation type between Kidete and Kikundi areas along the proposed access road. Tall tree on the for ground left are *Sterculia africana* and on right side is *dansonia digitata*-Mbuyu (Swahili)

Drier Miombo woodland

This vegetation type is characterized being dominated with tree species of the genera *Brachystegia, Isoberlinia* and *Julbernardia* in association with *Acacia* and *Combretum* species.

In the project area this vegetation category occupies 17% cover of the total vegetation occupies the largest cover spreading from the hill sides to the ridge tops. Canopy height ranges between 7-10m tall dominated with tree species of: -*Brachystegia boehmii B.spicifolmis,* and *B. microphylla,* other tree species include *Diplorhynchus condylocarpon, Dalbergia melanoxylon*, *Pterocarpus angolensis, Pseudolachnostylis maprouneifolia, Combretum molle, C. collinum* and *Lannea schimperi.* On the ground layers dominant grass species are *Themeda triandra, Panicum maximum* and herb species of *Hypoestes forskalii*.

This vegetation type is of ecological important as it hosts the life of the two key plant species CITES listed timber tree species of *Pterocarpus angolensis* (Mninga)and *Dalbergia melanoxylon*(Mpingo/ Ebony).This vegetation type will not face direct impacts of the project activities as it is situated on the hills sides. The only expected impact re extraction of poles, fuel wood and charcoal burning during the construction activities as most of the preferable tree species are available here with high abundant. Also construction of access road along the railway line will likely to increase exploitation of the tree species for the above listed activities.

However, this vegetation category is locally and regionally common and the two CITES tree species are well distributed in some protected areas. Therefore, there are no risks of loss of biodiversity due to project activities as long as the proposed mitigation measures are well implemented.


Plate 31: Drier Miombo woodland vegetation type on hillside at Mkadange and Munisagara dominated with *Brachystegia boehmii* tree species

Tamarix nilotica Stands

This vegetation category is common found in halophytic areas on bottom valleys along the flood plains. It is being characterised dominated with single tree species of *Tamarix nilotica forming* a dense stand sometimes impenetrable. Canopy height reaches 6-8m tall, few associated tree species includes; *Cordia sinensis* and *Acacia polyacantha* and the giant grass *phragmites mauritiana* becomes dominant on the ground floor. In the project area this vegetation category is found in patches between Godegode and Gulwe areas and it occupies estimated cover 3% of the total vegetation within the project area.

However, this vegetation category is locally and regionally common and it support no species of ecological significance. The project activities will have no impact onto it hence the railway line will be shifted far away from it as it lies between the river bank and the current railway line as shown on Plate 32.


Plate 32: A stand of *Tamarix nilotica* vegetation type near Godegode area (left) with its seedling on the right side

Cultivation

This vegetation category is being characterised by a land which its natural vegetation has been cleared being replaced with agricultural crops. In the project area, this vegetation is common found along the railway line near the river and it occupies 30% cover of the total vegetation cover which is the largest cover. Dominant agricultural crops found there are annual with few perennial ones. The annual includes; Onions (*Allium cepa*), Meize (*Zea*

mays), Tomatoes (*Lycopersicon esculentum*) and Sweet potatoes (*Ipomea batatus*). Perennial ones include Pawpaw (*Carica papaya*), Sugar cane (*Saccharum* cultivars) and Bananas (*Musa* cultivars) as shown on Plate 33.

This vegetation category will be slightly being affected by the project activities in places where the river training will be applied to control erosion, the water course will be directed and irrigation activities on the farmlands will be affected. Also in places where the railway line will be shifted further inland, it will pass through some farmland.

In order to avoids land use conflicts, a reasonable compensations should be negotiated between the project developer and property owners. Also to avoid food insecurity the construction activities in farm land areas should be done immediately after harvesting and people should be alerted prior.

Plate 33: Cultivations along the railway line at Munisagara and Gulwe areas. Maize field (*Zea mays*) can been seen behind on right side with onions *(Allium cepa)* on the left side

Settlements with alien species

This vegetation category is being characterised by a land which its natural vegetation has been cleared being replaced with infrastructures and planted exotic species around the house holds. In the project areas it occupies 10% cover and common exotic plant species identified includes; *Delonix regia* (Flamboyant), *Azidarachta indica* (Neem tree-Mwarubaini), *Acacia insulae-iacobi* (Algarrobo) and *Bouganvillea glabra.*

This vegetation category will be slightly being affected by the project activities. In places where the river training will be applied to control erosion, the water course will be directed and irrigation activities to farmlands will be affected. Also in places where the railway line will be shifted further inland, it will pass through some human settlements where houses and farmland will be destroyed as shown on Plate 34.

In order to avoids land use conflicts, a reasonable compensations should be negotiated between the project developer and property owners.


Plate 34: Some exotic tree species planted for ornamental and ecological uses- soil erosion protection (left). *Delonix regia*-Flamboyant with red flowers (right). *Acacia insulae-iacobi* –Algarrobo a vigorous and fast growing tree species (native to Argentina and Bolivia) planted for protecting soil erosion in arid areas

Riparian

This vegetation category is characterised by an association of different plant life forms growing along the water course. In the project occupies 6% cover of the total vegetation. It is common found along the railway sections of Mkadange, Munisagara and Muzaganza. Common plant species found in this vegetation includes; trees *Acacia polyacantha, Trichilia emetica, Milicia excelsa, Kigelia africana, Sterculia appendiculata, Albizia versicolor, Ficus exasperata, F. sur* and *Sorindeia madagascariensis*. Shrubs are Combretum *pentagonum, Flueggea virosa, Costus afer* and *Acalypha ornata* and dominant climbers are *Mascarenhasia arborescens* and *Ipomoea eriocarpa. Panicum maximum* and *Pennisetum purpureum* are the common grass species.

This vegetation category supports the life on one CITES listed timber tree species *Milicia excelsa*-Mvule. This vegetation type will be affected by the project activities as in most places it cut across the railway line from the hills towards the main river at the foothills as shown on Plate 35.

However, this vegetation category is locally and regionally common. The CITES listed timber tree species is available in other places where the project activities will not reach. Therefore there are no risks of loss of biodiversity as long as the proposed mitigation measures are well implemented by the project developer.


Plate 35: Riparian vegetation type near Munisagara area. The tall trees are *Acacia polyacantha* and *Albizia versicolor*-Mkenge maji-Swahili

Marshland with sands

This vegetation category is characterised by an association of water loving plants species growing in areas with permanent water along the river banks, lake shores or depression with sands. Dominant plant species are sedges, grass and reeds. In the project area this vegetation category occurs on flood plains along the Mkondoa River and part of it has been cleared for agricultural activities. It occupies 10% cover of the total vegetation in the study area being dominated with grass species; *Phragmites mauritianus, Leersia hexandra Pennisetum purpureum, Echinochloa pyramidalis* and *Cynodon dacylon.* Sedges are *Cyperus alticulatus,* C. *distans, C. exaltatus* and *Cyperus grandis Typha capensis* is the dominant reed species. Other herbs and climbers are *Jussiaea jussiaeoides, Pluchea disocoridis, Xanthium strumarium, Polygonum senegalense* and *Luffa cylindrica* as shown on Plate 36.

This vegetation category support many plant species with socio economic important values such as roofing materials *Cyperus exaltatus,* and thatching materials giant grass *Phragmites mauritianus.* Also it has some ecological values as it protect loss of water from transpiration.

This vegetation category will be slightly being affected by the project activities in places where the river training will be applied to control erosion. However, this vegetation category is locally and regionally common and it support no plant species with conservation significant. Therefore there are no risks of loss of biodiversity as long as the proposed mitigation measures are well implemented by the project developer.

Plate 36: Marshland with sands vegetation category along Mkondoa river at Muzaganza area. The giant grass on the left is *Phragmites mauritianus* and the herb behind on right side is *Xanthium strumarium*

List of IUCN Threatened Plant species Categories (Version 2013)

The globally threaten plant species from the IUCN Red List falls under the following main categories: - Extinct (Ex), Extinct in the Wild (EW), Endangered (E), Vulnerable (V), Extinct (Ex)

A taxon is Extinct when there is no reasonable doubt that the individual has died. A taxon is presumed Extinct in the wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), and throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

In the project area, non-of the plant species in this category have been identified.

Extinct in the Wild (EW)

A taxon is Extinct in the will when it is known only to survive in cultivation, in captivity or as a naturalised population (populations) well outside the past range. A taxon is presumed Extinct in the wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), and throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

In the project area, non-of the plant species in this category have been identified.

Critically Endangered (CR)

A taxon is critically Endangered when the best available evidence indicates that it is facing an extremely high risk of extinction in the wild.

In the project area, non-of the plant species in this category have been identified.

Endangered (E)

A taxon is endangered when the best available evidence indicates that it meets any of the criteria for Endangered is therefore facing considered to be facing a very high risk of extinction in the wild.

In the project area, non-of the plant species in this category have been identified.

Vulnerable (VU)

A taxon is Vulnerable when the best available evidence indicates that it is facing a high risk of becoming endangered in the wild.

In the project area, one tree species have been identified growing in *Acacia – Commiphora* deciduous bushland at Kitete and Gulwe as shown on Plate 37.

Plate 37: *Cordyla densiflora*-(Mkwata-Kigogo) Vulnerable (VU) tree species growing in *Acacia – Commiphora* deciduous bushland near Gulwe station and Kidete Kikundi access road

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

The basic principles of the CITES is to control and monitor international trade in endangered and threatened species.

The Convention establishes the international legal framework for co-operation of the producer and consumer is essential for the conservation of the species traded from the wild. The convention operates by means of a licensing system. At the core of the Convention are three appendices-in effect three species lists.

Appendix 1: *includes those species of animals and plants in which, with a few exceptions trade in wild specimens is prohibited*

In the project area, non-of the plant species in this category have been identified.

Appendix 11: *Includes those species whose survival is not yet threatened but may become so. Here trade is allowed in both wild and artificially propagated or captive bread specimens-subject to licensing.*

In the project area, non-of the plant species in this category have been identified.

Appendix 111: *This category acts as a support mechanism to domestic legislation, where countries ask other parties to monitor trade on taxa not listed on Appendix 1 or 11.*

In the project area, four timber tree species have been identified growing on the miombo woodland and riparian vegetation types as shown on Plate 38 - Plate 41.

Plate 38: Pterocarpus angolensis- Mninga (Swahili) a highly exploited timber tree species protected under the forest department of Tanzania bylaws growing in Miombo woodland vegetation at Muzaganza area

Plate 39: *Milicia excelsa*- Mvule (Swahili) a highly exploited timber tree species protected under the forest department of Tanzania bylaws growing in Riparian and lowland forest patches vegetation type at Munisagara section 1. (GPS location: S 06.74490 N 36.86994)

Plate 40: - *Afzelia quanzensis* Mkongo(Swahili) a highly exploited timber tree species protected under the forest department of Tanzania bylaws growing in *Acacia –Commiphora* deciduous bushland at Magulu village (GPS location: S 06.69930 N 36.78778)

Plate 41: *Dalbergia melanoxylon (*Mpingo/Ebony) a highly exploited tree species for carvings protected under the forest department of Tanzania bylaws growing in *Acacia –Commiphora* deciduous bushland at Magulu village (GPS location: S 06.69930 N 36.78778)

Endemic plant Species

Endemic plant species are plants which are native and confined to a particular region and not native to other areas.

In the project area, one plant species has been identified growing in *Acacia – ommiphora* deciduous Bushland vegetation type as shown on Plate 42.

Plate 42: *Aloe secudiflora* an endemic shrub species restricted to florist regions of T4, 5 ,6 & 7 only in Tanzania growing *Acacia – Commiphora* deciduous Bushland vegetation type at Kidete area (GPS location: S 06.68562 N 36.75033)

Plant species with socio-economic importance (Ethnobotany)

Medicinal plants

Plate 43: Some of Traditional Healers

Table 40: List of Medicinal plant recorded from Traditional healer Mama Evelin Kologogwe at Gulwe Ng'ambo A -Mpwapwa

Kigogo name	Scientific name	Family	Habit	Disease treated
Mduguya	*Balanites aegyptiaca*	Balanitaceae	**Tree**	Accelerate pregnancy, and after pain
Mtati	*Dombeya cincinata*	Sterculiaceae	**Tree**	Treating Rectoprolaps
Chinzenze	*Thylachium africanum*	Capparidaceae	**Shrub**	Rectoprolaps ,Gonorrhea venereal diseases
Muopola	*Gymnema sylvestre*	Asclepiadaceae	**Liana**	Stomache & dysentery

Table 41: List of Medicinal plant recorded from Traditional healer Mr. Zacharia Reuben at Munisagara Village-Kilosa

Kisagara name	Scientific name	Family	Habit	Disease treated
Gidapandwanoni	*Parkinsonia aquelata*	caesalpiniaceae	Shrub	Juice of boiled roots treat tooth
Malulambuli	*Ormocarpum trachycarpum*	Papilionaceae	Shrub	Fresh juice of leaves used as snake antidote
Mduyuyu	*Balanites agyptiaca*	Balanitaceae	Tree	Juice of Stem back heals swollen parts
Mgu	*Acacia polyacantha*	Mimosaceae	Tree	Stem back chewed roll as Viagra(Aphrodisiac)
Mkondoyampuli	*Tamarix nilotica*	Tamaricaceae	Tree	Stomache
Msubata	*Diospyros fischeri*	Ebenaceae	Shrub	Cures gonorrhea
Mtulamtula	*Solanum incanum*	Solanaceae	Woody herb	Juice of root back heals swollen mouth gum
Mtunduru	*Dichrostachys cinerea*	Mimosaceae	Shrub	Juice of boiled roots clean urine
Ngungunu	*Ziziphus muctonata*	Rhamnaceae	Tree	Powder of dried roots used as snake antidote

Table 42: Building & tools

Species Name	Common Name/ Local Name	Uses	Habit
Acacia polyacantha	Mgu	Fuel wood, building poles	Tree
Acacia senegal	Mnara	Charcoal & gum arabic	Tree
Adansonia digitata	Mbuyu/ Baobab	Edible fruits	Tree
Albizia amara	Mpogolo	Fuel wood	Tree
Brachystehia spiciformis	Muyombo	Fuel wood, timber	Tree
Combretum paniculatum	Mlobashi	Tools handle	Climber
Cordia sinensis	Mdabi/ Midabi	Edible fruits	Tree
Cordyla densiflora	Mkwata	Edible fruits	Tree
Cyperus articulatus	Ndago	Making mats	Sedge
Cyperus exaltatus	Ndagwe	Roofing	Sedge
Dalbergia melanoxylon	Mgembe	Stem used for building poles and carvings	Tree
Grewia fallax	Mdagwasa	Thatches and Walking sticks	Shrub
Mormodica charantia	Ibomolwa	Edible fruits	Climber
Panicum maximum	Ikoka	Roofing & sweeping brush	Grass
Phragmites mauritianus	Matete	Roofing &Thatching	Giant grass
Pterocarpus angolensis	Mninga	Timber	Tree
Tamarindus indica	Nshishi/ Mkwaju	Edible fruits	Tree

Table 43: List of agricultural plants identified from the project site

Scientific name	Common name
Carica papaya	Pawpaw/Papai
Cocos nucifera	Coconut/Mnazi
Culocasia esculenta	Cocoyam/Magimbi
Hibiscus esculentus	Okra/Bamia
Ipomoea batatus	Sweet potato/ Viazi vitamu
Lycopercicon esculentum	Tomato/Nyanya
Manihot esculenta	Cassava/Mhogo
Mussa cultivers	Banana/migomba
Oryza sativa	Rice/ Mpunga
Saccharum officinarum	Sugar cane/Muwa
Vigna unguiculata	Cow pea/Kunde

Scientific name	Common name
Zea mays	Maize/ Mahindi
Allium sepa	Onion/Vitunguu

4.2.3.6. Fauna of the Project Area

The survey of fauna was done through literature review, site observation (7^{th} – 13^{th} June 2015 (Dry Season) and 30^{th} November 2015 – 10^{th} December 2015 (Wet Season), and interviews with locals.

Ad libitum observations of the terrestrial fauna (amphibians, reptiles, birds and mammals) were made along, and in the vicinity of, the railway line. Any animal observed either crossing or along the railway line were recorded. To identify any amphibians, water sources particularly the rivers Mkondoa were briefly visited. Channing, 2001; Channing and Howell, 2006; Preez and Carruthers, 2009, Harper *et al*. 2010 were used to identify amphibians and Spawls *et al*. (2004) was used to identify reptiles. A pair of binoculars (8 x 42 magnifications) was used to identify birds and Stevenson and Fanshawe (2002) was used as a field guide of birds. In addition, residents, particularly older individuals who know the area better than young ones and other residents knowledgeable about wildlife were interviewed in order to ascertain which terrestrial fauna are found in their areas.

Methodology

Dry season: Ad libitum observations of the terrestrial fauna (amphibians, reptiles, birds and mammals) were made along, and in the vicinity of, the railway line. Any animal observed either crossing or along the railway line were recorded. To identify any amphibians, water sources particularly the rivers Mkondoa were briefly visited. Channing, 2001; Channing and Howell, 2006; Preez and Carruthers, 2009, Harper *et al*. 2010 were used to identify amphibians and Spawls *et al*. (2004) was used to identify reptiles. A pair of binoculars (8 x 42 magnification) was used to identify birds and Stevenson and Fanshawe (2002) was used as a field guide of birds. In addition, residents, particularly older individuals who know the area better than young ones and other residents knowledgeable about wildlife were interviewed in order to ascertain which terrestrial fauna are found in their areas.

Wet season:

Data Collection

Methods used to sample terrestrial fauna varied depending on the faunal group or taxa. The methods were selected to ensure maximum detection of the animal groups based on their size, behaviour and habitat preferences.

Amphibians

Time-constrained searches and opportunistic surveys were used to sample amphibian fauna along the Kilosa-Gulwe railway and the access road. The searches were conducted during the day and in some places during the night and were of various lengths (2-6 man-hours). Night searches were conducted with the aid of 200 lumen's waterproof head torches. Since many amphibians normally hide when conditions are not suitable for surface activity, thorough searches were carried out in the leaf litter, between or within grass tussocks, on herbs and tree leaves, under rocks or rotting logs, and at the base of trees.

Amphibians observed opportunistically were also recorded when they were encountered out of the normal (systematic) timed searches.

Audio-strip surveys were conducted on the basis that amphibians are mostly active at night and the majority are noticeable where males are vocalizing. Visual searching for vocalizing individuals is the most productive method of locating and capturing male anurans, and vocals/calls help in the identification. A team camped along the railway and looked for vocalizing amphibians around the water bodies during the night. Audio recordings were done where possible for species confirmation with the available amphibian calls at the University of Dar es Salaam.

Amphibians were identified using standard field guides for the taxon available in the East Africa (Channing and Howell, 2006 and Harper *et al*., 2010) and Southern African (du Preez and Carruthers, 2009).

Reptiles

Reptiles were sampled using time-constrained searches and opportunistic observations. The searches were conducted mainly during the day and in some places during the night. These were of various lengths, ranging from 2 - 6 man-hours. Night searches were conducted with the aid of 200 lumen's waterproof head torches. Because of the hiding behaviour of reptiles thorough searches were carried out under rocks and rotting logs. Also, we used *ad hoc* observations to record any reptiles present in the project area. Spawls *et al*. (2004) was used as the main reference document to identify reptiles.

Birds

Point counts were used for sampling birds. This involved visual identification of the birds with the aid of a pair of binoculars (8 x 42 Magnification) and using bird's vocalizations. We surveyed the avifauna of each point using limited-distances ten minute duration point counts (Borghesio *et al.,* 2008), during which all birds seen or heard within a 50 m radius were recorded. The point counts were conducted along the mentioned rerouting sections as well as along the access road. Points were located at least 150 m from each other. In addition, any evidence of breeding birds was recorded. At each site, potential refugia and roosting sites, if any, were recorded. Stevenson and Fanshawe (2002) was the reference used to identify birds. Observers also listened for bird calls, such as the calls of owls and nightjars.

Mammals

Mammals were surveyed using transects at the proposed rerouting sections as well as along the proposed access road. Mostly large mammals were surveyed as it was logistically impossible to set bucket pitfall, Sherman's and snap traps which are normally used to sample small mammals. We used foot transects to survey large mammals. These transects were walked slowly during the morning usually from 0600 to about 1100 hours and in the evening from 1600 to 1800 hours. For each transect, the observation team consisted of two people: the observer and a local assistant. Any large mammal that was seen was recorded. Records were kept of each mammal species seen and/or heard; and local residents were interviewed informally as to the presence or absence of mammal species in the project area (see Plate 44). This was done by asking people with wildlife experience along the railway regarding the large mammals they have seen in their areas and the possibility of the area being used as migratory corridor/route by large mammals. This was conducted in Swahili and sometimes with the aid of field guides by showing them photographs of different mammals as they are presented in the local field guide of the mammals of Africa by Kingdon (1997). Mammals that were seen opportunistically within the project area were also recorded. We also recorded any tracks and scats (faeces) that were able to be located and identified.

Plate 44: Interviewing local people about the presence of different species of large mammals along the proposed rerouting railway and access road

Data Analysis

Indices of abundance of amphibians and reptiles were calculated as number of individuals per man-hours spent in the time-constrained searches. The index of abundance was presented as number of individuals per man-hour. Man hour is expressed as number of people participated in a day/night searches multiplied by time of search in hours). The animals that were included in the analysis were only those that were found in time-constrained searches. Those animals that were observed opportunistically were not included in the analysis. They, nevertheless, were used in compiling species list for the area.

The density of birds was calculated as number of individuals and species per unit of area (number of species and individuals per hectare/square kilometre). Abundance of mammals observed during the study area was expressed as number of individuals per square kilometre. Nomenclature follows Channing and Howell (2006) for amphibians, Spawls *et al*. (2004) for reptiles, Sinclair and Ryan (2010) for birds and Kingdon (1997) for mammals.

Results

Observation during dry season

Birds

At least 46 species of birds were observed by direct observation either along, or within 100 metres from, the railway line covering the survey area's 174 km stretch as provided in Table 44. The list includes species of conservation importance such as the birds of prey which are a threatened group worldwide.

Table 44: Bird species observed along the railway line between Kilosa and Msagali

Common name	Species	Common name	Species
African Goshawk	*Accipiter tachiro*	Mourning Dove	*Streptopelia decipiens*
African Hoopoe	*Upupa africana*	Namaqua Dove	*Oena capensis*
African Paradise Flycatcher	*Terpsiophone viridis*	Palnut Vulture	*Gypohierax angolesnis*
Amethyst Sunbird	*Chalcomitra amethystina*	Pied Kingfisher	*Ceryle rudis*
Black-headed Weaver	*Ploceus cuculattus*	Pied Wagtail	*Motacilla aguimp*
Bronze Mannikin	*Lonchura cucullata*	Pin-tailed Whydah	*Vidua macroura*
Cardinal Woodpecker	*Dendropicos fuscescens*	Red-billed Firefinch	*Lagonosticta senegala*
Cisticola	*Cisticola sp.*	Red-cheeked Cordon-bleu	*Uraeginthus bengalus*

Common name	Species	Common name	Species
Common Bulbul	*Pycnonotus barbatus*	Red-chested Cuckoo	*Cuculus solitarius*
Common Drongo	*Dicrurus adsimilis*	Red-eyed Dove	*Streptopelia semitorquatus*
Crowned Hornbill	*Tockus alboterminatus*	Red-fronted Tinkerbird	*Pogoniulus pusillus*
Emerald Spotted Wood Dove	*Streptoelia chalcopilos*	Ring-necked Dove	*Streptopelia capicola*
Fisher's Lovebird	*Argapornis fisheri*	Speckled Mousebird	*Colius striatus*
Fisher's Sparrow Lark	*Eremopteryx leucopareia*	Superb Starling	*Lamprotornis superbus*
Green-winged Pytilia	*Pytilia melba*	Tawny-flanked Prinia	*Prinia subflava*
Grey-backed Camaroptera	*Camaroptera brachyura*	Tropical Boubou	*Laniarius aethipicus*
Grey-headed Sparrow	*Passer griseus*	Village Indigobird	*Vidua chalybeata*
Harmerkop	*Scopus umbretta*	White-bellied Canary	*Serinus dorsostriatus*
House Sparrow	*Passer domesticus*	White-browed Robin Chat	*Cossypha heuglini*
Laughing Dove	*Streptopelia senegalensis*	White-browed Scrub Robin	*Cercotrichas leucophrys*
Lilac-breasted Roller	*Coracius caudata*	Yellow Bishop	*Euplectes capensis*
Little Bee-eater	*Merops pussilus*	Yellow White-eye	*Zosterops senegalensis*
Lizard Buzzard	*Kaupifalco monogrammicus*	Yellow-bellied Greenbul	*Chlorocichla flaviventris*

Mammals

Based on field direct observation at least two species were seen during the scoping survey including the vervet monkeys and Four-toad elephant shrew while rodents were seen but could not be identified to species level. From interviews of the residents along the railway between Kilosa and Gulwe at least 22 mammal species were recorded. The animals include resident and migratory species such as elephants (Table 45).

Table 45: Mammal species both observed and mentioned by residents as present in the project area

Common name	Species	Comments
African Elephant	*Loxodonta africana*	Occasionally visits Gulwe and Msagali individuals migrate during the dry season
Spotted Hyaena	*Crocuta crocuta*	Was mentioned to kill goats
Jackal	*Canis* sp.	
Rock Hyrax	*Procavia capensis*	Usually hunted by residents
Aadvark	*Orycteropus afer*	
Yellow Baboon	*Papio cynocephalus*	One of causes of human-wildlife conflicts: raiding crops
Vervet monkey	*Cercopithecus pygerythrus*	Was observed crossing the rail as well as in the vicinity of the project area. It was reported to be among the causes of human-wildlife conflicts: raiding crops
Blue monkey	*Cercopithecus mitis*	
Leopard	*Panthera pardus*	Mentioned by pastoralists as being present in the study area
Egyptian mongoose	*Herpestes ichneumon*	
Slender tailed mongoose	*Herpestes sanguine*	
Banded mongoose	*Mungos mungo*	
Ratel (Honey badger)	*Mellivora capensis*	
Common genet	*Genetta genetta*	
African civet	*Civettictis civetta*	

Aardvark	*Orycteropus afer*	
Bush pig	*Potamochoerus larvatus*	It was mentioned as among the causes of human-wildlife conflicts: raiding crops
Dik dik	*Madoqua kirkii*	Commonly hunted by residents
Bushbuck	*Tragelaphus scriptus*	Commonly hunted by residents
Crested Porcupine	*Hystrix cristata*	
Striped bush squirrel	*Paraxerus flavovittis*	
Mutable sun squirrel	*Heliosciurus mutabilis*	
Hare	*Lepus* sp.	Commonly hunted by residents
Four-toad elephant shrew	*Petrodromus tetradyctylus*	Was observed crossing the railway line
Smaller rodents		Observed but could not be determined to species level

Observation during wet season

Amphibians

A total of eleven species of amphibians were recorded between Kilosa and Gulwe (Table 46 and Appendix 4). More amphibian species were recorded at sections 1 and 9 (Appendix 4). Some of the species recorded are shown in Plate 45 - Plate 49. None of the amphibian species observed is threatened with extinction according to International Union for Conservation of Nature (IUCN) (www.iucnredlist.org in 2015).

Table 46: Amphibian species recorded along the proposed rerouting sites between Kilosa and Gulwe. For rerouting sections 1-9 (see Figure 4). LC = Least Concern according to IUCN Red List of threatened species.

Common name and Family	Species Name	Rerouting survey sections								
		1	2	3	5	7	8	9	Access road	IUCN status
Family Arthroleptidae										
Common Squeaker	*Arthroleptis stenodactylus*							x		LC
Yellow-spotted tree frog	*Leptopelis flavomaculatus*	x								LC
Family Bufonidae										
Guttural toad	*Amietophrynus gutturalis*	x						x	x	LC
Flat-backed toad	*Amietophrynus maculatus*							x		LC
Family Hemisotidae										
Marble snout-burrower	*Hemisus marmoratus*	x								LC
Family Hyperoliidae										
Mitchell's reed frog	*Hyperolius mitcheli*	x								LC
Tinker reed frog	*Hyperolius tuberilinguis*	x								LC
Family Phrynobatrachidae										
East African puddle frog	*Phrynobatrachus acridoides*	x		x						LC
Family Ptychadenidae										
Anchieta's ridged frog	*Ptychadena anchietae*							x	x	LC

Common name and Family	Species Name	Rerouting survey sections								IUCN status
		1	2	3	5	7	8	9	Access road	
Schilluk grass frog	*Ptychadena shillukorum*							x		LC
Family Rhacophoridae										
Gray tree frog	*Chiromantis xerampelina*							x	x	LC
Total number of species		6	0	1	0	0	0	6	3	

Plate 45: Southern Form-nest Frog *Chiromantis xerampelina*, observed at Section 9 and along the access road at Godegode (Section 8).

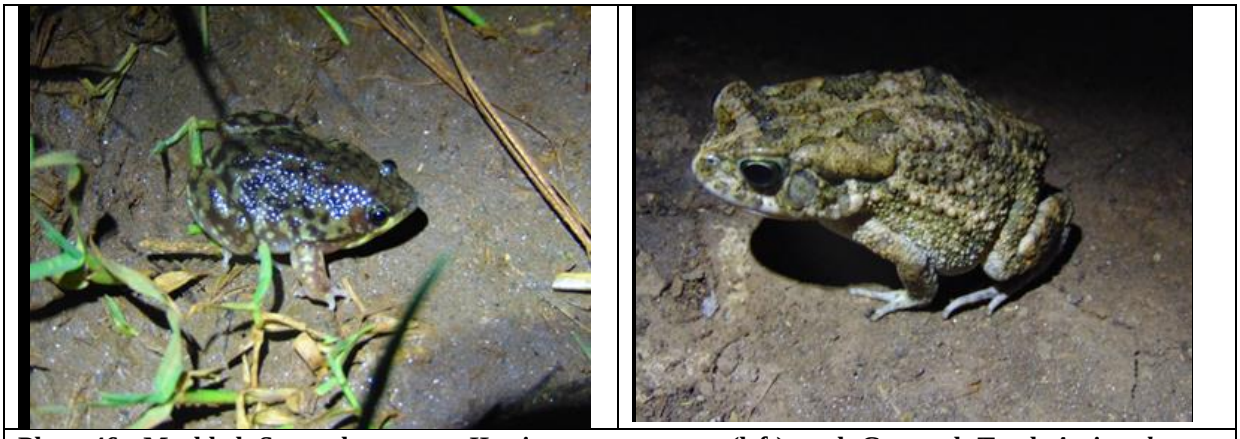


Plate 46: Marbled Snout burrower *Hemisus marmoratus* (left) and Guttural Toad *Amietophrynus gutturalis* (right)


Plate 47: Mitchell's Reed Frog Hyperolius *mitchelli* (left) and Ornate Tree Frog *Leptopelis flavomaculatus* (right).


Plate 48: Anchieta's Rocket Frog *Ptychadena anchietae* (left) and Schilluk Grass Frog *Ptychadena schillukorum* (right) observed at Section 9 and along the access road.


Plate 49: Tinker Reed Frog *Hyperolius tuberilinguis* (left) and Common Squeaker *Arthroleptis stenodactylus* (right) observed at section 9.

Reptiles

Twenty three species of reptiles were observed at the proposed rerouting survey sections and access road between Kilosa and Gulwe (Table 47 and Appendix 4). Most of the reptiles observed belong to the Family Scincidae. Some of the representative species are shown in Plate 50 to Plate 55. Most of the species detected, except Rainbow Skink *Trachylepis margaritifer and* Blue-headed Tree Agama *Acanthocercus atricollis,* do not appear in IUCN Red List of Threatened species.

Table 47: Reptiles observed along the proposed re-routing survey sections and access road between Kilosa and Gulwe

Common name and Family	Species name	Re-routing survey sections								IUCN status
		1	2	3	5	7	8	9	AR	
Family Gekkonidae										
Tropical House Gecko	*Hemidactylus mabouia*	X	X			X		X		NL
Tree Gecko	*Hemidactylus platycephalus*	X				X		X		NL
Cape Dwarf Gecko	*Lygodactylus capensis*	X	X					X		NL
Yellow-headed Dwarf Gecko	*Lygodactylus luteopicturatus*		X		X			X	X	NL
Turner's thick-toed Gecko	*Pachydactylus turneri*					x			x	NL
Family Scincidae										
Speckle-lipped Skink	*Trachylepis maculilabris*	x								NL
Rainbow skink	*Trachylepis margaritifer*			x				x	x	LC
Striped skink	*Trachylepis striata*		x	x						NL
Variable skink	*Trachylepis varia*	x	x						x	NL
Wahlberg's snake-eyed skink	*Panaspis wahlbergii*		x							NL
Family Lacertidae										
Speke's sand lizard	*Heliobolus spekii*		x							NL
Southern long-tailed lizards	*Latastia longicaudata*			x		x	x	x	x	NL
Family Gerrhosauridae										
Yellow-throated plated lizards	*Gerrhosaurus flavigularis*				x					NL
Family Agamidae										
Blue-headed tree Agama	*Acanthocercus atricollis*						x			LC
Red-headed rock Agama	*Agama agama*	x	x	x	x		x	x	x	NL
Tropical Spiny Agama	*Agama armata*						x	x		NL
Family Varanidae										
White-throated savannah monitor	*Varanus albigularis*	x			x					NL, App. II
Nile Monitor	*Varanus niloticus*		x					x		NL, App. II
Family Lamprophiidae										
Brown House snake	*Boaedon fuliginosus*				x					NL
Cape Wolf snake	*Lycophidion capense*							x		NL
Family Colubridae										
Spotted bush snake	*Philothamnus semivariegatus*								x	NL
Family Elapidae										
Black-necked spitting Cobra	*Naja nigricollis*						x			NL
Family Viperidae										
Puff adder	*Bitis arietans*							x		NL
Total number of species		7	9	4	5	7	2	11	7	


Plate 50: Red-headed Rock Agama *Agama* (Left – male; right – female)


Plate 51: Wahlberg's Snake Eyed Skink *Panaspis wahlbergii* (left) and Variable Skink *Trachylepis varia* (right)


Plate 52: Southern Long-tailed Lizard *Latastia longicaudata*


Plate 53: Rainbow Skink *Trachylepis margaritifer* (left –male, right – female)


Plate 54: Cape Wolf Snake *Lycophidion capense* (left) and Spotted Bush Snake *Philothamnus semivariegatus* (right).


Plate 55: Tropical House Gecko *Hemidactylus mabouia* (right) and Puff adder *Bitis arietans* (left)

Birds

Using a combination of point counts and opportunistic observations, we recorded 126 species of birds (Table 48). More species were observed at sections 8 and 9. Densities of individuals and species were higher at sections 7 and 8 compared to the other sections (Figure 36 and Figure 37, Appendix 5).

All species are in Least Concern (LC) category of threat status according to IUCN except Fisher's Lovebird *Agapornis fischeri* and Tanzania Red-billed Hornbill *Tockus ruahae*. The Fishers Lovebird is Near Threatened (NT) according to IUCN while Red-billed Hornbill is not in the list. The Red-billed Hornbill is not listed possibly because it has been described just recently (Kemp and Delport, 2002) or it is still considered a subspecies of the red-billed hornbill (*Tockus erythrorhynchus*) complex. Ten species in the Families Accipitridae and Psittacidae fall under *Appendix 11* of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (http://www.cites.org; Table 48). Endemic species and species of conservation importance that were observed are shown in Plate 56 to - Plate 58

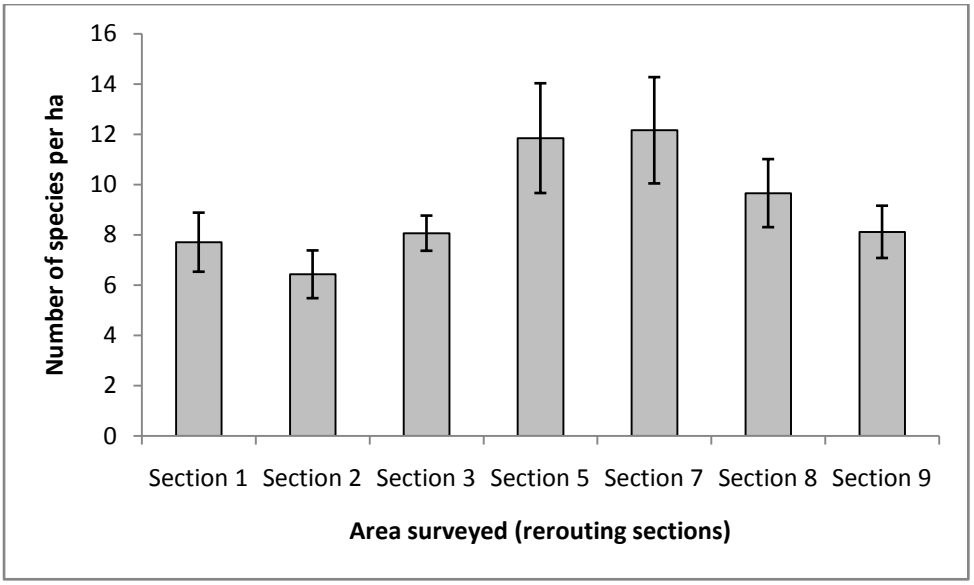


Figure 36: Number of bird species per ha in the rerouting sections (± 1 SE)

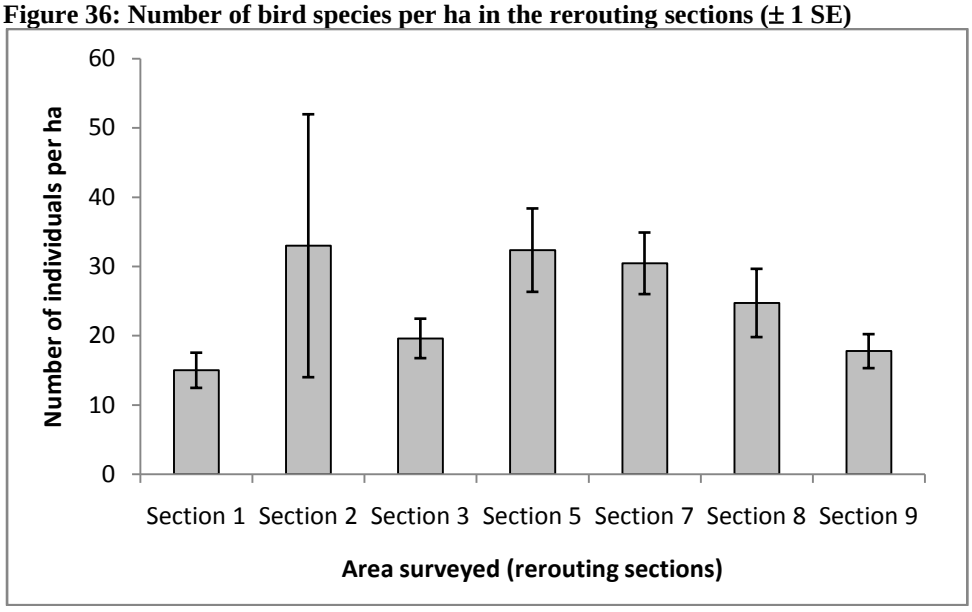


Figure 37: Number of individuals of birds per ha in the rerouting sections (± 1 SE)

Table 48: Bird species observed in the rerouting sections and along the proposed access road between Kilosa and Gulwe. LC = Least Concern of IUCN; NT = Near Threatened according to IUCN; App. II = Appendix II according to CITES

Family and Common Name	Species Name	Rerouting survey sections								IUCN status
		1	2	3	5	7	8	9	AR	
Family Ciconiidae										
African Openbill	*Anastomus lamelligerus*					x		x		LC
Family Ardeidae										
Cattle Egret	*Bubulcus ibis*							x		LC
Family Scopidae										
Harmerkop	*Scopus umbretta*								x	LC
Family Threskiornithidae										

Family and Common Name	Species Name	Rerouting survey sections								IUCN status
		1	2	3	5	7	8	9	AR	
Hadada Ibis	*Bostrichia hagedash*					x				LC
Family Accipitridae										
Palmnut Vulture	*Gypohierax angolensis*	x								LC, App. II
African Goshawk	*Accipiter tachiro*				x					LC, App. II
Augur Buzzard	*Buteo augur*			x						LC, App. II
Black-chested Snake Eagle	*Circaetus pectoralis*							x		LC, App. II
Brown Snake Eagle	*Circaetus cinereus*			x						LC, App. II
Lizard Buzzard	*Kaupifalco monogrammicus*				x					LC, App. II
Long Crested Eagle	*Lophaetus occipitalis*							x		LC, App. II
Family Falconidae										
Grey Kestrel	*Falco ardosiaceus*			x				x		LC, App. II
Family Numididae										
Coqui Francolin	*Peliperdix coqui*					x				LC
Helmeted Guineafowl	*Numida meleagris*								x	LC
Red-necked Spurfowl	*Pternistes afer*					x	x	x		LC
Small Button-Quail	*Turnix sylvaticus*	x				x				LC
Family Burhinidae										
Water Think-knee	*Burhinus vermiculatus*								x	LC
Family Charadriidae										
Three Banded Plover	*Charadrius tricollaris*	x								LC
Family Columbidae										
African Morning Dove	*Streptopelia decipiens*			x						LC
Emerald Spotted Wood Dove	*Turtur chalcospilos*	x	x	x	x	x	x	x	x	LC
African Green Pegion	*Treron calvus*	x	x							LC
Laughing Dove	*Streptopelia senegalensis*			x	x	x	x	x	x	LC
Namaqua Dove	*Oena capensis*					x			x	LC
Red-eyed Dove	*Streptopelia semitorquata*	x	x	x	x	x	x	x	x	LC
Ring-necked Dove	*Streptopelia capicola*				x	x		x		LC
Tamborine Dove	*Turtur tympanistria*		x							LC
Family Psittacidae										
Brown Parrot	*Poicephalus meyeri*		x				x	x		LC, App. II
Fisher's Lovebird	*Agapornis fischeri*					x	x	x	x	NT, App. II
Family Cuculidae										
Diderick Cuckoo	*Chrysococcyx*						x		x	LC

Family and Common Name	Species Name	Rerouting survey sections								IUCN status
		1	2	3	5	7	8	9	AR	
	caprius									
Klaas Cuckoo	*Chrysococcyx klaas*							x		LC
Red-chested Cuckoo	*Cuculus solitarius*						x	x	x	LC
White-browed Coucal	*Centropus superciliosus*	x			x	x	x	x		LC
Family Apodidae										
Little Swift	*Apus affinis*						x			LC
Family Coliidae										
Blue-naped Mousebird	*Urocolius macrourus*				x		x	x	x	LC
Speckled Mousebird	*Colius striatus*	x	x		x		x	x	x	LC
Family Alcedinidae										
Brown-hooded Kingfisher	*Halcyon albiventris*	x						x		LC
Grey-headed Kingfisher	*Halcyon leucocephala*	x						x		LC
Family Meropidae										
Little Bee-eater	*Merops pusillus*	x	x	x	x	x	x	x	x	LC
Family Coraciidae										
Rufous-crowned Roller	*Coracias naevius*					x	x			LC
Lilac-breasted Roller	*Coracias caudatus*			x		x		x		LC
Family Upupidae										
Abyssinian Scimitarbill	*Rhinopomastus minor*			x						LC
African Hoopoe	*Upupa africana*							x		LC
Green Wood Hoopoe	*Phoeniculus purpureus*				x					LC
Family Bucerotidae										
Crowned Hornbill	*Tockus alboterminatus*	x								LC
Tanzania Red-billed Hornbill	*Tockus ruahae*			x		x		x		Not assessed
Trumper Hornbill	*Bycanistes bucinator*			x						LC
Von der Deckens Hornbill	*Tockus deckeni*							x		LC
Family Capitonidae										
Black-coloured Barbet	*Lybius torquatus*								x	LC
Brown-breasted Barbet	*Lybius melanopterus*			x						LC
Red-fronted Tinkerbird	*Pogoniulus pusillus*			x	x			x	x	LC
Spot-flanked Barbet	*Tricholaema lacrymosa*			x	x	x	x	x	x	LC
Family Indicatoridae										
Greater Honeyguide	*Indicator indicator*								x	LC
Family Picidae										
Cardinal Woodpecker	*Dendropicos fuscescens*	x						x		LC
Family Alaudidae										
Fisher's Sparrowlark	*Eremopterix leucopareia*					x	x	x		LC

Family and Common Name	Species Name	Rerouting survey sections								IUCN status
		1	2	3	5	7	8	9	AR	
Fappet Lark	*Mirafra rufocinnamomea*						x	x		LC
Family Hirundinidae										
Barn Swallow	*Hirundo rustica*			x			x			LC
Lesser-stripped Swallow	*Hirundo abyssinica*	x	x	x	x	x	x		x	LC
Mosque Swallow	*Hirundo senegalensis*					x	x			LC
Family Motacillidae										
African Pied Wagtail	*Motacilla aguimp*			x						LC
Family Pycnonotidae										
Dark-capped Bulbul	*Pycnonotus tricolor*	x	x	x	x	x	x	x	x	LC
Grey-olive Greenbul	*Phyllastrephus cerviniventris*	x								LC
Terrestrial Brownbul	*Phyllastrephus terrestris*						x	x		LC
Yellow-bellied Greenbul	*Chlorocichla flaviventris*			x	x					LC
Sombre Greenbul	*Andropadus importunus*	x	x				x			LC
Eastern Nicator	*Nicator gularis*	x	x							LC
Family Turdidae										
Kurrichane Thrush	*Turdus libonyanus*					x				LC
Red-capped Robin Chat	*Cossypha natalensis*	x	x							LC
Spotted Morning Thrush	*Cichladusa guttata*							x	x	LC
Thrush Nightngale	*Luscinia luscinia*	x								LC
White-browed Robin Chat	*Cossypha heuglini*	x	x			x	x			LC
White-browed Scrub Robin	*Cercotrichas leucophrys*			x	x	x		x	x	LC
Family Sylviidae										
Grey-backed Camaroptera	*Camaroptera brevicaudata*	x	x	x	x	x	x	x	x	LC
Moustached Grass Wabler	*Melocichla mentalis*	x								LC
Rattling Cisticola	*Cisticola chiniana*	x	x	x	x	x	x	x	x	LC
Tawny-flanked Prinia	*Prinia subflava*	x	x				x	x	x	LC
Yellow-breasted Apalis	*Apalis flavida*							x		LC
Family Muscapidae										
African Grey Flycatcher	*Bradornis microrhynchus*	x		x	x	x	x		x	LC
Family Platysteiridae										
Chinspot Batis	*Batis molitor*				x	x		x	x	LC
Family Zosteropidae										
African Yellow White-eye	*Zosterops senegalensis*				x			x	x	LC
Family Timaliidae										
Arrow Marked Babbler	*Turdoides jardineii*	x	x							LC
Family Nectariniidae										
Beautiful Sunbird	*Cynnyris pulchella*		x			x	x	x	x	LC

Family and Common Name	Species Name	Rerouting survey sections								IUCN status
		1	2	3	5	7	8	9	AR	
Collared Sunbird	*Hedydipna collaris*	x	x		x					LC
Eastern Violate-backed Sunbird	*Anthreptes orientalis*				x		x	x	x	LC
Malachite Sunbird	*Nectarinia famosa*		x							LC
Scarlet-chested sunbird	*Chalcomitra senegalensis*	x	x			x				LC
Family Malaconotidae										
Black-backed Puffback	*Dryoscopus cubla*	x	x	x	x	x	x	x	x	LC
Black-crowned Tchagra	*Tchagra senegala*	x		x				x		LC
Brown-crowned Tchagra	*Tchagra australis*		x		x	x	x		x	LC
Brubu	*Nilaus afer*					x	x		x	LC
Grey-headed Bushshrike	*Malaconotus blanchoti*	x	x							LC
Orange-breasted Bush-Shrike	*Telophorus sulfureopectus*	x							x	LC
Slate Coloured Boubou	*Laniarius funebris*				x	x	x	x	x	LC
Tropical Boubou	*Laniarius aethiopicus*	x	x	x	x	x	x		x	LC
Family Prionopidae										
Nothern-white Crownal Helmer Shrike	*Eurocephalus rueppelli*						x	x		LC
Family Dicruridae										
Fork-tailed Drongo	*Dicrurus adsimilis*					x	x	x	x	LC
Family Corvidae										
Pied Crow	*Corvus albus*					x				LC
Family Oriolidae										
Black-headed Oriole	*Oriolus larvatus*	x								LC
Family Sturnidae										
Red-billed Oxypecker	*Buphagus erythrorhynchus*							x		LC
Ashy Starling	*Cosmopsarus unicolor*					x			x	LC
Superb Starling	*Lamprotornis superbus*					x				LC
Variable Sunbird	*Cinnyris venustus*			x		x	x		x	LC
Violet-backed Starling	*Cinnyricinclus leucogaster*		x							LC
Family Passeridae										
House Sparrow	*Passer domesticus*							x		LC
Swahili Sparrow	*Passer suahelicus*			x	x	x	x	x	x	LC
Family Ploceidae										
Golden-backed Weaver	*Ploceus jacksoni*	x								LC
Grossbeak Weaver	*Amblyospiza albifrons*		x							LC
Red-billed Quelea	*Quelea quelea*							x		LC
Spectacled Weaver	*Ploceus ocularis*	x								LC
Village Weaver	*Ploceus cuculatus*		x	x	x	x	x		x	LC
Vitelline Masked Weaver	*Ploceus velatus*	x	x				x		x	LC

Family and Common Name	Species Name	Rerouting survey sections								IUCN status
		1	2	3	5	7	8	9	AR	
White-winged Widowbird	*Euplectes albonotatus*	x								LC
Yellow Bishop	*Euplectes capensis*	x								LC
Family Fringillidae										
White-bellied Canary	*Serinus dorsostriatus*	x					x	x		LC
Yellow-rumped Seedeater	*Serinus reichenowi*								x	LC
Family Emberizidae										
Pin-tailed Whydah	*Vidua macroura*			x						LC
Purple Glenardier	*Granatina ianthinogaster*								x	LC
Red-billed Firefinch	*Lagonosticta senegala*	x	x	x			x		x	LC
Village Indigobird	*Vidua chalybeata*							x		LC
Bronze Mannikin	*Spermestes cucullatus*	x	x							LC
Common Waxbill	*Estrilda estrild*		x							LC
Eastern Paradise Whydah	*Vidua paradisaea*							x		LC
Blue-cheecked Cordonbleu	*Uraeginthus cyanocephalus*		x			x			x	LC
Green-winged Pytilia	*Pytilia melba*		x		x	x	x	x		LC
Peter's Twinspot	*Hypergos niveogutatus*	x								LC
Zebra Waxbill	*Amandava subflava*			x						LC
Cinnamon Breasted Bunting	*Emberiza tahapisi*			x				x		LC
Total number of species		37	33	32	44	44	51	49	34	

Plate 56: Fisher's Lovebird *Agapornis fischeri,* endemic to East Africa

Plate 57: Ashy starling *Cosmopsarus unicolor*, endemic to Tanzania

Plate 58: Tanzania Red-billed Hornbill *Tockus ruaha*, endemic to Tanzania

Mammals

From mammal transects and interviews, 26 species were recorded in the study area. Of these, only five species, the vervet monkey *Cerecopithecus pygerythrus*, Yellow Baboon *Papio cynocephalus*, Slender Mongoose *Herpestes sanguinea*, Four-toed Elephant Shrew *Petrodromus tetradactylus* and Mutabe Sun Squirrel *Heliosciurus mutabilis* were observed during the survey (See Table 49). The other mammals were reported to be present in the study area based on interviews with the local people. One of the mammal species that was reported to be present in the study area, the African Elephant *Loxodonta africana* was mentioned to occasionally visit Gulwe and Godegode (See Table 49 for comments). Some of the mammal species that were observed are shown in Plate 59 and Plate 60.

Table 49: Mammal species recorded along the rerouting sections and access road between Kilosa and Gulwe. All mammals presented in this Table fall under Least Concern (LC) category according to IUCN Red List of threatened species except the Leopard *Panthera pardus* and *Loxodonta Africana*

Family and Common name	Species	Comments
Family Cercopithecidae		
Yellow baboon	*Papio cynocephalus* (App. II)	Several individuals were observed near Gulwe (density *ca*. 20 individuals/km^2), and elsewhere along the railway, the baboons were reported to cause human-wildlife conflicts mainly though raiding crops

Family and Common name	Species	Comments
Vervet monkey	*Cercopithecus pygerythrus* (App. II)	Three groups were seen: one near Munisagara (density *ca*. 30 individuals/km^2), another near Kikundi (density *ca*. 50 individuals/km^2) and the other between Kidete and Gulwe both feeding up on the trees. Together with the yellow Baboon, they were mentioned to be the main problem animals (in raiding crops)
Blue monkey	*Cercopithecus mitis* (App. II)	This was not observed during the survey, but was mentioned by the interviewees to have occasionally visited the area
Family Macroscelidinae		
Four-toad elephant shrew	*Petrodromus tetradyctylus*	One individual was observed crossing the railway during the reconnaissance survey in June 2015
Family Leporidae		
Hare	*Lepus* sp.	Commonly hunted; was not observed
Family Sciuridae		
Striped bush squirrel	*Paraxerus flavovittis*	One individual was observed at section 3
Mutable sun squirrel	*Heliosciurus mutabilis*	One individual was observed at Section 5
Family Hystricidae		
Crested Porcupine	*Hystrix cristata*	Was mentioned to be present in the project area: was not observed
Muridae and Crocidura		
Small rodents		Several mices and shews were observed but could not be identified to species level as there identification needs close observation and even detailed examination of the skulls
Family Canidae		
Jackal	*Canis* sp.	They were mentioned to passed at Rea-rooting 5 in previous years, but none was seen in this survey
Family Mustelidae		
Ratel (Honey badger)	*Mellivora capensis*	Mentioned to occur in the area but not seen during the survey.
Family Herpestidae		
(Ichneumon) Egyptian mongoose	*Herpestes ichneumon*	Mentioned to occur in the area but not seen during the survey.
Slender mongoose	*Herpestes sanguinea*	Several individuals were seen (*ca*. 10 individuals/km^2) during the day search. Some were seen hunting rodents along the railway
Banded mongoose	*Mungos mungo*	Mentioned to occur in the area but not seen during the survey.
Family Hyaenidae		
Spotted Hyaena	*Crocuta crocuta*	Was mentioned to kill goats: Was heard during the night at Godegode (sections 7 & 8) and Gulwe (section 9).
Family Viverridae		
Common genet	*Genetta genetta*	Mentioned to occur in the area but not seen during the survey.
African civet	*Civettictis civetta*	Piles of droppings were found in several places along the railway and its presence was confirmed by the people who were interviewed
Family Felidae		
Leopard	*Panthera pardus* (NT, App. I)	Mentioned by pastoralists as being present in the study area
Family Orycteropodidae		
Aardvark	*Orycteropus afer*	Mentioned to occur in the area but not seen during the survey.

Family and Common name	Species	Comments
Family Procavidae		
Rock Hyrax	*Procavia capensis*	Usually hunted: was not observed during the survey
Family Elephantidae		
African Elephant	*Loxodonta Africana* (VU, App. I)	According to villagers, very occasionally, the elephants visit Gulwe and Msagali during the dry season
Family Suidae		
Bush pig	*Potamochoerus larvatus*	It was mentioned as among the causes of human-wildlife conflicts: raiding crops
Common warthog	*Phacochoerus africanus*	Mentioned by farmers to occasionally raid their crops
Family Bovidae		
Eland	*Tautotragus oryx*	Mentioned by local hunters to occurs in nearby mountains
Bushbuck	*Tragelaphus scriptus*	Commonly hunted
Dik dik	*Madoqua kirkii*	Commonly hunted

Plate 59: Vervet Monkey *Cercopithecus aethiops pygerythrus* (left) and Yellow Baboon *Papio cynocephalus* (right)

Plate 60: Slender Mongoose *Herpestes sanguinea*

Discussion

Amphibians

It was expected to see more amphibian species than the ones that were observed. This could be due to dryness of the sub-strum in most of the sections that were surveyed because amphibians are known to prefer to live in wet habitats (Channing and Howell, 2006; Du Preez and Carruthers, 2009). In those sections that were wet there were more amphibian species that were observed there than in the other sites. For example, there were more amphibians that were observed at sections 1 and 9 due to wetness of these sites. Another reason for the fewer species of amphibians could be due to the fact that we did not use bucket pitfall traps for logistical reasons. This method is well known to be adequate in sampling amphibians (Msuya, 2001).

Reptiles

While the area sampled could have more reptile species, only 23 were observed. This could be limited by the only methodologies used were time-constrained searches and opportunistic observations. In addition, it was logically difficult to set bucket pitfall traps which could have added the sampling of some more reptile species.

More species were detected at section 9 possibly because it was relatively longer than the other sites and more time was spent searching than the other sections.

Birds

A number of bird species were observed along the proposed rerouting sections. This is due to the availability of different habitat types along the railway line between Kilosa and Gulwe. Most of the species observed are those that are typically found in open woodlands, wooded grasslands and shrublands. In addition, most of the species observed were non-forest dependent species (Pomeroy and Dranzoa, 1996).

Mammals

Few mammals were observed in the project area possibly due lack of suitable habitat along the proposed rerouting sections and access road. Hunting could be another reason for the lower number of large mammals in the area. During the interviews it was noted that large mammals are usually hunted mostly by poachers.

Animal movements and migration

Most vertebrates (amphibians, reptiles, birds and mammals) are liable to move from one habitat to another depending on different circumstances. Birds in particular move from one habitat to another in search for food, water, roosting sites and nesting areas. For example, at Godegode a number of birds particularly doves were observed moving into River Mkondoa to drink water. Flocks of more than 100 individuals of African Openbill *Anastomus lamelligerus* were observed at Godegode (Sections 7) and Gulwe (Section 9).

The project area is potentially used by Palaearctic migrants. For example, during the study individuals of Barn Swallow Hirundo *rustica* were observed at Sections 3 and 8.

It was reported that there are mammals that move into river Mkondoa to drink water, particularly during the dry season. Elephants *Loxodonta africana* were reported to have been seen at Kikundi, Godegode and Gulwe in the past but the frequency is very low. In other

areas, elephant were seen very long ago. For example, the last record of elephants sighting at Muzaganza is in 1978.

Critical wildlife habitats

Most of the area that was surveyed has been disturbed in one way or another bearing in mind that rerouting and access roads will be located in the vicinity of the existing railway. In addition most the area surveyed is used for crop cultivation and housing. There are some hills that had relatively less disturbed vegetation but still they may not be considered as critical habitats. Areas that could be considered as critical habitat for the survival of species and fauna communities are far away from the rerouting and access roads except the proposed access road at section 8.

Human wildlife conflicts

Human-wildlife conflicts exist in the project area where by wildlife particularly some birds (e.g., Black-headed Weavers *Ploceus cuculatus* and Red-billed Quelea *Quelea*) and mammals (e.g., Vervet Monkeys *Cercopithecus pygerythrus*, Bush Pig *Potamochoerus larvatus*, Common Warthog *Phacochoerus africanus* and Yellow Baboons *Papio cynocephalus*) raid crops.

Snakes that are potentially harmful to human being such as Black-necked Spitting Cobra *Naja nigricollis* were mentioned to be dangerous both to humans and livestock. However, due to poor record keeping no data was readily available for presentation to show prevalence and distribution of the incidents.

Endemic Species and Species of Conservation Concern

Endemic species

Of all the species observed (i.e., amphibians, reptiles, birds and mammals), only two bird species, the Tanzania Red-billed Hornbill *Tockus ruahae* and Ashy Starling *Cosmopsarus unicolor* are endemic to Tanzania (Sinclair and Ryan, 2010).

Species of conservation concern

Species of conservation concern are those that are regarded as threatened with extinction according to the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (http://www.redlist.org) and or those falling on the Convention on International Trade in Endangered Species of Wild flora and Fauna (CITES) appendices (http://www.cites.org). CITES is an international agreement between governments that are members of the IUCN whose aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival (http://www.cites.org). No amphibians recorded in the project area are threatened as per IUCN redlist. No amphibian species from the area was found to fall under CITES Appendices.

At least 23 species of reptiles were detected at the proposed project site and only two species, the Nile Monitor *Varanus niloticus* and *V. albigularis* were found to fall under CITES *Appendix II (Table 3).* Most species have not been accessed as per IUCN Red List, only two species; the Rainbow Skink *Trachylepis margaritifer* and Blue-headed Tree Agama *Acanthocercus articollis* are in Least Concerns (LC) category according to IUCN RedList of threatened species (see *Table 3*).

One of the bird species observed, the Fisher's Lovebird *Agapornis fischeri* was found to fall under "Near-Threatened (NT)" category of threat status according to IUCN Red List of threatened species (see *Table 3*). Ten species of birds from four Families Accipitridae and Psittacidae (*Table 3*) were found to fall under CITES *Appendix II.*

Of the mammals recorded in the study area, the Vervet Monkey *Cerecopithecus pygerythrus* and Yellow Baboon *Papio cynocephalus* fall under *Appendix II* of CITES and two more species recorded in the interviews, the Leopard *Panthera pardus* and African Elephant *Loxodonta africana* are in *Appendix I* of CITES. Of these latter two species, the Leopard in Near Threatened and African Elephant is vulnerable as per IUCN red list of threatened species.

4.2.3.7. **Archeological Resources of the Project Area**

Three methods including review of documents, inquiring ethnographies from stakeholders and surveying the sampled areas (7^{th} – 13^{th} June 2015) were employed in gathering data for the scoping purpose.

Generally speaking, the archaeology and cultural heritage of Morogoro and Dodoma regions particularly Kilosa and Mpwapwa District remains relatively unknown. Literature review revealed that the nearest areas known to have archaeological potentials are Dakawa and Nguru hill situated about 60km east of the project area. The surveys conducted at these sites during the 1980s and 1990s revealed cultural material remains including Later Stone Age (LSA) artefacts, potteries of Early Iron Age (EIA) and indicators of ancient iron smelting activities that include slag, tuyeres and furnaces (Haaland & Msuya, 2000; Haaland, 1995; Thorp, 1992). These cultural heritage properties recorded from these sites date between the 6^{th} and 15^{th} centuries AD. Also some of the artefacts especially potteries of TIW/Tana variants recovered from the site of Dakawa indicate an interaction between the coast and hinterland (Haaland & Msuya, 2000; Chami, 1994).

The site visit several important archaeological materials were recorded at vicinities within which the relocation will take place. At Mkadage for instance, one major archaeological site of early iron working was recorded. Nearby the basement of a hill close to the proposed rail relocation, there were metal assemblages indicating iron smelting took place over the area. Indicators of this ancient activity are scatters of metal slag and potteries of Iron Age period (see Plate 61). Within the same vicinity at near Mkadage primary school, the consultant recorded ancient settlement indicated by protruding ceramics some of which have clearly seen decorative motifs (see Plate 62 a-b).

Plate 61: Assemblages of metal slag and potteries of Iron Age recorded at Mkadage
Photo taken on (Photo taken on 08/06/2015)

Plate 62: A part of a larger surface of probably ancient settlement indicated by protruding ceramics (a) some of which have clearly seen decorations (b) (Photo taken on 08/06/2015)

Scatters of ancient settlements were observed at Munisagara village. While few potsherds of between the 17th and 19th centuries were recorded within the relocation points, a huge scatter of the ceramic materials were recorded at point 0268109/9253800 (see Plate 63). A quick examination of few of the ceramics record some with grooves and comb stamping decorations (see Plate 63b). Like Mkadage and Munisagara, Kikundi seemed to be rich in terms of archaeology. Ceramics of different age period ranging from the 8th to the 18th century were recorded at the vicinity within which the rail will be relocated. For instance, at point 0253142/9260103 scatters of ceramics that are yet to be identified and some of the decorations have not been located from literatures (see Plate 64 a-b). The nearby area, but within the same vicinity, exhibited spiritual baobab tree under which there some pieces of plain ceramics of probably recent times (see Plate 65).

Plate 63: A part of an ancient settlement recorded in Munisagara village (a) and the sampled ceramics showing grooves and comb stamping decorations (b) (Photo taken on 09/06/2015)

Plate 64: One of the ancient settlements at Kikundi (a) and some of the sampled ceramics that exhibit various decoration motifs (b) (Photo taken on 10/06/2015)

Plate 65: A spiritual site recorded under the baobab tree within the relocation area in Kikundi village (Photo taken on 10/06/2015)

The villages of Muzaganza, Godegode and Gulwe did not show much of archaeological importance. Only few ceramics of probably the 19th century and land snails were recorded in Muzaganza village but within the vicinities of relocation (see Plate 73). In Godegode and Gulwe villages, area of archaeological potential was recorded within the cemetery areas. Because of the taboos guiding graves within these respective communities and with the exception of quick documentation, no surveys were undertaken. Because these cemeteries and close vicinities have remained intact for quite sometimes, a thorough survey and test pitting of the areas would provide some clues on the areas past.

Plate 66: Some pieces of local pottery, daub, glass and land snails recorded at the relocation point in Muzaganza village (Photo taken on 09/06/2015)

Plate 67: Various sections of the major cemetery in Godegode village (Photo taken on 10/06/2015)

4.2.3.8. Land use in the project area

Land uses that were identified during the site visit (field work) made from Kilosa to Ihumwe ((7th – 13th June 2015 (Dry Season) and 30th November 2015 – 8th December 2015 (Wet Season), include human settlement, grazing, mining and agriculture.

Most of the buildings are located outside of the railway corridor (60m), few houses were observed to be inside the railway corridor. The settlements (buildings) were observed to be concentrated at railway stations at Kidete, Godegode, Gulwe, Kikombo and Ihumwe. Some of the villages lack roads to connect the villages and uses the railway infrastructures (embankment, bridges and culverts). In some areas the grazing was observed to be done

inside the railway corridor whereas at Munisagara there observed cattle crossing the railway in search of water (see Plate 68). Mining activities were observed to exist close to railway line corridor. Copper ore mining was observed at Gulwe and Gypsum mining at Msagali and Gulwe (at Pandambili).

Plate 68: Cattle crossing the railway line (Photo taken on 10/06/2015)

Agriculture was also observed adjacent to railway line (Plate 69 - Plate 70), extensively done in the low land (Flood plain areas) and wetland areas. The crops cultivated including rice, maize, onions, banana and Millet.

Plate 69: Settlement close to railway line at Muzaganza (UTM 9258534, 0257779) (Photo taken on 09/06/2015)

Plate 70: Agriculture close to railway line (RHS) (Flood plain at Muzaganza) (Photo taken on 09/06/2015)

Plate 71: Copper Ore Mine at Gulwe (Genge tisa area)(Photo taken on 11/06/2015)	Plate 72: Mined Gypsum at Msagali (Photo taken on 12/06/2015)

4.2.3.9. Existing environmental threats and challenges

a) Erosion prone area

During the field survey it was observed two parts that are affected by erosion; along the river banks and along the slopes of the hills and mountain. The section between Kilosa and Gulwe has been much affected with the soil erosion along the river bank attributed by the River flow patter (River meandering), the volume, speed and the constituent of the river water that strike the river banks and therefore enhance erosion. The effect of bank erosion to the section between Gulwe and Ihumwe is noticed at the river crossings. The erosion along the hills is mainly due to human activities whereby the activities such as cultivation, construction, grazing, etc. slacken the soil, the loosen soil particles are washed away by wind or water when it rains.

b) Siltation

The siltation was also observed to be a major problem along the project area. The siltation affects the river dimensions, and blocks the drainage structures along the railway line. The siltation to the river channel reduces the depth of the river channel as a results water spread over the large area. This damages the river banks as well as destroying the fertile land for agriculture. The siltation also reduces the flow capacity of the drainage structures which causes the water to overflow through the railway embankment in some locations.

c) Land/ ground instability areas (landslides, creep, etc.)

During the site visit it was observed that most of the cut areas for railway passage have the landslides attributed by the nature of the rock (fragmented bedded rock) and the high angle of cut (most of the area is 90° vertically).

d) Impact of Climate Change)

The above environmental threats are exacerbated by rain pours and denuded land masses. The extent and frequency of rains is influenced by the climate change. It is reported that most parts of Tanzania, particularly the Central and Northern Zones, which are semi-arid are vulnerable to climate variability and they will be more vulnerable to the projected increase in frequency and amplitude of extreme climate events such as heavy rain pours (URT, 2007)[17].

[17] URT (2007). National Adaptation Programme of Action (NAPA)

With the predicted increase in climate variability, the problems faced by the central railway line are expected to persist.

Plate 73: Siltation along the river basin at Mkadage Village (9249248) (Photo taken on 08/06/2015)

Plate 74: Observed landslide (Found in most of the cut areas) (0272910) (Photo taken on 08/06/2015)

4.2.3.10. Existing benefits

Although the existing man-made Gombe dam (located in Kidete village, Kilosa District) was not constructed under this project, it was constructed to retain water for community use and to flood control. Therefore, the dam will have a positive impact to the project.

4.2.3.11. Existing quarries

Literature search has established that there is scanty information on existing quarries. This means comprehensive data on existing quarry needs further investigation. The following sections provide, albeit limited information on some of the quarries.

Tura quarry site in Tabora

This quarry belongs to RAHCO. The quarry ballast stock at Tura is exhausted. The concessionaire has not produced any ballast since commencement date and they have no plans to revive production. There are also no ballast hoppers to carry the ballast as almost all of them were involved in accidents beyond economic repair and have been scrapped. This information was provided by the former RAHCO CEO when presenting a paper in the REGIONAL CONFERENCE ON EAST AFRICAN RAILWAYS, titled "Revitalizing the Railways for Enhanced Regional Integration and Economic Growth" TANZANIA CURRENT PLANS FOR DEVELOPMENT OF EXISTING AND NEW RAILWAYS, At Mlimani City Conference Hall – Dar es Salaam on 11 – 12 March, 2010]

Kongolo Quarry in Mbeya

Has the capacity to produce more than 2,000mt of quarry products per hour. It produces high quality ballast as the main product for railway maintenance whilst aggregates, chippings, boulders, quarry dust and crusher dust are produced as by-products for sale to the public. In addition to the quarry at Kongolo, there is also the **Concrete Sleeper Plant** where all sleepers for the 1,860km track are manufactured

Twiga Aggregates – Lugoba Quarry
This quarry belongs to the Tanzania Portland Cement Company Ltd. The quarry site is situated in Lugoba Ward, Bagamoyo District, covering an area of approximately 14.2 Ha, has capacity to produce between 400,000 to 600,000tons of aggregate per year.

Nyanza Road Works Limited
Nyanza Road Works Ltd was founded on quarrying and this still remains as a core activity and an integral part of the company's associated operations. They claim to operate 3 quarries throughout Tanzania (but without mentioning their location). The company produces primary and secondary construction aggregates, asphalt and ready-mixed concrete.

Others which are just mentioned in literature without details

- Arusha Aggregate
- Tanga Aggregate and stone quarries Co. Ltd.

4.3. SOCIO-ECONOMIC CHARACTERISTICS OF PROJECT SITE

4.3.1. Methodology

On one hand, quantitative data was mainly gathered from the available social economic reports of the study area e.g. the Kilosa and Mpwapwa Districts Socioeconomic Profiles, The Tanzania population and Housing Census of 2012 and the Tanzania Demographic and Health Survey of 2010. These documents provided the socioeconomic profile of the study Regions, Districts, Wards and Villages. Important information such as population structure, i.e. size, gender, age; ethnicity; economic activities, social services were obtained from these reports. On the other hand, qualitative data was generated through methods such as interviews, observation and focus group discussions with famous people village leaders and various social groups such youths, women etc. in the study area. The field surveys were done between 7th and 13th June 2015 (and between 30th November 2015 and 8th December 2015. The filed visits also helped the Consultant to fill the data gaps.

Sampling
Study area: sampled purposively, i.e. village communities, namely Mkadage, Munisagara, Muzaganza, Kikundi, in Kilosa and Godegode, Gulwe, Igandu, and Ihumwe in Dodoma in which the line faces floods, e.g. being washed away, run off over the line etc. From these villages, members such as influential people, e.g. politicians and local government administrators, social groups such as youths, women, the elderly etc.

4.3.2. Administrative Issues

The project areas falls under two different regional and district jurisdictions. While the section in Kilosa falls within Morogoro Region and Kilosa District jurisdictions, the section in Mpwapwa falls under Dodoma Region and Mpwapwa District council jurisdictions. Under district councils are wards led by Ward Executive Officers and councils which in the project area include Masanze and Kidete in Kilosa and Gulwe and Godegode in Mpwapwa. Moreover, under wards are villages which in Kilosa include, Munisagara (Masanze Ward), Muzaganza and Kikundi (Kidete Ward); in Mpwapwa they include, Kisisi and Godegode (Godegode Ward) and Gulwe (Gulwe Ward). Villages are led by village chairpersons (as political leaders) and Village Executive Officers (VEO) as administrators. All leaders have

had important roles to play in this study, as community gate keepers by particularly organizing community/village assemblies, introducing the study team to communities and guiding the team to identify community members' properties.

4.3.3. Geography and Ecology

The study area can be roughly divided into two ecological zones, namely: Kilosa district and Dodoma region. The study area in Kilosa is evergreen (Plate 75) because it has two rainfall peaks annually. It is also steep hills both in the northern and Southern parts, thus concentrating most of people's socioeconomic activities in the valley: River Mkondoa Valley. The steep slopes of this area however are also inhabited by pastoralists for pastures of their animals and residence. The Dodoma section of the study area is dry land (Plate 76) with one sometimes unreliable rainfall peak. For this reason, agricultural activities (which are seasonal) in this area are concentrated in river valleys particularly the Kinyamsungwi River Valley. Such ecological differences between Kilosa and Dodoma constitute a difference in the agricultural activities carried out in these areas. While Dodoma produces seasonal crops and drought resilient crops such as millet, sunflower, simsim; in Kilosa almost all crops are grown both permanent and seasonal.

Plate 75: A Green Ecological Zone in Kilosa (Photo taken on 08/06/2015)

Plate 76: A Dry Ecological Zone in Mpwapwa-Dodoma (Photo taken on 11/06/2015)

4.3.4. Demographic Dynamics

Just like other areas of Tanzania, population in the study area is growing. In the span of 10 years, from 2002 to 2012 for instance, population increased nearly by 10 persons per square kilometre in Kilosa District. From 2002 to 2012 population in Kilosa district had increased by 28%. Moreover, on comparison, the household size in Mpwapwa seems to be slightly bigger, i.e. 4.6 persons than Kilosa, 4.2 persons per household. Moreover, the household size in both Mpwapwa and Kilosa are slightly lower than the national household average of 4.8 persons per household. The population growth rate in Kilosa however, is slightly higher than the national average of 2.7 persons. This indicates that the population of Kilosa will double faster/earlier before national population doubles. Such a population increase would multiply pressure on low lying land where the railway is located since much of the Kilosa's geographic area is mountainous (and thus inhabitable) and that of Mpwapwa is dry.

Table 50: Comparing population characteristics of the study area to those of the country and respective regions

	Total Population	No of Household	Household size	Population Density	Growth rate
Country	**44,928,923**	**9,362,758**	4.8	51	2.7
Morogoro	2,218,492	506,289	4.4	31	2.1
Dodoma	2,083,588	453,844	4.6	50	2.4
Kilosa	438,175		4.2	35	2.9
Mpwapwa	305,056	-	4.6		
Kidete ward	11,329	-	4.0	-	-
Gulwe ward	10,385	-	4.5	-	-

4.3.5. Ethnic groups and History

The ethnic makeup of the study area can be roughly divided into two, i.e. between those in Kilosa and Dodoma. In Kilosa there is a mix of ethnic groups. This fact is in line with history of this district that it was one of the areas with sisal plantations since the colonial period. As such, it attracted migrant labourers from various parts of Tanzania. For this reason, there is a multiplicity of ethnic groups in this area, namely: the Hehe, the Ha, the Sagara, the Kaguru, the Gogo, the Sukuma/Nyamwezi and the pastoralist Maasai and Mang'ati, etc. Moreover, the Sagara and the Kaguru which are the indigenous ethnic groups are the minority when compared to the other groups in the area. Most of the groups in Kilosa are predominantly small scale farmers, off course with few animals especially goats. In recent years, starting from the mid-1980s, pastoralists started flocking into Kilosa for green pastures. The communities especially Munisagara and Muzaganza we interviewed however testified that they have devised a mechanism of granting membership to pastoralists on condition that they abide by the bylaws and regulations set by the village council, in order to avoid farmer-pastoralist conflict over land use. Specifically pastoralists are granted membership on conditions that they limit their animals to an agreed minimum, and they keep their animals to the non-agricultural zones, i.e. the bush/grasslands on the steep slopes.

Unlike Kilosa, (where there is a multiplicity of ethnic groups) the study area in Dodoma is dominated by the one ethnic group: the Gogo. There are however other ethnic groups such as the Hehe, the Nyamwezi, etc. but they are the minority compared to the Gogo. The Gogo are partly farmers and partly pastoralists. Farming is seasonal; it takes place during the rainy season from November to June. Animal keeping ranges from few animals (less than ten) to hundreds. Due to scarcity of land for pasture, pastoralists (the Mang'ati and the Maasai) have penetrated into this area not physically but through the indigenous people. That is, a Mang'ati may enter into an informal contract with a Gogo so that a Mang'atis' animals are shifted to a Gogo's place (in return for some benefits off course) such that they are known to the public to be a Gogo's property.

Generally, there is a sense of harmony among various ethnic groups in the study area. But, the fact that populations of both people and animals are increasing through both natural increase and in-flocking, it is justifiable to predict that in the near future the study area would

experience ethnic conflicts albeit underpinned by resource (water and land) access and utilization.

4.3.6. Social Groups: Youths, women and the Vulnerable

Generally, the findings of the study indicate that the prevailing living conditions in the study area cut across various social groups depending on their access to life producing resources. The differences which manifest themselves in the special social groups such as the elderly, children, the disabled, the sick etc. are but just manifestations of the crosscutting conditions. Consequently therefore, even members of the special groups experience different living conditions. In an in-depth interview at Muzaganza-Kilosa, it was revealed that vulnerability of the elderly varies depending on what they own. Those old people who have large tracts of arable farming land could not starve because they can hire people to till the land in return for cash or in kind pay. Elderly who is poor, i.e. who has no access to land or children for instance suffers more because they cannot move around and sell their labour in return for money/food. Moreover, youths at Munisagara had concerns similar to other social groups, i.e. lack of transport for their crops, floods which wash away their crops, etc. An activity which across the study area engaged male youths exclusively was motorcycle riding commonly known as *"bodaboda"*.

4.3.7. Economic Activities

Farming is the main economic activity in the study area followed by livestock keeping. For community members in Kilosa, farming is a permanent due to the fact that the area receives rainfalls biannually and that farming activities take place mainly in wetlands (in the Mkondoa river valley). For this reason, both permanent and seasonal crops are grown in Kilosa. Such crops include bananas, maize, soya beans, sunflower, simsim, onions, mangoes, sugarcane etc. in Mpwapwa on the other hand, rainfalls are uni-annual. As such farming is mainly seasonal rowing seasonal crops mainly maize, groundnuts, sunflower etc. in both Kilosa and Mpwapwa farming technology is still low, i.e. dependent on nature (rainfalls and wetlands), animals (maksai in Kiswahili) hand hoe, sword and axe and some machinery such as power tiller.

Livestock keeping is the second economic activity in the study area next to farming. It is more common in Dodoma than Kilosa because of the dry climate of Dodoma which makes farming for them only seasonal. Yet, in recent years, Kilosa was been receiving livestock keepers especially the Mang'ati and the Maasai from North eastern Tanzania. What crosscuts among all livestock keepers is that that their system of keeping animals is traditional grazing whereby they shift from one place to another in search for pastures. Such pastures are always village lands subjected to common use.

Other economic activities include bee keeping, (noted at Gulwe), salt making as noted at Godegode and fruit gathering (especially baobab fruits in Mpwapwa).

Food and income security

In the entire study area, incidences of food insecurity were reported. In the Kilosa food insecurity was attributed to the flooding of Mkondoa River which implied washing away of the crops grown in the river valley. Moreover, the declining of Mkondoa River depth due to siltation has negated the possibility of fishing activities in this river further contributing to both food and income insecurity. In Dodoma on the other hand, and especially in Godegode,

Gulwe and Kisisi, food insecurity was attributed to frequent droughts which burn off the crops before maturation. Since the communities in the study area depend on such natural resources as land, water sources, rainfalls etc. for their livelihoods, food insecurity in these areas is always coupled with income insecurity. This is particularly because; people get money through selling off the surplus, whenever there is surplus production. So, minimal production implies both food and income insecurity.

4.3.8. Resource acquisition and use

Land resources: In the entire study area, three (3) mechanisms of land acquisition were identified, namely: (i) inheritance, (ii) buying and selling of land, and (iii) grabbing idly lying land. While the first two mechanisms are the most common means of land acquisition, the third mechanism is increasingly becoming unpopular following the increase of both human and livestock population in the study area. The majority of peasants' farm size depends on their ability to buy and the size of land they inherit from their parents. Moreover, the dominant land tenure system in the study area is customary rights of occupancy (whereby the village is entitled to manage village land) on behalf of village members. In this case, households occupy small plots ranging from averagely two acres to medium size farms raging from eight (8) to fifteen (15) acres. It is only very rare cases, e.g. a part of Magomeni ward in Kilosa which is a large plantation owned by investors who have a statutory right of occupancy. Roughly, family farmland can be categorized as shown in Table 51.

Table 51: Allocation of Farmland in the Study area

Farm Size	Proportion of occupiers
Small 2 to 5 acres	The large majority
Medium 8 to 30	Few
Large 50 acres and above	The minority

Forest resources: In all the villages are commonly used according to regulations set be local government authorities (village and district councils). According to these regulations harvesting fresh trees for timber (for commercial or subsistence purposes) one has to get a permit from the district council and submit it to the village council for consideration. Those who qualify for permission to harvest timber have to pay the required tributes to the local authorities. Village members however are always permitted to harvest dry wood for firewood, medicine plants etc.

Water sources: the commonly available water sources include rivers particularly Kinyasungwi in Dodoma and Mkondoa in Kilosa, shallow wells dug in the valley of these rivers. In some villages there are also deep wells in constructed by non-governmental organizations (NGOs). In most of the villages in Mpwapwa particularly access to fresh water is a big problem. Moreover, in Mkadage village in Kilosa people complained of being attacked by whales when they go to the stream to fetch water.

Pasture lands: in most of the villages pasturelands are located next to the farmlands (wilderness, grasslands, natural unreserved forest, and natural water). These are commonly accessed/use by those who have who keep animals especially cattle.

Cultural resources: in the study area there are also cultural resources especially grave yards/cemeteries. There are three patterns of using land for this purpose. That is, (i) each household having its own burial place around in farm around their home. This practice was

found to be common in Mkadage village. In other villages however, burying around the home is increasingly uncommon however following the mounting land shortage and education on village land use; (ii) clan owned burial places, whereby only people of the same clan burry their deceased (iii) village owned burial places, whereby each household in the village, regardless of their clan/ethnic background has an opportunity to bury their deceased in that village cemetery. This was particularly found at Godegode in Mpwapwa district; (iv) a combination of (ii) and (iii) above is also a possibility as it was found at Kikundi village in Kilosa distinct.

4.3.9. Built-environment: the State of Social Services

Transport: for the entire study area, the main means of transport has historically been railway. But in the recent, the service offered by the railways authorities has been unreliable since most of the substations have been either completely closed down or provide services only rarely. Moreover the extent to which people in the study area have been affected by the unreliable railway services has so much depended on the availability of alternative means of transport especially road transport. The Dodoma section has suffered less (than Kilosa) because there are roads albeit seasonal which serve a purpose of connecting these village communities to urban areas such as, Mpwapwa Town, Dodoma Municipal and Dar es Salaam. On the contrary, the study area in Kilosa lacks road transport probably because of its landscape which is full of steep hills. For this reason, village communities in Kilosa study area section suffers most in terms of lack of the means for transportation of people to various points e.g. health facilities, and crops to the market. The problem of transport is particularly severe in Mkadage and Munisagara villages which are agricultural communities but yet have no access to markets due to lack of reliable transport. Moreover, many cases of 'people knocking the train' were reported in these villages due to pedestrian pass way being located very close to the line.

		
An irrigated maize farm at Kikundi	Weathering sunflower farm at Gulwe	Traditional healer's residence at Muzaganza
		
Greeny vegatation in Kilosa	Dry climate at Mpwapwa	Cemetery at one of the PAP's residence at Gulwe

		
Cattle shed at Godegode	Hilly Geogaraphy at Kilosa	A modern house at Gulwe
		
An eldery woman at Godegode	A low income residence at Kisisi	A grain store at Gulwe
		
Unbuilt pit latrine	Charcoal burning at Godegode	

Plate 77: A collection of socioeconomic activities in project area

Communication: Communication **s**ystem in the study area seemed to follow the same pattern. That is, Kilosa communities being in the valley of River Mkondoa have access on only one mobile communication network AIRTEL. In Dodoma on the contrary all mobile communication networks, i.e. VODACOM, TIGO, AIRTEL, TTCL (and an emerging VIATEL) are available.

Education and Health Facilities: Schools are available. Every village community has at least one primary school and every ward has at least one secondary school. Ihumwa ward which in Dodoma Municipal has some private schools. Moreover, the late of enrolment of pupils into class one in regions where the study area is located, i.e. Morogoro (75.5%), Dodoma (67.7%) is slightly below the national average which is 76.8%. Health facilities are also available at least in every ward, though people were complaining that these dispensaries did not have reliable services, e.g. once could be told to buy medicine on their own money. In the similar fashion, health facilities are mainly dispensaries which are located at ward level, i.e. every ward has at least one dispensary, while bedded hospitals are located at the district and regional levels, (see Table 53).

Table 52: Enrolment rate (in %) in Primary School for Tanzania and regions under study

	Male	Female	Total
Tanzania	76.8	75.2	78.4
Morogoro	75.5	73.6	77.3

Dodoma	67.7	64.7	70.8

Source: Tanzania Population Census, 2012

Table 53: Summary of some social services in study area

	Education facilities			Health facilities		Communication services
	Primary	Secondary	college	dispensary	Bedded hospital	
Kilosa district	161	38	8	54	3	All networks
Magomeni	4	1	-	1		Vodacom & airtel
Mzase	7	1	-	1		Airtel only
Kidete	5	1	-	1		Airtel only
Mpwapwa district	173	40	2	37	1	All networks
Godegode	3	1	-	1		All networks
Gulwe	3					
Dodoma Municipal	202	83	-	49	11	All networks
Igandu	3	1		1		All networks
Chamwino	5	1	1	1	1	All networks
Chunyu	2	1	-	2		

Source: Fieldwork data

Water supply: Pumped water in the study area is a very rare phenomenon. In few villages particularly Kikundi and Muzaganza in Kilosa, some households shared few wells constructed by humanitarian nongovernmental organizations. In Kikundi for instance some wells were constructed under the programme called *"I wash"*. Otherwise, the majority depend on the dirty natural sources of water especially Mkondoa River in Kilosa and Chinyinyasungwi River in Mpwapwa. Women in Mkadage village reported to be attacked by whales in Lumuma steam when they go to pick water. Senior village members at Gulwe reported that the conditions of access to water for domestic use were on decline in their village because in the 1970s and 1980s they used to have water pumped from Kongwa (the nearby district) to their village; but since the 1990s this infrastructure is obsolete and has since then not seen any repair.

An out of use water tank at Gulwe

Pathway in the existing railway reserve

Dirty water for domestic use

Cattle Shed at Godegode

A grain store at Gulwe

Some Bags waiting for Railway Transport at Kidete

		
Low income residence at Godegode	Cart as Means of Transport at Gulwe	Banana farm at Munisagara

Plate 78: Some social services in the project are

4.3.10. Living Conditions: Poverty and Livelihoods

The quality of livelihoods[18] in the study area depends on factors such as access to and control of resources particularly land, availability of rainfall, means of transport, ownership of animals especially cattle and formal employment. People who have access to and control of wetlands e.g. river valleys and or large number of animals in Dodoma have their living conditions better off than those people who either have limited or have no access at all to wetland and either have fewer or no animals at all. Equally, years of inadequate rainfall such as this year (2015) induce severe income poverty and food insecurity among people in Dodoma compared to people in Kilosa where inadequate rainfalls are rare. Moreover, unreliable transportation and communication systems in Kilosa are responsible for people's severe poverty because the cash crops they produce cannot easily reach the lucrative markets in urban areas. Generally, in the entire study site, people who are formally employed e.g. teachers, health workers, local government administrators e.g. ward executive officer, councillors etc. seemed to enjoy better living conditions comparable to their counterpart farms who own large shares of resources.

Plate 79: A Low Income Household's Home in Mpwapwa

Plate 80: A Modern Home under Construction in Mpwapwa

[18] In this study quality of life was measured in terms of their resources one owns. That is, those who are better off own large size of farm, large number of animals e.g. 50 cattle and above, high quality house, e.g. brick and concrete made and iron roofed, means of transport e.g. motorcycle etc. on the contrary those with poor living conditions have small plots to work which cannot adequately feed them, low quality home made up of mad, and stick and grass roofed.

4.3.11. Political landscape and community dynamics

Tanzania is a multiparty democracy as such almost all Political Parties are present in the Project Area.

4.4. Summary of Baseline information

Table 54 provides a summary of socioeconomic data for the Kilosa and Mpwapwa District while Table 55 provides same information for the Wards.

Table 54: Summary of Socioeconomic Data for Kilosa and Mpwapwa Districts

Issue	Kilosa	Mpwapwa
Administrative boundaries	Mvomero on the East; Gairo district on the North; Kilolo on the South West; Kilombero district on the South East; Mpwapwa District (Dodoma Region) on the South West	Kilosa district on the East; Kongwa district on the North; Kilolo district on the South; Chamwino District on the West; Kilosa district
Population and household number	Pop: 438,175 , HH: 104,328	Pop: 305,056 , HH: 66,317
Ratio of ethnicity and religion+	Hehe, Ha, Sagara, Kaguru, Gogo, Sukuma/Nyamwezi and the pastoralist Maasai and Mang'ati, mix of Christians and Muslims	Gogo, Nyamwezi and Hehe
Industry and employment	No industry. Employment is in the service sectors: education, health, and administration	No industry. Employment is in the service sectors: education, health, and administration
Livelihood	Salary/wages, petty business and subsistence farming	Salary/wages, petty business and subsistence farming
Production of crops	Almost all crops, seasonal and perennial Bananas, maize, yams, cassava, sugarcane, all legumes, sunflower, simsim, etc.	Drought resilient: millet, sunflower, simsim; In wetlands: maize, groundnuts
Education	Primary 161; secondary 38; college 8	Primary 173; Secondary 40; college 2
Health condition including AIDS/HIV	New infections dropped from 430 people (3.9%) of those who tested in 2009 to 132 people (1.2%) of those who tested in 2014.	New infections dropped from 342 people (4.2%) of those who tested in 2009 to 153 people (1.2%) of those who tested in 2014.
Water supply	Piped water for some areas at district councils, in villages sources are boreholes and streams	Piped water for some areas at district councils, in villages sources are boreholes
Electric supply	Mainly at district headquarters; most of the villages have no power	At district headquarters and in most of the villages there is electricity.
Sanitary condition (e.g. domestic waste water discharge and solid waste disposal)	Mainly pit latrines in rural; Some flash toilets at district headquarters	Mainly pit latrines in rural; Some flash toilets at district headquarters
Land use and land title (village land/general land)	No land title; most of the people own land under customary law when they inherit land from their fore fathers, others allocated by village government	No land title; most of the people own land under customary law when they inherit land from their fore fathers, others allocated by village government
Cultural heritages	Mainly public/community graveyards could be identified	Mainly public/community graveyards could be identified
Gender issue	Mainly patriarchal society but there is evolution towards acceptance of some of women's rights	Mainly patriarchal society but there is evolution towards acceptance of some of women's rights
Indigenous people	Hard to find as the indigenous; the	Most of Gogo (the dominant and

Issue	Kilosa	Mpwapwa
(population, lifestyle and migratory routes)++	Sagara have lived with other ethnic groups (Hehe, Ha, Sukuma, the Nyamwezi etc.) for so long such that their life styles have become similar. Few Maasai and Mang'ati are new comers in the area	the indigenous tribe) is predominantly Christian. So most of their ways of life are common to other ethnic groups.

+ the ratios are not known as Tanzania do not collect data base on tribe and religion (this is a policy issue – we have only ONE Tanzania)

++ here the term indigenous is used to distinguish people who are dominant in that area.

Table 55: Summary of Socioeconomic Data for Relevant Wards in Kilosa and Mpwapwa Districts

Issue	Magomeni	Masanze	Kidete	Godegode	Kimagai	Gulwe
Administrative boundaries	Part of Kilosa town, becomes rural southwards towards the Masanze ward	Magomeni ward in the North; Kidete in the South	Masanze in the North; (Godegode in Mpwapwa) in the South	Kidete in east; Gulwe in the West; Kibakwe in the North	Gulwe in the East; Mpwapwa town in the North	Godegode in the east; Kimagai in the West; Mpwapwa Town in the North
Population and household number	Pop: 11998 HH: 3.9	Pop: 7890 HH: 4	Pop:11329; HH: 4	Pop: 7884, HH: 4.3	Pop:7340 HH: 4.6	Pop: 10385; HH: 4.5
Ratio of ethnicity and religion	Hehe, Ha, Sagara, Kaguru, Gogo, Sukuma/Nyamwezi and the pastoralists: Maasai and Mang'ati, Mix of Christians and Muslims	Hehe, Ha, Sagara, Kaguru, Gogo, the Sukuma/Nyamwezi and the pastoralists: Maasai and Mang'ati, Mix of Christians and Muslims	Hehe, Ha, Sagara, Kaguru, Gogo, Sukuma/Nyamwezi and the pastoralists: Maasai and Mang'ati, Mix of Christians and Muslims	The Gogo; Christianity	The Gogo; Christianity	The Gogo; Christianity
Industry and employment	No industry, Salaried employment; Self-employment in petty business Subsistence farming	No industry, Salaried employment; Self-employment in petty business Subsistence farming	No industry, Salaried employment; Self-employment in petty business Subsistence farming	No industry, Salaried employment; Self-employment in petty business Subsistence farming	No industry, Salaried employment; Self-employment in petty business Subsistence farming	No industry, Salaried employment; Self-employment in petty business Subsistence farming
Livelihood	Salary/wages, petty business and subsistence farming	Salary/wages, petty business and subsistence farming	Salary/wages, petty business and subsistence farming	Salary/wages, petty business and subsistence farming	Salary/wages, petty business and subsistence farming	Salary/wages, petty business and subsistence farming
Production of crops	Almost all crops, seasonal and perennial Bananas, maize, yams, cassava, sugarcane, all legumes, sunflower, simsim, etc.	Almost all crops, seasonal and perennial Bananas, maize, yams, cassava, sugarcane, all legumes, sunflower, simsim, etc.	Almost all crops, seasonal and perennial Bananas, maize, yams, cassava, sugarcane, all legumes, sunflower, simsim, etc.	Drought resilient: millet, sunflower, simsim; In wetlands: maize, groundnuts	Drought resilient: millet, sunflower, simsim; In wetlands: maize, groundnuts	Drought resilient: millet, sunflower, simsim; In wetlands: maize, groundnuts

Education	4 primary schools; 1 secondary school	2 primary schools; 1 secondary school	2 primary schools; 1 secondary school	2 primary schools; 1 secondary school	3 primary schools; 1 secondary school	2 primary schools; 1 secondary school
Health condition including AIDS/HIV	1 dispensary	1 dispensary	1 dispensary	1 dispensary	1 dispensary	1 dispensary
Water supply	Boreholes, streams	Boreholes, streams	Boreholes, streams	Boreholes	Boreholes	Boreholes
Electric supply	None	None	None	None	Some households electricity supplied by TANESCO	Some households electricity supplied by TANESCO
Sanitary condition (e.g. domestic waste water discharge and solid waste disposal)	Each household has its own	Each household has its own	Each household has its own	Each household has its own	Each household has its own	Each household has its own
Land use and land title (village land/general land)	No land title; most of the people simply settled others allocated by village government	No land title; most of the people simply settled others allocated by village government	No land title; most of the people simply settled others allocated by village government	No land title; most of the people simply settled others allocated by village government	No land title; most of the people simply settled others allocated by village government	No land title; most of the people simply settled others allocated by village government
Cultural heritages	Cemetery	Cemetery	Cemetery	Cemetery	Cemetery	Cemetery
Gender issue	Mainly patriarchal but slowly accepting women's rights	Mainly patriarchal but slowly accepting women's rights	Mainly patriarchal but slowly accepting women's rights	Mainly patriarchal but slowly accepting women's rights	Mainly patriarchal but slowly accepting women's rights	Mainly patriarchal but slowly accepting women's rights. Most of the Gogo (the dominant and the indigenous tribe) is predominantly Christian. So most of their ways of life are common to other ethnic groups
Indigenous people (population, lifestyle and migratory routes)	Hard to find as the indigenous; the Sagara have lived with other ethnic groups (the Hehe the Ha, the Sukuma, the Nyamwezi	Hard to find as the indigenous; the Sagara have lived with other ethnic groups (the Hehe the	Hard to find as the indigenous; the Sagara have lived with other ethnic groups (the Hehe the Ha, the Sukuma, the	Most of the Gogo (the dominant and the indigenous tribe) is predominantly	Most of the Gogo (the dominant and the indigenous tribe) is predominantly	Most of the Gogo (the dominant and the indigenous tribe) is predominantly Christian. So most of

	etc.) for so long such that their life styles have become similar. Few Maasai and Mang'ati are new comers of the area	Ha, the Sukuma, the Nyamwezi etc.) for so long such that their life styles have become similar. Few Maasai and Mang'ati are new comers of the area	Nyamwezi etc.) for so long such that their life styles have become similar. Few Maasai and Mang'ati are new comers of the area	Christian. So most of their ways of life are common to other ethnic groups.	Christian. So most of their ways of life are common to other ethnic groups.	their ways of life are common to other ethnic groups.
Means of transport and frequency of railway use	Motorcars, motorcycles, Animals (donkeys), Railway rarely used	motorcycles, Animals (donkeys), Railway rarely used	Motorcars, (only for Kikundi) motorcycles, Animals (donkeys), Railway rarely used	Motorcars, motorcycles, Animals (donkeys), Railway rarely used	Motorcars, motorcycles, Animals (donkeys), Railway rarely used	Motorcars, motorcycles, Animals (donkeys), Railway rarely used
Foot paths and animal/cattle's path crossing the railway truck	Several	Several	Several	Several	Several	Several

5. STAKEHOLDERS CONSULTATION AND PARTICIPATION

5.1. INTRODUCTION

Stakeholder consultations were carried out during the pre-scoping visit which took place between 31st May 2015 and 03rd June 2015, during the study, which took place between 7th June and 13th June 2015 and during detailed baseline survey which took place between 30th November 2015 and 10th December 2015, to identify and respond to project issues of concern to stakeholders. This process will continue during the environmental assessment stage and during the CRP studies. Details of the meetings and discussions with individuals and groups of stakeholders are found in Volume II.

This chapter describes the definition of stakeholder, stakeholders identification process, the initial list of stakeholders identified and consulted; the consultation methodology used; and identified stakeholders' issues concerns regarding the propose project.

5.2.STAKEHOLDERS IDENTIFICATION

The principle entities of stakeholders consulted are Regional, district and local levels; community-based organizations and user groups; communities' leaders and individual community members; and people who potentially will be directly affected by the project.

5.3.USES AND VALUES OF PROJECT AREA

As discussed in previous sections (4.2.3.5 and 4.2.3.8) the majority of land is used for Agriculture (i.e. cropland), grazing areas and building housing structures. Other uses include: forest (collection of medicinal plants, firewood and building wood etc).

5.4.STAKEHOLDER CONCERNS REGARDING ACTIVITIES

For the details of concerns raised during the various meetings and discussions with individuals and groups of stakeholders see Table 56. As per the requirements of the Environment Management Act (2004), stakeholders expect that the project proponent will take their views into consideration in the planning and implementation of the project. Below are the main issues raised and highlighted.

Based on the concerns raised during consultation meetings and an assessment of how broadly the issue was considered relevant, the issues raised are ranked (see Table 56). Ranking reflects the number of times an issue was raised by stakeholders at the four levels of consultations: community members; Subward and Ward leaders; Town /District level; and Regional level. The highest (10) ranked concerns are elaborated on below. In reference to the proposed project locals have expectation of benefiting from the project through employment during construction and enhanced livelihoods during operations of the railway.

Table 56: Ranking of environmental and socio-economic issues raised by stakeholders consulted

S/N	Issue	Category	Frequency of Mention by Village meetings	Ranking
1.	Employment opportunities to locals	+SE	12	1
2.	Ease transportation of people and goods	+SE	12	1
3.	Increase in accident events	-SE	12	1
4.	Increase in HIV transmission from / to new comers and local community and consequent increase in AIDS sufferers in project area.	-SE	12	1
5.	Loss of agricultural and residential land	-SE	10	2
6.	Increase in per capita income of individuals	+SE	9	3
7.	Disturbance from noise from construction equipment	-SE	8	4
8.	Air pollution due railway line development activities	-E	8	4
9.	Loss of natural vegetation cover and contained valuable wildlife due site clearance during flood protection measures / construction works	-E	7	5
10.	Directing the culvert towards peoples' settlement / houses	-SE	5	6
11.	Interfering with the village settlement patterns and the landscape in general	-SE	5	6
12.	Support in construction of infrastructure such as road	+SE	4	7
13.	Knowledge transfer from newcomers to local community.	+SE	4	7
14.	The railway construction/development and rehabilitation works is expected to attract opportunity seekers to areas in its vicinity	+SE	4	7
15.	Hiking of prices of goods and services	-SE	3	8
16.	Flood control measures on the railway will also have a multiplier effect – on flood control on local peoples' farms	+SE	3	8
17.	Compensation should be done on time	I	2	9
18.	Siltation on the dams and need to rehabilitate them	-SE	2	9
19.	Children will drop out of school	-SE	2	9
20.	Loss of natural vegetation cover due site clearance during the construction works / rehabilitation the railway	-E	1	10
21.	Construct underground pathways for enhancing crossing the railway track	I	1	10
22.	Track elevation will cause an interruption on the availability of water for irrigation	-SE	1	10
23.	Reduced incidences of accidents to moving livestock and people across the railway line	+SE	1	10
Key: +ve = Positive impact / aspect, -ve = Negative impact / aspect, E = Environmental issue, SE = Social, economic issue, I = Institutional, policy, legal issue				

From Table 56, it can be seen that the following concerns/impacts were frequently mentioned by stakeholders. These are addressed in subsequent chapters.

5.4.1. Environmental Concerns

Losses of natural vegetation cover and contained valuable wildlife due site clearance during flood protection measures / construction works
The flooded sections (within Mkadage Village) of the railway nearby area is endowed with trees and herbs of local importance i.e. medicinal, building materials and fuel-wood etc. that will be cleared, or damaged due to railway development / rehabilitation works i.e. shifting of the existing route and river banks training.

Air pollution due railway line development activities
Air pollution as a result of moving vehicles and other earth moving machinery during the construction / rehabilitation phase will affect the community at vicinity.

5.4.2. Socio-economic Concerns

Loss of agricultural and residential land
During the rehabilitation phase people might lose their croplands/ pastureland in areas where relocation/ shifting of the existing railway route will occur. Other people might lose their houses.

Interfering with the village settlement patterns and the landscape in general
The original landscape of the village will be interfered with; i.e. shifting of the railway to another location might separate the village.

5.4.3. Health and Safety Issues

Increase in accident events
Locals expected flood free railway line will encourage an increase number of train trips and its consequential increase on the number of accidents to those who use railway as side walk/ ride their motorbike/bicycle by the railway side. Also accidents might occur during construction and may result into loss of some body parts i.e. leg, arm etc.

Increase in HIV transmission from / to new comers and local community and consequent increase in AIDS sufferers in project area
Interactions between project personnel and service providers who have better income than locals have a potential to increase HIV transmission rate and spread of other STDs.

Disturbance from construction equipment
Noise from different machineries (such as vehicle, earth moving heavy machineries: compacters, fork lifters and other construction equipments) used during railway rehabilitation could be potential sources of nuisance hence disturbing the nearby people.

5.4.4. Positive Expectations

Employment opportunities to locals
Community members expect employment opportunities for unskilled and semi-skilled labour during railway development/ rehabilitation works (i.e. site clearance, construction of gabions, security guards, digging ditches etc.)

Ease transportation of people and goods
By protecting the railway line from floods; locals expected an accelerated movement of people/goods to the market as result of a reliable means of transport.

Increase in per capita income of individuals
The locals are expecting that during the project implementation; people's income will generally increase (due to income generated from salaries, wages and market for their local produce). This will consequently improve the living standards local people.

Table 57 provides a summary on how the major stakeholders' concerns have been handled.

Table 57: Handling of stakeholders' concerns

Issue	Comment	How the comment was handled
Environment degradation	Losses of natural vegetation cover and contained valuable wildlife due site clearance during flood protection measures / construction works	Mitigation of natural vegetation clearance have been recommended in Section 7.1.1, 7.1.2
	Air pollution due railway line development activities	Mitigation measures for air pollution have been proposed In Section 7.1.1, 7.1.2
Loss of properly and livelihoods	Loss of agricultural and residential land	A Compensation and resettlement Plan for Project Affected People has been recommended in section 7.2.1
	Interfering with the village settlement patterns and the landscape in general	Mitigation measures to minimise the impact are proposed in section 7.1.2.
Occupation and Public health and safety	Increase in accident events	Mitigation measures to minimise accidental events and how to handle emergencies have been proposed in section 7.2.2
	Increase in HIV transmission from / to new comers and local community and consequent increase in AIDS sufferers in project area	Mitigation measures to minimise HIV/AIDS have been proposed in section 7.3.2.
	Disturbance from construction equipment	Mitigation measures to minimise impacts of construction equipment have been proposed in section 7.3.1.
Positive Expectations		
Improved income and livelihoods	Employment opportunities to locals	Measures to enhance local employment have been proposed in section 7.4.2
	Ease transportation of people and goods	Measures to enhance benefits of the project are proposed in section 7.4.2
	Increase in per capita income of individuals	Measures to enhance incomes of local people have been proposed in section 7.4.2

5.5. PROJECT ACCEPTANCE

The stakeholders met generally viewed the proposed Flood Protection Measure project positively, hoping that it might result in better services, increase access to the project area, ensure operation of the railway system throughout the year and stimulation of national economic development and of the affected areas. (See Table 58) summary of the degree of acceptance for different stakeholders).

Table 58: Summary of project acceptance by different stakeholders

Stakeholder Group	Acceptance level		
	High	Medium	Low
Central Government: Ministries, Departments and Agency.	√		
LGAs: Morogoro Region, Kilosa District Council, Mpwapwa District Council	√		
Ward/Village Government: Mkadage Ward, Ihumwa Ward, Munisagara Village, Muzaganza Village, Kikundi Village, Gulwe Village, Msagali Village, Igandu Village	√		
Community Assembly: Munisagara, Kikundi, Godegode, Gulwe	√		

6.0 IDENTIFICATION AND ASSESSMENT OF IMPACTS AND RISKS

6.1.IMPACT ZONES

The geographical spread of the impacts (short term or long term) is likely to encompass the areas discussed below. The actual spatial dimension will vary with the nature of the impact and the receptor environmental and social component.

6.1.1. Primary Impact Area

This is the core impact zone where the flood protection measures will take place and the area immediately bordering it. The primary impact area thus includes the entire railway section from Kilosa to Gulwe railway Stations, and the access road. Within this core area the main hub of activities will include rerouting of the railway track (25km); Relocation of Gulwe Station (1 km from the current station) [relocation also implies demolishing of the existing Gulwe Station]; Bank Protection Measures (14.2km); Construction of river channel (at Mzase River and Maswala River); renewal of railway track material [by replacing the existing 60 lb track with 80 lb track] (15km); Track rectification (48km); Construction of a temporary access road (96km); housing land development (50m x 200m). The details of these activities are provided in section 2.3.1.

6.1.2. Secondary Impact Area

These are off-site locations linked to the implementation of flood protection measures including borrow areas, quarries and other sources of materials such as sand, gravel, aggregates, stones, sleepers, ballast, subgrade materials, water, etc. involving civil works / extraction activities done by / or on behalf of the project. Other sites will be waste disposal sites, construction camp site or other location chosen for accommodation of construction crew and equipment and material storage. These secondary impact areas will be interspersed along the project area and may be shifted depending on easy movement of materials and construction crew. For the Wards and Villages that are found along the railway line refer to Chapter 2 on mobilisation phase.

6.1.3.General Project Area of Influence

This includes the wider geographical areas that are influenced by this project (in Morogoro and Dodoma Regions and beyond) including area in the near vicinity of the project area within a 5km radius; transportation routes from sources of material to the project location; and general areas served by the Central Railway line i.e. Kigoma, Mwanza, and Dar es Salaam.

6.2. ACTIVITIES LIKELY TO CAUSE ENVIRONMENTAL AND SOCIAL EFFECTS

Box 1 shows procedure for impact identification that was adopted. Impacts associated with implementation of flood protection measures (rerouting, planning/designing, mobilization, construction / installation are identified separately from impacts associated with Railway Line operation and maintenance stages of the project.

Box 1: Impacts identification procedure adopted
Impacts identification has based on cause-effect interactions between the projects' activities and the existing relevant baseline (valued) receptors - physical, chemical, biological, built or human. Impacts identification extends through entire project cycle from site selection for rerouting, planning/designing, mobilization /construction, operation and maintenance and decommissioning stages of the project. Project activities and levels of civil works will differ with type of project component and will affect all types of natural and settlements features and extend the impact area to include offsite locations. Thus impacts identification considers a range of impacts at all project related locations: the project sites at primary core area, All wards and villages mentioned in section 2.2.1; and immediate vicinity and off-site locations

Box 2: provides a summary of Flood Protection Measures which are likely to cause environmental and social impacts and risks.

Box 2: Summary: activities likely to cause impacts and risks
Flood Protection Measures *i. Rerouting of the railway track (25km);* *ii. Relocation of Gulwe Station (1 km from the current station)[relocation also imply demolishing of the existing Gulwe Station];* *iii. Bank Protection Measures (km);* *iv. Construction of river channel (at Mzase River and Maswala River);* *v. Renewal of railway track material [by replacing the existing 60 lb track with 80 lb track] (15km);* *vi. Track rectification (48km);* *vii. Construction of a temporary access road (96km); housing land development (50m x 200m).* **Railway Line operation and maintenance** *1. Railway Line operations* *2. Routine maintenance / repairing damages* *3. Natural disasters* *4. Railway health and safety hazards* **Decommissioning phase**

6.2.1. Flood Protection Measures

The scope for the flood protection measures project will involve following components as discussed in section 2.3 (as repeated in Table 59).

Table 59: Project components

Component	Project
Rerouting of the railway track	25km x 60m wide
Relocation of Gulwe Station	*1 km from the current station)[relocation also imply demolishing of the existing Gulwe Station* Demolishing the existing Gulwe station Land for new station 50m x 100m
Bank Protection Measures	*(14.5km);*
Construction of river channel (at Mzase River and Maswala River)	
Renewal of railway track material [by replacing the existing 60 lb track with 80 lb track] (15km);	15 km
Track rectification (48km);	48 km
Construction of a temporary access road	*(96km);*
Housing land development	*(50m x 200m).*

The above activities, which are well described under Chapter 2, section 2.3.1 are likely to cause impacts of different magnitude, extent and duration as follows:

Land take and physical location of project components
The relocation of railway track, development of housing land, and to a small extent Construction of river channel (at Mzase River and Maswala River) will take place on land that belong either to Village or individuals in the Villages. Some individuals will lose farms or housing. As such land take issues are important consideration in this project.

Bank Protection Measures, Renewal of railway track material, Track rectification will either be constructed along the existing route or on land that is a hazardous land and not suitable for any other economic activity.

Construction of temporary access road is a linear development with the size of the Corridor of Impact (CoI) estimated at 96km (length) x 7 meter width. This will also take place on land that belongs to the villages or individuals, however this will be only for 74 months, i.e. the construction period.

Box 3: Number of affected people[19]

The preliminary CRP study shows that about 180 individuals will be invariably affected by the project.

Besides land take, vegetation clearances for construction of railway track, house development land are likely to cause changes to access, land uses and landscape view of the area. Table 60 shows the potential changes / modification of existing land uses and local population and its quality of life identified to emanate from land acquisition / Land take.

Table 60: Causes and impacts associated with Land take and physical presence of the project

IMMEDIATE CAUSES	RISK / IMPACTS
Loss of economic and livelihood resources: farming land, trees, crops Fragmentation of property (i.e. farms) by linear access road construction and track rerouting Physical damage of economic and social infrastructure existing on the routes (e.g. cattle routes and foot paths criss-crossing the railway crossing.	Environmental impacts: Direct encroachment of Mzase and Maswala Rivers as a result of channelling causing partial replacement of the sensitive natural river habitats Socio-economic impacts: Loss of income or livelihoods sources (farm, pasture) resulting from taking some parcels of farmland Disruption of income and livelihood activities (farming, grazing, trees, crops) resulting in disturbances and food insecurity Temporary disruption of access and transportation services on the community access roads and footpaths resulting in disturbances and nuisances to road users Visual effects: Modifications in the quality of the landscape features

[19] Resettlement Action Plan (RAP) for the Flood Protection measures, JSB-EnviDep Ltd. 2016

6.2.1.1.
6.2.1.2. Field investigations and surveys

These are hydrological studies and topographical and soil surveys necessary in establishing project feasibility and informing the design of components. Elements of these survey that are likely to be intrusive to the environment will involve clearance of vegetation, trampling, or digging pits while obtaining subsoil data and information (Table 61).

Table 61: Causes and impacts associated with field investigation and surveys activities

IMMEDIATE CAUSES	RISK / IMPACTS
Clearance of vegetation Trampling Digging pits	Environmental impacts: Soil disturbances and loss of vegetation Destruction of archeological and cultural heritage resources Socio-economic impacts: Loss of valuable crops Heath, safety and security impacts / risks: Occupational HSS risks

Although physical presence of the railway line is not a new activity, frequent disruption of the railway line due to floods was causing immense loss of income, constrained access to markets, constrained movement of goods and people, at times loss of lives etc. The project will therefore bring with some positive as well as negative impacts as shown in Table 62.

Table 62: Causes and impacts associated with physical presence of the flood protection measures

IMMEDIATE CAUSES	RISK / IMPACTS
Improved socio-economic activities along the route, the surrounding areas and landlocked countries of DRC, Rwanda, and Burundi Physical improvement of existing rail track from 60 lb to 80 lb which will not bring it in line with the rest of the track, but will also increase its carrying capacity Improved safety of the rail track due to construction of river banks, renewal of rail track materials, and rectification measures Improved comfort of passengers as this project will allow Tanzania Railway Corporation to increase frequencies of both passenger and cargo trains	Environmental impacts: Release of oils and fuels in the aquatic environment from train engines Socio-economic impacts: Increased income and improved or livelihoods as result of increased agricultural production, trading activities, and movement of people within the region and bordering countries Visual effects: Modifications in the quality of the landscape features and appearance as a result of taming river bank erosion and washing away of bridges

Mobilization of resources and early works

Sourcing, transportation / delivery of construction materials for flood protection measures is likely to cause impacts both at project location, transportation routes and offsite sources of materials.

Table **12** in Chapter 2 shows types of input materials and other resources, their sources and estimated quantities that will need to be delivered to the project locations including fill materials; sand, ballast, rail fastenings and sleepers, cement timber, steel bars, concrete blocks, and water for construction activities which will be sourced from nearby rivers and/or boreholes. Mobilization phase will also involve recruitment of the workforce and enlistment and delivery of resources (including working tools and equipment). The phase will also involve establishment a construction camp, approximately 1,000m^2 in size.

Table 63 shows the potential direct environmental and social impacts and risks identified to emanate from mobilization of resources from the various sources to project site.

Table 63: Causes and impacts associated with mobilization works

IMMEDIATE CAUSES	RISK / IMPACTS
Exploitation of construction materials - (sand, stones, ballast, gravel etc.). Transportation by fuel powered vehicles – leading to exhaust emissions Employment of skilled, semi-skilled, casual labourers Procurement of local domestic and industrial supplies and services - cement, wood, steel structure, metal, chemicals, equipment); food, consumables, fuel, oils and lubricant etc.	<u>Physical – chemical impacts</u> Land disturbances / soil erosion at offsite location - sources of construction materials - (fill materials to be extracted from Kilosa and Mpwapwa and sand, aggregates and stones from Tura or Lugoba, concrete blocks from Morogoro, ballast from Tura or Lugoba) <u>Environmental (biological / ecological) impacts</u> Impaired air quality & emission of greenhouse gases Nuisance and disturbances from noise / vibrations from moving vehicles (exceeding allowable level for the zone) Dust emissions (including fugitive (unavoidable, residual) impairing air quality Physical damage / disturbance of flora, fauna (by trampling, noise, dust emissions) <u>Socio-economic impacts:</u> Depletion/degradation at points of source of construction materials e.g. fill materials, ballast, sand, aggregates and crushed stones Enhanced incomes to local suppliers Employment opportunities <u>Heath, safety and security impacts / risks:</u> Occupational HSS risks Public HSS risks: traffic accidents

Demolition of structures

Relocating of Gulwe Train Station will mean demolishing the existing one. There are 3 buildings at the railway station. Table 64 shows the potential direct environmental and social impacts and risks identified to emanate from demolition of existing infrastructure.

Table 64: Causes and impacts associated with demolition of existing infrastructure

IMMEDIATE CAUSES	RISK / IMPACTS
Demolishing hazards: falling objects, accidents of moving trucks Demolition waste	<u>Environmental impacts:</u> Contamination of surface waters with demolition debris and soils Deterioration of air quality due to air pollutants from engines,

Air emissions, noise and dust Water pollution due to release of demolition debris	dust Noise pollution from demolition equipment and moving vehicles <u>Socio-economic impacts:</u> Disruption of socioeconomic activities as the station shifts Loss of aesthetics due to haphazard disposal of demolition waste <u>Heath, safety and security impacts / risks:</u> Occupational HSS risks from demolition activities

Construction of flood protection measures

For rail rerouting, relocation of Gulwe station, access road construction and housing land development, site preparation activities will entail clearance for setting of new structures including removal of vegetation. Earth/excavation and construction civil works using earth moving machines as well as stockpiling of cut materials etc. channel works will involve excavation of a trench. For all above project components, construction will involve collection, treatment and disposal of generated wastes. River embankment protection will involve shaping of river embankment, installation of gabions or concrete blocks. Demobilization and site restoration are standard site practices that will be done at the end of construction period. Table 65 shows potential direct environmental and social impacts and risks identified to emanate from construction works, installation and maintenance works.

Table 65: Causes and impacts associated with construction and installation of flood protection measures

IMMEDIATE CAUSES	RISK / IMPACTS
Vegetation clearance Earth/excavation works (removal of top soils, cutting/filling, trimming, levelling and compacting) Civil works: digging, trenching, excavation draining, filling, placement of material and spreading, resurfacing, watering and compacting, piling of foundation; concrete works, block/brick works. Piling of spoil materials Spread of track materials Excavation, culverting of access road Filling material, watering and compacting of access road Operations of construction equipment producing exhaust air emissions, noise, vibrations) Channel works at Mzase and Maswala Rivers – trenching Generation and disposal of wastes (overburden, demolition rubble, spoilt materials / excavated materials, domestic solid waste (by construction	<u>Physical – chemical impacts</u> Land disturbances / soil erosion Impaired air quality & emission of greenhouse gases Destruction of archeological and cultural heritage resources Nuisance and disturbances from noise / vibrations (exceeding allowable level for the zone) Dust emissions (including fugitive (unavoidable, residual) impairing air quality Impaired water qualities and contained resources from discharge of pollutants (wastes, chemicals, oily substances etc.) Impaired land qualities and land-based resources from discharge of pollutants (chemicals, wastes) Change of natural water flows and movements <u>Environmental (biological / ecological) impacts</u> Impairment of natural and ecological habitats: along channelled Mzase and Maswala Rivers Physical damage / loss of flora, fauna, sub-surface organisms, biological diversity and species of concern Reduction / loss of riverine and indigenous terrestrial

IMMEDIATE CAUSES	RISK / IMPACTS
crew), storm water; spills and leakages of fuel and oils, lubricants and sludge). Site restoration	vegetation (by clearance, trampling) Temporary disturbances / flight of fauna from noise, gaseous and dust emissions <u>Socio-economic impacts:</u> Employment opportunities

6.2.1.3. Mobilisation / Demolition / Construction health and safety hazards

Mobilization and construction activities will expose workers and public to various health, safety and security hazards of varying types and extent depending on the circumstances (Table 66).

Table 66: Construction health and safety risks

IMMEDIATE CAUSES	RISKS / IMPACTS
Working conditions	Occupation health & safety risk
Lack of /inadequacies in use of Personal Protective Equipment (PPE) Use of hazardous practices e.g. motored / sharp edged equipment, noise / emissions emitting Exposure to hazardous substances / chemicals: noxious / poisonous gases; dust, corrosive substances, disease agents Practices exposing workers to extreme / risky working conditions: low/high temperatures, excess heat/cold, ventilation for hazardous fumes, drinking of unsafe water Exposure to disease agents / vectors Negligence at work i.e. understaffing and long working hours, employing wrong people on particular jobs, low morale, etc.	Disturbances / nuisance and discomfort Serious injuries Fatalities Sickness and ill-health Snake bites Negligence due to fatigue Loss of morale
Construction hazard	Public health and safety risk
Site hazards: falling in open pits, excavations accidents Air emissions, noise, dust and odours Contamination of water by eroded soils Social interactions among newcomers and local communities Transport hazards: vehicles causing accidents, congested traffic, material spillage Creation of new water bodies (pits) as breeding habitats for agents / vectors of water-borne diseases (malaria, bilharzias etc.)	Disturbances / nuisance Serious injuries / fatalities Risks of human-human transmission of diseases (STD, HIV) Infections from putrescible wastes with disease pathogens Children and elderly people falling into canal

6.2.2. Railway Operation and Maintenance Activities

Railway operations and maintenance activities are long term, related to the use of the flood protected railway truck and management of support facilities and services. A combination of a number of activities will be performed during operation phase of the railway which may cause environmental and social risks and impacts. Most of these impacts will be associated with deficiencies in management and monitoring procedures.

Railway operation and management
Railway operations involve conveyance of passengers and cargo. It also includes receiving, loading, transferring, and discharging cargo. The main activities that will be executed at different railway stations will be loading and unloading modes of transport, shunting, manifesting, stow planning loads, and documenting movement. Since the railway will be serving the landlocked countries of Burundi and DRC Congo some stations will provide transit storage. Other operations will include ticketing and customs operation. Table 67 shows the potential direct environmental and social impacts and risks identified to emanate from railway operation and maintenance operations.

Table 67: Causes and impacts associated with Railway Operation operations

IMMEDIATE CAUSES	RISK / IMPACTS
Site hazards (falling cargo, colliding with moving trains, falling down from moving train) Air emission, noise, dust from engines Improved railway operations Increased socio-economic activities to the surrounding area and landlocked countries of DRC, Rwanda, and Burundi Enhanced market access Increased social interaction	Environmental impacts: Release of oils and fuels on land and surface waters Impairment of local air quality Socio-economic impacts: Potential loss of lives and property as a result of falling off from train, colliding with train engines, falling cargo Increased income and improved or livelihoods as result of increased agricultural production, trading activities, and movement of people within the region and bordering countries Improved movement of people and cargo Improved comfort of passengers as a result of increased capacity, frequency of trains Potential for transmission of communicable diseases including HIV/AIDS and other STDs etc.

6.2.2.1. Routine maintenance / repairing damages
For the railway line to continue operating efficiently routine maintenance of not only the railway track but also the flood protection measures, immediate repair of damaged parts is very important. Repair of damages (caused by anthropogenic activities and/or by major natural disasters will involve attending to defects, replacing destroyed structures. Maintenance activities will include general basic cleanliness of the track (removing debris) and waste management (excreta and solid waste disposal); maintenance of railway tracks and signals. *Potential direct environmental and social impacts identified to emanate from maintenance works are similar to construction impacts albeit to a smaller extent.*

6.2.2.2. Forces of natural factors and processes

The Central railway Station has been experiencing frequent shut down because of floods. This project is intended to mitigate flood. While it is expected that the project will minimise such occurrence, depending on the intensity of rains floods may happen. Other natural factor that may affect the project is earthquake. When these are very high they may cause damage to railway line. Damage to structures increase project costs (re-construction, haltered services etc.); and potential injuries/loss of life to workers and travellers. Table 68 shows list of potential unplanned natural and human-induced factors that pose risk to constructed structures.

Table 68: Causes and risks associated with external natural and human-induced disasters

IMMEDIATE CAUSES	IMPACTS / RISK
External natural factor	
Extremes climatic conditions: heavy rains / storms / El Nino Soil movements (soil erosion, landslides) Tectonic movement	Discharges into project site (flooding, overflows, waste) causing destruction and pollution of receiving water bodies) Physical damage of project structures Disruption of railway operations and schedules Injuries and fatalities to project personnel working on the site or people in vicinity.
External socio-economic factor	
Poor economic and social and occupation, status of nearby residences (poverty, unemployment) & security condition in neighbourhood	Vandalism of structures / equipment, theft of materials and portable items Injuries and fatalities to project personnel working on the site or visitors. Conflicts related to restricted access trespassing / illegal practices on the project site e.g. foot paths, Conflicts related to blocked access to local resources present on the site e.g. grazing of animals

6.2.2.3. Railway operations health and safety risks

The Railway operations will expose the people to new types of health, safety and security hazards or exacerbate existing ones (Table 69).

Table 69: Health, safety and security risks associated with Railway operations

IMMEDIATE CAUSES	IMPACTS / RISK
Site hazards: falling off from moving train, colliding with moving train Contamination of water by wastes and chemicals as a result of train accidents Increased social interactions as a result of anticipated increase in trade volumes Inadequacies in emergence prevention, preparedness and response	Serious injuries / fatalities Disturbances / nuisance Impairment of ecological function Risks of human-human transmission of diseases (STD, HIV/AIDS) Infections from putrescible wastes with disease pathogens

6.2.2.4. Improved railway infrastructure

The improvement of infrastructure will bring both positive and negative impacts both direct and indirect (Table 70).

Table 70: Socio-economic impacts from improved passenger terminal

Positive socio-economic impacts	Negative socio-economic impacts
Improved socio-economic activities to the surrounding area and landlocked countries of DRC, Rwanda, and Burundi Improved comfort of passengers as a result of increased frequency of train movement, capacity of the railway line Increased income and improved or livelihoods as result of increased agricultural production, trading activities, and movement of people within the region and bordering countries Increased Government revenue Stimulation of various economic, commercial and social activities (increased business opportunities) Induced development in other sectors: transport, energy, industry, etc.	Socio-economic impacts: Potential loss of lives and property as a result of accidents Temporary disruption of railway operation Increasing food hawkers as the number of passenger train increases Additional pressure and demands on local social services and resources (increase water users, road users) Visual effects: Modifications in the quality of the landscape features and appearance particularly on river embankments

6.2.3. Decommissioning of railway line /particularly the flood protection measures

In the event decommissioning i.e. another upgrading or replacement of whole or component of the railway line from Kilosa to Gulwe e.g. construction of new standard gage railway in the future will require demolition of structures and disposal of rubble. Table 71 shows a list of potential impacts associated with infrastructure decommissioning.

Table 71: Causes and impacts associated with decommissioning of infrastructure

IMMEDIATE CAUSES	RISK / IMPACTS
Generation and disposal of demolition wastes Reduced railway productivity (in case there is no standard gage railway)	Environmental Impacts Impair of air qualities from dust emissions Impair of water qualities from discharge of demolition wastes Loss of incomes

6.3. EVALUATION OF SIGNIFICANCE OF ENVIRONMENTAL AND SOCIAL IMPACTS

Box 4 shows a summary of environmental and social impacts and risks identified for the flood protection measures project. Below is the evaluation of the main categories of predicted risks and impacts. The presentation concludes with a table that presents long-term, short term, cumulative and residual environmental /social impacts and their severity.

Chapter 7 and Chapter 8 provide a list of mitigation measures and management controls connected to each identified impact that the designers of the flood protection measures,

construction Contractors and Project team will use to check and ensure the designs and operations activities addresses the negative impacts and enhance positive ones. Both environmental and social mitigation measures will be verifiably monitored during the various stages of the project cycle.

Box 4: Flood Protection Measures environmental and social impacts and risks

Flood Protection Measures / construction impacts and risks

Environmental

Site selection and Mobilisation phase

1. Land disturbances / soil erosion at offsite location - sources of construction materials - (sand, ballast, concrete blocks, aggregates and stones)
2. Loss / damage / disturbance of indigenous vegetation and contained biodiversity species
3. Depletion at point source
4. Impaired air quality & contribution to climate change due to release of dust, greenhouse gases and other noxious air pollutants
5. Release of oils and fuels in the aquatic environment
6. Contamination of surface and ground water with demolition debris

Construction Phase

7. Land disturbances / soil erosion
8. Impaired air quality & contribution to climate change due to release of dust (including fugitive (unavoidable, residual), greenhouse gases and other noxious air pollutants
9. Impaired land and water qualities and contained resources from discharge of pollutants (wastes, oily substances etc.)
10. Temporary disturbances / flight of fauna from noise, gaseous and dust emissions
11. Destruction of archaeological and cultural heritage resources

Social

Site selection and *Mobilisation* phases

12. Change or modification of population and its quality of life due to land take
13. Construction health and safety hazards
14. Temporary disruption of socioeconomic activities
15. Loss of aesthetics due to haphazard disposal of demolition waste

Construction Phase

16. Nuisance and disturbances from noise / vibrations (exceeding allowable level for the zone)
17. Occupational HSS risks (Serious injuries, Disturbances / nuisance and discomfort, Fatalities, Sickness and ill-health, Negligence due to fatigue, Loss of morale
18. Public HSS risks: traffic accidents, risks of human-human transmission of diseases (STD, HIV, etc.), Infections from putrescible wastes with disease pathogens
19. Vandalism of structures / equipment, theft of materials and portable items during construction

Railway operation (including the project segment)

Environmental

20. Release of oils and fuels in the aquatic environment
21. Impairment of local air quality

Social

22. Occupational and Public health and safety during operation
23. Potential loss of lives and property as a result of falling off from moving train, collision with train at road crossing as a result of increased train frequencies
24. Additional pressure and demands on local social services and resources (increase water users, toilet users)
25. Vandalism of structures / equipment, theft of materials and portable items, railway tracks during operation.

Natural and accidental events

Environmental

26. Physical damage of project structures and disruption of railway operations and schedules due to natural causes
27. Impairment of environmental quality due to accidental events
28. Impairment of railway operation as a result of floods of Gombe Dam

Positive impacts

Social

29. Increased train frequencies and therefore smoothen in passenger and cargo movement
30. Protection of roads from heavy cargo as is the current practice
31. Increased income to local suppliers
32. Employment opportunities
33. Increased income and improved or livelihoods as result of increased agricultural production, trading activities, and movement of people within the region and bordering countries
34. Improved comfort of passengers as a result of increased train frequencies
35. Improved quality of the landscape features and appearance of the river embankments
36. Improved flood management emanating from proper operation of the Gombe Dam

Decommissioning phase

Environmental

37. Environmental degradation due to haphazard disposal of wastes

Social

38. Loss of employment
39. Loss of income to government
40. Destruction of road infrastructure as the cargo will revert back to current transport system

6.3.1. Flood Protection Measures

Sixteen (16) direct environmental impacts (both positive and negative) and risks and twenty two (22) Social impacts / risks are identified associated with flood protection measures project.

Design and Mobilisation Phase

Impact # 1: Land disturbances / soil erosion at onsite and offsite location

At offsite location in Lugoba, Tula, Mlima wa Nyuki and Gulwe where construction materials (sand, ballast, aggregates and crushed stones) will be sourced, the soils will be exposed as such soil erosion may occur especially during rainy season i.e. December to April. The quantities to be used are substantial see

Table **12**.

The impact is negative, long-term, cumulative and rated moderate because of its high likelihood of occurring

Impact # 2: Loss / damage / disturbance of indigenous vegetation and contained biodiversity species

The 25 km rerouting of the railway will be established on "green field" meaning the land where there has never been any developed and whose indigenous growth of natural riverine or terrestrial vegetation and contained biodiversity still exist. Site preparation for the rerouting will necessitate clearance of vegetation found along the 60m-wide corridor of 25km length. It is estimated that about 1,500,000m^2 (1,500 acres) of land will be cleared. Other causes of loss or damage of farm vegetation are trampling and compaction by construction machines.

Vegetation loss result in disturbance and direct loss of contained biodiversity (flora, fauna) resulting in ecological changes albeit localised including physical changes such as temperature, light, moisture and nutrient levels and/or changes in natural community processes i.e. invasion of non-native plant species. Loss of plant communities also may result into decreased water quality, increased erosion as a result of unstable soil, nutrient imbalances in the soil, and/or compaction of soil. These impacts will be experienced along the relocated portion of the project as the Corridor of Impact (CoI) of 60m wide and likely to encounter patches with some good growth of indigenous trees and bushes.

Causes of disturbances to fauna especially avifauna are noise and vibrations generated by working equipment and machinery. Operation of transportation and construction machinery and equipment i.e. Bulldozer, Backhoe, Wheel Loader, Dump truck, Truck with Crane, Vehicles, Generator, Welder, Vibration Hammer and Batcher Plant will generate noise and vibrations causing disturbance to sensitive surface and subsurface organisms and consequently flight / immigration from the project area. Table 72 shows a list of equipment and associated typical noise levels.

The impact is long-term but rated moderate because though limited in magnitude will cover a wide area.

Table 72: Noise emission by various transportation and construction machinery and equipment

Type of Machinery	Typical Noise Level dBA
Bulldozer	85
Backhoe	80
Wheel Loader	80
Dump truck	84
Truck with Crane	84
Vehicles	55
Generator	70
Welder	73
Vibration Hammer	75
Batcher Plant	80

Source[20]

[20]**Source:** Adapted from Central Artery/Tunnel Noise Specification (**fhwa.dot.gov**/environment/**noise**/**...**/handbook/handbook07.cfm) (accessed on 30 January 2015)

The impact is negative, short-term and rated medium.

Impact # 3: Depletion at point source

Majority of flood protection works are dry operation, as such less than $5m^3$ of water per day will be used. This water will be sourced from rivers or boreholes within the project area, see Table 32. Although this amount may seem small, some rivers dry up during dry season as such even getting such small amount may be challenging. The project is expected to use fossil fuel to run construction equipment and vehicles. It is expected that the project will use about 500 litres per day (mainly for lighting construction camp). It is not expected that this amount of fuel will have impact on fuel situation of Tanzania (Tanzania consumed 35,000 barrels per day of refined oil products in 2013[21]). The amount of construction materials

Table 12 shall be sourced from either licensed suppliers or from RAHCO's own quarry at Tula, Mlima wa Nyuki and Gulwe. As it can be seen from the table the amounts can only contribute to cumulative depletion of the resource.

VRs include, fresh water quantity, energy, land quality.

The impact is likely to occur, it is considered negative, short-term, localised, cumulative and of medium significance

Impact # 4: Impaired air quality & contribution to climate change due to release of dust, greenhouse gases and other noxious air pollutants

The trucks will be used in the conveyance of construction materials such as cement, steel, wood, sand, stones, ballast, and aggregates brought from different sources in Lugoba, Tula, Mlima wa Nyuki or Gulwe and in the process the trucks will emit dust, noise and exhaust fumes which are unwanted atmospheric pollutants. See Table 12 for the quantities and distances that will be travelled. Furthermore the blasting and excavation generate noise, vibrations and dusts. Production of dusts, fumes as exhaust from fuel-powered excavation equipment (earth moving equipment) and vehicles engines will cause deterioration of ambient air quality albeit to a very small degree. Dust emissions from transportation of construction materials (in uncovered trucks), and vehicles running on loose earth village roads will impair the air quality.

Table 73 shows emission factors of construction equipment, while Table 74 shows estimated emissions per day for the types of trucks and equipment expected to be used for the Flood Protection project.

Table 73: Emission Factors of various transportation and construction machinery and equipment

Source	CO_2 g/hp-hr	VOC g/hp-hr	CO g/hp-hr	NOX g/hp-hr	PM10 g/hp-hr	$PM_{2.5}$ g/hp-hr	SO_2 g/hp-hr
Bull Dozer	536	0.37	1.48	4.9	0.34	0.33	0.74
Back Hoe	536	0.44	2.07	5.49	0.41	0.42	0.74

[21] https://www.eia.gov/beta/international/analysis.cfm?iso=TZA (Accesed on 29 December 2015)

Source	CO_2 g/hp-hr	VOC g/hp-hr	CO g/hp-hr	NOX g/hp-hr	PM10 g/hp-hr	$PM_{2.5}$ g/hp-hr	SO_2 g/hp-hr
Wheel Loader	536	0.37	1.48	4.9	0.34	0.33	0.74
Tipper (dump truck)	536.3	0.44	2.07	5.49	0.41	0.42	0.74
Construction Cranes	536.3	0.35	1.36	4.73	0.33	0.32	0.74
Generators	587	1.2	3.76	5.97	0.73	0.71	8.81
Welding machines	0.75	0.054	1.47	4.31	0.101	0.093	0.006
Vibration Hammer	536	0.37	1.48	4.9	0.34	0.33	0.74
Batcher Plant	529	0.61	2.32	7.215	0.48	0.47	0.73

Table 74: Estimated Emissions of various transportation and construction machinery and equipment

Source	Emissions level						
	CO2 tonnes	VOC tonnes	CO tonnes	NOX tonnes	PM10 tonnes	PM2.5 tonnes	SO2 tonnes
Bull Dozer	2058.24	1.42	5.68	18.82	1.31	1.27	2.84
Back Hoe	6174.72	5.07	23.85	63.24	4.72	4.84	8.52
Wheel Loader	1029.12	0.71	2.84	9.41	0.65	0.63	1.42
Tipper (dump truck)	61781.76	50.69	238.46	632.45	47.23	48.38	85.25
Construction Cranes	1801.97	1.18	4.57	15.89	1.11	1.08	2.49
Generators	540.98	1.11	3.47	5.50	0.67	0.65	8.12
Welding machines	0.36	0.03	0.71	2.07	0.05	0.04	0.00
Vibration Hammer	905.63	0.63	2.50	8.28	0.57	0.56	1.25
Batcher Plant	355.49	0.41	1.56	4.85	0.32	0.32	0.49

Table 75: Vehicular emissions

	Emission factors (gm/veh-km)	**Total Emissions (tones/year)**
CO_2	3.2	3.89
CO	0.027	0.03
NOx	0.038	0.05
N_2O	0.00022	0.00
SO_2	0.1	0.12
VOC	0.00023	0.00
CH_4	0.0054	0.01
PM_{10}	0.1	0.12
$PM_{2.5}$	0.03	0.04

Source[22]

Exhaust contain pollutants notably carbon-dioxide (CO_2) plus small quantities of noxious gases such as nitrogen oxides (NOx), sulphur dioxides (SOx), hydrocarbons and particulate matters (PM). CO_2 is a greenhouse gas which is known to cause global warming and consequently climate change effects. Clearance of vegetation will reduce vegetation cover

[22] http://www.urbanemissions.info (Accessed on 29 December 2015)

thus reducing sink for carbon-dioxide and consequent climate change effects. However, the contribution of the project to global is of minor significance and the extent of impairment of local air quality, will be very low because of small quantities of pollutants that will be emitted (see Table 75), the short duration of mobilization and construction works and prevailing atmospheric conditions.

VRs include air quality

The impact is negative, short-term, rated minor and localized, the emissions affecting local air quality but will have no significant impact on global air quality issues

Impact # 5: Release of oils and fuels in the aquatic environment

Oil affects fish and aquatic invertebrates through **surface exposure, ingestion, absorption** and in the long term by changing their ecosystem. Fish that are exposed to oil may suffer from changes in heart and respiratory rate, reduced growth, fin erosion, a variety of biochemical and cellular changes, and reproductive and behavioural responses. Chronic exposure to some chemicals found in oil may cause genetic abnormalities or cancer in sensitive species.[23]

In this project chemical pollutants (hydrocarbons, cleaning fluids) associated with construction activities and increased volume of vehicles and engines during construction and operation phase, respectively, could potentially wash into the rivers and pollute the water. The project may cause a medium term risk of chemical pollution resulting in severe impacts of high significance.

The impact is likely to occur, it is considered negative, long-term, can disperse to cover large area, cumulative and of moderate significance.

Impact # 6: Contamination of surface and ground water with demolition debris

As stated earlier Gulwe Station will be relocated. This may necessitate demolition the building at the existing Gulwe Station. Demolition works and construction works at river embankments and river channelling at Mzase and Maswala Rivers may cause sedimentation and elevated turbidity levels with a major negative impact on aquatic biota, including fish. These impacts include:

- the whole food chain is disrupted due to reduced light penetration and photosynthesis, resulting in reduced primary production, a reduction in submerged plant life, including phytoplankton and reducing the capacity of the shallow Bay waters to support fish,
- reduced number of bottom food organisms (invertebrates) due to smothering;
- clogging, abrading and damage to fish gills, leading to reduced oxygen absorption, damage to gill filaments, leading to increased stress, disease and even death,
- Smothering of eggs and larval fish (i.e. lack of breeding success due to death of eggs and larvae),
- Altered spawning behaviour – fish will not deposit eggs on muddy substrate;
- Reduced feeding efficiency – major impact on visual predators as they are unable to see and find enough food in the turbid water.

[23] https://www.nwf.org/What-We-Do/Protect.../**Oil**.../**Effects**-on.../**Fish**.aspx (Accessed on 29 December 2015)

The above impacts can lead to reduced populations of fishes and can totally eliminate sensitive species from the affected areas. For maintaining health aquatic ecosystem turbidity levels should not be more than 5-25 NTUs (Dallas and Day, 2004)[24].

In this project significant soil erosion will result from site clearance, mobilization of construction materials, construction works at river embankments. Most of the erosion would be associated with surface water runoff and would be relatively significant during the rainy season. Soil erosion may increase sediment input into the rivers and elevating turbidity levels. The negative impacts of elevated turbidity can be very significant and even lethal for both aquatic invertebrates and fish.

Potentially Hazardous Waste

There are likely to be hazardous materials (such as asbestos, PCB, high pressure mercury vapour lamps, neon tubes, etc.) found on industrial demolition sites. Hazardous waste should be removed from the site prior to demolition activities commencing. If they have become impregnated into the fabric of the building it may be possible to neutralize or treat them *in situ* prior to demolition.

The impact is likely to occur, it is considered negative short-term, and of moderate significance

Construction Phase

Impact # 7: Land disturbances / soil erosion

Vegetation clearance, excavation and other civil works will involve some degree of land disturbance and/or movement of soils at different locations of the project. This will expose the soils to erosion by the elements especially if excavation and construction activities are undertaken during rainy period (December - April).

Soil erosion impacts will increase siltation of the rivers. Sedimentation is known to cause the river to change course.[25] Deposited soils will also interfere with water quality directly through increasing turbidity levels, siltation and indirectly from contaminants carried with or attached to eroded soil particles.

The impact is negative, long-term and rated moderate because of its high likelihood of occurring.

Impact # 8: Impaired air quality & contribution to climate change due to release of dust (including fugitive (unavoidable, residual), greenhouse gases and other noxious air pollutants

At the construction site fumes as exhaust from fuel-powered and construction equipment (earth moving equipment), compactor, loaders, generators and vehicles engines will cause deterioration of ambient air quality albeit to a very small degree. Dust emissions from land

[24] DALLAS HF and DAY JA (2004) The Effect of Water Quality Variables on Aquatic Ecosystems: A Review. WRC Report No. TT 224/04. Water Research Commission, Pretoria, South Africa. 222 pp.

[25] www.cep.unep.org/publications-and...and.../**sedimentation**-and-erosion (Accessed on 29 December 2015)

clearance, progressive stockpiling, offloading materials at the site and construction of temporary access road will also impair the air quality along the haul route and the construction sites. The air quality impacts associated with construction are similar to those discussed under impact No. 4

Impact # 9: Impaired land and water qualities and contained resources from discharge of pollutants (wastes, oily substances etc.)

Mobilization and construction works involve collection, transportation, handling, storage and disposal of various types of materials some of them containing pollutants. Planned or accidental discharges will involve various types and quantities of solid and liquid wastes including:

i. Discharge of eroded soils from disturbed areas caused by vegetation clearance and uncontrolled earth moving works and disposed spoils;
ii. Domestic solid waste and sanitary waste and littering by construction crew. Assuming that per capita waste generation is about 0.35 kg per day, the expected about 2500 construction labour force will generate about 900 kg / day of solid waste mostly organic waste.
iii. Assuming that each person will use 30 litres of water per day, and 80% of this amount is discharged as waste, the amount of domestic wastewater that will be generated is about $60m^3$ per day.
iv. Spillage / leakages of chemicals including discharge of fuel, oil and lubricants from equipment and vehicle repairs and re-fuelling; and
v. Storm water loaded with wastes, oils, sediments etc.

The wastes albeit in small quantities, if not properly managed, will discharge directly into or drain across and pollute farm land, settlement areas and natural areas e.g. Mkondoa River, Mdukwi River, Mkondoa River, Isima River etc.

Discharges of wastes directly into surroundings will impair qualities of receiving medium including surface water bodies and underground water sources (increase their biological & or chemical oxygen demands - BOD, COD and increase total dissolved and suspended solids). Wastes contaminate and reduce quality of land areas or soils. Leaking fuel, oil and lubricants increase grease and oil concentrations in soils and water medium.

Increase in soil deposits from eroded soils due to construction activities as reiterated above, will obstruct natural drainage systems and cause effects on the integrity of watercourses, drainage, and sedimentation regime. Construction works of linear access road leading into rivers and other local natural water resources will disturb / distort natural drainage systems exacerbating flooding tendencies in some areas. Decrease in volumes of local rivers due to siltation, low storm water flow and increase water turbidity and change colour will be much evident during dry season. Pollution to watercourses as well as existing wetland areas in the locality is potentially detrimental to aquatic fauna such as fishes and other invertebrates (Table 76).

Table 76: Pollutants impacts on soil and water in the project area

Pollutant	Expected Impact	
	Soil	Water
Soil erosion	• Increase in soil deposits • Increase in bare land	• Decrease in volume due to siltation • Increase in water turbidity

	• Gullies formation • Increase in storm water flow	• Increase in colour • Increase in total dissolved and suspended solids

The effects of discharged wastes and chemicals will tend to be severe if discharged wastes are hazardous and/or will contaminate rivers which are used as source of domestic water or pollute arable land. Discharges in a water habitat tend to reach further due to dispersion. The effects on land will tend to be concentrated and localized, not dispersed or diluted (unless by rain).

The impact is negative, short-term rated moderate because of its high likelihood of occurring and magnitude and extent if left unabated.

Impact # 10: Temporary disturbances / flight of aquatic fauna from noise emission

As discussed above different machinery produce noise of varying levels as shown in Table 72. High noise levels may cause fright of resident aquatic fauna. As shown in Section 4.2.3.6, the area is endowed with wild animals. However, the project corridor is small compared to the larger wild area surrounding the project and the fact the project is not entirely new.

The impact is negative, short-term, cumulative and of low significance

Impact # 11: Destruction of archeological and cultural heritage resources

As discussed in section 4.2.3.7 scatters of ancient settlements were observed at Munisagara village. The study noted the ceramics some with grooves and comb stamping decorations. Like Mkadage and Munisagara, Kikundi seemed to be rich in terms of archaeology. Ceramics of different age period ranging from the 8^{th} to the 18^{th} century were recorded at the vicinity within which the rail will be relocated. Construction work may destroy such archeology artefacts if not done properly.

The impact is negative, long term, and of medium significance

Social impacts

Site selection and *Mobilisation* phases

Impact # 12: Change or modification of population and its quality of life due to land take

The project is expected to cover a total length of 25km (rerouting). Part of this will use existing track and right of way. About 25 km and 60m will take new route. This rerouting will take away about 1,500 acres. Land acquisition for this portion of project is inevitable.

The involuntary taking of land and removal of economic assets (permanent crops and trees) owned and/or used by both individuals and by communities and replacing them with project structures will cause changes or modification of existing or potential land uses (including change of farmland, pasture areas etc. This will result in a number of direct social and economic impacts of varying severity to general population and its quality of life as summarised in Table 50 above. Such impacts will include (i) loss of means of livelihood

(farmland (ii) loss of assets (land, mature trees); (iii) loss of income sources (crops) and in some cases (v) involuntary restrictions or access to resources (due to fragmentation of farms by linear railway line) resulting in adverse impacts on livelihoods and income of affected persons. Table 77 shows a list of people and the property that is likely to be lost.

A number of the residential settlements will be affected by the project resulting in the loss of physical housing (private houses with associated auxiliary structures). In the process of resettlement, people will also incur significant transitional costs, including transportation, and other expenses.

Displacement and resettlement of residents is significant and can lead to further impacts on community. Residents displaced by the construction of the railway may experience additional impacts such as:

- economic impact resulting from acquiring new housing at a new location;
- social and psychological impacts due to the disruption of social relationships and establishing relationships in a new social environment; and
- changes in type and tenure of housing.

According to the preliminary assessments in total, 180 residences will be affected by the project.

Table 77: Affected People

Location		**Project Affected Households**	**Affected Community Institutions**	**Project Affected Person**		**PAHs Members**
Region	**Village**			**Landowners**	**Tenants**	
Morogoro	Munisigara	38	1	31		152
	Muzaganza	31	2	27	1	131
	Kikundi	39	2	39		195
Dodoma	Kisisi	4	0	4		24
	Godegode	28	0	21		123
	Gulwe	59	6	56	1	387
TOTAL		199	11	178	**2**	1012

The impacts is negative, long-term, localized and rated major

Impact 13: Construction health and safety hazards

A variety of risks are associated with construction works (Table 65 and Table 66). Common construction hazards include workers sustaining injuries while hoisting heavy items, slips and falls etc. Other causes of disturbances to workforce are noise and vibrations generated by working equipment and machinery. Table 72 is a list of equipment and associated noise levels. In terms of threshold the expected noise level are acceptable provided the exposure duration is kept below 8 hours. The generally accepted standard to minimize hearing risk is based on an exposure to 85 dBA for a maximum limit of eight hours per day, followed by at least ten hours of recovery time at 70 dBA or lower (at which the risk of harm to healthy ears is negligible).[26]

[26]http://www.noisehelp.com/noise-dose.html (accessed on 30 January 2015)

Users of land abutting or neighbouring the project site are likely to be affected by accidents during construction (traffic movements, open pits filled with water) due to lack of appropriate /sufficient signage at construction sites and timely notification. Workers are commonly exposed to health risks that are prevalent in the project area (e.g. STD, guinea worm, malaria, meningitis, cholera etc.);

The impact is negative, medium-term, cumulative and rated moderate

Impact # 14 Temporary disruption of socioeconomic activities

Inevitably during construction, movement of people will be kept away from the construction sites the access road will be closed. This will last for 74 months.

The impact is negative, short-term and rated minor

Impact # 15: Loss of aesthetics due to haphazard disposal of demolition waste

The project activities will entail demolishing some of the existing structure e.g. Gulwe station which will generate demolition wastes. Mobilisation of construction materials will involve bringing onsite some waste materials such as packaging, plastics, pallets etc. Construction workers will be eating fruits or food and they will also be responding to natural calls. All these activities will generate solid as well as well as liquid wastes. If these are not managed properly they will degrade aesthetic value of the port.

The impact is likely to occur, long-term, cumulative and rated moderate

Construction Phase

Impact # 16: Nuisance and disturbances from noise / vibrations (exceeding allowable level for people comfort) due to construction activities

Construction works will use various noise-emitting heavy equipment, tools and engines such as excavator, wheel loader, compactor, compressors, generators, concrete mixers, heavy duty trucks, etc., see Table 14. These, will emit noise and vibrations of various levels as shown in Table 72, particularly during the day. As mentioned under Impact No. 2, some equipment generate noise which above that the recommended 85dB for human exposure.

Movement of heavy equipment on existing local roads may be one of the main problems for the local residents during the construction works. Vibration may damage the nearby structures.

The impact is negative short-term, cumulative and moderate significance

Impact # 17: Occupational Health and Security and Safety (HSS) risks

Construction works will involve hazardous situations such as falling objects, moving vehicles and machines, generation of noxious fumes, working on elevated heights, exposure to welding blaze, falling in ditches, high temperature surfaces, noisy operations etc. All these

constitute occupational health and safety risks. Occupational health hazards may also be promoted by lack of procedures that mitigate negligence at work, fatigue due to understaffing and long working hours, employing wrong people on particular jobs and low morale etc.

During the rail operation there is risk of workers accidents due to the different causes. Workers could be subject to injury from falls, falling objects, electrocution, heavy equipment use, vehicle accidents or interaction with hazardous substances.

The impact is likely to occur, negative short-term, cumulative and rated high

Impact # 18: Public HSS risks: traffic accidents, Risks of human-human transmission of diseases (STD, HIV etc.) Infections from putrescible wastes with disease pathogens

The railway line passes through villages and townships. Therefore interaction of project, construction crew and the villagers is unavoidable. Several causes of hazards to public relate to construction activities without proper or adequate facilities to cater for human health, safety and security needs. Facilities without toilets / inadequate water supply are predisposed to poor sanitation and hygiene. Construction work will add about 2500 people, albeit for a short period of time.

Lack of periodic maintenance flood protection infrastructure is another public health and safety hazards.

Entry of a temporary labour force into an area could cause different negative impacts to the local communities including conflicts between local community members and new arrived people due to the socio-cultural differences and other issues.

A potential increase in crime may be experienced during the construction period if mitigation measures are not introduced. With an increase in construction activities and the possibility of job seekers arriving, it may be more difficult to identify strangers in the area. In addition, the increase in disease associated with the entry of a temporary labour force into an area could also occur (Box 5).

Box 5: Potential increase of HIV/AIDS

While most workers may originate from the local community where they have families, there might be others from distant places and working away from their families. This will have an impact of breaking the social fabric and spreading diseases such as STIs and HIV/AIDS.

Local community members could become victims of accidents involving the different machinery used during construction work.

The risks are likely to occur, negative and rated major because high rates of disease transmission may lead to invalidity and/or loss of life

Impact # 19: Vandalism of structures / equipment, theft of materials and portable items during construction

Construction activities if not well secured, incidences of vandalism and theft of equipment and materials such as cement, fuel and other portable items that can be easily sold, may occur. This will inevitably increase the cost of construction.

The impact is likely to occur, negative and rated moderate

6.3.2. Railway Operation

Environmental

Impact # 20: Release of oils and fuels and other waste in the environment
Similar impacts as discussed under impacts # 5 and 6

Waste generated during normal railway operations are:

- Waste oils from lubricants, etc. have to be collected and reused. If the oil contains PCBs, it must be handled as hazardous waste and cannot be reused.
- Metals have to be separately collected for reuse.
- Combustion air has to be cleaned with filters installed in the depot
- Waste water must be collected, processed through a sedimentation tank and neutralized, usually with gaseous CO_2 before being evacuated.
- Household waste – has to be separately collected for disposal

Removal of Old Railway Track (At the rerouted section)

Wooden Sleepers
Wooden sleepers are not used.

Concrete Sleepers and Rails
Concrete sleepers are not used.

Steel Sleepers
Steel sleepers can be reused.

Ballast
Railway ballast can be cleaned (from hydrocarbons, heavy metals etc.) with ballast cleaning machines and reused if the granulometer

Impact # 21: Impairment of local air quality
During operation air emission will come from locomotives, which are bound to increase as the frequency of train is expected to increase.

The impact is likely to occur, negative and rated moderate

Social

Impact # 22: Potential for transmission of communicable diseases including HIV/AIDS etc.
Similar impacts as discussed under impact # 18

Impact # 23: Potential loss of lives and property as a result of falling off from moving train, collision with train at road crossing as a result of increased train frequencies

There are tendencies of passengers to jump on and off the train while the train is moving. Also there people, particularly children and elderly people who may cross the railway line while the train is approaching. Another vulnerable group is the motor cycle riders who at times are knocked off at level-crossings. These are vulnerable because sometime they ride bikes under influence of alcohol. With the expected increase of number of trains (both cargo and passenger trains) accidents may happen more frequently.

The impact is negative, long-term, cumulative and of high significance

Impact # 24: Additional pressure and demands on local social services and resources (increase water users, toilet users)

As mentioned earlier the flood protection measures and other upgrade interventions such as renewal of rail/track materials, track ratification is expected to increase the number of both passenger and cargo trains. Increasing reliability of train movement will inevitably attract more train user and petty traders, which will in turn exert pressure on social amenities. Failure to provide adequate toilets and water will result into open defecation and hence spread of disease such as cholera, Diarrheal etc. The challenge of dealing with many people therefore is keeping the facilities in good sanitary conditions. If sanitary conditions will not be properly maintained these facilities will be a source of diseases transmission and loss of aesthetics of the project area.

The impact is negative, long-term, cumulative and of high significance

Impact # 25: Vandalism of structures / equipment, theft of materials and portable items during construction

In the past there have been reports of people stealing signalling and telecommunication system, overhead open wire system, copper wires, permanent ways materials bridges lines, water pipes, rolling stock tracks and sell them as scrap metals.[27]

The impact is negative, long-term, and of high significance

6.3.3. Natural, accidental and anthropogenic events

Environment

Impact # 26: Physical damage of project structures and disruption of railway operations and schedules due to natural causes

River banks vulnerable to natural elements, particularly in the area under the project. Similarly railway lines sometime pass through sensitive ecosystems which are vulnerable to floods. This has time and again resulted into loss of railway line itself, loss of goods and lives. Damage to structures increase project costs (re-construction, haltered services etc.).

[27] SUMATRA (2011) Performance Indicators and Benchmarking for Raiway Sector in Tanzania

Natural events that may affect the project include earthquake and flooding. On one hand, the area is known to be prone to flooding, that is why this project is being considered. On the other hand, Tanzania has two major geological faults run parallel from north to south, forming the country's major earthquake-prone belts with one running from Mount Kilimanjaro to Dodoma via Arusha and the other from Kigoma to Mbeya. Both geological faults are part of the East African Rift Valley system. However, Tanzania is less prone to earthquakes in the east and more prone to tremors in the west, especially along the shores of Lake Tanganyika.[28]

Furthermore, the studies have indicated that the project area is vulnerable to climate change. It is expected the central of Tanzania will continue experiencing extreme events such as heavy rain pour.

The impacts is considered likely to occur and rated high

Impact # 27: Impairment of environmental quality due to accidental events

Spillage of chemical substance from freight trains can occur as a result of tipping and damage of wagon tanks.

Accidents related to the transportation of dangerous goods

During railway operation there is a risk of accidents related to the transportation of dangerous goods. Dangerous goods are frequently transported by rail, which represents a potential risk of release into the environment in the event of an accident. In intermodal containers spills and leaks may result from improper packing and the resultant shifting of loads during transport. Additionally, there is potential diesel release during fuelling operations.

The impacts is considered likely to occur and rated high

Impact # 28: Impairment of railway operations as a result of flooding of Gombe Dam

Depending on the intensity, extent and duration of the rainfall in the project catchment area, the Gombe Dam may flood beyond its boundaries, which may impact the railway operation.

The impacts is considered likely to occur and rated moderate

6.3.4. Positive impacts

Impact # 29: Increased train frequencies and therefore smoothening passenger and cargo movement

It is widely reported that due to deteriorating railway infrastructure and inefficient operating standards, the freight traffic carried by Tanzania Railways Limited (TRL) declined substantially, from 1.6 million tons in 2002 to 0.15 million tons in 2013. Two of the primary reasons for the deterioration are the deferred maintenance and inadequate rolling stock. In addition, the floods in December 2009 between Kilosa and Gulwe damaged part of the Central Railway Line, halting train services between Dar es Salaam and Dodoma for about five months, which degraded further the confidence of would be users. However, with the increased economic growth and improved railway infrastructure and efficiency in operations it is forecasted that the railway traffic is bound to increase.

The impact is long-term, and of high significance

[28] http://en.people.cn/200607/26/eng20060726_286946.html

Impact # 30: Protection of roads from heavy cargo as is the current practice
Increased reliance on railway system will mean majority of cargo will be transported using railway line. This will have a positive impact on the roads as they are currently overloaded by cargo trucks.

The impact is positive, long-term, and of high significance
Impact # 31: Increased income to local suppliers
The project is expected to use lot materials as shown in

Table **12**. Majority of these materials will be sourced within Tanzania hence increased income to local suppliers. During operation, it is expected that increased passenger train frequency will provide opportunity to petty traders to sell their merchandise including food and fruits. Easy intercity transportation will enhance movement of business people and easy transportation of agricultural produce.

The impact is positive short - long-term, and of high significance

Impact # 32: Employment opportunities
Implementation of flood protection measures will employ about 2500 people during construction. Most of these people will come from Villages around the project. Considering that some of these people have families, who will be indirectly benefiting from the project.

The impact is positive short to long-term, and of moderate significance

Impact # 33: Increased income and improved or livelihoods as result of increased agricultural production, trading activities, and movement of people within the region and bordering countries

During operation, it is expected that increased passenger train frequency will provide opportunity to petty traders to sell their merchandise including food and fruits. Easy intercity transportation will enhance movement of business people and easy transportation of agricultural produce.

The impact is positive short - long-term, and of high significance

Impact # 34: Improved comfort of passengers as a result of increased train frequencies
Currently the passenger train runs two times. When the train is running would be passengers spend more than 12 hours on train station waiting for the train. During that period there is not proper place for passengers to wait for the train. They are sleeping on ground, on floor etc. Increased train frequencies will minimise such hassles.

The impact is positive long-term, and of high significance

Impact # 35: Improved quality of the landscape features and appearance of the river embankments
It can be seen from Plate 81 shows a deformed river bank which make the place look ugly, while **Plate 82** shows a gabion protected river bank which is aesthetically attractive.

Plate 81: Soil erosion along Mkondoa river at Mkadage (08/06/2015)

Plate 82: Gambion protected river embankment at Site Km 315.1

The impact is positive long-term, and of high significance

Impact # 36: Improved flood management emanating from proper operation of the Gombe Dam

Proper operation of the Gombe Dam will not only provide water for domestic purpose, the dam is expected to asset in the control of floods. This will be a positive contribution of the dam to the project objectives.

The impact is positive long-term, and of high significance

6.3.5. Decommissioning Phase

Impact # 37: Environmental degradation due to haphazard disposal of wastes

Although it is not likely in the event that the railway line (including the flood protection measures) is decommissioned, demolition works will generates waste, dust and noise that may cause disturbance to neighbouring houses and loss of aesthetics if the demolition wastes remain on site for a long time to the extent of becoming an eyesore.

The impact is negative short-term, and of moderate significance

Impact # 38: Loss of employment

As mentioned above, although it is not likely to decommission the railway transport system, if it happens to be closed down, the people employed by the project will lose employment and income. This will have significant impact to these people and their families. Other groups of people who will be indirectly dependent on the project are those dealing with and special service providers (e.g. food vendors and petty traders).

The impact is long-term, and of moderate significance

Impact # 39: Loss of income to government

Movement of goods within and outside Tanzania has a government revenue component in it. As the business flourish, so is the income tax payable to government. If it happens, that the project stops, this income will disappear with it.

All benefit Proponent will contribute to national revenue collection through usual taxes associated with Railway investment payable to the government. In addition visitors will pay fees and services.

The impact is negative, long-term, and of high significance

Impact # 40: Destruction of road infrastructure as the cargo will revert back to current transport system

Since life has to go on, cargo has to continue flowing with or without the rail. Decommissioning of the railway system will mean that cargo will be transported using trucks to the detriment of the roads.

The impact is negative, long-term, and of high significance

6.3.6. Summary of Environmental and Social Impacts and their Significance

Table 78: Summary of Impacts

PROJECT ASPECTS		VALUED RECEPTORS					
Project Phase	Project Activity/	Physical	Chemical	Biological/ Ecological	Social	Economic	Cultural
Design / Mobilisation	Impact # 1: Land disturbances / soil erosion at onsite and offsite location	M	L	H	H	L	IN
	Impact # 2: Loss / damage / disturbance of indigenous vegetation and contained biodiversity species	M	IN	M	M	IN	M
	Impact # 3: Depletion at point source	M	IN	L	L	M	IN
	Impact # 4: Impaired air quality & contribution to climate change due to release of dust, greenhouse gases and other noxious air pollutants	L	IN	L	L	IN	IN
	Impact # 5: Release of oils and fuels in the aquatic environment	M	M	M	M	M	IN
	Impact # 6: Contamination of surface and ground water with demolition debris	M	M	M	M	L	IN
Construction phase	Impact # 7: Land disturbances / soil erosion	H	L	M	M	M	L
	Impact # 8: Impaired air quality & contribution to climate change due to release of dust (including fugitive (unavoidable, residual), greenhouse gases and other noxious air pollutants	M	IN	L	L	M	IN
	Impact # 9: Impaired land and water qualities and contained resources from discharge of pollutants (wastes, oily substances etc.)	M	L	M	M	M	IN
	Impact # 10: Temporary disturbances / flight of aquatic fauna from noise emission	L	IN	L	IN	IN	IN
	Impact # 11: Destruction of archeological and cultural heritage resources	M	L	M	M	IN	M

PROJECT ASPECTS		VALUED RECEPTORS					
Project Phase	Project Activity/	Physical	Chemical	Biological/ Ecological	Social	Economic	Cultural
Social							
Site selection and Mobilisation phases	Impact # 12: Change or modification of population and its quality of life due to land take	M	IN	M	VH	H	H
	Impact 13: Construction health and safety hazards	IN	IN	IN	M	M	M
	Impact # 14: Temporary disruption of socioeconomic activities	IN	IN	IN	L	L	L
	Impact # 15: Loss of aesthetics due to haphazard disposal of demolition waste	L	L	L	M	L	IN
Construction Phase	Impact # 16: Nuisance and disturbances from noise / vibrations (exceeding allowable level for people comfort) due to construction activities	L	L	M	M	M	IN
	Impact # 17: Occupational Health and Security and Safety (HSS) risks	L	L	IN	H	M	IN
	Impact # 18: Public HSS risks: traffic accidents, Risks of human-human transmission of diseases (STD, HIV etc.) Infections from putrescible wastes with disease pathogens	L	L	IN	H	H	H
	Impact # 19: Vandalism of structures / equipment, theft of materials, fuel and portable items during construction	H	IN	L	H	H	L
Environmental							
Operation	Impact # 20: Release of oils and fuels in the aquatic environment	M	M	M	M	M	IN
	Impact # 21: Impairment of local air quality	L	IN	L	L	IN	IN
	Impact # 22: Potential for transmission of communicable diseases including HIV/AIDS etc.	L	L	IN	H	H	H
	Impact # 23: Potential loss of lives and property as a result of falling off from moving train, collision with train at road crossing as a result of increased train frequencies	L	L	IN	H	H	IN
	Impact # 24: Additional pressure and demands on local social services and resources (increase water users, toilet users)	L	L	IN	H	H	H
	Impact # 25: Vandalism of structures / equipment, theft of materials and portable items during operation	H	IN	L	H	H	L
Environmental							
Natural, accidental and anthropogenic events	Impact # 26: Physical damage of project structures and disruption of railway operations and schedules due to natural causes	H	IN	L	H	H	H
	Impact # 27: Impairment of environmental quality due to accidental events	H	M	H	H	H	IN
	Impact # 28: Impairment of railway operation as a result of floods of Gombe Dam	H	M	H	H	H	IN
Positive impacts	Impact # 29: Increased train frequencies and therefore smoothening passenger and cargo movement	L	IN	IN	H	H	M
	Impact # 30: Protection of roads from heavy cargo as is the current practice	H	M	H	H	H	IN

PROJECT ASPECTS		VALUED RECEPTORS					
Project Phase	Project Activity/	Physical	Chemical	Biological/ Ecological	Social	Economic	Cultural
	Impact # 31: Increased income to local suppliers	L	L	IN	M	M	L
	Impact # 32: Employment opportunities	L	L	IN	M	M	M
	Impact # 33: Increased income and improved or livelihoods as result of increased agricultural production, trading activities, and movement of people within the region and bordering countries	L	L	M	M	M	M
	Impact # 34: Improved comfort of passengers as a result of increased train frequencies	L	L	IN	M	M	M
	Impact # 35: Improved quality of the landscape features and appearance of the river embankments	H	M	L	M	IN	IN
	Impact # 36: Improved flood management emanating from proper operation of the Gombe Dam	H	M	L	M	IN	IN
Decommissioning Phase	Impact # 37: Environmental degradation due to haphazard disposal of wastes						
	Impact # 38: Loss of employment	IN	IN	IN	H	H	M
	Impact # 39: Loss of income to government	IN	IN	IN	VH	VH	M
	Impact # 40: Destruction of road infrastructure as the cargo will revert back to current transport system	H	M	IN	H	H	M
Legend							
Acronym	Classification						
IN	Insignificant						
L	Low						
M	Moderate						
H	High						
VH	Very High						

6.4. PROJECT ALTERNATIVES

The purpose of developing alternatives is to ensure that the selected solution is the most environmentally sustainable, socially acceptable and economically feasible. Comparing such alternatives, including the "no-project" alternative, provides relevant and transparent information for decision making.

6.4.1. The "No-Project" Alternative

In the event that the proposed Flood Protection Measures project is not implemented, the current state of railway line operations will be the norm of the day. It should be recalled that the poor state of railway infrastructure and frequent floods on some sections has resulted to falling passenger and cargo trains. Considering that Tanzania is envisioned to become a middle income country by 2025, reliance on road network to transport cargo within and outside Tanzania does not augur well with this vision. This alternative therefore is not considered appropriate.

6.4.2. With Project Alternatives

The establishment and development of the proposed project would bring to fore numerous socio-economic benefits as outlined in this report. However alternative consideration was essential to maximise the benefits of the project.

Site alternatives
The site for the project is dictated by the circumstances. The goal of the project is to install flood protection measures, which can only be done at the flood prone area.

Rerouting alternatives
The project considered several routes alternative as follows (The details can be found in PADECO Co., Ltd. Nippon Koei Co., Ltd. Japan International Consultants for Transportation Co., Ltd. Fukken Engineering Co., Ltd. 2015, Preparatory Survey on Flood Protection Measures for Central Railway Line in the United Republic of Tanzania, Interim Report Vol. 1)

An alternative was considered which fully meets the design flood water level of the scale for the entire segment between Kilosa and Gulwe, namely, as Alternative C. In addition, since the total investment cost of Alternative C had been presumed rather high – beyond the critical level to keep economic viability of the proposed project – the other two alternatives (i.e., Alternatives A and B) were studied.

Alternative A protects selected serious bank erosion sites by (i) rerouting the existing railway with revetments for bank protection, and (ii) rerouting the existing railway. On the other hand, Alternative B covers the protection works under Alternative A as well as the sites which have the potential for flood inundations causing a longer period of suspension of railway services. Alternatives A and B involve less costs compared with Alternative C for securing economic viability. Further, all alternatives include a series of groundsill to stabilize the riverbed and strengthening of existing revetment, etc., of three tributaries (i.e., Maswala, Kidibo, and Mzase Rivers) as common protection measures against sediment disasters.

Table 80 provides a summary of the Alternatives with the flood damages and proposed measures. The core elements of the alternatives are as follows, with details provided in Subsections 6.4.2.1 – 6.4.2.3:

6.4.2.1. Alternative A:
This alternative aims at providing flood protection measures in areas where serious bank erosion has occurred or might occur in the future due to shorter distance between the bank shoulder and the existing rail, current condition of bank erosion, bank height, etc.

In case of design floods for the sections where no protection is provided by Alternative A, it may result in (i) track damages due to large-scale floodwaters overtopping the track, and (ii) wash-aways of ballast, roadbed, and some riverbank protections (e.g., gabions, spur dikes, etc.), leading to small-/medium-scale restoration works and suspension of train service.

6.4.2.2. Alternative B:

This alternative aims at providing flood protection measures in areas where inundation has occurred in the low terrain at mountain skirts together with overtopping by landside flood

flow resulting acceleration of flood damage, in addition to the bank erosion areas covered by Alternative A.

In case of design floods for the sections where no protection is provided by Alternative B, it may result in a similar magnitude of flood damage to track, ballast, roadbed, and some riverbank protections (e.g., gabions, spur dikes, etc.) as anticipated in Alternative A, leading to small-/medium scale restoration works and suspension of train service.

6.4.2.3. Alternative C:

This alternative aims at providing flood protection measures in areas with possibility of track submergence in case of design floods, and is intended to minimize flood damages through the most strengthened/extended hard measures among the three alternatives. Therefore, even if design floods occur, this alternative will not be subject to track submergence; however, suspension of train services is needed.

Among the three alternatives, this will entail the largest vertical movement of the track and installation of flood walls and flood embankments, meaning that it will reduce flood risk to the greatest extent. Therefore, no flood restoration works will be needed.

It is important to note that:

Alternative B covers the entire scope of Alternative A, and Alternative C covers the entire scope of Alternative B (let alone Alternative A).

In case of the railway alignment traversing villages, an additional alignment is drawn considering the reduction of the number of buildings slated for relocation, and is depicted as Alternatives A-2, B-2, and C-2 (as compared to these, alternatives favoring track alignments are depicted as Alternatives A-1, B-1, and C-1).

All the alternatives may require speed restrictions or suspension of train services in case of partial submergence of railway embankments and bank erosion.

These alternatives were prepared by applying the same specifications (e.g., minimum curve radius, maximum gradient, etc.) used throughout the entire Central Railway Line, so that the re-routing of sections would not restrict future improvements in transport capacity.

There would be no difference in terms of the resulting transport capacity among alternatives, as future traffic demand (both freight and passenger) were assumed equal.

6.4.3. Evaluation of Site Alternatives

Figure 38 shows schematic drawing of the alternatives, and Table 81 compares major elements of the alternatives. The major points are summarized as follows:

Alternative A-2 shows the lowest cost, followed by Alternative B-2 in a narrow margin with only 5.4% difference, and further Alternatives A-1 and B-1. The costs of alternatives C-1 and C-2 are nearly 2.6 times higher than the lowest cost.

Alternative C reduces danger of flood damages to the largest extent through the provision of hard measures. The project effectiveness of Alternative B ranks second and that of Alternative A third, indicating that the reliability of railway transport will be the highest in Alternative C, followed by Alternative B, and further to Alternative A. It is noted that transport capacity is equal among the alternatives.

With respect to technical difficulty, Alternative A requires the shortest construction period with 66 months, while Alternatives B and C require 70 months and 74 months, respectively. Although construction during rainy seasons is not planned, Alternatives A and B have a low hurdle to do so if necessary. It is noted that the bank protection length of Alternatives A-2 and B-2 is 14.3 km, much longer than that of Alternatives A-1 and B-1 of 8.6 km.

In terms of social impact, Alternatives A-1, B-1, and C-1 are not desirable due to the large requirement for resettlement. There are some villages in which the majority of residents need to be relocated. Among the remaining alternatives, Alternative A-2 requires the smallest number of buildings and cultivation land area for relocation. However, the difference between A-2 and B-2 is not large in terms of number of buildings for relocation, with 124 in Alternative A-2 and 164 in Alternative B-2.

In an economic analysis, a conclusion is drawn as “economically feasible” when the estimated value of economic internal rate of return (EIRR) is above the opportunity cost of capital. Suppose the opportunity cost being 12%, the result of preliminary economic analysis indicates that Alternatives A-1, A-2, B-1, and B-2 are all economically viable, and the implementation of any of these alternatives is justified.

From above points, Alternatives A-2 and B-2 are the most advantageous and well-balanced, but considering that Alternative B-2 is able to reduce danger of flood damages more than Alternative A-2, the Alternative B-2 was selected as the optimal alternative, and used for preliminary design (see Table 79).

Table 79: Alternative selection

Alternatives	A-1	A-2	B-1	B-2	C-1	C-2
Cost	◎$^{-}$	◎	○	◎$^{-}$	×	×
Reduction in danger	△$^{+}$	△$^{-}$	○$^{+}$	○$^{-}$	◎$^{+}$	◎$^{-}$
Technical	○	○	○	○	◎	◎
Env. and Social	×	◎	×	◎	×	△
Economic Feasibility	○	○	○	○	×	×
Overall Evaluation		○		◎		

Note: ◎=Best, ○=good, △=fair, ×=not good

Table 80: Summary of alternatives with Flood Damages and Proposed Measures

Alternatives			Flood Damages	Causes	Sites	Proposed Railway Measures	Proposed River Measures
A	B	C	Loss of bridge	Loss of girder	Bridge around Km 293	Prevention of bridge at Km 293 from falling[1]	Bank protection around the left bank abutment
				Collapse of abutment	Kidibo River (Km 355)	-	River channel work in downstream (groundsill, bank protection, sheet pile)
			Loss of roadbed and subgrade	Riverbank erosion	Areas susceptible to bank erosion	Relocation of the track	Installation of bank protection with gabions, gigantic stones, and spur dikes
			Large-scale wash-aways of track	Large-scale overtopping	Maswala River (Km 349.5)	Relocation of the bridge (box culverts) at Maswala	River channel work in downstream (groundsill and embankment)
					Mzase River (Km 365.6)	Relocation of the existing railway structures (box culverts) at Mzase and Gulwe Station	River channel work in downstream (groundsill and bank protection)
			Medium-scale wash-aways of track	Medium-scale overtopping	Km 363–Km 368	Relocation of the track	-
			Track submergence	Small-scale overtopping	Areas where the existing railway level is below the design flood level	Elevation of the track by re-routing	-
					Areas susceptible to bank erosion	-	Installation of steel sheet pile/pipe
					Maswala River (Km 349.5)	-	River channel works in upstream (groundsill)
					Kidibo River (Km 355)	Relocation of the bridge at Kidibo	River channel works in upstream (groundsill and bank protection)
					Mzase River (Km 365.6)	-	River channel works in upstream (groundsill and bank protection)

Note: Alternative C requires the replacement of the bridge at Km 293.
Source: JICA Study Team

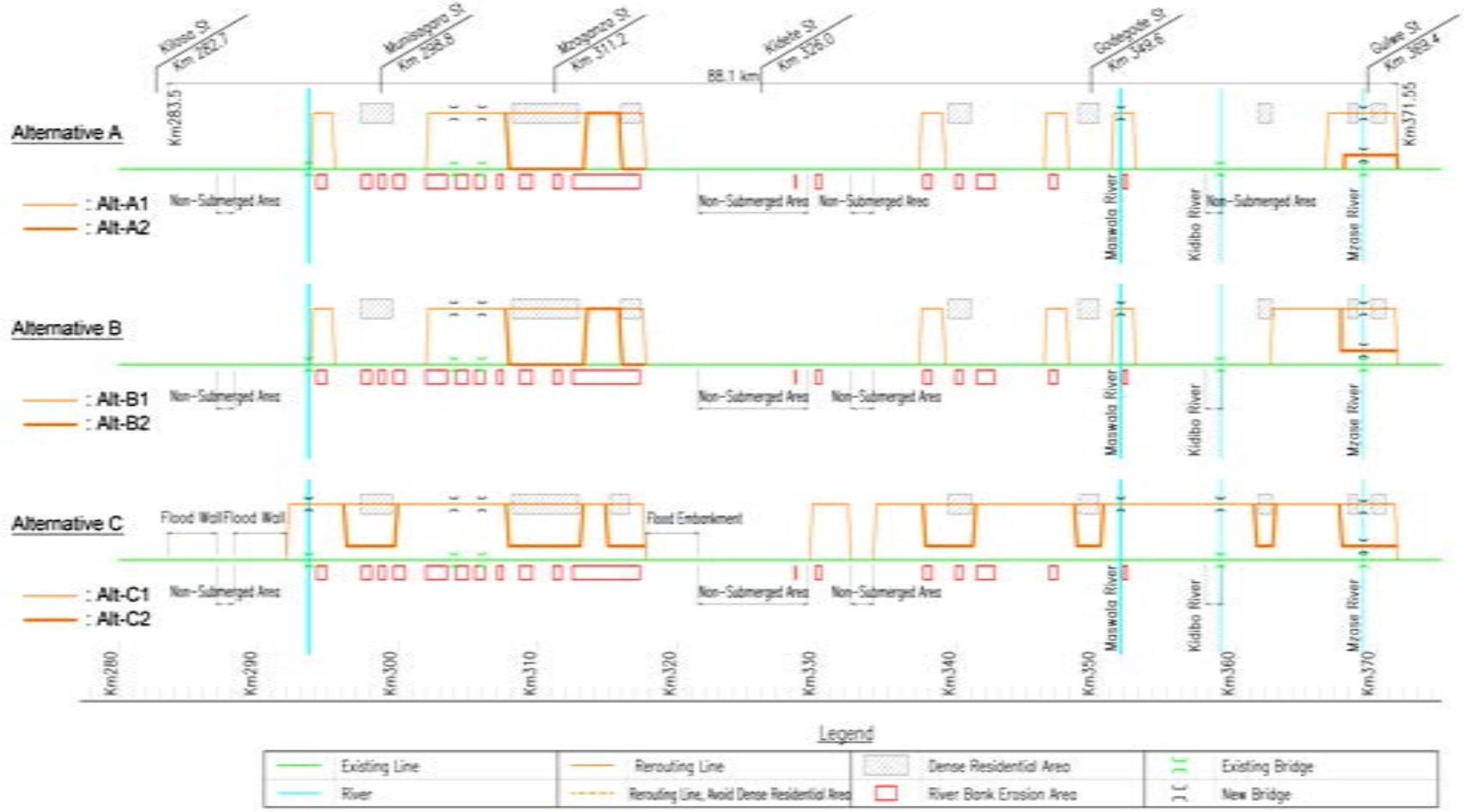


Figure 38: Schematic Drawing of the Alternatives A, B, and C

Source: JICA Study Team

Table 81: Comparison of Alternatives for Preliminary Economic Analysis

	Alternatives	A-1	A-2	B-1	B-2	C-1	C-2
Cost (TZS mil.)	**Railway construction 1/**	**272,188**	**212,604**	**287,956**	**232,858**	**494,958**	**472,026**
	River construction	**98,405**	**136,453**	**98,405**	**136,453**	**594,416**	**594,416**
	Miscellaneous 2/	26,021	26,021	26,021	26,021	26,021	26,021
	Consultants	39,661	37,508	41,238	39,533	55,770	54,623
	Contingency	21,814	20,629	22,681	21,744	58,558	57,354
	Price escalation	169,056	159,877	175,778	168,510	453,826	444,497
	1) Subtotal above	627,145	593,092	652,079	625,119	1,683,549	1,648,937
	2) Maintenance costs 3/	42,721	40,460	44,377	42,587	1,077	1,077
	3) Total of 1)+2)	669,866	633,552	696,456	667,706	1,684,626	1,650,014
	4) Land acquisition cost	172	95	179	105	301	230
	5) Total of 3)+4)	670,038	633,647	696,635	667,811	1,684,927	1,650,244
	Total of 3)+4) in Yen (mil.)	44,805	42,372	46,584	44,656	112,671	110,352
Reduction in danger of flood damages by hard measures		**Low**	**Low**	**Middle**	**Middle**	**High**	**High**
Length of existing railway to be relocated (km)		**28.1**	**19.7**	**32.0**	**25.0**	**66.2**	**66.2**
Length of river bank protection (km)		**8.6**	**14.3**	**8.6**	**14.3**	**49.8**	**49.8**
Degree of technical difficulty	**Construction period (months)**	**66**	**66**	**70**	**70**	**74**	**74**
	Construction in rainy season	**Low**	**Low**	**Low**	**Low**	**Middle**	**Middle**
	Bank protection	**In terms of bank protection length, Alternative B's protection area is three times that of Alternative A.** Flexible type of bank protection works with periodical recovery against some extent of flood damages is applied.				**Most rigid and durable type of bank protection works (steel sheet pile and steel pipe pile) to meet planning scale for the entire target areas are applied.**	
Environmental and social considerations	**Natural environment**						
	Deforestation (ha)	**16**	**15**	**16**	**15**	**31**	**31**
	Volume of cutting soil (m^3)	385,000	281,000	387,000	284,000	683,702	525,110

Alternatives		A-1	A-2	B-1	B-2	C-1	C-2
	Volume of embankment (m^3)	788,000	594,000	891,000	729,000	1,803,996	1,896,764
	Social environment						
	Number of buildings for relocation	552	124	573	164	1,132	489
	Land acquisition area (ha)	**140**	**83**	**163**	**116**	**342**	**283**
	Cultivation land area (ha)	**42**	**22**	**56**	**41**	**104**	**86**
	Disruption of community	Significant. The railway separates the populated area (Gulwe) into two parts. Large portion of populated area (Muzaganza) needs to be relocated.	Some extent but not significant comparing with A1.	Significant. The railway separates the populated area (Gulwe) into two parts. Large portion of populated area (Muzaganza) needs to be relocated.	Some extent but not significant comparing with B1.	Significant. The railway separates the populated area (Gulwe and Godegode) into two parts. Large portion of populated area (Muzaganza and Munisagara) needs to be relocated.	Some extent but not significant comparing with C1.
	Convenient location of station	Stations become closer to the communities (Gulwe and Muzaganza).	Access road to the station is required at Gulwe.	Stations become closer to the communities (Gulwe and Muzaganza).	Access road to the station is required at Gulwe.	Stations become closer to the communities (Gulwe, Godegode, Muzaganza and Munisagara).	Access road to the station is required at Gulwe.

Alternatives		A-1	A-2	B-1	B-2	C-1	C-2
	Impact of noise and vibration	Impact becomes larger than the present as the railway is relocated within the community (Gulwe and Muzaganza).	Same with the present condition.	Impact becomes larger than the present as the railway is relocated within the community (Gulwe and Muzaganza).	Same with the present condition.	Impact becomes larger than the present as the railway is relocated within the community (Gulwe, Godegode, Muzaganza and Munisagara).	Same with the present condition.
Provisional Economic Feasibility (EIRR)		Feasible (12.5%)	Feasible (13.1%)	Feasible (12.1%)	Feasible (12.5%)	Not feasible (4.0%)	Not feasible (4.1%)
Overall Evaluation			○		◎		

Notes:
1/ Including track materials for renewal of 60 lbs/yard rails by 80 lbs/yard rails.
2/ Including new station buildings and siding tracks on the rerouted sections, small machinery and equipment for track renewals, and supply of track materials for the existing 80 lbs/yard track section.
3/ Including recovery costs from flood disasters
Source: JICA Study Team

Table 82: Evaluation of alternatives

Alternative	Criteria			
	Cost	Reduced Danger of Flooding	Technical Difficult	Social Impact
Alternative A-1	Lowest Cost		Shortest Construction time (66 months)	Large requirement for resettlement
Alternative A-2				Requires the smallest number of buildings and cultivation land area for relocation
Alternative B-1		2nd Best	2nd shortest construction time (74 months)	Large requirement for resettlement
Alternative B-2	2nd Lowest			Almost similar to A-2
Alternative C-1	Highest Cost	1st Best option		Large requirement for resettlement
Alternative C-2	Highest Cost			

The JICA Study Team concluded that Alternatives A-2 and B-2 are the most advantageous and well-balanced, but considering that Alternative B-2 is able to reduce danger of flood damages more than Alternative A-2, Alternative B-2 is considered the optimal alternative, and hence was used for preliminary design.

Influence of the land topography

The cutting slope and the pile length of bridge substructures are influenced by topography and soil characteristic. The cutting angle is steep. The cutting site is assumed the rock rather than sand. The pile length has been estimated based on the soil survey results.

6.4.2 Alternatives for Embankments

Table 83: Comparison of Gabion and Branch Block

Item	Gabion Mattress Bank Protection	Branch Block Bank Protection
Description of Method	Revetment and Retaining wall construction method which is composed of steel wire mesh cage "Gabion" with stone	Revetment and Retaining wall construction method which is composed of steel wire mesh cage pillar--shaped precast concrete product "Branch Block" with stone
	This can form revetment structures and protect against slope failure	
	Wall is constructed by Gabion (W=1.2m, H=0.5m, L=1-m) which is arranged in stepwise shape see Figure 20	Wall is constructed by RC Pillar element (W=1.3m, H=1.2m, L=1.0-2.0-m), boulders in front, and in-filling behind which is similar as masonry retaining wall construction method
Candidate Sites to be applied	Protection at bank erosion section and slope along main stream etc.	Protection at progressive bank erosion section and slope surrounding the Machala and Mazes etc.
Merit	Conventional construction method	Short-term construction can be attained. Branch Block Bank Protection has durable longevity performance. Reduce velocity by roughness of the surface can mitigate erosion at foundation. Construction cost lower.
Demerit	Gambian steel mesh has no durable longevity performance. This is not suitable to use at eroded bank where high velocity flow is anticipated	It is necessary to provide technical guidance by experts from Japan during construction

Item	Gabion Mattress Bank Protection	Branch Block Bank Protection
Evaluation	Branch Block Bank Protection is recommended in view points of performance, construction cost, and construction period Branch Block Bank Protection is recommended in extremely progressive erosion section Gabion Bank Protection is recommended utilizing in moderately progressive erosion section Branch Block RC Pillar form should be imported from JAPAN	

Table 84: Comparison of Gabion and Filter Unit for measure against foot erosion in structures

Item	Gambian Mattress Method	Filter Unit Method
Description of Method	Foot protection for river structure, which is composed of steel wire mesh cage "Gabion" with stone filling	Foot protection for river structure, which is composed of recycled polyester fibber mesh bag "Filter Unit" with stone filling
	Both methods can form erosion measures which resist to water current in weight on structure's foot	
	The foot protection is constructed by Gabion (Stone=5.7m^3: 1.2WxH0.5mx10.0L) which is arranged in stepwise shape see Figure 20	The foot protection is constructed by Filter Units (Stone=5.7m^3: 1.25m^3 ton / bag x 4.56 bags) which is arranged in a trefoil shape
Candidates sites to be applied	Protection at progressive bank foot erosion and areas around bridge pier, abutment etc.	
Merit	Conventional protection work	Short-term construction can be attained by using machines in construction. . Filter Unit Protection has durable longevity performance. Construction cost lower. Flexible bag can mitigate erosion at foundation
Demerit	This method cannot save labour because stone filling in cage needs manpower. Therefore short-term construction cannot be attained. Gabion steel mesh has no durable longevity performance. Construction cost is a little higher	Recycled polyester fibre mesh bag "Filter Unit" is needed to import from JAPAN
Evaluation	Filter Unit Protection is recommended in view points of performance, construction cost, and construction period Recycled polyester fibre mesh bag "Filter Unit" need to be imported from Japan Gabion Bank Protection is recommended utilizing in moderately progressive erosion section	

6.4.4. Alternative Construction Methods

Hat-Shaped Steel Pile

Table 85: Comparison of steel sheet pile

Item	Conventional Steel Sheet pile (400mm width)	Hat type sheet pile (900mm width)
Description of Method	Base machine: Hydraulic Crawler Crane 50-55 ton	Base machine: Hydraulic Crawler Crane 50-55 ton
	Pile hammer: Conventional Electric Vibration Hammer 60kW	Pile hammer: Conventional Electric Vibration Hammer 60kW
	Teel sheet pile: Type II (W=400mm, t=13mm)	Steel sheet pile: Hat Type 25H (W=900mm; t=13mm)

Item	Conventional Steel Sheet pile (400mm width)	Hat type sheet pile (900mm width)
Candidates sites to be applied	The foundation of bank protection where significant erosion is in progress at 330.1km-330.6km and 339.7km-340.1km,in total 900m	
Merit	To utilise vibration – hammer for pile driving method which is high versatile equipment	Short-term construction can be attained To reduce management cost and construction cost
Demerit	Steel sheet pile is necessary to import	Steel sheet pile, vibration hammer is necessary to import
Evaluation	HAT type steel sheet method is recommended considering following items: - To reduce 16% of construction cost - To reduce 36% of construction period - Sheet pile and electric vibration hammer should be imported	

In-Situ Stabilised Excavation Material

Table 86: For Mzase, Maswala riverbed structure: Comparison between Conventional Construction method and Construction method utilising In-Situ Stabilisation Excavated Material

Item	Conventional construction method utilising normal concrete	Conventional construction method utilising Sabo Soil Cement (INSEM) Method: In-Situ Stabilised Excavated Material)
Description of Method	Mixing aggregate, cement, water at concrete plant or portable mixer. Then transporting to construction spot	Mixing excavated soil, sand, water, and cement in field. Then transporting to construction spot, bulldozing mixed material, compacting with vibrating roller. The surface of the above, if required, protected with concrete, masonry
Candidates sites to be applied	Ground sills, check dam at Maswala, Mzase tributary	
Merit	Durable longevity performance is higher. Therefore surface protection is not required	Construction cost is lower Residual soil could be reduced
Demerit	Construction cost is higher	Durable longevity performance is lower. Therefore, if required, surface protection is needed
Evaluation	Construction method utilising sub-Soil Cement is recommended in following view points - To reduce 33% of construction cost - To reduce 20% of construction period - Furthermore, mixing solid cement is utilising improvement for soft ground - Material investigation, sampling, trial mixing and confirmation of mix proportion is required before construction	

6.4.5. Alternative Rail Gage and Weight

There are two types of gages that can be used, namely (i) the existing gauge of 1,000mm and (ii) a standard gauge of 1,435mm. The standard gauge cannot be applied for a section of an existing railway line gauge as such this was not considered as a viable option.

The project also had an option of maintain the current weight of 60 pounds use 80 pounds track so as to bring this section to the same functional level of the central railway line. The project chose to install 80pounds tracks considering envisaged increase in cargo after the implementation of the project.

6.4.6. Alternative Flood Protection Measures

Construction of flood protection dam

With the objective being the protection of railway between Gulwe-Kilosa, it has been concluded that dam development is not advantageous considering the topographic conditions (possible height restricted by topography potential reservoir storage capacity) at those candidate sites such as Kidete and Kimagai. Further, the candidate sites in the upstream, such as Msagali, the catchment area is too small to reduce flood peak discharge.

However, potential of sand trapping dams, so-called "sabo dams" will need to further examination in particular for several tributaries, such as the Mzase, Maswala and Kidibo, in the future.

7. IMPACTS MITIGATION MEASURES

Chapter 6 identified the potential impacts and analysed their significance. This chapter provides mitigation measures of those impacts which are considered to be of moderate and high significance, by matching the predicted impacts with possible mitigation measures. Impacts which were considered to have minor or insignificant are not discussed further.

7.1. ENVIRONMENTAL IMPACTS

7.1.1. Site Selection / Design / Mobilisation Phase

Impact # 1: Land disturbances / soil erosion at onsite and offsite location
In order to mitigate the impact of land disturbance and hence soil erosion the Contractor shall be required to:

- Implement soil erosion control and land rehabilitation measures at all project sites and offsite locations
- Ensure strict control of trucks, vehicles as well as equipment and machinery to ensure that they operate only within the project area
- Limit excavations area needed for construction works, construct temporary drainage grooves and sedimentation ponds for surface runoff collection and compact the disturbed areas soon after construction.
- Compact the disturbed areas soon after construction.
- Whenever possible development activities shall be implemented when the agents of erosion (i.e. rain and wind) are not active.
- RAHCO will monitor areas of exposed soil during periods of heavy rainfall throughout the project development phase.

Erosion control
Regulation of erosion processes during the construction is very important, especially at sites where cutting the slopes will be necessary. At these locations activation of erosion processes is expected, which in turn will lead to deterioration of stability and integrity of railway embankment and rails. Therefore, implementation of erosion control measures: arrangement of berms, stone mounds and gabions will be required at the cut slopes and in the bottom of the slopes. Cut topsoil shall not be used for construction of berms within the RoW.

Impact # 2: Loss / damage / disturbance of indigenous vegetation and contained biodiversity species
For the purpose of prevention, mitigation and/or compensations of the following measures shall be implemented with the aim ensuring that any disturbance to flora and fauna is restricted to the actual project area and avoid spill over effects on the neighbouring areas. There will be strict control of trucks, vehicles as well as equipment and machinery to ensure that they operate only within the area to be disturbed by access routes and other works.

Specifically following measures will be implemented to protect specific valued receptor (VR):

Vegetation

- Develop a Flora and Vegetation Conservation and Restoration Plan – which shall include: conduct pre-construction floristic conservation survey; identification and re-planting of the species to be conserved in similar alternative habitats; collection of their seeds and bulbs and establishment of small-scale nurseries and ex- situ and in situ conservation measures.
- As a compensation measure, trees shall be planted on the areas adjacent to the RoW.
- Training the workers and construction site managers in avoiding cutting of trees and bushes along the RoW and destruction of soils on large areas (as well as preventing falling of animals in pits).
- Implement a Flora and Vegetation Restoration Plan in parallel with a Soil Restoration Plan.

Fauna

During pre-construction field surveys the following shall be examined at each section:

- breeding areas of special wildlife and invertebrates in water objects
- presence of small mammals;
- presence of the nests of protected birds;
- presence of colonies of bats in the trees to be cut; and
- whether the individual section of a big mammal falls within the construction zone.

Mitigation of noise

The Contractor shall put in place several measures that will minimize noise and vibrations arising from various activities of the mobilization phase. The measures shall include:

- Maintaining machinery and equipment in good running conditions and avoiding sudden loud noise
- Use quiet equipment (i.e. equipment designed with noise control elements) and the proponent will ensure all vehicles have properly functioning mufflers,
- Establish and enforce good site management
- Develop and observe best practice - methods of working
- Restrict hours of working during day light at the settlements;
- Exercise efficient material handling
- Define access routes to the site with the smallest number of properties in proximity
- Keep trucks and vehicle movements to a minimum possible

Impact # 3: Depletion at point source

In order to mitigate the impact of depleting construction resources following measures will be implemented:

- The developer will source construction materials such as sand, gravel, natural stones, ballast from registered quarry and sand mining firms, whose projects have undergone satisfactory environmental assessment/audit and received NEMC/District Council approval.
- To reduce the negative impacts on availability and sustainability of the materials, the developer will only order what will be required through accurate budgeting and estimation of actual construction requirements. This will ensure that materials are not extracted or purchased in excessive quantities.
- Moreover, the developer will ensure that wastage, damage or loss (through run-off, wind, etc.) of materials at the construction site is kept minimal, as these would lead to additional demand for and extraction or purchase of construction materials.

Impact # 4: Impaired air quality & contribution to climate change due to release of dust, greenhouse gases and other noxious air pollutants

The developer will implement the following measures to minimize air quality impacts associated with mobilization activities thereby implementing the following measures:

- Use of best practice management techniques during extraction, loading of and transporting raw materials.
- Use efficient trucks and vehicles
- Train driver training to minimize emissions (e.g. prevention of over revving, shut off engines when vehicles not in use).
- Regular (monthly) servicing of engines will improve efficiency of engines and hence reduction in emissions
- Avoiding idling of engines (i.e. switching when they are not in use)
- Equipment operations and maintenance measures that minimize emissions of substances into the atmosphere.
- Proposed management actions for participating LGAs: requirement and instructions to the Contractors and facility operators to institute procedures for preventive maintenance of equipment.
- Institute proper planning of transportation of materials to ensure that vehicle fills are increased in order to reduce the number of trips done or the number of vehicles on the road.

Impact # 5: Release of oils and fuels in the aquatic environment

- Fuels and lubricants shall be stored only at designated areas.
- Storage of fuel and lubricants shall be kept at least 30m from the edge of the surface waters e.g. rivers
- Refuelling and lubrication of equipment shall be restricted to areas at least 30m away from the edge of the surface waters
- Perform all routine equipment maintenance at least 30 meter away from the edge of the rivers and recover and dispose of wastes in an appropriate manner.
- Fixed fuel dispensing locations will be provided with secondary containment to capture fuel from leaks, drips, and overfills.
- A supply of sorbent and barrier materials sufficient to allow the rapid containment and recovery of spills shall be maintained at construction site
- Ensure that all equipment is free of leaks prior to use on the Project and prior to entering or working in or near the water bodies.
- Conduct regular maintenance and inspections of the equipment to reduce the potential for spills or leaks.
- Rubber-tired vehicles (trucks) shall refuel at commercial fuel stations. Tracked machinery (e.g. backhoes, bulldozers) shall be refuelled and lubricated on the construction site.

Impact # 6: Contamination of surface and ground water with demolition debris

Demolition wastes shall be managed according to:

i) Prevent the generation of hazardous waste;
ii) Where elimination is not possible apply means and techniques to reduce the quantity of hazardous waste generated;
iii) Minimize amount of waste for disposal by recycling, reuse and/or recovery. This includes the recovery of energy which may be available from the waste.

iv) Treat waste to stabilize, immobilize, contain or destroy hazardous properties.
v) Dispose of residues with minimum environmental impact.
vi) Appropriately contain, isolate and store hazardous waste for which no acceptable treatment or disposal option is currently available.

Following specific measures shall be implemented where applicable:
Inert Construction Materials: These are wastes which degrade neither independently, nor in contact with other substances or under other physical, chemical or biological influence to such an extent to damage the environment or affect human health. Inert wastes such as natural materials – earth, stone, concrete blocks etc. generate during demolition of existing buildings and infrastructures:

- These materials shall be used for construction of embankments, acoustic barriers or as filling materials on rural roads.

Non-hazardous Waste: Demodulation may generate non-hazardous waste, i.e. wastes which have no hazardous features: household waste, certain plastic materials, textile waste, etc.

- ✓ The civil works will produce significant quantities of concrete wastewater. These will be disposed in similar manner as inert wastes.
- ✓ Existence of metal waste (including scrap and wires) is expected as well. Metal waste shall be disposed separately for reuse and recycling.

Hazardous Waste: Wastes are considered to be hazardous if they are: explosive, oxidizing, flammable, irritable or toxic, carcinogenic corrosive, infectious, teratogenic, and mutagenic; when incinerating or in contact with air, water and acids generate toxic substances. Hazardous wastes can be generated during demolition of existing facilities. These may include: lubricants, liquid fuel, hydraulic oils, chemical substances, vehicle/engine filters, oiled textile, old filters, polluted soil, etc.

- Hazardous wastes will be collected and transported to Dar es Salaam for their final disposal.
- Uncontrolled incineration will not be allowed.
- Before removal of wastes from the site, the quantity (volume) and size of wastes; the name of waste collector/disposal agent and the name of the place of their final disposal/measure shall be specified. This issue shall be controlled by site manager
- The technical personnel shall be trained and informed about the appropriate regulations for handling hazardous waste i.e. Environment Management (Hazardous Waste Control and Management) Regulations, 2008
- After demolition the place shall be restored to the pre-construction state.

Table 87 shows some possible hazardous waste that may be found on site and how they could be managed.

Table 87: Some **Potentially Hazardous Elements in Construction and Demolition**[29]

Product / material	Potentially hazardous component(s)	Potentially hazardous properties	Treatment and/or disposal options
Concrete additives	Hydrocarbon solvents	Flammable	Return to supplier, recycle, or remove for specialist

[29] Report to DGXI, European Commission, *Construction and Demolition Waste Management Practices, and Their Economic Impacts*, Final Report, February 1999, Report by Symonds, in association with ARGUS, COWI and PRC Bouwcentrum, http://ec.europa.eu/environment/waste/studies/cdw/cdw_report.htm, 2009.

Product / material	Potentially hazardous component(s)	Potentially hazardous properties	Treatment and/or disposal options
			disposal.
Damp proof materials	Solvents, bitumen	Flammable, toxic	Return to supplier, recycle, or remove for specialist disposal. Allow to cure prior to disposal
Adhesives	Solvents, isocyanates	Flammable, toxic, irritant	Return to supplier, recycle, or remove for specialist disposal. Allow to cure prior to disposal.
Mastics / sealants	Solvents, bitumen	Flammable, toxic	Return to supplier, recycle, or remove for specialist disposal. Allow to cure prior to disposal. Seek alternative less hazardous products. Use water.
Road surfacing	Tar-based emulsions	Toxic	Return to supplier, recycle, or remove for specialist disposal
Asbestos, to be found in: Cement fibre products Ceiling panels, thermo insulation, noise insulation, electrical insulation, flooring, tile glue, etc.	Respiratable fibre	Toxic, carcinogenic	Remove under controlled conditions for specialist disposal.
Mineral fibres	Respiratable fibres	Skin & lung irritants	Remove for separate disposal.
Treated timber	Copper, arsenic, chrome, tar, pesticides, fungicides	Toxic, ecotoxic, flammable	Recycle. Hazardous components bound into timber, low impact on landfill. Toxic fumes and residue produced on burning.
Fire resistant wastings	Halogenated compounds	Ecotoxic	Possible low impact in landfill if bonded to substrate; high impact in product form; possible toxic fumes on burning.
Paint and coatings	Lead, chromium, vanadium, solvents	Toxic, flammable	Possible low impact in landfill if bonded to substrate; high impact in product form; possible toxic fumes on burning.
Power transfer Equipment (transformers, capacitors and switchgear)	PCBs	Ecotoxic	Contaminated transformer oils to be removed under controlled conditions for specialist disposal.

Product / material	Potentially hazardous component(s)	Potentially hazardous properties	Treatment and/or disposal options
Lighting	Sodium, mercury, PCBs	Toxic, ecotoxic	Recycle or remove for specialist disposal.
Air conditioning systems	CFCs	Ozone depleters	Remove for specialist recovery.
Fire fighting systems	CFCs	Ozone depleters	Remove for specialist recovery.
Contaminated building fabric (including contamination due to previous use)	Radionuclides	Toxic	Specialist decontamination prior to demolition or refurbishment.
	Hydrocarbons (oil, solvent)	Toxic	Remove under controlled conditions for specialist disposal.
	Heavy metals including cadmium and mercury	Toxic	Specialist decontamination prior to demolition or refurbishment.
	Biohazards (anthrax)(1)	Toxic	Specialist decontamination prior to demolition or refurbishment.
Animal products(1)	Biohazards (anthrax)(1)	Toxic	Specialist decontamination prior to demolition or refurbishment.
Gas cylinders	Propane, butane, acetylene, etc.	Flammable	Return to supplier.
Resins/ fillers, precursors	Isocyanates, phthalic anhydride	Toxic, irritant	Return to supplier, recycle, or remove for specialist disposal.
Plasterboard	Possible source of hydrogen sulphide in landfill	Flammable, toxic	Return to supplier, recycle, or disperse within landfill.
Glass			Recycle. Possibly physically hazardous to handle.
Road running surface	Tar, asphalt, solvents	Flammable, toxic	Recycle if 'cured' and low leachability. Separate for disposal if high leachability / solvent content.
Sub base (ash / clinker)	Heavy metals, including cadmium and mercury, radionuclides	Toxic	Recycle if low leachability. Separate for disposal if high leachability.

7.1.2. Construction Phase

Impact # 7: Land disturbances / soil erosion

Trees and vegetation clearance at the project site to pave way for construction activities will be inevitable. However, the developer will ensure proper demarcation of the project area to be affected by the construction works.

- Contractors will be required to control soil erosion and rehabilitate disturbed land; the project proponent shall provide oversight supervision and monitoring during and after project implementation.
- Contractor shall identify erosion prone areas, identify permanent erosion control measures (applicable for a particular site) and plan construction works and sites to limit quantity of material likely to be eroded and transported into the nearby rivers.
- The Project Proponent shall procure and use Contractors with requisite experience of land management and soil erosion control; develop management plans for existing quarry sites, and new sources of construction materials.
- Deliberately the proponent will cover exposed soils with grass and other appropriate species as soon as possible and temporarily will bind exposed soil and redirect flows from heavy runoff areas that threaten to erode or result in substantial surface runoff to adjacent water courses.

Topsoil removal, disposal and piling

Removal of soils, especially topsoil at the initial stage of construction works is very important in terms of topsoil conservation.

- First of all the topsoil and then subsoil shall be cut and piled (stocked) separately on specially selected area for their purposeful use.
- The stocked topsoil should not be mixed up with unfertile soils, stones, etc. It should be prevented from washing to preserve the structure, fertility and seeds base of the topsoil.
- Topsoil will be stored in the form of stockpiles having the height up to 2 m and slope inclination up to 30-35^{o}.
- Erosion of stockpile surface shall be provided through compacting surfaces to the level having no threat of development of anaerobic processes.
- The contractor shall stop topsoil removal and stocking operations if topsoil is saturated with water.
- Stocked soil shall be protected from washing, therefore, it is necessary to arrange drainage [system] in the bottom of the storage.
- Stocking of removed topsoil outside the RoW, shall be avoided as far as possible. If this is not possible appropriate sites shall be identified in accordance with the current Tanzania Laws (e.g. Village Land Act, 1999)

Erosion control

Following erosion control measures shall be implemented:

- Arrangement of berms, stone mounds and gabions will be required at the cut slopes and in the bottom of the slopes.
- Cut topsoil shall not be used for construction of berms within the RoW.
- At the location of cult slopes and ravine crossings where the excavation works are to be carried out, water collecting and conveyance canals shall be built to regulate the flows of surface waters.
- At the ends of water conveyance canals the settlers shall be arranged (pits, sand sacks) to prevent damage of areas adjacent to RoW with water.
- Phyto-amelioration measures shall be implemented to stabilize the edges of slopes and cut slopes if required.

It is particularly important to protect the removed and stocked topsoil from erosion processes.

- Stocked topsoil shall be drained.

- To control erosion processes at the edge of the cut slope, phyto-amelioration measures shall be implemented on the slope.
- For regulation of surface waters, berms and water canals shall be arranged at the edge of the slope that will be connected to natural water courses to avoid development of lateral erosion.

Soil reinstatement measures

- After completion of excavation works and laying the rails the soil reinstatement activities shall be implemented in the areas adjacent to the embankment.
- The reinstatement works shall be carried out in favourable meteorological (dry) conditions and in the shortest possible time.
- During implementation of soil reinstatement works mechanical and physical-chemical characteristics of soils shall be taken into account.
- Soils shall be reinstated at least to its initial state for the purpose of observation of the principles of environmental safety and preservation of the recreational value of landscapes.

Impact # 8: Impaired air quality & contribution to climate change due to release of dust (including fugitive (unavoidable, residual), greenhouse gases and other noxious air pollutants

Mitigation measure under Impact # 4

Impact # 9: Impaired land and water qualities and contained resources from discharge of pollutants (wastes, oily substances etc.)

- Mitigation measures listed under Impact # 4 and Impact # 5 apply
- Project implementers to develop and implement project – specific Waste Management Procedure / Plan (i) identify what type of solid or liquid wastes and categories of wastes the project will generate or handle (biodegradable / organic wastes; packaging materials; non-biodegradable (metallic, plastic), and hazardous wastes i.e. fuels, oils, lubricants, vehicle / machinery fluids etc.);(ii) identify ways to reduce the volume of waste by reusing or recycling initiatives (iii) establish technological interventions to capture and removal unwanted materials and sand before entering the water ways i.e. bar screens, sand traps and grit chambers.

The following are specific waste management procedures to be implemented:

- During earthworks, i.e. excavation, digging pits, quarrying, etc. Contractor shall ensure the top soil is pilled aside at one place, then after finishing the earthwork the top soil shall be used to fill any bare land surfaces around the site.
- Plastic and glass bottles (about 9[30]kg per day) shall be collected into litter bins, and transported to plastic recyclers.
- At completion of each day, site shall be left clean and tidy; debris, scrap and spill materials removed.
- Biodegradable waste of about 900kg per day consisting of mainly paper, etc. from offices and open workshop will be disposed by buried within RoW.
- Batteries will be sent to YUASA in Dar es Salaam for recycling

[30] 10% of the solid waste

- No waste oil will be disposed at the site during construction. Fuel, oils and lubricants (300kg per day) on average from construction machinery and equipment from maintenance workshops, fuelling points etc. will be collected for use in furnaces
- Demolition debris will be used during construction as construction aids or distributed to community project and filling of rural roads.

Following specific measures shall be implemented where applicable:
Inert Construction Materials: Inert wastes such as natural materials – earth, stone, concrete blocks etc. generate during earth works and tunnelling.

- These materials shall be used for construction of embankments, acoustic barriers or as filling materials on rural roads.

Non-hazardous Waste: Construction operations generate non-hazardous waste, i.e. wastes which have no hazardous features: household waste, certain plastic materials, textile waste, etc.

- Construction camps will be provided with toilet / shower facilities connected to a regularly empting septic tank;
- Special waste bins and waste collection system will be introduced to ensure disposal of wastes at landfills;
- The civil works will produce significant quantities of concrete wastewater. Such water is generally heavily loaded with suspended material, mainly silicates and sand, and has a pH usually over 12. Such water must be collected, processed through a sedimentation tank and neutralized, usually with gaseous CO_2, before their disposal;
- Vegetation wastes generated from site clearance during construction can be left on the site only in exceptional cases. They will be transported to the suitable waste management facility;
- Existence of metal waste (including scrap and wires) is expected as well. Metal waste shall be disposed separately for reuse and recycling.

Hazardous Waste
Hazardous wastes can be generated during maintenance of vehicles. Hazardous wastes include: lubricants, liquid fuel, hydraulic oils, chemical substances, vehicle/engine filters, oiled textile, old filters, polluted soil, etc.

- Hazardous wastes will be collected and transported to the place of their final disposal.
- Uncontrolled incineration will not be allowed.
- Reserves of potential polluters will be stored on special insulating bedding and fenced by a berm made of the similar material to retain the polluter in an amount of 10% more than stored.
- During operation all stationary construction machinery operating on diesel and petrol will be equipped with a special container to collect leaking fuel for disposal.
- Main equipment and vehicles will be fuelled on special insulating bedding wherever possible.
- A special attention will be paid to prevention of fuel spills. Special collectors will be installed at the points of potential leakage. Absorbents will be used as well. Fuel will be transported by specially designed fuel trucks.
- Collection, treatment and transportation of waste wastes generate at the construction site will be implemented in accordance with the general plan of waste management.
- Wastes shall be collected on a daily basis. Waste bins labelled with special signs will be placed on specially allocated points for collection and further disposal of wastes.

- Before removal of wastes from the site, the quantity (volume) and size of wastes; the name of waste collector/disposal agent and the name of the place of their final disposal/measure shall be specified. This issue shall be controlled by site manager
- The technical personnel shall be trained and informed about the rules of environmental and ecological safety of construction camps (to be developed prior to construction).
- After removal of temporary collectors the territory shall be restored to the pre-construction state.

In addition the following measures will be implemented:

- vehicle fuelling stations (in case of their existence at the construction stage) shall be embanked to prevent spread of fuel and pollution of the surrounding area in case of accidental spills;
- vehicle wash areas within the garages shall be embanked. For wastewater treatment a primitive treatment facility in the form of concrete covered two-step ditches to prevent discharge of untreated waters in ravines and rivers;
- washing of vehicles in river and other surface water object shall not be allowed;
- layers of soil polluted by fuel and lubricants spilled from construction machinery shall be removed and transported to the place agreed with the Vice President's Office (VPO), Division of Environment (DoE), and Department of Natural Resources in advance;
- when painting metal constructions, especially metal bridges, tin or other covers shall be placed under the sections to be painted to avoid spill of paints into the surface water objects;
- places for toilets within the construction camps shall be selected with consideration of the groundwater levels.
- Cesspools shall be covered with cement solution to avoid pollution of groundwater with faeces.
- Cesspools shall be emptied on a regular basis in accordance with the number of workers living in the construction camp.
- construction and household waste shall be piled at a distance of at least 50 m from the riverbeds of rivers and ravines prior to disposal to the specially allocated dumpsites;
- temporary barriers shall be arranged at the small ravines and gullies to avoid movement of increased volumes of solid materials from the RoW to large ravines and rivers at the construction stage;
- the design of shall ensure protection of the groundwater and the river water from pollution;
- Crossing of the planned railway with water bodies shall be designed in a manner to avoid penetration of pollutants in water bodies.

Impact # 10: Temporary disturbances / flight of aquatic fauna from noise emission

Mitigation under Impact # 2 will apply

- During the construction phase small supporting enterprises, construction camps, parking and maintenance areas shall be arranged at a considerable distance from the settlements.
- To avoid and minimize excessive vibration and deformations during the construction phase it is recommended to use alternative methods of drilling and explosion; e.g. so-called "shields" to drill tunnels. Or at worst drilling-explosion shall be carried out using minimal explosive charge.

- If protected species are found, develop special measures to minimize their disturbance during reproduction and breeding periods;
- Arrange fences to prevent animals from falling into the trenches. Before filling the trenches make sure that there is no animal there. In general, it will be sufficient to place wooden boards in trenches that will be used by animals for escaping;
- Keep old trees near the RoW during the construction works;
- After completion of construction works the water courses and forest strips shall be recovered, topsoil shall be reinstated and re-cultivated, shrubbery shall be planted along the RoW. Pipes laid in gorges will play the role of so-called "Green Bridges" for animals.

Impact # 11: Destruction of archeological and cultural heritage resources

- During implementation of eartheworks at the project sites and adjacent areas permanent inspection/monitoring of the archaeologist shall be done
- The results of inspection will be reflected in the construction progress report
- If cultural / archeological heritage is discovered or the grounds for assuming its existence are revealed during construction works, RAHCO (or/and its Contractor) is legally bound to stop the activities that bear the risk of damaging cultural heritage and inform in writing the Director of Archeology and Cultural Resources in the Division of Antiquities, Ministry of Natural Resources and Tourism . The Director has to verify the discovered cultural heritage or the grounds for supposing the discovery and inform RAHCO 9or /and its Contractor) about the verification results in writing no later than in 2 weeks after receipt of the notification.

7.2. SOCIAL IMPACTS

7.2.1. Site Selection / Design / Mobilisation Phase

Impact # 12: Change or modification of population and its quality of life due to land take

- The Project Affected People will be compensated as proposed in the Resettlement Action Plan (RAP)[31]
- Ensure user participation at the planning, design, and implementation stages of the project. Consultations with and the assistance of NGOs can be particularly helpful in minimizing adverse socio-economic impacts.
- Ensure women and other vulnerable groups are not disadvantaged by the project. This could be done through involving women in the Committee overseeing the compensation planning etc.
- Encourage the PAPs to join Village Community Bank (VICOBA) as a way of protecting their money. This is an activity that may be facilitated by the District Community Development Officer.

Loss of land and property

- To minimize the negative effects of the relocation of affected communities RAHCO shall develop a Resettlement and Compensation Plan. Consultations on the developed relocation program with the affected people are subject to relocation are important. They should be informed about the detailed timeframe of the relocation program. In addition, railway staff should be trained on relocation program if appropriate.

[31] JSB-EnviDep Ltd. 2015. RAP for Flood Protection Measures Project

- RAHCO has developed a preliminary Project Resettlement Framework containing possible mitigation measures (see Appendix 6). At the later stage, when the project is proved feasible, RAHCO will develop Resettlement Action Plan (RAP) where detailed action plan of physical displacement will be prescribed. Profound consultations with affected people shall be carried out. Consultations should be conducted not only with the people that are subject of displacement but also with the host community members. The affected community members should be involved in the decision-making process related to the resettlement process: compensation packages, resettlement assistance, suitability of proposed resettlement sites and the proposed timing.
- In terms of mitigation and reduction of negative impacts from disruption of social relationships and networks while considering resettlement opportunities priority should be given to those areas where the possible resettlement of the whole community / settlement exists.
- To address in a timely manner specific concerns that will be raised during the resettlement process Grievance Mechanism should be established at an early stage as possible. However it shall be noted that in spite of implementation of mitigation measures the members of those communities that are subject of resettlement will feel psychological discomfort and especially elderly groups will be affected.

7.2.2. Construction Phase

Impact 13: Construction health and safety hazards

In order to mitigate these impacts RAHCO should oblige construction company through contractual terms to conduct the following activities:

- First of all *Public health and Safety and Construction Health and Safety Plans* addressing the dust and noise issues during construction works should be developed.
- The following mitigation measures could be used to mitigate impacts of dust on the area isolation of the construction area from the settlements through special fences; adequate sheeting of vehicle loads up until tipping point when moving around the site; use of dust filters on fixed plant and machinery.
- To avoid negative impacts on the dust on the workers they should wear special masks especially those workers who are involved in the implementation of dust generating works.
- In order to mitigate the impacts from the noise caused due to the construction works noise barriers, such as temporary walls or piles of excavated material, between noisy activities and noise-sensitive receivers should be constructed. It is important to avoid conduction works during night-time since sensitivity of residents to noise increases during night hours. Therefore, it is very important to implement construction works during daytime hours (07:00 – 18:00). During construction works should be used special quiet equipment, such as silenced and enclosed air compressors and properly working mufflers on all engines.

It is very important to establish Grievance Mechanism through which local residents and workers could bring their concerns on the noise and dust caused to the construction. Their involvement in the process will help to undertake more appropriate measures to mitigate these impacts and monitor dust and noise impacts on the residents and workers.

Additional measures include:

- In order to avoid and minimize the pollution and ensure environmental safety of workers and the population all construction equipment should be licensed and permitted in good running conditions. This will allow avoiding accumulation of high concentrations of NO_X, SO_2 and other harmful substances at the construction site and their impact on workers.
- To protect the workers from excessive dust, the following shall be considered in the Construction Site Management Plan: regular watering of relevant sites, especially in dry and windy weather, regular washing of construction machinery and their wheels and use of closed waste containers to ensure additional protection from unpleasant smell
- At the operation stage use of diesel engines in closed spaces shall be restricted within depots and maintenance areas, exhaust mufflers shall be installed on internal boilers and proper ventilation of closed spaces shall be ensured.

Impact # 14: Temporary disruption of socioeconomic activities

- Establish and enforce good site management to limit the construction activities as close as possible to the construction site
- Develop and observe best practice - methods of working – e.g. avoid unnecessary noise
- Restrict hours of working during day light;
- Exercise efficient material handling to minimise vehicle movement
- Define access routes to the site, and try to avoid unnecessary inconvenience to communities
- Keep trucks and vehicle movements to a minimum possible

Impact # 15: Loss of aesthetics due to haphazard disposal of demolition waste

Mitigation measures under impacts # 6 and 9 apply

Impact # 16: Nuisance and disturbances from noise / vibrations (exceeding allowable level for people comfort) due to construction activities

Mitigation measures under Impact # 10 apply

Impact # 17: Occupational Health and Security and Safety (HSS) risks

In order to protect the workers against health and safety the following measures will be implemented:

- **Avoid use of faulty equipment, tools and risk practices:** Standards and operations and equipment: lifting, electrical isolation / installation, working at heights, manual handling, fitness for work, hand tools, housekeeping, building and office, vehicle and driving, hazardous substances etc. The Project Proponent and the Contractor shall employ trained /qualified and competent Personnel.
- **In order to protect the health and safety of the workers the Project proponent shall implement the following measure:**
  - ✓ Provide appropriate equipment and working condition. Provision of and enforcement of use of Personal Protective Equipment (PPEs) (workers and visitors).
  - ✓ Put in place fall-prevention systems for people working at elevated sites.
  - ✓ Install Signage: post warning signs with appropriate text (local language) and graphics.

- ✓ Observe standard working hours
- ✓ Secure equipment properly and demarcate any hazardous areas.

- **Enforce best code of practices at the work place**
- Observe internationally acceptable Performance Standards on health/safety requirements.
- Institute procedures and guidelines, work procedures, inspections and maintenance system,
- Implement in-house health and safety manual /guidelines
- **Avoid inadequacies in water and sanitation provisions by following measures:** Implement water conservation measures as indicated in the education information materials

Additional measure shall include:

- Water sprinklers shall be used to suppress dust during construction
- Post warning signs with appropriate text (local language) and graphics.
- Raise awareness on construction hazards to construction workers.
- In order to minimize the negative impacts from the entry of a temporary labour force into an area the *Workers Code of Conduct* with the *Community Liaison Plan*; rules of conduct while conflict situations; emphasizing cultural characteristics of the local communities if migrants from different cultures enter the area shall be developed. Moreover, workers should be trained in order to ensure that they behave according to the developed Workers Code of Conduct.

Impact # 18: Public HSS risks: traffic accidents, Risks of human-human transmission of diseases (STD, HIV etc.) Infections from putrescible wastes with disease pathogens

- Mitigating the public health and safety hazard include the mitigation measures under project management procedures and plans above,
- Cooperate with local Civil Society Organizations (CSOs)/public health offices in programmes for reduction/eradication of the diseases and establish worker's health protection procedures (e.g. make available free condoms to workers)
- Enforce surveillance measures e.g. yellow fever vaccination
- Enforce speed limit for vehicles
- Demarcate construction site to keep away the public

Other measures include:

- To minimize risks of local community members' accidents *Public Health and Safety Plan* shall be developed to mitigate the impacts of the movement of heavy equipment on existing local roads.
- The construction area should be isolated with special fences from the settled areas; clear signs should be posted at the entrance to the construction area to ensure that community members will avoid entrance of this area and will be more cautious when passing the construction site.
- *Construction Traffic Management Plan* shall be developed which will allow re-routing of the truck traffic from residential streets or using local roads with fewest homes for transportation of construction materials.
- Establishment of Grievance Mechanism could be also considered as one of the mitigation measures of this impact. Early notifications received from the public could support the monitoring of this issue and introduction of more effective measures in this regard.

Impact # 19: Vandalism of structures / equipment, theft of materials and portable items during construction

- Strengthen security on the construction site
- Strengthen patrol, particularly to mitigate theft of construction materials and fuel on its way to construction site

7.3. RAILWAY OPERATION

7.3.1. Environmental Impacts

Impact # 20: Release of oils and fuels in the aquatic environment
Mitigation measures under impacts # 5 and 6

Impact # 21: Impairment of local air quality
Mitigation measures under impacts # 4 and 8 apply

Other mitigation measures include:

- Proper maintenance of trains, rails and wheels;
- Speed of trains may be restricted when passing the sensitive areas;
- Supporting structures may be constructed along the railway track which will play a role of acoustic screens.

7.3.2. Social Impacts

Impact # 22: Occupational and Public health and safety
Mitigation measures under impact # 18
In order to reduce risks of worker accidents during rail operations TRL will:

- Develop and implement a *Safety Program* in accordance with the international norms.
- Ensure that every manager and worker receives training before they perform any work on the line, and are provided refresher training at least every year thereafter. This applies to temporary workers as well.
- Train workers in personal track safety procedures
- Block train traffic on lines where maintenance is occurring (green zone working) or if blocking the line is not possible use an automatic warning system
- Segregation of stabling, marshalling and maintenance areas from running lines.
- Railway workers should schedule rest periods at regular intervals and during the night to the extent feasible, to maximize the effectiveness of rest breaks and in accordance with international standards and good practices for work time in order to avoid fatigue of workers and accidents invoked by this.

Impact # 23: Potential loss of lives and property as a result of falling off from moving train, collision with train at road crossing as a result of increased train frequencies

- To avoid, minimize and control the risks associated with crossings the use of bridges or tunnels is recommended. If level crossings are unavoidable, signals shall be installed and their regular inspection/maintenance provided.
- Increase the security at all railway station

- Continuously provide awareness campaign to inform passengers on the dangers of boarding or disembarking train while the train is moving.
- In order to reduce risks of public accidents on the places of local roads crossing TRL will develop and implement a *Safety Program* in accordance with the international norms. Underpasses or level crossings should be developed based on the consultations with the public and representatives of local government.
- In addition for reducing risks of pedestrians during the rail operation visible warning signs should be posted at potential points of entry to track areas. Fencing or other barriers should be installed at station ends and other locations to prevent access to tracks by unauthorized persons.
- Stations should be designed in such a way to ensure that the authorized route is safe, clearly indicated and easy to use.
- In addition awareness raising campaign should be conducted in the area for the local public to provide them relevant information and increase their awareness on the risks of trespassing.

Impact # 24: Additional pressure and demands on local social services and resources (increase water users, toilet users)

- Ensure there enough amenities at all stations
- Ensure availability of clean water at all stations
- Construct passenger waiting room
- Provide areas for canteen operation

Impact # 25: Vandalism of structures / equipment, theft of materials and portable items during operation

- Strengthen patrol of the railway infrastructure
- Work with village leadership to get their cooperation to guard the infrastructure
- Strengthen community outreach and Corporate Socio Responsibility programmes

7.4. NATURAL, ACCIDENTAL AND ANTHROPOGENIC EVENTS

7.4.1. Environmental Impacts

Impact # 26: Physical damage of project structures and disruption of railway operations and schedules due to natural causes

- This project is aimed at mitigating recurrent flood risk as such efforts should be made to implement it

RAHCO should develop a disaster management program. The main tasks of this programme are:

- Introduction and systematic use of methods for analyzing, evaluating and predicting the risks of disasters in practice;
- Improve the management and coordination activities for the reduction of disaster risk and increase the resilience of sites of critical infrastructure;
- Establishment of an early warning system and notification of disasters;
- Improving the quality of management, organization and technical provision of the single rescue system;
- Development of systems for seismic surveys and monitoring of water basins and rivers;

- Improving the system for training of managerial staff for disaster response;
- Public education using modern technologies and media to form a culture of safe life activity.

Impact #27: Impairment of environmental quality due to accidental events

The following internationally recognized management actions are recommended for the railway operations:

- ✓ ***Continuous research and monitoring to determine the reasons for and reduce the risk of freight train derailment:*** The probability that a train will be involved in a derailment is a function of the quality of track, the length of train, and exposure in terms of distance travelled. The probability of derailment for an individual carriage within a derailed train consist is a function of the point of derailment (position within the consist), train length, train speed, and the cause of accident. Changes to any of these parameters can alter the risk level of particular shipments.[32]
- ✓ Implementation of rail operational safety procedures aimed at reducing the likelihood of train collisions, such as a positive train control (PTC) system. If a full PTC system is not practical, automatic rail switches should be installed or, where manual switches remain, documenting when a manually operated switch in non-signalled territory is changed from the main track to a siding, and returned back to the normal position for main track movements. This information should be communicated to all crew members and the train dispatcher.
- ✓ Regular inspection and maintenance of rail lines and facilities to ensure track stability and integrity in accordance with national and international safety standards.
- ✓ Implementation of an overall safety management program that is equivalent to internationally recognized railway safety operations. Examples include the elements of a safety management system specifically applicable to rail such as provided in the European Union Railway Safety Directive 2004/49/EC or Guidelines for the Safety Management System published by the Safety Management in Railways group of the International Union of Railways (IUR).[33]

Accidents related to the transportation of dangerous goods

Implementation of a system for the proper screening, acceptance and transport of dangerous goods. Since this kind of material could be provided by third parties, the screening and acceptance process should be in accordance with international standards applicable to packaging, marking and labelling of containers. RAHCO should develop spill prevention and control, and emergency preparedness and response plans and ensure its implementation.

Vegetation

- In case of damage of the vegetation as a result of railway accidents (oil spills, destruction of the soil horizon, etc.) along with implementation of the Emergency Response Plan, actions for elimination of the consequences of the pollution and rehabilitation of the vegetation shall be undertaken in a timely manner.
- Regular training of the relevant employees for preparedness and timely and effective response to emergency situations.

[32] Anderson & Barkan, URL: http://ict.illinois.edu/railroad/CEE/pdf/Anderson%20&%20Barkan%202005%20IHHA134.pdf (August 2009).
[33] IFC, EHS Guidelines, Railways, 2007.

Impact # 28: Impairment of railway operations as a result of flooding of Gombe Dam
RAHCO shall continuously liaise with the operator of the Gombe Dam to ensure that the dam is effectively operated to ensure that it does not flood beyond its boundaries.

7.4.2. Social Impacts

Impact # 29: Increased train frequencies and therefore smoothen passenger and cargo movement

- RAHCO should invest in other requirements of efficient railway system operation such procure more wagons, more engines, etc. so as to take advantage of improved railway line.

Impact # 30: Protection of roads from heavy cargo as is the current practice

- Tanzania should make it mandatory to transport heavy cargo with railway system instead of using road

Impact # 31: Increased income to local suppliers

The construction period of the project will have temporary positive impact also on the local economy.

- In order to support this process Local Procurement Plan will be developed aiming at providing opportunities for procurement contracts with local companies in the context of all areas of service requirement during construction.

Impact # 32: Employment opportunities
The construction period of the project will have temporary (about six years) positive impact on the local labour market.

- In order to optimize this positive impact Local Workforce Recruitment Plan will be developed aiming at providing opportunities for employment of local workforce. Information with regard to construction recruitment will be comprehensively and timely communicated to the local community members by contractors.

Impact # 33: Increased income and improved or livelihoods as result of increased agricultural production, trading activities, and movement of people within the region and bordering countries

- Measure under impact # 18 will apply

Impact # 34: Improved comfort of passengers as a result of increased train frequencies

- Measure under impact # 18 will apply

Impact # 35: Improved quality of the landscape features and appearance of the river embankments

- River embankment measures should be implemented as proposed

Impact # 36: Improved flood management emanating from proper operation of the Gombe Dam

- Measure under impact # 28 will apply

7.5. DECOMMISSIONING PHASE

Impact # 37: Environmental degradation due to haphazard disposal of wastes
Mitigation measures under Impacts #6 and 9 apply

Impact # 38: Loss of employment

- Preparing the workers to be employed elsewhere through regular and periodic training
- Ensuring that all employees are members of the Social Security Fund. The employer shall ensure that the company contributions are paid to respective Social Security Fund.

Impact # 39: Loss of income to government

- The government to develop other transport sectors to compensate for the loss

Impact # 40: Destruction of road infrastructure as the cargo will revert back to current transport system

- The government to strictly enforce maximum allowable axle load

7.6. GRIEVANCES HANDLING PROCESS

During the implementation of the project, some issues may be handled differently contrary to what is recommended in this EIS, some mitigation measures may fall short, and the project proponent may overlook some aspects of the Environmental and Social Management Plan. The Grievance procedure presented in the Compensation and Resettlement Plan (CRP) (Chapter 10) should be used to handle grievances. However, the structure of environmental management which starts at Village Level with the Village Environmental Committee up to the Minster responsible for environment may be used as appropriate.

8. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.1. INTRODUCTION

The Environmental and Social Management Plan (ESMaP) shown in **Table 89**, provides the way forward for implementation of the identified mitigation measures. RAHCO and the Consultant shall implement components related to design, while the Contractor shall implement components relevant to demolition, mobilisation, construction and installation. RAHCO shall be responsible for overall implementation of the ESMaP, as summarised in **Table 89**.

RAHCO Environmental Control Officer shall make day-to-day follow-ups (supervision and liaising with stakeholders). The estimated costs for implementing the mitigation measures are just indicative. Appropriate bills of quantities should clearly give the actual figures. The consultant uses informed judgement to determine these figures.

8.2. INSTITUTIONAL CAPACITY

8.2.1. The Project Proponent: RAHCO

Implementation of the ESMaP is solely the responsibility of the project proponent. RAHCO shall supervise and monitor all components implemented by the Contractor. RAHCO shall provide the necessary supervisory oversight to ensure the mitigation measures are implemented.

Health Safety and Environment (HSE) Roles and Responsibilities for Key Personnel

The project's HSE will be developed to ensure that the environmental management requirements identified during project implementation are implemented on site through clear designation of roles and responsibilities.

The roles and responsibilities for managing environmental and social issues associated with the proposed project, rest principally the Project proponent, RAHCO (and contractors will be contractually mandated to implement all mitigation measures during mobilisation and construction). As per the EMA Cap 191 the local authorities and NEMC may play an oversight role. A summary of the HSE responsibilities for the key personnel within RAHCO are given:

RAHCO Director General (DG) - Overall Responsible for RAHCO corporate management in Tanzania, including overall responsibility for ESIA compliance, the DG is the principal interface to the Tanzania Government for all RAHCO issues.

RAHCO Project Manager – will be ultimately responsible for the safe and environmentally acceptable execution of the project in a manner consistent with the requirements of the ESMaP of this EIS.

Environmental Control Officer (ECO) – RAHCO may designate an ECO whose would be Responsible for oversight of environmental compliance. The ECO shall provide day-to-day supervisory role during the entire construction period. The ECO shall be capacitated to coordinate the implementation of the various activities in the ESMaP and ensure all RAHCO's HSE management requirements are met by all aspects of the project. The ECO shall be the main contact person on all environmental and social matters related to the project (shall maintain contacts with officials in the various relevant Ministries, Departments and agencies both central and within Local Government Authorities and the RAHCO.

RAHCO Project Consultant - The Consultant shall ensure that those mitigation measures that are to be incorporated in the designs are completed before the implementation of the project; and that all mitigation measures are implemented in each phase before signing performance certificates.

8.2.2. Contractor

The Contractor shall ensure that those mitigation measures that are to be implemented during mobilisation and construction are attended to. The Contractor shall designate among its staff /appoint an officer to act as Environmental Liaison Officer (ELO) and he/she will be responsible to ensure the environmental and social management mitigation measures are implemented during the contract period. The ELO will report to the RAHCO ECO. The ELO after being provided with the required capacity shall be responsible for:

- Establishing procedures, contracts, memorandum of understanding (MOU), where applicable, for interaction with authorities and local communities.
- Keeping record of materials and technologies used and actions performed and reporting on the same (environmental monitoring and reporting).
- Documenting all complaints/conflicts/disagreements with details of the persons involved and the subject matter.
- Coordinating necessary studies/inspections of environmental performance (self-audits).

8.2.3. Capacity Development and Training

To support timely and effective implementation of environmental project components and mitigation measures, the ESMaP draws on the EA's assessment of the existence, role, and capability of environmental unit on site or at RAHCO headquarters. RAHCO shall train all staff in the environmental unit to enhance their capacity to provide the needed supervisory role of the ESMP implementation and conducting monitoring. The training should be provided prior to the commencement of the project. The training should cover clearly specific description of institutional arrangements as far as the project is concerned i.e. who is responsible for carrying out the mitigatory and monitoring measures (e.g., for operation, supervision, enforcement, monitoring of implementation, remedial action, financing, reporting, and onsite staff training). To strengthen environmental management capability at RAHCO the following additional topics shall be covered (a) technical assistance programs, (b) procurement of equipment and supplies, and (c) organizational changes.

8.2.4. Stakeholders

A number of stakeholders will come into play during implementation of the ESMaP. It will be the responsibility of RAHCO ECO to coordinate the involvement of relevant government authorities and service providers particularly Kilosa and Mpwapwa District Councils; Gulwe Ward, Msagali Ward, Igandu Ward; Mkadage Village, Munisagara Village, Muzaganza Village, Mwasa Village and Kidete Village all in Kilosa District and Godegode Village, Kimagai Village in Mpwapwa and meet related costs. Roles of some of the key stakeholders are summarized as follows:

Table 88: Roles of different key stakeholders

Stakeholder	Role in ESMP implementation
Mkadage Village, Munisagara Village, Muzaganza Village, Mwasa Village and Kidete Village all in Kilosa District and Godegode Village, Kimagai Village in Mpwapwa (Community Development, Environment Management, etc.)	- Community mobilization and awareness (material mobilisation, drilling operations and related safety hazards, HIV/AIDS, etc.
Gulwe Ward, Msagali Ward and Igandu Ward	- Community mobilization, training and awareness

Table 89: Environmental and social Management Plan

Receptor	Project Aspect / Potential Direct Impacts	Mitigation Measures/ Management Programme	Target Level/ Standard	Responsibility	Estimated Costs [Tsh]
DESIGN AND MOBILISATION PHASE					
Natural Resource Receptor	Impact # 1: Land disturbances / soil erosion at onsite and offsite location	In order to mitigate land degradation onsite and offsite the contractor shall, through the entire mobilisation phase, implement the following measures: ▪ Implement soil erosion control and land rehabilitation measures at all project sites and offsite locations ▪ Ensure strict control of trucks, vehicles as well as equipment and machinery to ensure that they operate only within the project area ▪ Limit excavations area needed for construction works, construct temporary drainage grooves and sedimentation ponds for surface runoff collection and compact the disturbed areas soon after construction. ▪ Compact the disturbed areas soon after construction. ▪ Whenever possible development activities shall be implemented when the agents of erosion (i.e. rain and wind) are not active. ▪ RAHCO will monitor areas of exposed soil during periods of heavy rainfall throughout the project development phase.	All disturbed land is rehabilitated	RAHCO	25,000,000
Natural Resource Receptor	Impact # 2: Loss / damage / disturbance of indigenous vegetation and contained biodiversity species	In order to mitigate loss, damage, disturbance of indigenous flora and fauna, through the entire project phases, RAHCO shall ensure the following measures are implemented: ***Vegetation*** ▪ Develop and Implement a Flora and Vegetation Conservation and Soil Restoration Plan – which shall include: conduct pre-construction floristic conservation survey; identification and re-planting of the species to be conserved in similar alternative habitats; collection of their seeds and bulbs and establishment of small-scale nurseries and ex- situ and in situ conservation measures. ▪ Train the workers and construction site managers in avoiding cutting of trees and bushes along the RoW and destruction of soils on large areas ***Fauna*** Examine at each section: ▪ breeding areas of special wildlife and invertebrates in water objects ▪ presence of small mammals; ▪ presence of the nests of protected birds;	As minimum impact as possible	RAHCO	50,000,000

Receptor	Project Aspect / Potential Direct Impacts	Mitigation Measures/ Management Programme	Target Level/ Standard	Responsibility	Estimated Costs [Tsh]
		▪ presence of colonies of bats in the trees to be cut; and ▪ whether the individual section of a big mammal falls within the construction zone. ***Mitigation of noise*** The Contractor shall implement the following measures: ▪ Maintaining machinery and equipment in good running conditions and avoiding sudden loud noise ▪ Use quiet equipment (i.e. equipment designed with noise control elements) and the proponent will ensure all vehicles have properly functioning mufflers, ▪ Establish and enforce good site management ▪ Develop and observe best practice - methods of working ▪ Restrict hours of working during day light at the settlements; ▪ Exercise efficient material handling ▪ Define access routes to the site with the smallest number of properties in proximity ▪ Keep trucks and vehicle movements to a minimum possible			
Material efficiency and waste receptor	Impact # 3: Depletion at point source	▪ RAHCO shall ensure that the construction materials such as sand, gravel, natural stones, ballast are procured from registered quarry and sand mining firms, whose projects have undergone satisfactory environmental assessment/audit and received NEMC/District Council approval. ▪ RAHCO shall impress the Contractor to avoid over procurement of construction materials ▪ RAHCO shall impress the Contractor to avoid wastage, damage or loss (through run-off, wind, etc.) of materials at the construction site	Resources are used as per requirement	RAHCO	0
Air quality and climate change receptor	Impact # 4: Impaired air quality & contribution to climate change due to release of dust, greenhouse gases and other noxious air pollutants	In order to mitigate the impairment of climate change, throughout the project cycle, the Contractor, RAHCO will continuously implement the following measures: ▪ Use of best practice management techniques during extraction, loading and transporting raw materials. ▪ Use efficient trucks and vehicles ▪ Train driver training to minimize emissions (e.g. prevention of over revving, shut off engines when vehicles not in use). ▪ Regular (monthly) servicing of engines ▪ Avoiding idling of engines ▪ Ensure efficient equipment operations and maintenance measures to minimize	Environmental Management (Air Quality Standards) Regulations, 2007	RAHCO	100,000,000 per year

Receptor	Project Aspect / Potential Direct Impacts	Mitigation Measures/ Management Programme	Target Level/ Standard	Responsibility	Estimated Costs [Tsh]
		emissions. ▪ Institute proper planning of transportation of materials to ensure that vehicle fills are increased in order to reduce the number of trips done or the number of vehicles on the road.			
Water resources receptor	Impact # 5: Release of oils and fuels in the aquatic environment	In order to protect the receiving environment against fuels the Contractor and RAHCO shall implement the following measure: ▪ Fuels and lubricants shall be stored only at designated areas. ▪ Storage of fuel and lubricants shall be kept at least 30m from the edge of the surface waters e.g. rivers ▪ Refuelling and lubrication of equipment shall be restricted to areas at least 30m away from the edge of the surface waters ▪ Perform all routine equipment maintenance at least 30 meter away from the edge of the rivers and recover and dispose of wastes in an appropriate manner. ▪ Fixed fuel dispensing locations will be provided with secondary containment to capture fuel from leaks, drips, and overfills. ▪ A supply of sorbent and barrier materials sufficient to allow the rapid containment and recovery of spills shall be maintained at construction site ▪ Ensure that all equipment is free of leaks prior to use on the Project and prior to entering or working in or near the water bodies. ▪ Conduct regular maintenance and inspections of the equipment to reduce the potential for spills or leaks. ▪ Rubber-tired vehicles (trucks) shall refuel at commercial fuel stations. Tracked machinery (e.g. backhoes, bulldozers) shall be refuelled and lubricated on the construction site.	Environmental Management (water Quality Standards) Regulations, 2007	RAHCO	Covered under impact # 4
Water resources receptor	Impact # 6: Contamination of surface and ground waters with demolition debris and soils	In order to mitigate impacts of demolition waste the Contractor together with RAHCO shall be guided by the waste management guidelines as follows:[34] ▪ Prevent the generation of hazardous waste; ▪ Where elimination is not possible apply means and techniques to reduce the quantity of hazardous waste generated; ▪ Minimize amount of waste for disposal by recycling, reuse and/or recovery. This includes the recovery of energy which may be available from the waste.	All waste are handled accord to respective regulations	RAHCO	10,000,000

[34] Environmental Management (Harzadous waste Managenement) Regulations, 2008

Receptor	Project Aspect / Potential Direct Impacts	Mitigation Measures/ Management Programme	Target Level/ Standard	Responsibility	Estimated Costs [Tsh]
		▪ Treat waste to stabilize, immobilize, contain or destroy hazardous properties. ▪ Dispose of residues with minimum environmental impact. ▪ Appropriately contain, isolate and store hazardous waste for which no acceptable treatment or disposal option is currently available. Other specific measures that will be implemented are: ***Inert Construction Materials:*** These materials shall be used for construction of embankments, acoustic barriers or as filling materials on rural roads. **Non-hazardous Waste:** ▪ Concrete waste will be disposed in similar manner as inert wastes. ▪ Metal waste shall be disposed separately for reuse and recycling. ***Hazardous Waste:*** ▪ Hazardous wastes will be collected and transported to Dar es Salaam for their final disposal. ▪ Uncontrolled incineration will not be allowed. ▪ Before removal of wastes from the site, the quantity (volume) and size of wastes; the name of waste collector/disposal agent and the name of the place of their final disposal/measure shall be specified. This issue shall be controlled by site manager ▪ The technical personnel shall be trained and informed about the appropriate regulations for handling hazardous waste i.e. Environment Management (Hazardous Waste Control and Management) Regulations, 2008 ▪ After demolition the place shall be restored to the pre-construction state.			
CONSTRUCTION PHASE					
Land resources receptor	Impact # 7: Land disturbances / soil erosion	In addition to mitigation measures listed under impact # 1 following measures will also be implemented: ▪ RAHCO shall make land management and soil erosion control a requirement in the bidding document; ▪ RAHCO shall develop management plans for its existing quarry sites, and new sources of construction materials. ▪ Contractors will be required to control soil erosion and rehabilitate disturbed land; RAHCO shall provide oversight supervision and monitoring during and after project implementation.	All site with erosion tendencies	RAHCO	The cost of implementing these measures is part of the project implementation. They will be included in bill of quantities

Receptor	Project Aspect / Potential Direct Impacts	Mitigation Measures/ Management Programme	Target Level/ Standard	Responsibility	Estimated Costs [Tsh]
		▪ Contractor shall identify erosion prone areas, identify permanent erosion control measures (applicable for a particular site) and plan construction works and sites to limit quantity of material likely to be eroded and transported into the nearby rivers. ▪ Deliberately the Contractor will cover exposed soils with grass and other appropriate species as soon as possible and temporarily will bind exposed soil and redirect flows from heavy runoff areas that threaten to erode or result in substantial surface runoff to adjacent water courses. ***Topsoil removal, disposal and piling*** ▪ First of all the topsoil and then subsoil shall be cut and piled (stocked) separately on specially selected area for their purposeful use. ▪ The stocked topsoil should not be mixed up with unfertile soils, stones, etc. It should be prevented from washing to preserve the structure, fertility and seeds base of the topsoil. ▪ Topsoil will be stored in the form of stockpiles having the height up to 2 m and slope inclination up to 30-35^{o}. ▪ Erosion of stockpile surface shall be provided through compacting surfaces to the level having no threat of development of anaerobic processes. ▪ The Contractor shall stop topsoil removal and stocking operations if topsoil is saturated with water. ▪ Stocked soil shall be protected from washing, therefore, it is necessary to arrange drainage [system] in the bottom of the storage. ▪ Stocking of removed topsoil outside the RoW, shall be avoided as far as possible. If this is not possible appropriate sites shall be identified and used in accordance with the current Tanzania Laws (e.g. Village Land Act, 1999)			(the design team estimate this at 667,811,000)
Land resources receptor	Impact # 7: Continue	***Erosion control*** Following erosion control measures shall be implemented: ▪ Arrangement of berms, stone mounds and gabions will be required at the cut slopes and in the bottom of the slopes. ▪ Cut topsoil shall not be used for construction of berms within the RoW. ▪ At the location of cult slopes and ravine crossings where the excavation works are to be carried out, water collecting and conveyance canals shall be built to regulate the flows of surface waters. ▪ At the ends of water conveyance canals the settlers shall be arranged (pits, sand sacks) to prevent damage of areas adjacent to RoW with water.	All site with erosion tendencies	RAHCO	The cost of implementing these measures is part of the project implementation. They will be included in bill of quantities (the design

Receptor	Project Aspect / Potential Direct Impacts	Mitigation Measures/ Management Programme	Target Level/ Standard	Responsibility	Estimated Costs [Tsh]
		▪ Phyto-amelioration measures shall be implemented to stabilize the edges of slopes and cut slopes if required. ▪ It is particularly important to protect the removed and stocked topsoil from erosion processes – as follow. ✓ Stocked topsoil shall be drained. ✓ To control erosion processes at the edge of the cut slope, phyto-amelioration measures shall be implemented on the slope. ✓ For regulation of surface waters, berms and water canals shall be arranged at the edge of the slope that will be connected to natural water courses to avoid development of lateral erosion. ***Soil reinstatement measures*** ▪ After completion of excavation works and laying the rails the soil reinstatement activities shall be implemented in the areas adjacent to the embankment. ▪ The reinstatement works shall be carried out in favourable meteorological (dry) conditions and in the shortest possible time. ▪ During implementation of soil reinstatement works mechanical and physical-chemical characteristics of soils shall be taken into account. ▪ Soils shall be reinstated at least to its initial state for the purpose of observation of the principles of environmental safety and preservation of the recreational value of landscapes.			team estimate this at 667,811,000)
Land resources receptor	Impact # 7: Continue	▪ Reinstatement works to be carried out within the framework soil quality management; therefore the following will be required: ✓ preservation of landscapes and their recreational value; ✓ reinstatement-conservation of the areas modified as a result of construction activities to their initial visual-aesthetic state as much as possible; ✓ the construction shall not cause negative impact on the environment of the railway route and the RoW; ✓ implementation of slope stabilization and designing activities at the crossings of the railway with ravines; ✓ reinstatement of the private land parcels located in the vicinity of the railway bypass to their initial state, conservation of their fertility and natural characteristics; ✓ implementation of erosion control measures along and in the vicinity of the railway.	All site with erosion tendencies	RAHCO	The cost of implementing these measures is part of the project implementation. They will be included in bill of quantities (the design team estimate this at 667,811,000)

Receptor	Project Aspect / Potential Direct Impacts	Mitigation Measures/ Management Programme	Target Level/ Standard	Responsibility	Estimated Costs [Tsh]
		Other mitigation measure include: ▪ ***Training of workers and construction site managers*** to avoid, along other impacts, destruction-trampling and mechanical damage of soils by construction machinery in the areas adjacent to the construction sites.			
Air quality and climate change receptor	Impact # 8: Impaired air quality & contribution to climate change due to release of dust (including fugitive (unavoidable, residual), greenhouse gases and other noxious air pollutants	Mitigation measures listed under Impact # 4 apply.		RAHCO	Covered under Impact # 4

Receptor	Project Aspect / Potential Direct Impacts	Mitigation Measures/ Management Programme	Target Level/ Standard	Responsibility	Estimated Costs [Tsh]
Water resources receptor And Land Resources Receptor	Impact # 9: Impaired land and water qualities and contained resources from discharge of pollutants (wastes, oily substances etc.)	In addition to mitigation listed under Impact # 5 and Impact # 6 , the Contractor and RAHCO shall implement following additional measures: ▪ Develop and implement project – specific Waste Management Procedure / Plan (i) identify what type of solid or liquid wastes and categories of wastes the project will generate or handle (biodegradable / organic wastes; packaging materials; non-biodegradable (metallic, plastic), and hazardous wastes i.e. fuels, oils, lubricants, vehicle / machinery fluids etc.);(ii) identify ways to reduce the volume of waste by reusing or recycling initiatives (iii) establish technological interventions to capture and removal unwanted materials and sand before entering the water ways i.e. bar screens, sand traps and grit chambers. The following are specific waste management procedures to be implemented: ▪ During earthworks, i.e. excavation, digging pits, quarrying, etc. Contractor shall ensure the top soil is pilled aside at one place, then after finishing the earthwork the top soil shall be used to fill any bare land surfaces around the site. ▪ Plastic and glass bottles (about 9kg per day) shall be collected into litter bins, and transported to plastic recyclers. ▪ At completion of each day, site shall be left clean and tidy; debris, scrap and spill materials removed. ▪ Biodegradable waste of about 900kg per day consisting of mainly paper, etc. from offices and open workshop will be disposed by burying ▪ Batteries will be sent to YUASA in Dar es Salaam for recycling ▪ No waste oil will be disposed at the site during construction. Fuel, oils and lubricants (300kg per day) on average from construction machinery and equipment from maintenance workshops, fuelling points etc. will be collected for use in furnaces ▪ Demolition debris will be used during construction as construction aids or distributed to community project and filling of rural roads. Following specific measures shall be implemented where applicable: ***Inert Construction Materials:*** measures listed under impact # 6 apply	Environmental Management (Waste Management) Regulations, 2008	RAHCO	50,000,000

Receptor	Project Aspect / Potential Direct Impacts	Mitigation Measures/ Management Programme	Target Level/ Standard	Responsibility	Estimated Costs [Tsh]
	Impact # 9: continue	The Contractor and RAHCO shall implement following additional measures to mitigate water pollution from vehicle related activities: ▪ vehicle fuelling stations (in case of their existence at the construction stage) shall be embanked to prevent spread of fuel and pollution of the surrounding area in case of accidental spills; ▪ vehicle wash areas within the garages shall be embanked. For wastewater treatment a primitive treatment facility in the form of concrete covered two-step ditches to prevent discharge of untreated waters in ravines and rivers; ▪ washing of vehicles in river and other surface water object shall not be allowed; ▪ layers of soil polluted by fuel and lubricants spilled from construction machinery shall be removed and transported to the place agreed with the Vice President's Office (VPO), Division of Environment (DoE), Department Natural Resources in advance; ▪ when painting metal constructions, especially metal bridges, tin or other covers shall be placed under the sections to be painted to avoid spill of paints into the surface water objects; ▪ Crossing of the planned railway with water bodies shall be designed in a manner to avoid penetration of pollutants in water bodies. Other wastes ▪ places for toilets within the construction camps shall be selected with consideration of the groundwater levels. ▪ Cesspools shall be covered with cement solution to avoid pollution of groundwater with faeces. ▪ Cesspools shall be emptied on a regular basis in accordance with the number of workers living in the construction camp. ▪ construction waste shall be piled at a distance of at least 50 m from the riverbeds of rivers and ravines prior to disposal to the specially allocated dumpsites; ▪ temporary barriers shall be arranged at the small ravines and gullies to avoid movement of increased volumes of solid materials from the RoW to large ravines and rivers at the construction stage; ▪ the design of shall ensure protection of the groundwater and the river water from pollution			

Receptor	Project Aspect / Potential Direct Impacts	Mitigation Measures/ Management Programme	Target Level/ Standard	Responsibility	Estimated Costs [Tsh]
Water resources receptor And Land Resources Receptor	Impact # 9: Continue	**Non-hazardous Waste - *mitigation measures listed under impact # 6 apply*** ▪ Construction camps will be provided with toilet / shower facilities connected to a regularly empting septic tank; ▪ Special waste bins and waste collection system will be introduced to ensure disposal of wastes at landfills; ▪ The concrete wastewater will be collected, processed through a sedimentation tank and neutralized, usually with gaseous CO_2, before their disposal; ▪ Vegetation wastes generated from site clearance during construction can be left on the site only in exceptional cases. They will be transported to the suitable waste management facility; ***Hazardous Waste – mitigation measures listed under impact # 6 apply*** ▪ Reserves of potential polluters will be stored on special insulating bedding and fenced by a berm made of the similar material to retain the polluter in an amount of 10% more than stored. ▪ During operation all stationary construction machinery operating on diesel and petrol will be equipped with a special container to collect leaking fuel for disposal. ▪ Main equipment and vehicles will be fuelled on special insulating bedding wherever possible. ▪ A special attention will be paid to prevention of fuel spills. Special collectors will be installed at the points of potential leakage. Absorbents will be used as well. Fuel will be transported by specially designed fuel trucks. ▪ Collection, treatment and transportation of waste wastes generate at the construction site will be implemented in accordance with the general plan of waste management. ▪ Wastes shall be collected on a daily basis. Waste bins labelled with special signs will be placed on specially allocated points for collection and further disposal of wastes.	Environmental Management (Solid Waste Management) Regulations, 2009 Environmental Management (Hazardous Waste Control and Management) Regulations 2008	RAHCO	

Receptor	Project Aspect / Potential Direct Impacts	Mitigation Measures/ Management Programme	Target Level/ Standard	Responsibility	Estimated Costs [Tsh]
Natural environment & biodiversity receptor	Impact # 10: Temporary disturbances / flight of aquatic fauna from noise emission	In addition to mitigation listed under Impact # 2, the Contractor and RAHCO shall implement following additional measures: ▪ During the construction phase small supporting enterprises, construction camps, parking and maintenance areas shall be arranged at a considerable distance from the settlements. ▪ If protected species are found, special measures to minimize their disturbance during reproduction and breeding periods will be develop and implemented; ▪ Arrange fences to prevent animals from falling into the trenches. Before filling the trenches make sure that there is no animal there. In general, it will be sufficient to place wooden boards in trenches that will be used by animals for escaping; ▪ Keep old trees near the RoW during the construction works; ▪ After completion of construction works the water courses and forest strips shall be recovered, topsoil shall be reinstated and re-cultivated, shrubbery shall be planted along the RoW. Pipes laid in gorges will play the role of so-called "Green Bridges" for animals.	Environmental Management (Noise and Vibration) Regulations, 2008	RAHCO Contractor ECO ELO	The costs are covered under impact # 2
SOCIAL IMPACTS					
SITE SELECTION, MOBILISATION AND CONTSRUCTION PHASES					
Acrcheology and Cultural Heritage Receptor	Impact # 11 Destruction of archaeological and cultural heritage resources	▪ During implementation of eartheworks at the project sites and adjacent areas permanent inspection/monitoring of the archaeologist shall be done ▪ The results of inspection will be reflected in the construction progress report ▪ If cultural / archeological heritage is discovered or the grounds for assuming its existence are revealed during construction works, RAHCO (or/and its Contractor) is legally bound to stop the activities that bear the risk of damaging cultural heritage and inform in writing the Director of Archeology and Cultural Resources in the Division of Antiquities, Ministry of Natural Resources and Tourism . The Director has to verify the discovered cultural heritage or the grounds for supposing the discovery and inform RAHCO 9or /and its Contractor) about the verification results in writing no later than in 2 weeks after receipt of the notification.	Antiquities Act No 10 of 1964	RAHCO	Part of construction costs (the design team estimate this at 667,811,000)
Community wellbeing receptor	Impact # 12: Change or modification of population and its quality of life due	In order to mitigate impact associated with land take and land use change RAHCO shall implement the following measures, before project implementation begins; ▪ The Project Affected People will be compensated as proposed in the Resettlement Action Plan (RAP)	All PAPs to be compensated for their land and property before the project kicks	RAHCO	The estimated costs are contained in the CRP

Receptor	Project Aspect / Potential Direct Impacts	Mitigation Measures/ Management Programme	Target Level/ Standard	Responsibility	Estimated Costs [Tsh]
	to land take	▪ Ensure user participation at the planning, design, and implementation stages of the project. Consultations with. ▪ Ensure women and other vulnerable groups are not disadvantaged by the project. ▪ Encourage the PAPs to join Village Community Bank (VICOBA) as a way of protecting their money. ***Loss of land and property*** ▪ To minimize the negative effects of the relocation of affected communities RAHCO shall develop a Resettlement and Compensation Plan. RAHCO has developed a preliminary Project Resettlement Framework containing possible mitigation measures ▪ Consultations with the PAPs on the developed relocation program shall be continuously be made. Information on timeframe of the relocation program should be provides. In addition, railway staff should be trained on relocation program if appropriate. ▪ Consultations should be conducted not only with the people that are subject of displacement but also with the host community members. The affected community members should be involved in the decision-making process related to the resettlement process: compensation packages, resettlement assistance, suitability of proposed resettlement sites and the proposed timing. ▪ In terms of mitigation and reduction of negative impacts from disruption of social relationships and networks while considering resettlement opportunities priority should be given to those areas where the possible resettlement of the whole community / settlement exists. ▪ To address in a timely manner specific concerns that will be raised during the resettlement process Grievance Mechanism should be established at an early stage as possible.	off		
CONSTRUCTION PHASE					
Welfare, Health & Well-being receptor	Impact 13: Construction health and safety hazards	In order to mitigate these impacts RAHCO should oblige construction company through contractual terms to conduct the following activities: ▪ To develop and implement *Public health and Safety and Construction Health and Safety Plans - these should* address the dust and noise issues. ▪ Where possible erect special fences; provide adequate sheeting of vehicle, ensure loads up until tipping point when moving around the site; use of dust filters on fixed plant and machinery.	OSHA Regulations	RAHCO	20,000,000

Receptor	Project Aspect / Potential Direct Impacts	Mitigation Measures/ Management Programme	Target Level/ Standard	Responsibility	Estimated Costs [Tsh]
		▪ The workers they should provided with and require wearing protective special masks especially those workers who are involved in the implementation of dust generating works. ▪ Where possible noise barriers, such as temporary walls or piles of excavated material, between noisy activities and noise-sensitive receivers should be constructed. ▪ Where possible avoid conduction works during night-time ▪ Use special quiet equipment, such as silenced and enclosed air compressors and properly working mufflers on all engines. ▪ Develop and implement Grievance Mechanism through which local residents and workers could bring their concerns on the noise and dust caused to the construction. Additional measures include: ▪ Avoid and minimize the pollution and ensure environmental safety of workers and the population all construction equipment is maintained in good running conditions. ▪ Develop and implement Construction Site Management Plan: which will regular watering of relevant sites, especially in dry and windy weather, regular washing of construction machinery and their wheels and use of closed waste containers to ensure additional protection from unpleasant smell ▪ Use of diesel engines in closed spaces shall be restricted within depots and maintenance areas, exhaust mufflers shall be installed on internal boilers and proper ventilation of closed spaces shall be ensured.			
Community wellbeing receptor	Impact # 14: Temporary disruption of socioeconomic activities	During construction the Contractor shall implement the following measures to mitigate disruption of other socioeconomic activities: ▪ Establish and enforce good site management to limit the construction activities as close as possible to the construction site ▪ Develop and observe best practice - methods of working – e.g. avoid unnecessary noise ▪ Restrict hours of working during day light; ▪ Exercise efficient material handling to minimise vehicle movement ▪ Define access routes to the site, and try to avoid the large port area ▪ Keep trucks and vehicle movements to a minimum possible	As minimum as possible	RAHCO	Part of contract sum (the design team estimate this at 667,811,000)

Receptor	Project Aspect / Potential Direct Impacts	Mitigation Measures/ Management Programme	Target Level/ Standard	Responsibility	Estimated Costs [Tsh]
Landscape & Visual Amenity receptor	Impact # 15: Loss of aesthetics due to haphazard disposal of demolition waste	▪ Mitigation measures listed under Impacts # 6 & 9 apply			
Natural environment and habitants receptor	Impact # 16: Nuisance and disturbances from noise / vibrations (exceeding allowable level for people comfort) due to construction activities	▪ Mitigation measures listed under Impact # 10 apply			
Community wellbeing receptor	Impact # 17: Occupational Health and Security and Safety (HSS) risks	In order to mitigate Occupational and Health safety Hazards the Contractor and RAHCO shall implement the following measures: ▪ Avoid use of faulty equipment, tools and risk practices: Standards and operations and equipment: lifting, electrical isolation / installation, working at heights, manual handling, fitness for work, hand tools, housekeeping, building and office, vehicle and driving, hazardous substances etc. ▪ Employ trained /qualified and competent Personnel. ▪ Provide appropriate equipment and working condition. ▪ Provide PPEs (to workers and visitors) and enforce their use. ▪ Put in place fall-prevention systems for people working at elevated sites. ▪ Install Signage: post warning signs with appropriate text (local language) and graphics. ▪ Observe standard working hours (8 hours per day) ▪ Secure equipment properly and demarcate any hazardous areas. ▪ Enforce best code of practices at the work place: Observe internationally acceptable Performance Standards on health/safety requirements. ▪ Institute procedures and guidelines, work procedures, inspections and maintenance system, ▪ Implement in-house health and safety manual /guidelines ▪ Avoid inadequacies in water and sanitation provisions ▪ The demolition and construction work shall be contracted to class one	OSHA Regulations	RAHCO	Part of contract sum (the design team estimate this at 667,811,000)(the design team estimate this at 667,811,000)

Receptor	Project Aspect / Potential Direct Impacts	Mitigation Measures/ Management Programme	Target Level/ Standard	Responsibility	Estimated Costs [Tsh]
		contractor to avoid unnecessary health risks. ▪ OSHA guidelines on workers safety shall be implemented ▪ Raise awareness on construction hazards to construction workers. ▪ Use water sprinklers to suppress dust during construction ▪ Post warning signs with appropriate text (local language) and graphics. ▪ Workers Code of Conduct with the Community Liaison Plan will be developed and implemented – this will provide rules of conduct while conflict situations; emphasizing cultural characteristics of the local communities if migrants from different cultures enter the area shall be developed. Moreover, workers should be trained in order to ensure that they behave according to the developed Workers Code of Conduct.			
Community wellbeing receptor	Impact # 18: Public HSS risks: traffic accidents, Risks of human-human transmission of diseases (STD, HIV, etc.) Infections from putrescible wastes with disease pathogens	In order to mitigate public health and safety hazards, the Contractor and RAHCO shall implement the following measures: ▪ Cooperate with local Civil Society Organizations (CSOs)/public health offices in programmes for reduction/eradication of the diseases and establish worker's health protection procedures (e.g. make available free condoms to workers) ▪ Enforce surveillance measures e.g. yellow fever vaccination, potential Ebola infection etc. ▪ Enforce speed limit for vehicles ▪ The construction area shall be isolated with special fences from the settled areas; clear signs should be posted at the entrance to the construction area to ensure that community members will avoid entrance of this area and will be more cautious when passing the construction site Other measures include: ▪ *Public Health and Safety Plan* shall be developed and implemented to mitigate the impacts of the movement of heavy equipment on existing local roads. ▪ *Construction Traffic Management Plan* shall be developed which will allow re-routing of the truck traffic from residential streets or using local roads with fewest homes for transportation of construction materials. ▪ Develop and implement a Grievance Mechanism to facilitate early notifications of any concern from the public	No injuries to the public	RAHCO	Part of contract sum (the design team estimate this at 667,811,000)

Receptor	Project Aspect / Potential Direct Impacts	Mitigation Measures/ Management Programme	Target Level/ Standard	Responsibility	Estimated Costs [Tsh]
	Impact # 19: Vandalism of structures / equipment, theft of materials and portable items during construction	In order to mitigate vandalism tendencies RAHCO shall implement the following measures: ▪ Strengthen patrol of project construction sites and routes ▪ Strengthen security on construction sites	No theft or vandalism	RAHCO	Part of contract sum (the design team estimate this at 667,811,000)
RAILWAY OPERATION					
Water resources receptor	Impact # 20: Release of oils and fuels in the aquatic environment	In order to protect the receiving environment against oils and fuels during operation TRL shall implement the following measure: ▪ Fuels and lubricants shall be stored only at designated areas. ▪ Storage of fuel and lubricants shall be kept at least 30m from the edge of the surface waters e.g. rivers ▪ Refuelling and lubrication of equipment shall be restricted to areas at least 30m away from the edge of the surface waters ▪ Perform all routine equipment maintenance at least 30 meter away from the edge of the rivers and recover and dispose of wastes in an appropriate manner. ▪ Fixed fuel dispensing locations will be provided with secondary containment to capture fuel from leaks, drips, and overfills. ▪ A supply of sorbent and barrier materials sufficient to allow the rapid containment and recovery of spills shall be maintained at construction site ▪ Conduct regular maintenance and inspections of the locomotives to reduce the potential for spills or leaks.	Environmental Management (Water Quality Standard) Regulations 2007	TRL	Normal Operation and Maintenance of TRL
Air quality receptor	Impact # 21: Impairment of local air quality	Mitigation measures listed under Impact # 4 & 8 apply Other mitigation measures include: ▪ Proper maintenance of trains, rails and wheels; ▪ Speed of trains may be restricted when passing the sensitive areas; ▪ Supporting structures may be constructed along the railway track which will play a role of acoustic screens.	Environmental management (Standards for Control noise and vibration pollution) Regulations 2011	RAHCO	100,000,000 per year

Receptor	Project Aspect / Potential Direct Impacts	Mitigation Measures/ Management Programme	Target Level/ Standard	Responsibility	Estimated Costs [Tsh]
Welfare, Health & Well-being receptor	Impact # 22: Occupational and Public health and safety during operation	In addition to mitigation measures under impact # 17, TRL shall implement the following measures to reduce risks of worker accidents during rail operations: ▪ Develop and implement a *Safety Program* in accordance with the international norms. ▪ Ensure that every manager and worker receives training before they perform any work on the line, and are provided refresher training at least every year thereafter. This applies to temporary workers as well. ▪ Train workers in personal track safety procedures ▪ Block train traffic on lines where maintenance is occurring (green zone working) or if blocking the line is not possible use an automatic warning system ▪ Segregation of stabling, marshalling and maintenance areas from running lines. ▪ Railway workers should schedule rest periods at regular intervals and during the night to the extent feasible, to maximize the effectiveness of rest breaks and in accordance with international standards and good practices for work time in order to avoid fatigue of workers and accidents invoked by this.	OSHA Regulations	TRL	20,000,000 per year
Welfare, Health & Well-being receptor	Impact # 23: Potential loss of lives and property as a result of falling off from moving train, collision with train at road crossing as a result of increased train frequencies	To avoid, minimize and control the risks associated with railway operation including railway crossings the RAHCO and TRL shall implement the following measures: ▪ Use of bridges or tunnels is recommended. ▪ If level crossings are unavoidable, signals shall be installed and their regular inspection/maintenance provided. ▪ Increase the security at all railway stations ▪ Continuously provide awareness campaign to inform passengers on the dangers of boarding or disembarking train while the train is moving. ▪ TRL will develop and implement a *Safety Program* in accordance with the international norms. Underpasses or level crossings should be developed based on the consultations with the public and representatives of local government. ▪ Post visible warning signs at potential points of entry to track areas. ▪ Fencing or other barriers should be installed at station ends and other locations to prevent access to tracks by unauthorized persons. ▪ Stations should be designed in such a way to ensure that the authorized route is safe, clearly indicated and easy to use. ▪ In addition awareness raising campaign should be conducted in the area for	OSHA Regulations Zero accident	TRL RAHCO	20,000,000 per year

Receptor	Project Aspect / Potential Direct Impacts	Mitigation Measures/ Management Programme	Target Level/ Standard	Responsibility	Estimated Costs [Tsh]
		the local public to provide them relevant information and increase their awareness on the risks of trespassing.			
Welfare, Health & Well-being receptor	Impact # 24: Additional pressure and demands on local social services and resources (increase water users, toilet users)	RAHCO shall implement the following measures ▪ Ensure there enough toilets and washrooms at all stations ▪ Ensure availability of clean water at all stations ▪ Construct passenger waiting room ▪ Provide areas for canteen operation	Adequate numbers and quantities	TRL RAHCO	100,000,000
Welfare, Health & Well-being receptor	Impact # 25: Vandalism of structures / equipment, theft of materials and portable items	In order to mitigate vandalism tendencies RAHCO shall implement the following measures: ▪ Strengthen patrol of the railway infrastructure ▪ Work with village leadership to get their cooperation to guard the infrastructure ▪ Strengthen community outreach and Corporate Socio Responsibility programmes			
NATURAL, ACCIDENTAL AND ANTHROPOGENIC EVENTS					
Water and land resources receptor	Impact # 26: Physical damage of project structures and disruption of railway operations and schedules due to natural causes	This project is aimed at mitigating recurrent flood risk as such efforts should be made to implement it In order to protect the environment from natural or accidental events RAHCO shall implement the following mitigation measures: ▪ RAHCO should develop a disaster management program. The main tasks of this programme are: ✓ Introduction and systematic use of methods for analyzing, evaluating and predicting the risks of disasters in practice; ✓ Improve the management and coordination activities for the reduction of disaster risk and increase the resilience of sites of critical infrastructure; ✓ Establishment of an early warning system and notification of disasters; ✓ Improving the quality of management, organization and technical provision of the single rescue system;	Minimum or no damage	RAHCO	Const are included in the project costs. For additional measures 50,000,000 for developing a disaster management programme (the design team estimate this at 667,811,000)

Receptor	Project Aspect / Potential Direct Impacts	Mitigation Measures/ Management Programme	Target Level/ Standard	Responsibility	Estimated Costs [Tsh]
		✓ Development of systems for seismic surveys and monitoring of water basins and rivers; ✓ Improving the system for training of managerial staff for disaster response; ✓ Public education using modern technologies and media to form a culture of safe life activity.			
Natural Environment & Biodiversity receptor	Impact # 27: Impairment of environmental quality due to accidental events	RAHCO in collaboration with TRL shall implement the following measures: ▪ Carry out continuous research and monitoring to determine the reasons for and reduce the risk of freight train derailment – e.g. the probability that a train will be involved in a derailment is a function of the quality of track, the length of train, and exposure in terms of distance travelled etc. ▪ Implement rail operational safety procedures aimed at reducing the likelihood of train collisions, such as a positive train control (PTC) system. ▪ Conduct regular inspection and maintenance of rail lines and facilities to ensure track stability and integrity in accordance with national and international safety standards. ▪ Implement an overall safety management program that is equivalent to internationally recognized railway safety operations. E.g. the Safety Management System published by the Safety Management in Railways group of the International Union of Railways (IUR). **Accidents related to the transportation of dangerous goods** ▪ TRL should develop and implement a system for the proper screening, acceptance and transport of dangerous goods. ▪ RAHCO should develop spill prevention and control, and emergency preparedness and response plans and ensure its implementation. ***Vegetation*** ▪ TRL and RAHCO should develop and implement a system to rehabilitate areas of damaged vegetation as a result of railway accidents (oil spills, destruction of the soil horizon, etc.) along with implementation of the Emergency Response Plan. ▪ Conduct regular training of the relevant employees for preparedness and timely and effective response to emergency situations.			

Receptor	Project Aspect / Potential Direct Impacts	Mitigation Measures/ Management Programme	Target Level/ Standard	Responsibility	Estimated Costs [Tsh]
Natural Environment & Biodiversity receptor	Impact # 28: Impairment of railway operations as a result of flooding of Gombe Dam	RAHCO shall continuously liaise with operator of the Gombe Dam to ensure that the dam is effectively managed to ensure it does not flood beyond its boundaries	The flood does not extend beyond the boundaries of the dam	RAHCO	5,000,000 per year
Social Impacts					
Welfare, Health & Well-being receptor	Impact # 29: Increased train frequencies and therefore smoothen passenger and cargo movement	In order to enhance the benefits that will result from the implementation of this project TRL and RAHCO shall ▪ Invest in other infrastructure and operational requirements such as procuring more wagons and more engines, improving welfare of workers etc.	At least one passenger train per day to operate from Dar es Salaam and One from Kigoma and Mwanza	RAHCO TRL	
Built environment receptor	Impact # 30: Protection of roads from heavy cargo as is the current practice	In order to improve the usage of railway system to transport cargo instead of roads the following mitigation measure should be considered: ▪ Tanzania should make it mandatory to transport heavy cargo with railway system instead of using road			
Welfare, Health & Well-being receptor	Impact # 31: Increased income to local suppliers	In order to enhance the benefits that may result from procurement of construction materials and other services from local business people the following measures may be implemented: ▪ RAHCO and TRL will develop a plan aiming at providing opportunities, where possible, for procurement contracts with local companies in the context of all areas of service requirement during construction and operation			
Welfare, Health & Well-being receptor	Impact # 32: Employment opportunities	In order to enhance the employment benefits the following measures may be implemented: ▪ RAHCO and TRL will develop and implement a Local Workforce Recruitment Plan aiming at providing opportunities for employment of local workforce. ▪ Information with regard to construction recruitment will be comprehensively and timely communicated to the local community members by contractors.			

Receptor	Project Aspect / Potential Direct Impacts	Mitigation Measures/ Management Programme	Target Level/ Standard	Responsibility	Estimated Costs [Tsh]
	Impact # 33: Increased income and improved or livelihoods as result of increased agricultural production, trading activities, and movement of people within the region and bordering countries	Measures under Impact # 29 will apply			
	Impact # 34: Improved comfort of passengers as a result of increased train frequencies	Measures under Impact # 29 will apply			
Landscape & Visual Amenity receptor	Impact # 35: Improved quality of the landscape features and appearance of the river embankments	▪ River embankment protection will be implemented as planned			
	Impact # 36: Improved flood management emanating from proper operation of the Gombe Dam	▪ Mitigation measures under Impacts # 28 apply			

Receptor	Project Aspect / Potential Direct Impacts	Mitigation Measures/ Management Programme	Target Level/ Standard	Responsibility	Estimated Costs [Tsh]
DECOMMISSIONING					
Landscape & Visual Amenity receptor	Impact # 37: Environmental degradation due to haphazard disposal of wastes	▪ Mitigation measures under Impacts # 6 and 9 apply	To original state	RAHCO	100,000,000
Community wellbeing receptor	Impact # 38: Loss of employment	In order to minimise the impacts that may result from un-employment the following measures shall be implemented: ▪ RAHCO and TRL shall prepare their workers to be employed elsewhere through regular and periodic training ▪ Ensuring that all employees are members of the Social Security Fund. The employer shall ensure that the company contributions are paid to respective Social Security Fund.	National / international labour Standards.	RAHCO TRL	0 Part O&M costs
Welfare, Health & Well-being receptor	Impact # 39: Loss of income to government	In order to mitigate the impacts on loss of government revenue as a result of decommissioning the railway system (though very unlikely) ▪ The government to develop other transport sectors to compensate for the loss	As many alternative transportation systems as possible	GoT	0
Built environment receptor	Impact # 40: Destruction of road infrastructure as the cargo will revert back to current transport system	In order to mitigate the impacts on roads as a result of decommissioning the railway system (though very unlikely) ▪ The government to strictly enforce maximum allowable axle load	Road traffic Act No.30 of 1973, Regulation 2001 (Single axle load limit of 10 tons for single axle with dual tires, 18 tons for a tandem axle group and 24 tons for triple axle)	GoT	0

9. ENVIRONMENTAL & SOCIAL MONITORING PROGRAMME

9.1. ENVIRONMENTAL MONITORING PROGRAMME

Monitoring is both intended to ensure that the proposed mitigation measures, have been implemented and they are indeed working. Monitoring will be necessary so that degradation and deviation from the envisaged circumstances can be detected and restoration / remediation measures undertaken in good time. The Environmental and Social Monitoring Programme (ESMoP) will also include samples of recommended procedures related to monitoring of impacts from routine operations.

9.2. MONITORING RESPONSIBILITY

Implementation of the ESMoP is the solely the responsibility of the project proponent. RAHCO shall supervise and monitor components of the monitoring plan and keep record of monitoring outcome. RAHCO has ability to provide the necessary supervisory oversight to ensure the mitigation measures are working and where they are not remedial measures are established. **Table 90** presents a summary of the Environmental and Social Monitoring Programme.

Table 90: Environmental & Social Monitoring Programme

Potential Impact	Parameter to be monitored	Monitoring frequency	Monitoring areas	Measurement units	Target level or standard	Responsible party	Estimated Cost TSh
Mobilisation							
Impact # 1: Land disturbances / soil erosion at onsite and offsite location	Rills and gullies Sediments in receiving water bodies	Once every six months	Project site	None	gm/l	RAHCO	10,000,000 per year
Impact # 2: Loss / damage / disturbance of indigenous vegetation and contained biodiversity species	Types of vegetation being cleared Existence of endemic /protected species Area being cleared	Continuously during mobilisation and construction phase	Entire project site	Numbers	No endemic/ protected species cleared Clearance should be restricted to project corridor	Contractor	Part of contract costs
Impact # 3: Depletion at point source	Procurement records	Monthly during construction	Point of sourcing and Project site	all procurements from licensed operator	No material from unlicensed supplier, No new borrow pit	RAHCO Environmental Manager	200,000 per month
Impact # 4: Impaired air quality & contribution to climate change due to release of dust, greenhouse gases and other noxious air pollutants	CO, NOx, dust	Once every six month	Construction site	mg/l, ppm	NOx = 150 µg/ Nm^3 for 24-hours average value[35] CO = Daily average of hourly values shall not exceed 10mg/kg and average of hourly values in eight consecutive hours shall not exceed 20 mg/kg.	Contractor ELO ECO	1,000,000 per month
Impact # 5: Release of oils and fuels in the aquatic	Oil contents	Once every six month	Surface water bodies	mg/l	10[36]	RAHCO	500,000 per year

[35] TBS - Ambient air quality

[36] Environmental Management (Water Quality Standards) Regulations 2007

Potential Impact	Parameter to be monitored	Monitoring frequency	Monitoring areas	Measurement units	Target level or standard	Responsible party	Estimated Cost TSh
environment							
Impact # 6: Contamination of surface waters with demolition debris and soils	All types of waste including ▪ Heaps of soils ▪ Plastics wastes ▪ Glass wastes ▪ Turbidity ▪ Suspended solids in receiving water bodies ▪ BOD	Continuous throughout the project cycle	Project site	None NTU mg/l mg/l	No haphazard disposal of waste 300[31] 100 [31] 30 [31]	RAHCO Environmental Manager	500,000per month
Construction							
Impact # 7: Land disturbances / soil erosion	Rills and gullies Sediments in receiving water bodies	Once every six months during construction	Project site	None	gm/l	RAHCO	2,000,000 per year
Impact # 8: Impaired air quality & contribution to climate change due to release of dust (including fugitive (unavoidable, residual), greenhouse gases and other noxious air pollutants	CO, NOx, dust	Once every year during construction	Construction site	mg/l, ppm	NOx = 150 µg/ Nm^3 for 24-hours average value[37] CO = Daily average of hourly values shall not exceed 10mg/kg and average of hourly values in eight consecutive hours shall not exceed 20 mg/kg.	Contractor ELO ECO	1,000,000 per month
Impact # 9: Impaired land and water qualities and contained resources from discharge of pollutants (wastes, oily	Oil contents All types of waste including ▪ Heaps of soils ▪ Plastics wastes	Once every year during construction	Surface water bodies	mg/l NTU mg/l	10[38] 300[31] 100 [31]	RAHCO	1,000,000 per year

[37] TBS - Ambient air quality

[38] Environmental Management (Water Quality Standards) Regulations 2007

Potential Impact	Parameter to be monitored	Monitoring frequency	Monitoring areas	Measurement units	Target level or standard	Responsible party	Estimated Cost TSh
substances etc.)	▪ Glass wastes ▪ Turbidity ▪ Suspended solids in receiving water bodies ▪ BOD			mg/l	30 [31]		
Impact # 10: Temporary disturbances / flight of aquatic fauna from noise emission	Noise levels	Once month after commencement of construction	Project site	dB	<85 dB[39]	RAHCO Environmental Manager	1,000,000
Impact # 11: Destruction of archeological and Cultural heritage resources	No. of discoveries	Continuously	Project site	Number	All discoveries should be reported	RAHCO Contractor	12,000,000 per year
Impact # 12: Change or modification of population and its quality of life due to land take	Existing of land related conflicts Types of land use	Continuously	All villages along the project corridor	Number of conflicts	Zero	RAHCO	500,000 per six months
Impact # 13: Construction health and safety hazards	▪ Personnel health records ▪ Noise levels ▪ Concentration of pollutants such as dust in the working environment ▪ Number injuries	Once every year	Project site	None dB ppm numbers	Noise = <85dB Dust = Not to exceed 250 mg/Nm^3 (24h mean value)[40] Zero injuries	RAHCO OHS Officer	5,000,000 per year
Impact # 14: Temporary disruption of socioeconomic activities	Existence of complaints	Continuously during construction	Entire project site	Number of complaints	As minimum as possible	Contractor RAHCO	Included in impact # 11
Impact # 15: Loss of aesthetics due to haphazard disposal of demolition waste	All types of waste including ▪ Heaps of soils ▪ Plastics wastes ▪ Glass wastes ▪ Turbidity ▪ Suspended solids in	Continuous throughout the project cycle	Project site	None NTU mg/l	No haphazard disposal of waste 300[31] 100 [31]	RAHCO Environmental Manager	500,000per month

[39] Environmental Management (Noise and Vibration Management and Control) Regulations of 2007
[40] Environmental Management (air Quality Standard)Regulation of 2007

Potential Impact	Parameter to be monitored	Monitoring frequency	Monitoring areas	Measurement units	Target level or standard	Responsible party	Estimated Cost TSh
	receiving water bodies ▪ BOD			mg/l	30 [31]		
Impact # 16: Nuisance and disturbances from noise / vibrations (exceeding allowable level for people comfort) due to construction activities	Noise levels	Once month after commencement of construction	Project site	dB	<85 dB[41]	RAHCO Environmental Manager	Covered under 6
Impact # 17: Occupational Health and Security and Safety (HSS) risks	Incidences of breach of health and safety	Continuously	Project area	Number of incidence	Zero	RAHCO	3,000,000 per year
Impact # 18: Public HSS risks: traffic accidents, Risks of human-human transmission of diseases (STD, HIV, etc.) Infections from putrescible wastes with disease pathogens	STDs HIV/AIDS infections Cholera	At the beginning of the project and once every year	hospital / dispensary	Number of people infected	No or as minimum infectious cases	District Medical Officer	2,000,000 per year
Impact # 19: Vandalism of structures / equipment, theft of materials and portable items during construction	Destroyed infrastructure and loss of equipment	Continuously during construction phase	Construction site and stores	Number of theft incidences	No or minimum destruction, theft incidences	RAHCO	10,000,000
Railway Operation							
Impact # 20: Release of oils and fuels in the aquatic environment	Oil contents	Once every six month	Surface water bodies	mg/l	10[42]	RAHCO	
Impact # 21: Impairment of local air quality	CO, NOx, dust	Once every six month	Construction site	mg/l, ppm	NOx = 150 µg/ Nm^3 for 24-hours average value[43] CO = Daily average of	Contractor ELO ECO	1,000,000 per month

[41] Environmental Management (Noise and Vibration Management and Control) Regulations of 2007
[42] Environmental Management (Water Quality Standards) Regulations 2007
[43] Environmental Management (air Quality Standard)Regulation of 2007

Potential Impact	Parameter to be monitored	Monitoring frequency	Monitoring areas	Measurement units	Target level or standard	Responsible party	Estimated Cost TSh
					hourly values shall not exceed 10mg/kg and average of hourly values in eight consecutive hours shall not exceed 20 mg/kg.		
Impact # 22: Occupational and Public health and safety	▪ Personnel health records ▪ Noise levels ▪ Concentration of pollutants such as dust in the working environment ▪ Number injuries	Once every year	Project site	None dB ppm numbers	Noise = <85dB Dust = Not to exceed 250 mg/Nm^3 (24h mean value)[44] Zero injuries	RAHCO OHS Officer	
Impact # 23: Potential loss of lives and property as a result of falling off from moving train, collision with train at road crossing as a result of increased train frequencies	Reported cases of such injuries	Once every month	Railway stations	Number	Zero	TRL RAHCO	500,000 per year
Impact # 24: Additional pressure and demands on local social services and resources (increase water users, toilet users)	Number of toilets at each station Incidences of open defecations	Once at the beginning of operation and then one year and availability of clean water Continuously	Railway stations	Number of functioning toilets Clean water Signs of open defecation	As many as possible No open defecation	TRL RAHCO	500,000 per year
Impact # 25: Vandalism of structures / equipment, theft of materials and portable items	Reported cases of vandals	Continuously	Entire project	Reported cases	No or minimum vandalism cases	TRL RAHCO	500,000 per year

[44] Environmental Management (air Quality Standard)Regulation of 2007

Potential Impact	Parameter to be monitored	Monitoring frequency	Monitoring areas	Measurement units	Target level or standard	Responsible party	Estimated Cost TSh
Impact # 26: Physical damage of project structures and disruption of railway operations and schedules due to natural causes	Physical strength of impacted structure	Once every year	Project site	None	No structure weakness	Contractor RAHCO	5,0000,000 per year
Impact # 27: Impairment of environmental quality due to accidental event	Vegetation Oil contamination	Immediately after accident and once every six months	Site of accident	Decontaminated soils and plants mg/l	10[45]	TRL	5,000,000 per year
Impact # 28: Impairment of railway operations as a result of flooding of Gombe Dam	Flooding tendencies	Continuously during rainy season	Gombe Dam Area	Visual	Floods should not extend beyond the dam boundaries	RAHCO	5,000,000 per year
Impact # 29: Increased train frequencies and therefore smoothen passenger and cargo movement	Train frequencies	Once every year	TRL Head Quarters	Number	At least one passenger train per day	TRL	0
Impact # 30: Protection of roads from heavy cargo as is the current practice	Cargo tonnage transported by train	Once every year	TRL Head Quarters	Tonnage	At least 80% of cargo is reported by train by 2019	TRL	0
Impact # 31: Increased income to local suppliers	Supplies and services received from the residents	Monthly	Procurement supply list	Number of supplies and services from the residents	As many supplies and services from the residents	Procurement manager	0
Impact # 32 Employment opportunities	Number of residents employed	Every year	Employed employees	Number of employees	As many tenant employees as possible	RAHCO	0
Impact # 33: Increased income and improved or livelihoods as result of increased agricultural production, trading activities, and movement of people within the region and	Incomes of local people in the project area	Once every year	Affected villages	Per capita income	National per capita income average	RAHCO	10,000,000 per year

[45] Environmental Management (Water Quality Standards) Regulations 2007

Potential Impact	Parameter to be monitored	Monitoring frequency	Monitoring areas	Measurement units	Target level or standard	Responsible party	Estimated Cost TSh
bordering countries							
Impact # 34: Improved comfort of passengers as a result of increased train frequencies	Passenger perception	Once (six months after commissioning of the project sections)	Affected villages	Perception	Positive perception	RAHCO	5,000,000
Impact # 35: Improved quality of the landscape features and appearance of the river embankments	Landscape	Once after completing the construction work	The project area	Visual appearance	Attractive visual appearance	RAHCO	2,000,000
Impact # 36: Improved flood management emanating from proper operation of the Gombe Dam	Flooding tendencies	Continuously during rainy season	Dam area	Over flooding	No flooding beyond the border of the dam	RAHCOO	5,000,000 per year
Decommissioning							
Impact # 37: Environmental degradation due to haphazard disposal of wastes	Landscape appearance	Once after completing the decommissioning	The project area	Visual appearance	Attractive visual appearance	RAHCO	2,000,000
Impact # 38: Loss of employment	NSSF/PPF remittances	Once, one year after decommissioning	Project staff and personnel files	Number of employees registered with NSSF/PF	All workers	RAHCO	0
Impact # 39: Loss of income to government	Government Revenue from TRL	One year after decommissioning of the project	TRL audited accounts	Tsh.	As minimum as possible	TRL	1,000,000
Impact # 40: Destruction of road infrastructure as the cargo will revert back to current transport system	Damage on the road infrastructure	Once every six months	Road network transporting cargo to neighbouring countries	Visual	As minimum destruction as possible	TANROADS	10,000,000 per year

10. COST AND BENEFIT ANALYSIS

10.1. FINANCIAL COST BENEFIT ANALYSIS OF THE PROJECT

Cost-benefit analysis is normally done in the framework of feasibility study of an activity. The feasibility study is still ongoing. On completion it will state whether the project is feasible or not. However, with the current frequent flooding, most likely the project will be implemented. The aim of this chapter therefore, is to inform the project developer to make a decision on:

- Whether it makes economic sense to continue with the project;
- Whether the chosen option the cost effective alternative; and
- Whether the size of a project is appropriate.

In this project the costs will include:

- capital expenditures;
- operating and maintenance costs;
- staff costs;
- operations material costs; and
- Environment, health and other social costs.

Benefits will include:

- Better operations of the Central railway line;
- Better servicing and maintenance of the railway line facilities;
- Protection of road network by transprojecting the majority of cargo via railway line;
- Efficient and cheap cargo transportation costs to business people;
- Increased use of the Dar es Salaam Project by neighbouring land locked countries;
- Protection of environment and health; and
- Provision of other social benefits e.g. easy movement of agricultural goods and people.

The Project Proponent (RAHCO), with the help of JICA is currently undertaking a feasibility study of the implementation of flood protection measures. Even before this exercise has been concluded the Central railway Station has been closed once again on Saturday, 2nd January 2016 due to flooding, suggesting that the implementation of this project is necessary.

10.2. QUANTIFIABLE AND NON-QUANTIFIABLE BENEFITS TO COMMUNITIES

There will be direct and indirect benefits to the communities as follows:

a) The project will employ about 2500 people during construction over 74 months period. Almost all staff will be recruited locally.
b) Implementation of Flood Protection Measures will increase both passenger and cargo trains, will enhance movement of people and agricultural produces, will increase opportunities for petty traders
c) The project will increase the central corridor development especially on agricultural production, trading activities, and movement of people within the region and bordering countries. Thereby contribute to the general socioeconomic development of Tanzania.

d) The project will increase attractiveness of the Dar es Salaam harbour to the neighbouring land-locked countries.
e) It will reduce the amount of cargo transportation by road thereby by protecting the road network which is being constructed and huge amount of foreign money.

10.3. POSSIBLE COSTS AND BENEFITS TO COMMUNITIES

Chapter 6 presents all possible costs that are likely to occur. These are discussed under social impacts. As it can be seen in the impact analysis, there are no serious irreversible negative socioeconomic impacts. The Project Affected People will be compensated before the project kicks off. The same chapter also discusses the positive aspects of the project; some of the positive aspects translate into benefits to the communities. Specifically, the project activities will contribute towards employment opportunities to Tanzanians, and therefore, contributing towards poverty eradication activities. There are several villages alone the Central Railway line, which depend entire on the Central railway transportation. Having a reliable rail network will be a huge transportation relief. It can therefore be deduced that the social benefit outweigh the social costs that are anticipated.

10.4. ENVIRONMENTAL COSTS AND BENEFITS ANALYSIS

Environmental cost benefit analysis is assessed in terms of the negative and positive impacts. Chapter 6 discusses potential environmental impacts, in other words; these are potential environmental costs, if they are not mitigated properly. The same chapter discusses positive environmental impacts e.g. mitigation of soil erosion, improves site aesthetics, reduction of river siltation etc. These will continue happening in absence of the project. Furthermore, the analysis is considering whether the impacts can be mitigated and the costs of mitigating the impacts are reasonable. It should be noted that the cost benefit are discussed based on the commitment of the Project Proponent that all mitigation measures will be implemented. As presented in chapters 6 to 8. The identified impacts can be mitigated.

10.5. SOCIO-ECONOMIC COSTS AND BENEFITS ANALYSIS

Implementation of the flood protection measures will involve huge amounts of money as shown in section 6.4. However, in the absence of project, the current disruption of the railway system and low utilisation of railway system contribute significantly to economic performance of individuals and the nation in general. The project activities will contribute towards employment opportunities to Tanzanians, enhance market access of agricultural goods of people living along the railway line, enhance trade between neighbouring countries, and enhance use of the Dar es Salaam Project. Therefore the project will contribute significantly towards poverty eradication activities. It can therefore be deduced that the social benefit outweigh the social costs that are anticipated.

10.6. CONCLUSION

It is our expert opinion that the benefits outweigh the costs. The potential impacts can be mitigated.

11. DECOMMISSIONING PLAN

This is a preliminary decommissioning plan; it establishes feasible decommissioning schemes that can be accomplished without undue risk to the health and safety of the public and decommissioning personnel, without adverse effects on the environment, and within established guidelines and limits of the appropriate regulatory agencies. Although, the plan is not very detailed, it serves the purpose of ensuring that the decommissioning and ultimate disposition of the project is considered during the initial design and rehabilitation of the project. This preliminary plan is intended to remain a "living document," therefore; the revisions will be made throughout the operating life of the project. It must be reviewed periodically and revised to reflect any changes in the project construction or operation that might affect decommissioning. Prior to the initiation of actual decommissioning activities for the project, a detailed final disposition plan will be prepared.

The final plan should be based on the preliminary plan and revisions, and will define specific work activities and include safety evaluations of planned decommissioning methods, and the project status that will result from the decommissioning program. In addition, this plan must contain sufficient information to obtain any approvals needed from the appropriate regulatory agency, in this case NEMC.

11.1. PURPOSE AND CONTENT

Plan Purpose

The preliminary plan serves to establish decommissioning as an important consideration from the inception of the project, during design and throughout the operation of the project. The plan has the following purposes:

a) The primary purpose of the preliminary plan is to ensure that project designers are cognizant of decommissioning during the initial design of a plant. Thus, where design choices that would enhance decommissioning are available for types of construction materials and placement of structures, these choices should be made.
b) Another purpose of the preliminary plan is to identify the ultimate decommissioning options and final project status. These options would be evaluated and narrowed to the decommissioning method of choice as the end of project life is approached.
c) The final purpose of the preliminary plan is to demonstrate to regulatory agencies that important aspects of decommissioning are considered as early as possible during the initial re-design of the project. The plan serves as the starting point to demonstrate that areas such as decommissioning methods, costs, schedules, and operating impact on decommissioning will be reviewed and refined throughout the operating life of the project.

Plan Content

The preliminary plan will provide a general description of decommissioning methods considered feasible for the project. The description should demonstrate that the methods considered are practical and that they protect the health and safety of the public and decommissioning personnel.

Design personnel should study the proposed decommissioning methods and take steps to ensure that the design incorporates features that will facilitate decommissioning.

Considerations include:

a) Provisions for adequate material-handling equipment.
b) An estimate of manpower, materials, and costs anticipated to support decommissioning.
c) A description of the anticipated final disposition and status of the project and the site.
d) A discussion demonstrating that adequate financing will be programmed for decommissioning.
e) Identification of records that should be maintained during project construction and operation which might facilitate decommissioning, including a set of "as built" drawings.

11.2. PRELIMINARY PLAN

Project Removal Methodology and Schedule

RAHCO shall fund and implement all aspects of project decommissioning, including but not limited to, all engineering, environmental assessment, permitting, construction, and mitigation activities associated with the removal of the project, in accordance with this Plan and the Settlement Agreement, and mitigation of project removal impacts on site. RAHCO shall monitor environmental impacts during and after project removal to respond to defined events during the monitoring phase.

RAHCO shall remove the project structures safely and in a manner that:

- minimizes environmental impacts;
- satisfies RAHCO obligations under the EMA CAP 191;
- restores the site to a condition suitable for multiple use; and
- Pays all dues (workers, government, suppliers etc.).

Project removal will begin six months after closure and continue for six months. Within the six months from closure of the project. RAHCO Will compile inventory of all components that need to be removed and or disposed. This inventory will include building structures to be demolished, including debtors and creditors to be settled. Also mode of disposal will have to be finalized. This information will assist in the preparation of the Final decommissioning Plan, for approval by NEMC.

After approval of the decommissioning plan the metal parts will be removed first within the first month (this is important to ensure that they are not vandalized). The second month of the decommissioning will be used to remove concrete structures (if any). Debris (if any) will be used as road fills for rural roads.
Any hazardous material (for example used batteries, tyres, acids etc.) discovered during decommissioning will be cleaned up and disposed of in accordance with the appropriate regulations. All disturbed areas will be landscaped and re-vegetated using indigenous trees. Mitigation measures presented under Impact # 6 may apply in this case.

Project decommissioning has five phases: (1) pre-removal monitoring; (2) permitting; (3) interim protective measures; (4) project removal and associated protective actions; and (5) post-removal activities, including monitoring of environment and socio economic activities.

The first three phases will occur prior to removal of the project (i.e. within the first six months). The fourth phase — project removal and associated protective actions — will take place six months after closing business. The fifth phase will begin after total removal and due to nature of the project (small scale, with relatively moderate impacts) removal and continue for at least one year.

The following description outlines the activities that will occur in each phase and provides references to detailed descriptions of each activity elsewhere in the plan:

(1) **Pre-removal monitoring:** Pre-removal monitoring includes environmental and socio economic status of the Depot, and the surrounding. This monitoring is essential to identify if there is any environmental or social liability, which need to be settled before the permit for closure is given. This period will also be used to inventories all assets and facilities that need to be disposed of and to prepare a final decommissioning plan for approval by NEMC.

(2) **Permitting:** RAHCO shall obtain all permits required to undertake removal of the Project.

(3) **Interim Protective Actions:** This will take care of any interim protective measure that needs to be implemented to protect human health, environment and specifically the lake embankments.

(4) **Project Removal:** As noted above, the removal of the project will be completed within six months.

(5) **Post-Removal Activities:** Post-Project removal monitoring will continue for one year.

12. CONCLUSION

Given the nature and location of the project, the conclusion is that the potential impacts associated with the proposed development are of a nature and extent that can be reduced, limited and eliminated by the application of appropriate mitigation measures, as presented in Chapters 7 and 8. There are few impacts which are considered residual in nature.

JSB-EnviDep Ltd. (*Environment and Development Management Consultants*) of Dar es Salaam has proposed an environmental management plan and environmental monitoring plan that elaborates how these impacts will be mitigated and monitored. The monitoring and audit report from project activities that will be prepared regularly for RAHCO management will provide assurance of the efficacy of the mitigation measures and hence the environmental and social integrity of the project.

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APPENDICES

APPENDIX 1: APPROVED TERMS OF REFERENCE

INTRODUCTION

The purpose of Terms of Reference (ToR) is to offer formal guidance to the Proponent /ESIA Consultant of the proposed Flood Protection Measures for the Central Railway Line project on the range of issues that must be addressed in the ESIA process. They form the basis for subsequent review process. In these ToR, strategies for addressing the issues acknowledged during the scoping phase have been incorporated to focus the ESIA. The Scoping report and these drafts ToR have been prepared for submission by **RAHCO** to NEMC for approval.

OBJECTIVES OF ESIA STUDY

Construction or new expansion to existing railway lines is included in the mandatory list of projects that are required to develop ESIA by the Environmental Management Act Cap 191. Part IV of the EIA Regulations of 2005 provides the general objectives for carrying ESIA, among others:

- To ensure that environmental considerations are explicitly addressed and incorporated into the development of the project.
- To anticipate and avoid, minimise or offset the adverse significant biophysical, social and relevant effects of developmental proposal.
- To protect the productivity and capacity of natural systems and ecological processes which maintain their functions
- To promote development that is sustainable and optimises resources use and management opportunities.
- To establish impacts that are likely to affect the environment before a decision is made to authorize the project.
- To enable information exchange, notification and consultations between stakeholders.

Consequently, RAHCO is committed to undertaking a detailed ESIA process so as to ensure that the principles of sustainable development and environmental protection are incorporated into strategies and actions that can be practically applied during the proposed Flood Protection Measures.

The specific objectives of the ESIA include:

- To establish baseline information on both natural and built environment including socio-economic conditions of the offsite locations to the proposed project area.
- To identify, predict and evaluate foreseeable impacts, both beneficial and adverse, of the proposed investment.
- To develop mitigation measures that aim at eliminating or minimising the potential negative impacts and promote positive ones.
- To develop management plan and monitoring plan for ease of reference during project implementation.

DESCRIPTION OF THE PROJECT

The proposal is about the rehabilitation of the implementing the Flood Protection Measures in flood prone areas between Kilosa and Gulwe. The project shall involve:

(i) Flood protection works (route relocation, track elevation, riverbank protection work, construction of a training wall, etc.) at selected/ target sections between Kilosa and Igandu.
(ii) Track rehabilitation works (improvement in roadbed, ballast, and sleeper; rail replacement, etc.).
(iii) Development/rehabilitation of stations and related facilities (including a sleeper / ballast factory, rolling stock workshop, etc.).

The duration for the construction is not yet decided as the project is still in the feasibility study phase.

SCOPE OF WORK

In compliance with the NEMC requirements for an ESIA the scope of work shall follow national EIA guidelines as stipulated in the "Environmental Impact Assessment and Audit Regulations, of 2005". The impact assessment study shall culminate in the production of the Environmental Impact Statement (EIS). The ESIA shall be undertaken as a two-tier process starting with Scoping and development of Terms of Reference for the ESIA followed by detailed impacts identification, evaluation and mitigation.

The Scoping exercise identified boundaries for the ESIA. During the scoping process numerous key environmental, social, economic and compliance issues to be considered by the ESIA have been identified following consultations with stakeholders in Kilosa District Council and Mpwapwa District Council; Chamwino District Council; Gulwe Ward, Msagali Ward and Igandu Ward; Mkadage Village, Munisagara Village, Muzaganza Village, Mwasa Village, Kidete Village, Godegode Village, Kimagai Village reviewing relevant literature related to the project.

The below tasks shall be performed by the Consultant. The environmental and social assessment shall be done mainly as a desktop study and further field assessment to gather information and data on various aspects of the project and project sites. The Consultant shall carry out further stakeholder consultations and baseline data and information collection (started during scoping).

Task 1: Stakeholders Consultations and Community Involvement
The Consultant shall carry out further consultations with stakeholders particularly at the national level:

- Occupational Health and Safety Authority (OSHA),
- The Ministry of Transport
- The Ministry of Works,
- The Ministry of Water,
- The Ministry of Natural Resources and Tourism (Fisheries Department),
- The Vice President's Office - Division of Environment,
- The Tanzania Railway Authority,
- The Surface and Marine Transport Regulatory Authority (SUMATRA), Tanzania
- Investment Centre (TIC),

Task 2: Description of the Project Characteristics
The Consultant shall review already available information on the project and fill gaps identified in the scoping report

Task 3: Description of the Affected Environment
Comprehensive descriptions of the environmental and socio-economic characteristics of both primary impact area and area of influence are presented in the Scoping Report.

The Consultant shall review information detailed in the scoping report and carry out further collection of the baseline data and information mainly from secondary sources.

Task 4: Policy, Legislative and Institutional Considerations
The Consultant shall review relevant national policies, legislation and regulations, international treaties and agreements, local by-laws for appropriate relevance to project.

Task 5: Determination of the Potential Impacts and Significance
The Consultant shall superimpose project activities onto the existing environment and socio-economic setups to identify the impact sources quantify the impacts and evaluate level of significance of the impacts. Matrices, checklists, overlays and expert judgement shall be used to identify and analyse the project social and environmental impacts. Evaluation of the significance of the impacts will be done using criteria to determine the significance rating e.g. probability of occurrence, spatial and temporal extent, magnitude of intensity etc.

The Consultant shall take the following into consideration:

- Positive Economic, Social and Cultural Impacts
- Capacity of local groups and agencies i.e. environmental committees, Municipal Council, etc. for environmental management, enforcement and monitoring.

Task 6: Analysis of Alternatives to the Proposed Project

This analysis shall include the alternatives that were examined in the course of developing the proposed project. The consultant shall use matrix for comparison of alternatives in terms of potential impacts (irreversible or unavoidable or can be mitigated), costs, benefits suitability under local conditions, and institutional, training, and monitoring requirements. Analysis of alternatives will involve coordinated decisions by environmental, social, and technical teams. Alternatives will focus on project site, alternative technology and shall include no-project option.

Task 7: Development of Management Plan to Mitigate Negative Impacts and enhance positive impacts
The Consultant shall recommend feasible and cost-effective measures to prevent or reduce significant negative impacts to acceptable levels during entire cycle of the project. The consultant shall mainly use expert judgment, legal and national/international environmental and social standard requirement.

Task 8: Development of a Monitoring Plan

The plan will be developed as per standard procedures. The Consultant shall prepare a detailed plan to monitor the implementation of mitigation measures and the impacts of the project during its execution, implementation and decommissioning phases.

PERSONNEL REQUIREMENT

Experts with demonstrable practical experience in conducting ESIA studies shall be deployed with specific experience in environmental management/environmental impact assessment, environmental engineering, socio-economic analysis, water resources, aquatic ecologist, terrestrial ecologist, wildlife. The CVs of Lead Consultants are attached to this report.

REPORTING AND REPORT PRESENTATION

During the study, the Consultant shall report directly to the Contact person at RAHCO for operational and logistic issues and in no way shall this be allowed to influence the Consultant's independence.

RECORDS OF MEETINGS

The Consultant shall provide records of issues, names of organizations, government departments and individuals consulted

OUTPUTS

The Consultant shall submit to the Client an electronic copy of the Environmental Impact Statement (EIS). The Consultant shall, on behalf of the client, produce hard copies of the reports for submission to NEMC.
.
REFERENCES

The Consultant shall provide a list of all information sources used, including unpublished documents and sources.

APPENDIX 2: NEMC's Letter – Approval ToR

NATIONAL ENVIRONMENT MANAGEMENT COUNCIL (NEMC)
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TANZANIA

In reply please quote:
Ref: **NEMC/HQ/EIA/11/0157/Vol I/4**

Date: **27/08/2015**

Managing Director,
Reli Assets Holding Company,
P.O. Box 76959,
Dar es Salaam. ***Attn: Eng. Benhadard M.Tito***

RE: APPROVAL OF TERMS OF REFERENCE FOR THE PROPOSED FLOOD PROTECTION MEASURES FOR CENTRAL RAILWAY LINE – KILOSA TO DODOMA SECTION (174 Km) IN MOROGORO AND DODOMA REGIONS

The Council acknowledges receipt of your letter 14th July 2015 submitted with Scoping report and Terms of references (ToRs) for the above mentioned proposed project. Please be reminded that your project has been assigned an application reference No. **4667**, please quote the number in all your future correspondences with the Council.

The Council has reviewed the scoping report and terms of reference for the above mentioned project and found it to be generally adequate to guide Environmental Impact Assessment (EIA) study. Therefore, the ToRs is hereby approved and thus you are permitted to proceed with the EIA study.

In view of the above, you are thus required to pay to the Council funds amounting to **Tshs 7,866,000/= (breakdown attached, attachment BB)** to facilitate review process upon submission of fifteen copies of EIS. The funds can be paid either by cheque/cash or deposited in the NEMC Account whose details is outlined below:-

Bank/Branch: NMB/Bank House.

A/C Name: National Environment Management Council

A/C No: 2011100084

Swift Code: NMIBTZTZ

Please note that dates of site verification visit and Technical Advisory Committee review meeting will be communicated to you soon after payment and submission of the EIS.

All correspondence should be addressed to the Director - General

In case you need any further information or clarification on this matter, please contact us through Tel. 0756 055 766

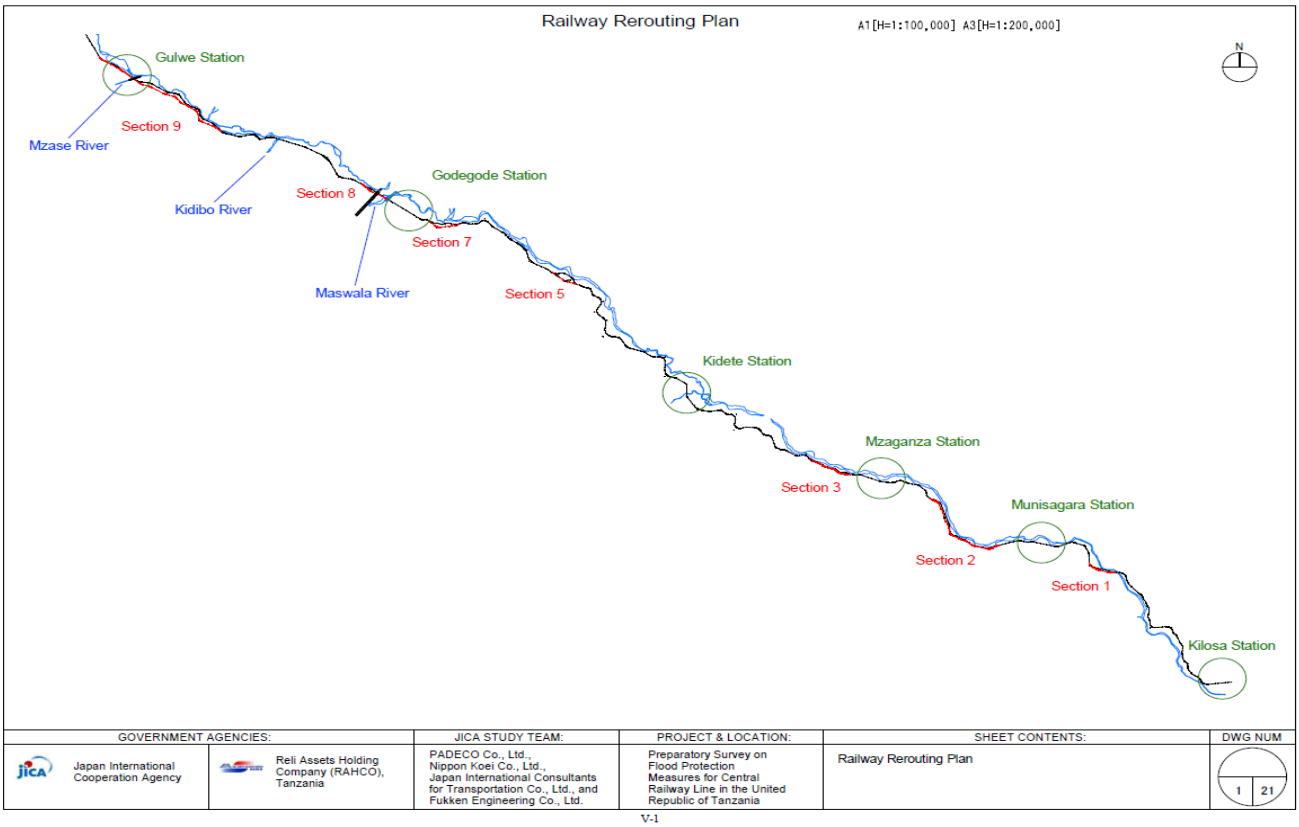
Yours sincerely,

Makene

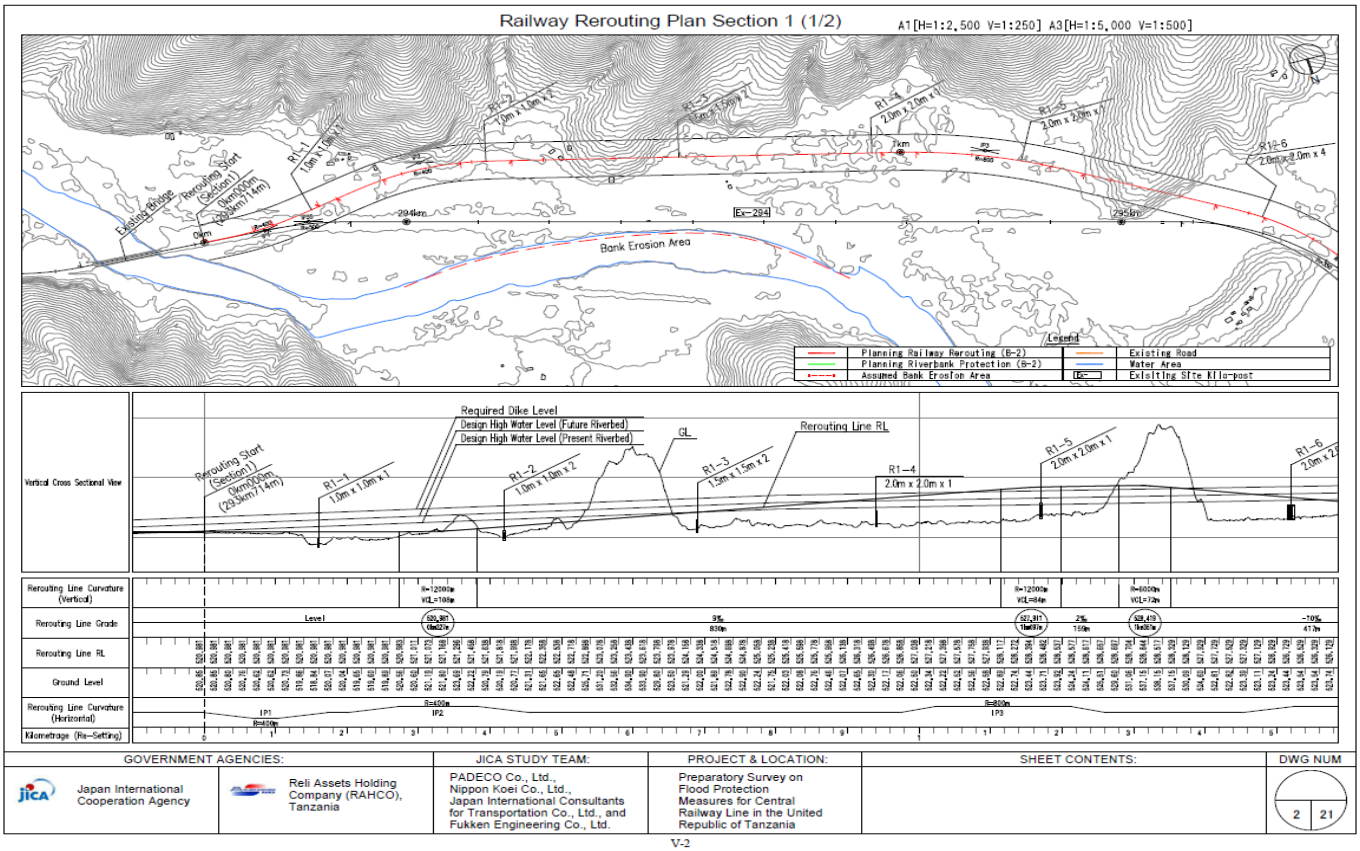
Eng. Dr. Madoshi Makene
For: Director General

Managing Director,
JSB Envidep Ltd,
P.O. Box 31312,
Dar es Salaam.

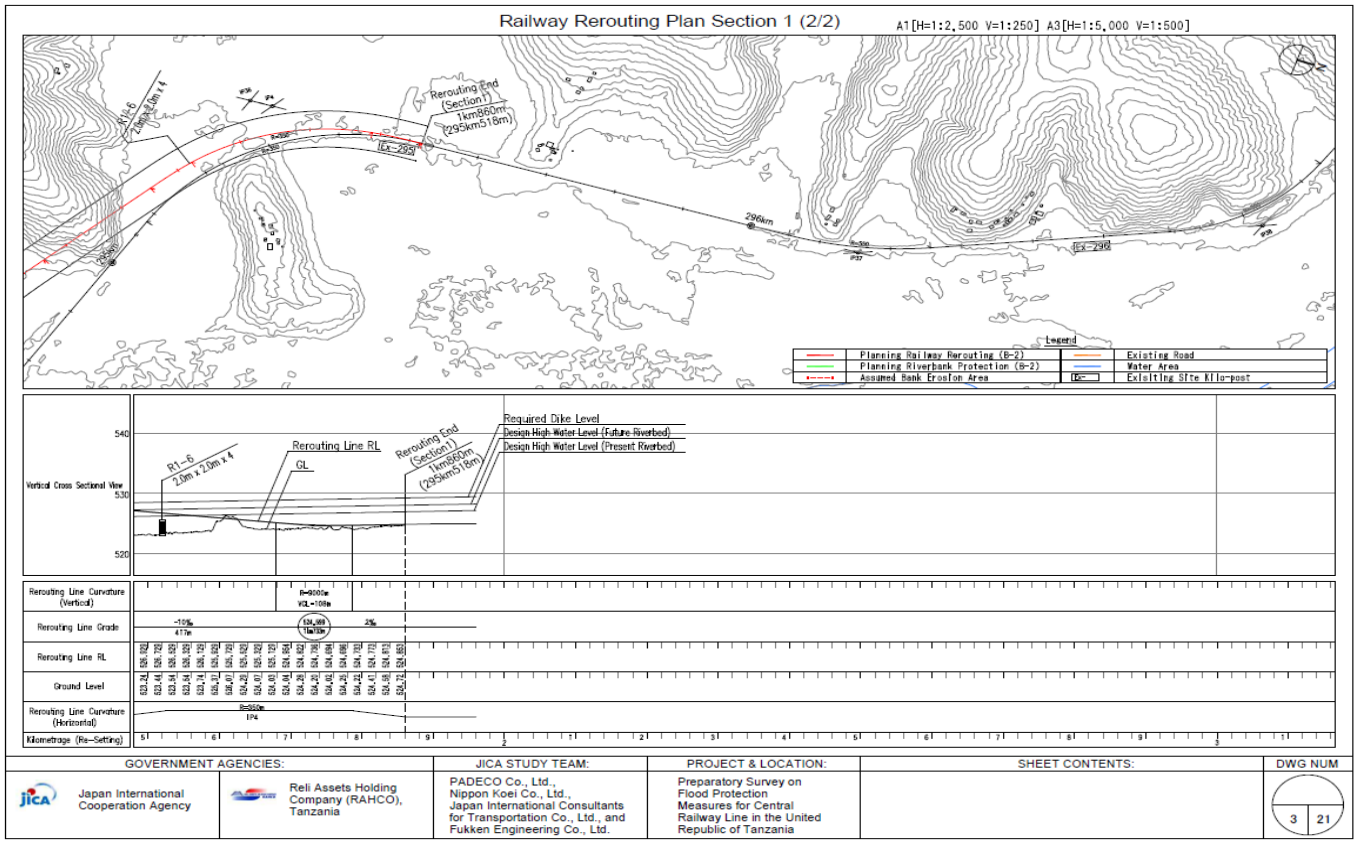
Appendix 3: **Alignment Drawing Of Rerouting Line**



V-1



V-2


Railway Rerouting Plan Section 1 (2/2)
A1[H=1:2,500 V=1:250] A3[H=1:5,000 V=1:500]
Rerouting End (Section1) 1km860m (295km518m)
Ex-295
Ex-296
Legend
Planning Railway Rerouting (B-2)
Planning Riverbank Protection (B-2)
Assumed Bank Erosion Area
Existing Road
Water Area
Existing Site Kilo-post
Vertical Cross Sectional View
R1-6 2.0m x 2.0m x 4
Rerouting Line RL
GL
Rerouting End (Section1) 1km860m (295km518m)
Required Dike Level
Design High Water Level (Future Riverbed)
Design High Water Level (Present Riverbed)
Rerouting Line Curvature (Vertical)
Rerouting Line Grade
Rerouting Line RL
Ground Level
Rerouting Line Curvature (Horizontal)
Kilometrage (Re-Setting)
GOVERNMENT AGENCIES:
Japan International Cooperation Agency
Reli Assets Holding Company (RAHCO), Tanzania
JICA STUDY TEAM:
PADECO Co., Ltd., Nippon Koei Co., Ltd., Japan International Consultants for Transportation Co., Ltd., and Fukken Engineering Co., Ltd.
PROJECT & LOCATION:
Preparatory Survey on Flood Protection Measures for Central Railway Line in the United Republic of Tanzania
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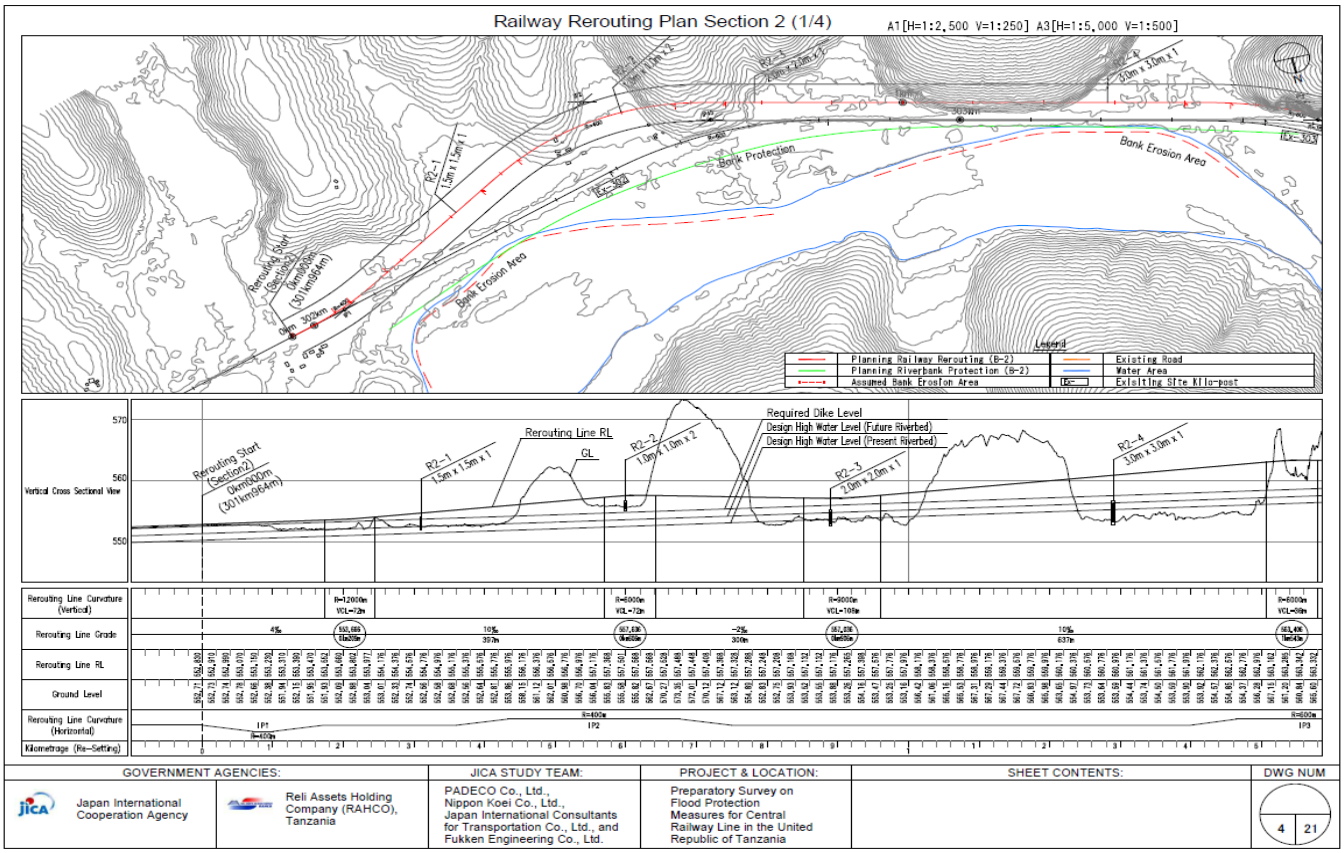
Railway Rerouting Plan Section 2 (1/4)
A1[H=1:2,500 V=1:250] A3[H=1:5,000 V=1:500]
Rerouting Start (Section2) 0km000m (301km864m)
Ex-301
Ex-302
Bank Protection
Bank Erosion Area
Legend
Planning Railway Rerouting (B-2)
Planning Riverbank Protection (B-2)
Assumed Bank Erosion Area
Existing Road
Water Area
Existing Site Kilo-post
Vertical Cross Sectional View
Rerouting Start (Section2) 0km000m (301km864m)
R2-1 1.5m x 1.5m x 1
Rerouting Line RL
GL
R2-2 1.0m x 1.0m x 2
R2-3 2.0m x 2.0m x 1
R2-4 3.0m x 3.0m x 1
Required Dike Level
Design High Water Level (Future Riverbed)
Design High Water Level (Present Riverbed)
Rerouting Line Curvature (Vertical)
Rerouting Line Grade
Rerouting Line RL
Ground Level
Rerouting Line Curvature (Horizontal)
Kilometrage (Re-Setting)
GOVERNMENT AGENCIES:
Japan International Cooperation Agency
Reli Assets Holding Company (RAHCO), Tanzania
JICA STUDY TEAM:
PADECO Co., Ltd., Nippon Koei Co., Ltd., Japan International Consultants for Transportation Co., Ltd., and Fukken Engineering Co., Ltd.
PROJECT & LOCATION:
Preparatory Survey on Flood Protection Measures for Central Railway Line in the United Republic of Tanzania
SHEET CONTENTS:
DWG NUM
4
21

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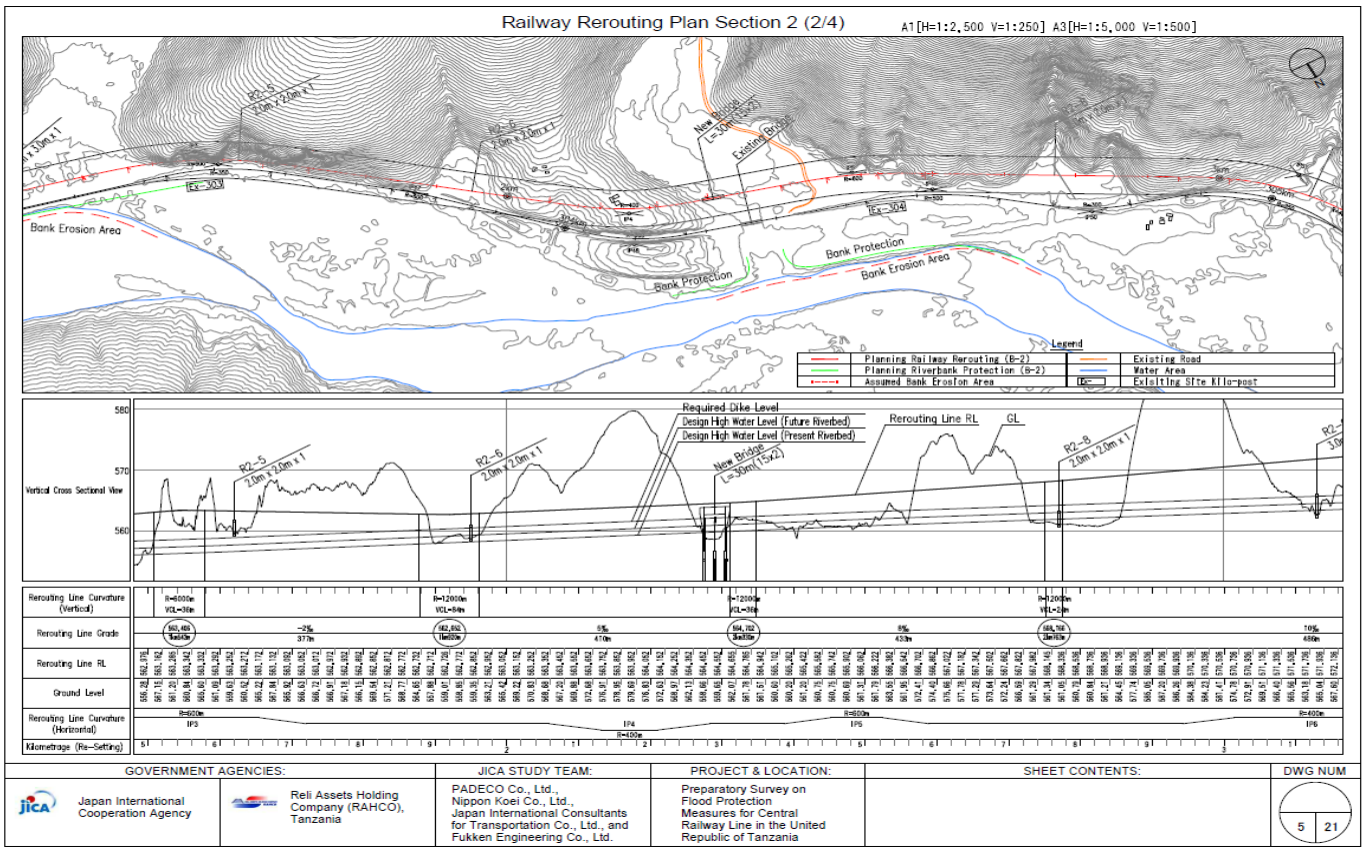

GOVERNMENT AGENCIES:		JICA STUDY TEAM:	PROJECT & LOCATION:	SHEET CONTENTS:	DWG NUM
Japan International Cooperation Agency	Reli Assets Holding Company (RAHCO), Tanzania	PADECO Co., Ltd., Nippon Koei Co., Ltd., Japan International Consultants for Transportation Co., Ltd., and Fukken Engineering Co., Ltd.	Preparatory Survey on Flood Protection Measures for Central Railway Line in the United Republic of Tanzania		5 / 21

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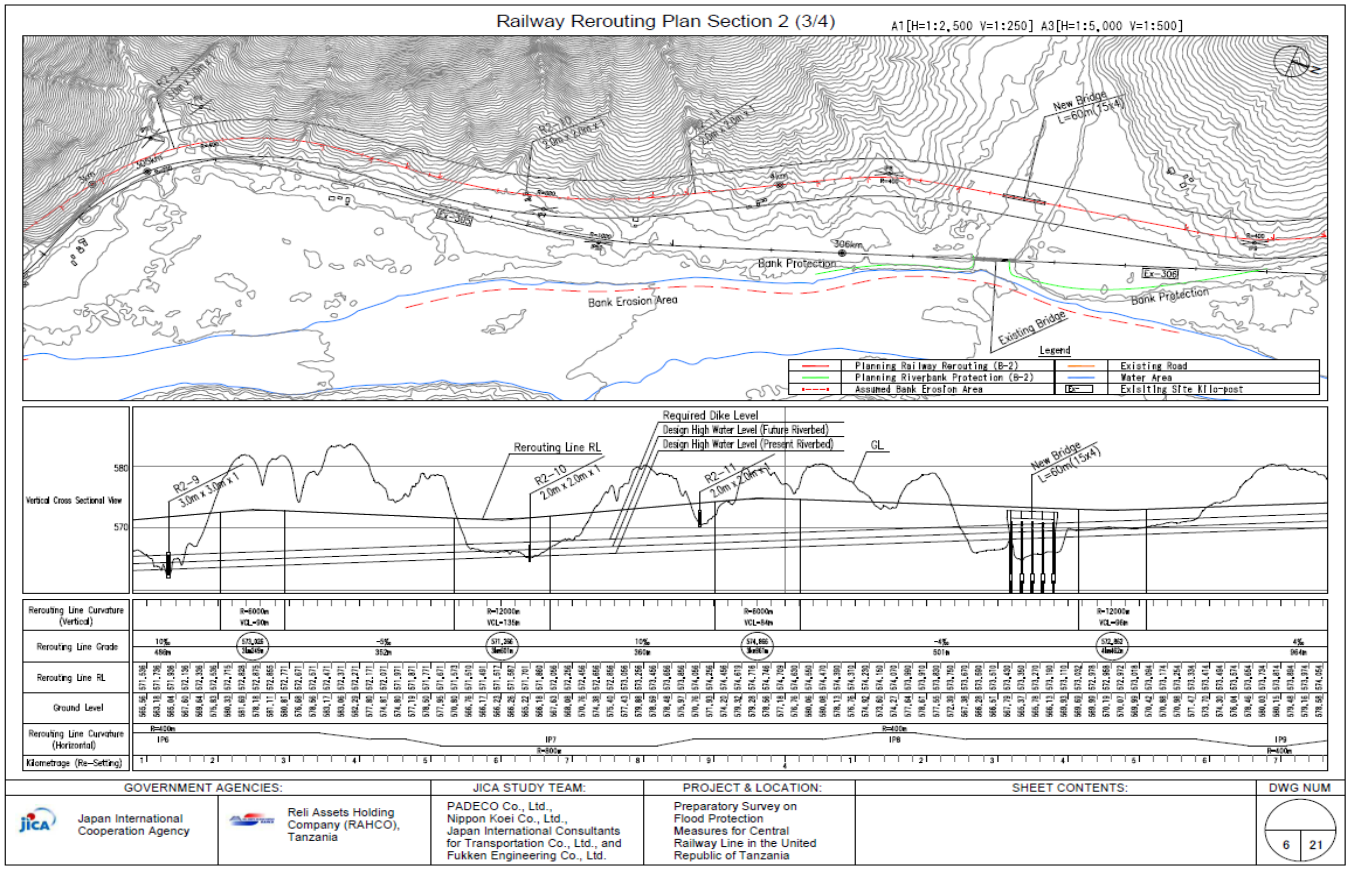
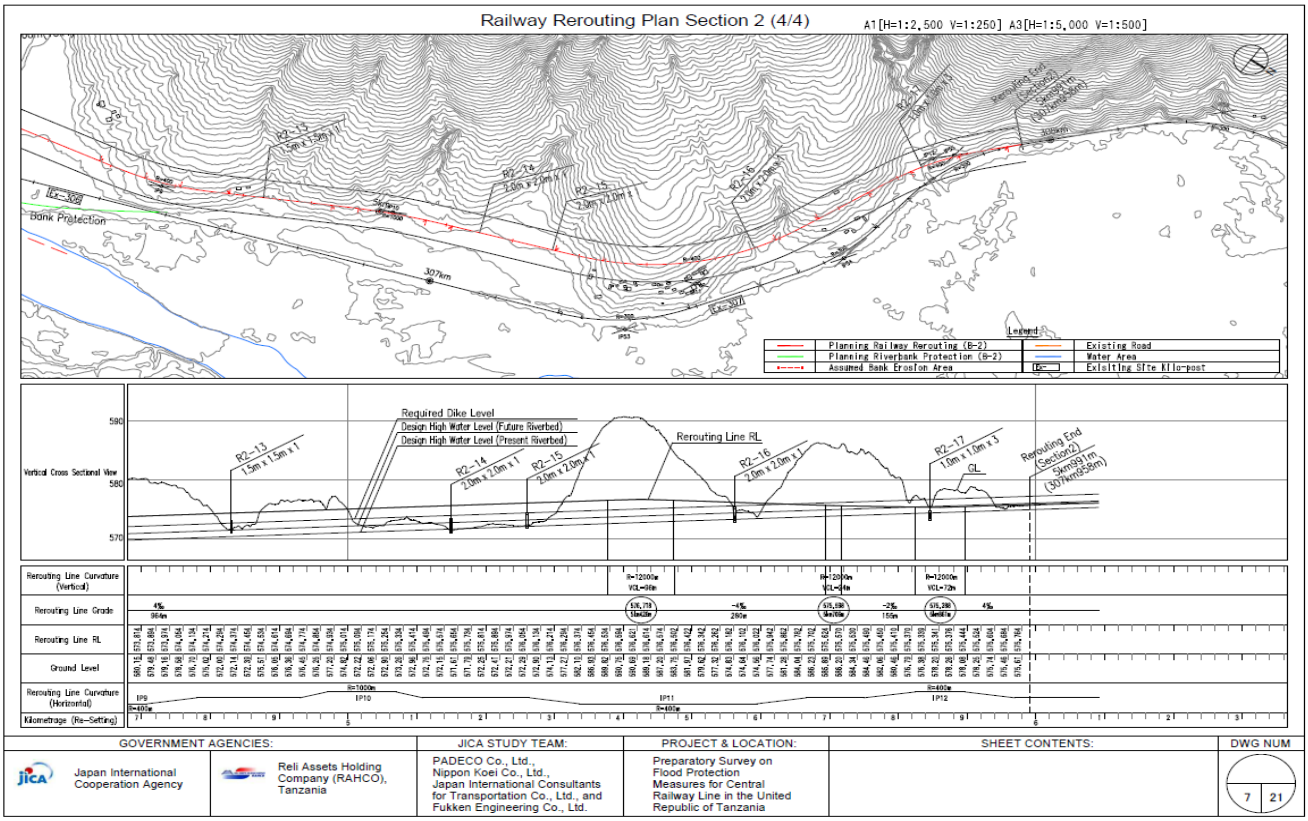


GOVERNMENT AGENCIES:		JICA STUDY TEAM:	PROJECT & LOCATION:	SHEET CONTENTS:	DWG NUM
Japan International Cooperation Agency	Reli Assets Holding Company (RAHCO), Tanzania	PADECO Co., Ltd., Nippon Koei Co., Ltd., Japan International Consultants for Transportation Co., Ltd., and Fukken Engineering Co., Ltd.	Preparatory Survey on Flood Protection Measures for Central Railway Line in the United Republic of Tanzania		6 / 21

V-6



GOVERNMENT AGENCIES:	JICA STUDY TEAM:	PROJECT & LOCATION:	SHEET CONTENTS:	DWG NUM
Japan International Cooperation Agency; Reli Assets Holding Company (RAHCO), Tanzania	PADECO Co., Ltd., Nippon Koei Co., Ltd., Japan International Consultants for Transportation Co., Ltd., and Fukken Engineering Co., Ltd.	Preparatory Survey on Flood Protection Measures for Central Railway Line in the United Republic of Tanzania		7 / 21

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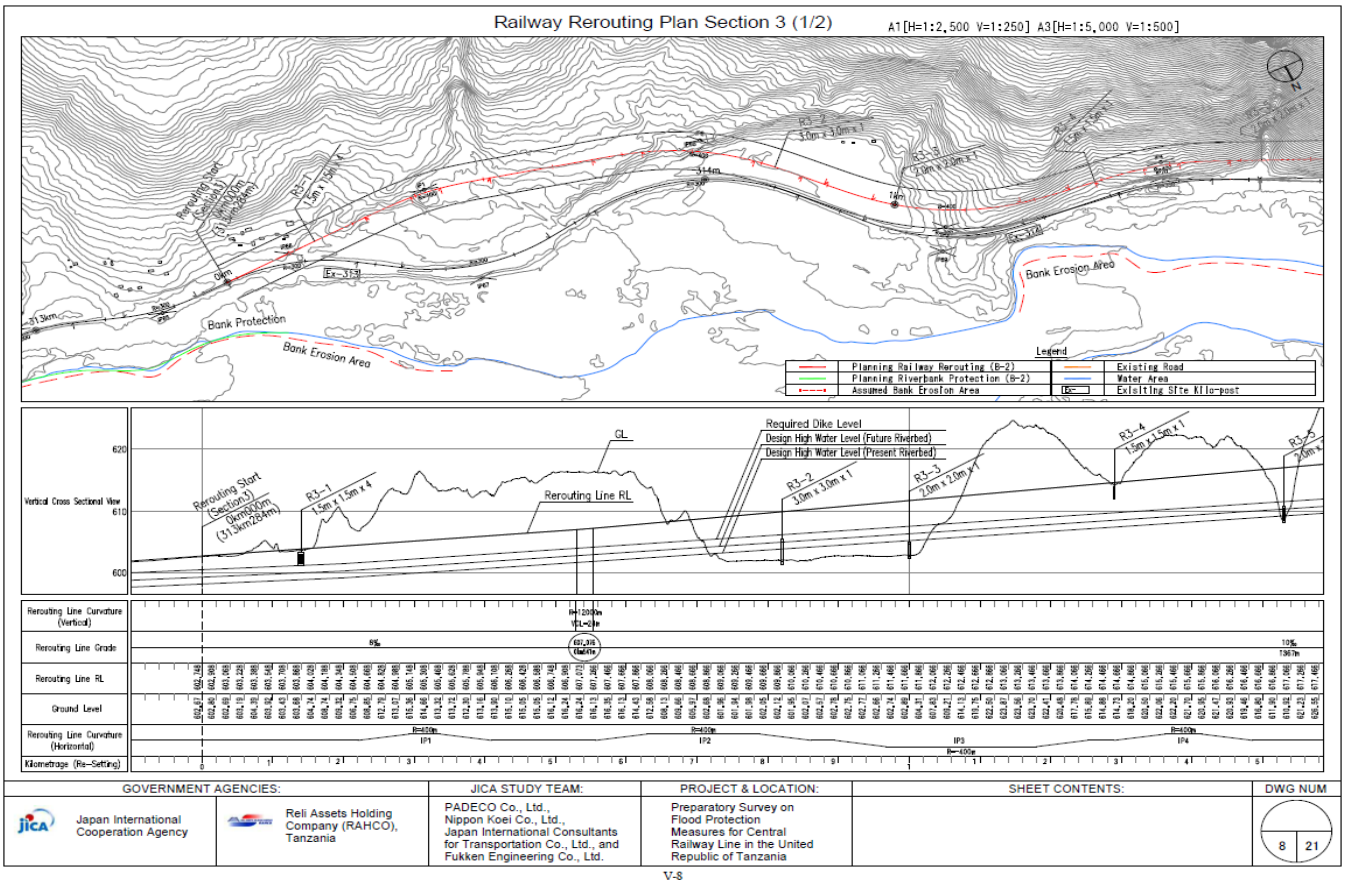

GOVERNMENT AGENCIES:	JICA STUDY TEAM:	PROJECT & LOCATION:	SHEET CONTENTS:	DWG NUM
Japan International Cooperation Agency; Reli Assets Holding Company (RAHCO), Tanzania	PADECO Co., Ltd., Nippon Koei Co., Ltd., Japan International Consultants for Transportation Co., Ltd., and Fukken Engineering Co., Ltd.	Preparatory Survey on Flood Protection Measures for Central Railway Line in the United Republic of Tanzania		8 / 21

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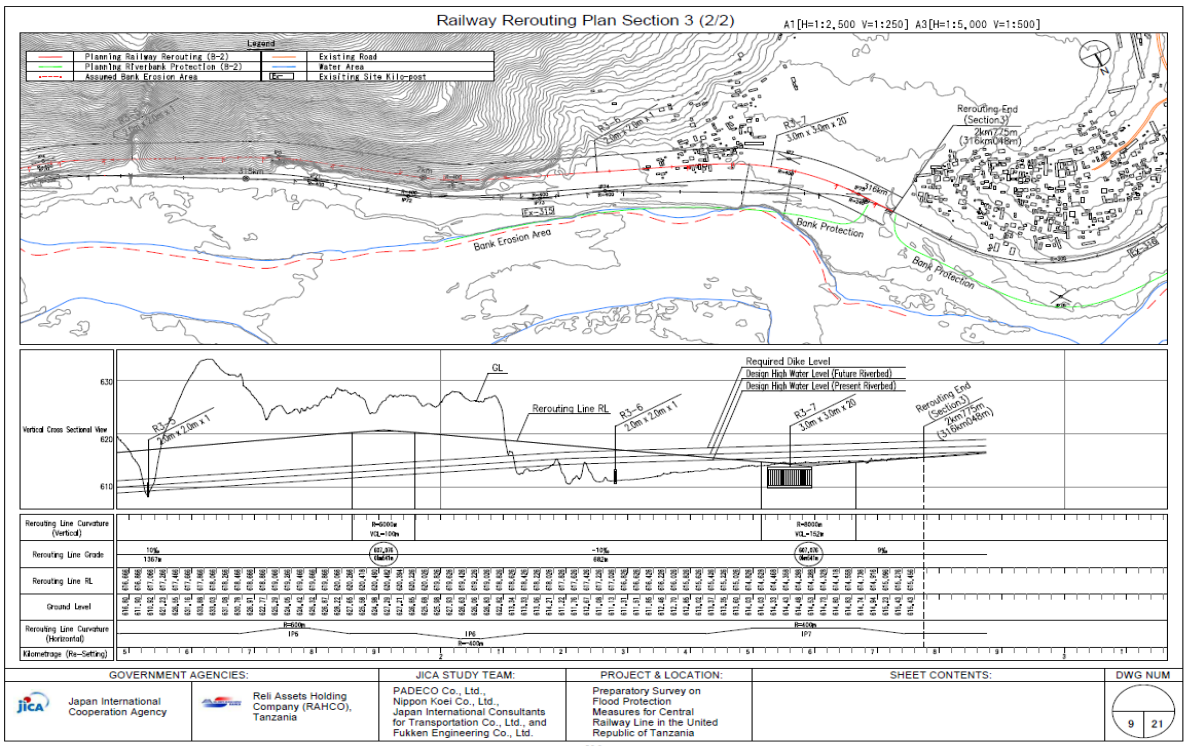
Railway Rerouting Plan Section 3 (2/2)
A1[H=1:2,500 V=1:250] A3[H=1:5,000 V=1:500]
Legend
Planning Railway Rerouting (B-2)
Planning Riverbank Protection (B-2)
Assumed Bank Erosion Area
Existing Road
Water Area
Existing Site Kilo-post
Rerouting End (Section 3) 2km775m (316km048m)
Bank Erosion Area
Bank Protection
Vertical Cross Sectional View
GL
Rerouting Line RL
Required Dike Level
Design High Water Level (Future Riverbed)
Design High Water Level (Present Riverbed)
Rerouting Line Curvature (Vertical)
Rerouting Line Grade
Rerouting Line RL
Ground Level
Rerouting Line Curvature (Horizontal)
Kilometrage (Re-Setting)
GOVERNMENT AGENCIES:
Japan International Cooperation Agency
Reli Assets Holding Company (RAHCO), Tanzania
JICA STUDY TEAM:
PADECO Co., Ltd., Nippon Koei Co., Ltd., Japan International Consultants for Transportation Co., Ltd., and Fukken Engineering Co., Ltd.
PROJECT & LOCATION:
Preparatory Survey on Flood Protection Measures for Central Railway Line in the United Republic of Tanzania
SHEET CONTENTS:
DWG NUM
9 21

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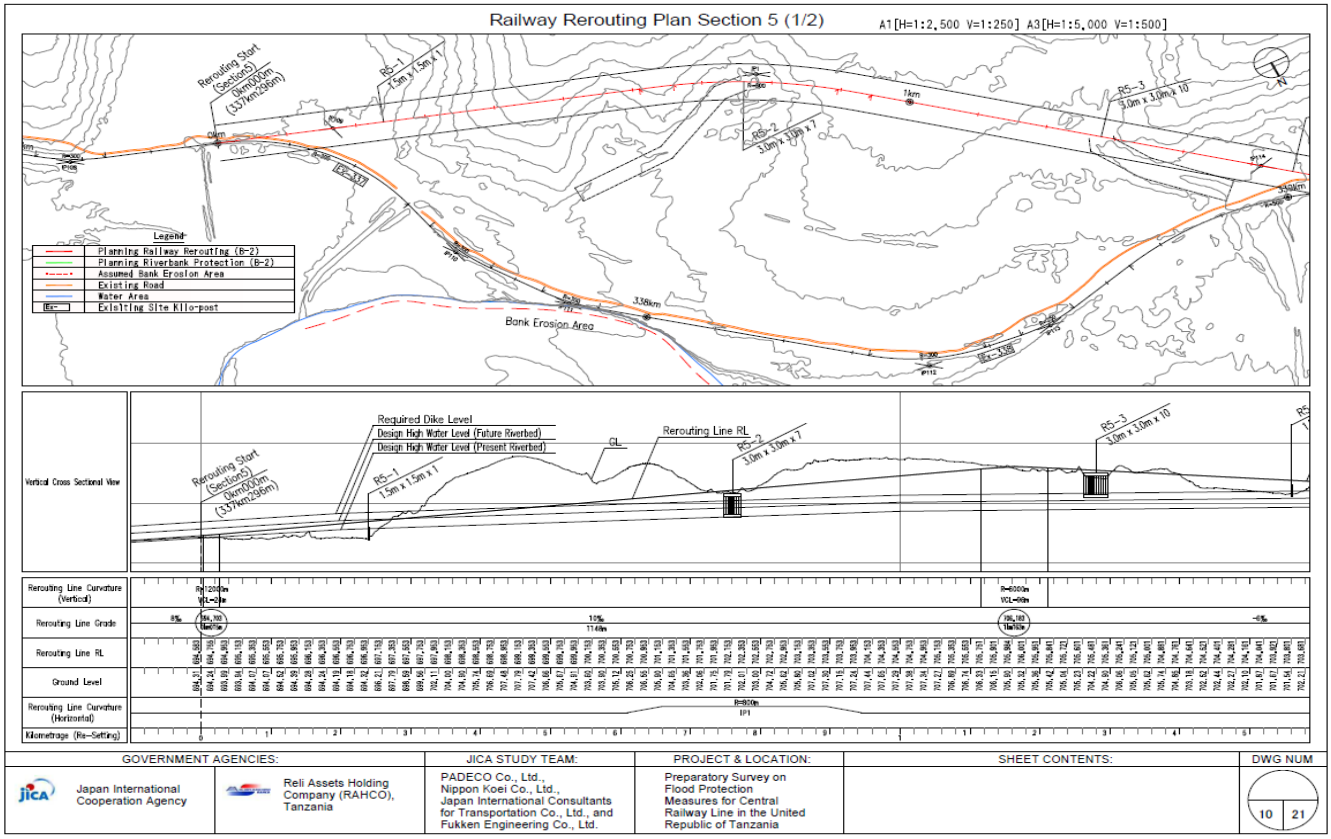
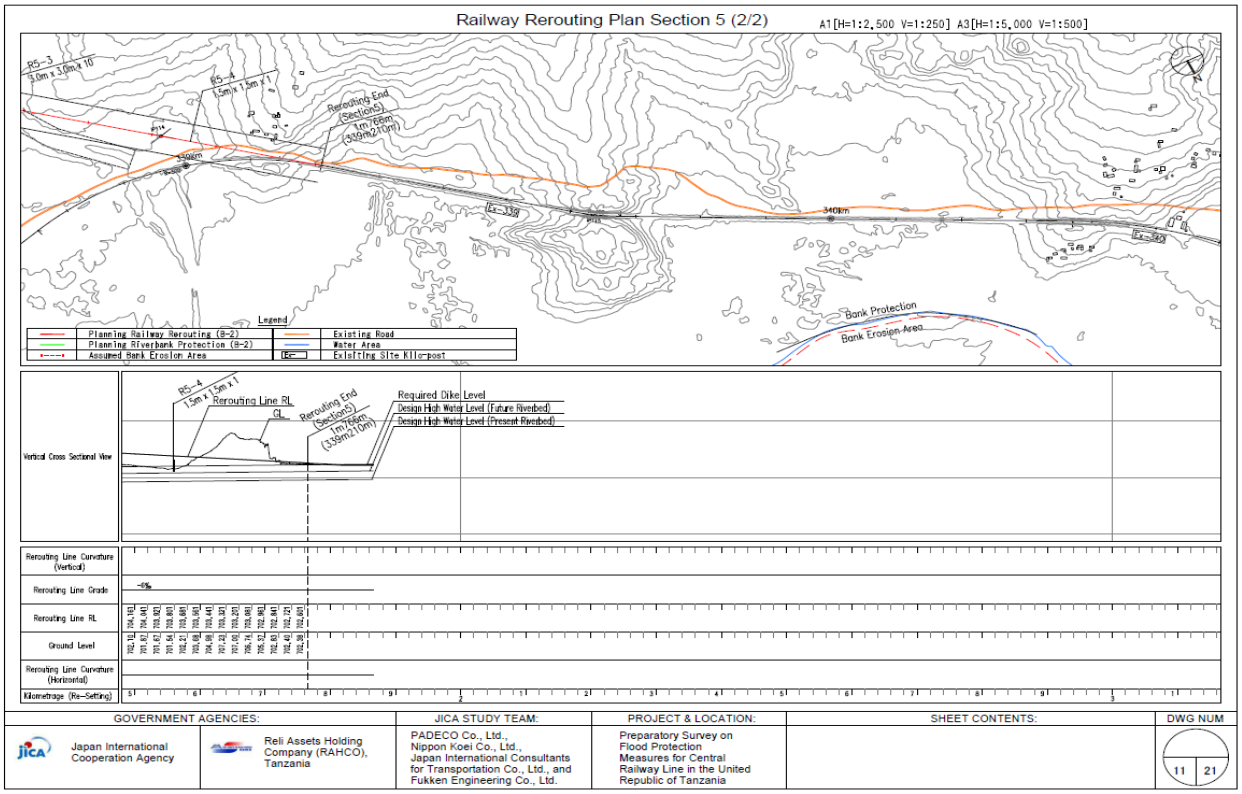

Railway Rerouting Plan Section 5 (1/2)
A1[H=1:2,500 V=1:250] A3[H=1:5,000 V=1:500]
Rerouting Start (Section 5) 0km000m (337km298m)
Legend
Planning Railway Rerouting (B-2)
Planning Riverbank Protection (B-2)
Assumed Bank Erosion Area
Existing Road
Water Area
Existing Site Kilo-post
Bank Erosion Area
Vertical Cross Sectional View
Required Dike Level
Design High Water Level (Future Riverbed)
Design High Water Level (Present Riverbed)
GL
Rerouting Line RL
Rerouting Line Curvature (Vertical)
Rerouting Line Grade
Rerouting Line RL
Ground Level
Rerouting Line Curvature (Horizontal)
Kilometrage (Re-Setting)
GOVERNMENT AGENCIES:
Japan International Cooperation Agency
Reli Assets Holding Company (RAHCO), Tanzania
JICA STUDY TEAM:
PADECO Co., Ltd., Nippon Koei Co., Ltd., Japan International Consultants for Transportation Co., Ltd., and Fukken Engineering Co., Ltd.
PROJECT & LOCATION:
Preparatory Survey on Flood Protection Measures for Central Railway Line in the United Republic of Tanzania
SHEET CONTENTS:
DWG NUM
10 21

V-10


Railway Rerouting Plan Section 5 (2/2)
A1[H=1:2,500 V=1:250] A3[H=1:5,000 V=1:500]
Legend
Planning Railway Rerouting (B-2)
Planning Riverbank Protection (B-2)
Assumed Bank Erosion Area
Existing Road
Water Area
Existing Site Kilo-post
Bank Protection
Bank Erosion Area
Rerouting Line RL
Required Dike Level
Design High Water Level (Future Riverbed)
Design High Water Level (Present Riverbed)
Vertical Cross Sectional View
Rerouting Line Curvature (Vertical)
Rerouting Line Grade
Rerouting Line RL
Ground Level
Rerouting Line Curvature (Horizontal)
Kilometrage (Re-Setting)
GOVERNMENT AGENCIES:
Japan International Cooperation Agency
Reli Assets Holding Company (RAHCO), Tanzania
JICA STUDY TEAM:
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Nippon Koei Co., Ltd.,
Japan International Consultants for Transportation Co., Ltd., and Fukken Engineering Co., Ltd.
PROJECT & LOCATION:
Preparatory Survey on Flood Protection Measures for Central Railway Line in the United Republic of Tanzania
SHEET CONTENTS:
DWG NUM
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21

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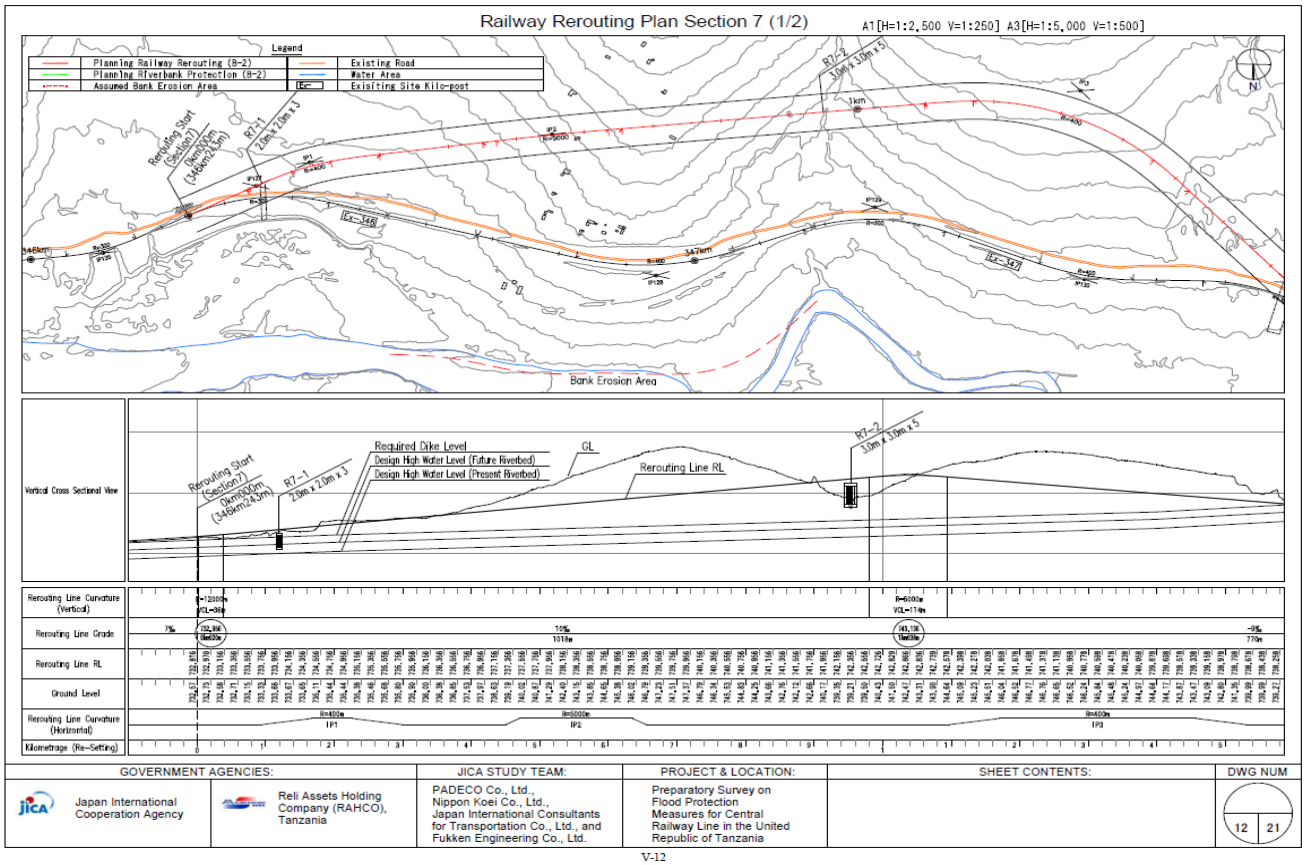
Railway Rerouting Plan Section 7 (1/2)
A1[H=1:2,500 V=1:250] A3[H=1:5,000 V=1:500]
Legend
Planning Railway Rerouting (B-2)
Planning Riverbank Protection (B-2)
Assumed Bank Erosion Area
Existing Road
Water Area
Existing Site Kilo-post
Bank Erosion Area
Rerouting Line RL
Required Dike Level
Design High Water Level (Future Riverbed)
Design High Water Level (Present Riverbed)
GL
Vertical Cross Sectional View
Rerouting Line Curvature (Vertical)
Rerouting Line Grade
Rerouting Line RL
Ground Level
Rerouting Line Curvature (Horizontal)
Kilometrage (Re-Setting)
GOVERNMENT AGENCIES:
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Reli Assets Holding Company (RAHCO), Tanzania
JICA STUDY TEAM:
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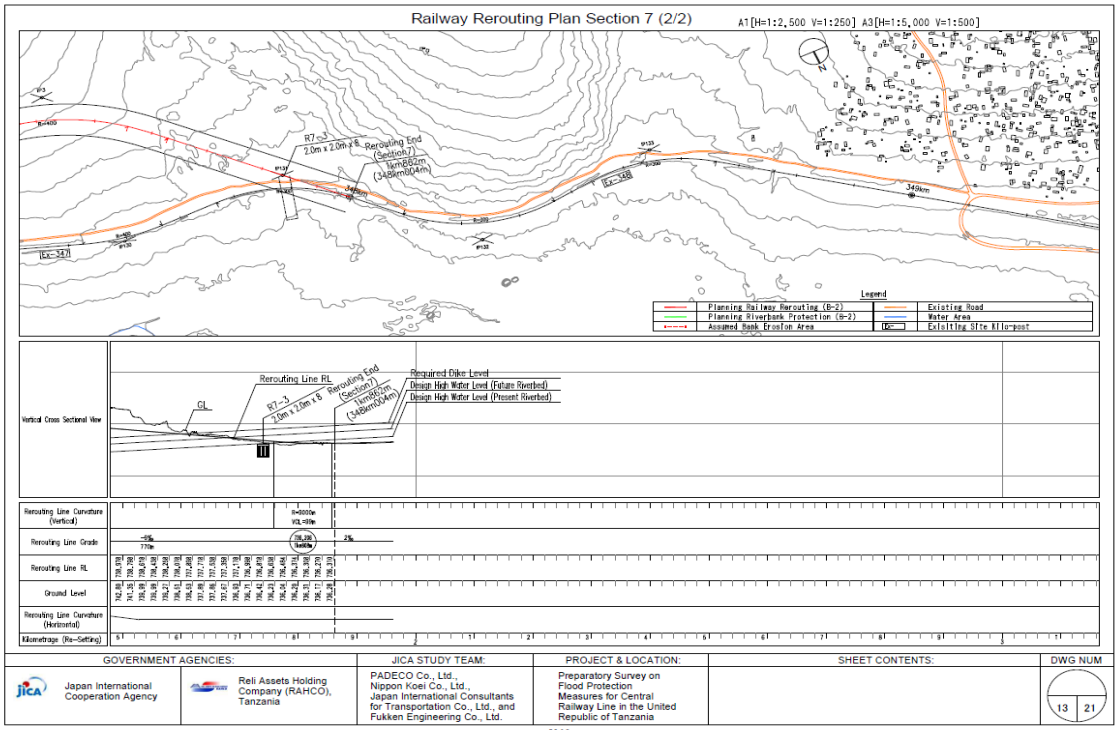
Nippon Koei Co., Ltd.,
Japan International Consultants for Transportation Co., Ltd., and Fukken Engineering Co., Ltd.
PROJECT & LOCATION:
Preparatory Survey on Flood Protection Measures for Central Railway Line in the United Republic of Tanzania
SHEET CONTENTS:
DWG NUM
12
21

V-12


Railway Rerouting Plan Section 7 (2/2)
A1[H=1:2,500 V=1:250] A3[H=1:5,000 V=1:500]
Rerouting End (Section7) 1km882m (348km804m)
Ex-348
Ex-347
Legend
Planning Railway Rerouting (B-2)
Planning Riverbank Protection (B-2)
Assumed Bank Erosion Area
Existing Road
Water Area
Existing Site Kilo-post
Vertical Cross Sectional View
Rerouting Line RL
Rerouting End (Section7) 1km882m (348km804m)
Required Dike Level
Design High Water Level (Future Riverbed)
Design High Water Level (Present Riverbed)
GL
Rerouting Line Curvature (Vertical)
Rerouting Line Grade
Rerouting Line RL
Ground Level
Rerouting Line Curvature (Horizontal)
Kilometrage (Re-Setting)
GOVERNMENT AGENCIES:
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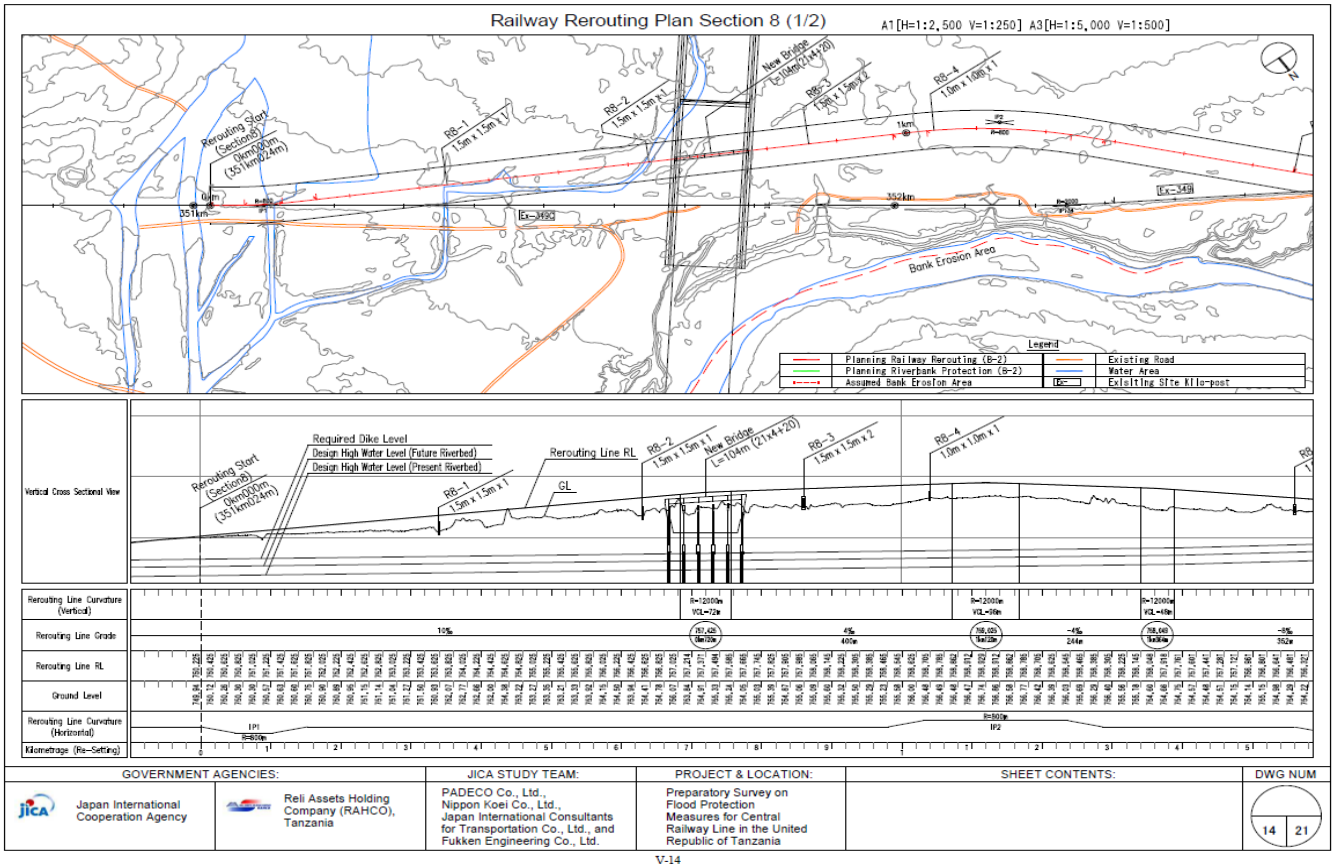
JICA STUDY TEAM:
PADECO Co., Ltd., Nippon Koei Co., Ltd., Japan International Consultants for Transportation Co., Ltd., and Fukken Engineering Co., Ltd.
PROJECT & LOCATION:
Preparatory Survey on Flood Protection Measures for Central Railway Line in the United Republic of Tanzania
SHEET CONTENTS:
DWG NUM
13 21

V-13


Railway Rerouting Plan Section 8 (1/2)
A1[H=1:2,500 V=1:250] A3[H=1:5,000 V=1:500]
Rerouting Start (Section8) 0km000m (351km024m)
RB-1 1.5m x 1.5m x 1
RB-2 1.5m x 1.5m x 1
New Bridge L=104m (21+4+20)
RB-3 1.5m x 1.5m x 2
RB-4 1.0m x 1.0m x 1
Ex-349
Ex-350
Bank Erosion Area
Legend
Planning Railway Rerouting (B-2)
Planning Riverbank Protection (B-2)
Assumed Bank Erosion Area
Existing Road
Water Area
Existing Site Kilo-post
Vertical Cross Sectional View
Required Dike Level
Design High Water Level (Future Riverbed)
Design High Water Level (Present Riverbed)
Rerouting Line RL
GL
Rerouting Line Curvature (Vertical)
Rerouting Line Grade
Rerouting Line RL
Ground Level
Rerouting Line Curvature (Horizontal)
Kilometrage (Re-Setting)
GOVERNMENT AGENCIES:
Japan International Cooperation Agency
Reli Assets Holding Company (RAHCO), Tanzania
JICA STUDY TEAM:
PADECO Co., Ltd., Nippon Koei Co., Ltd., Japan International Consultants for Transportation Co., Ltd., and Fukken Engineering Co., Ltd.
PROJECT & LOCATION:
Preparatory Survey on Flood Protection Measures for Central Railway Line in the United Republic of Tanzania
SHEET CONTENTS:
DWG NUM
14 21

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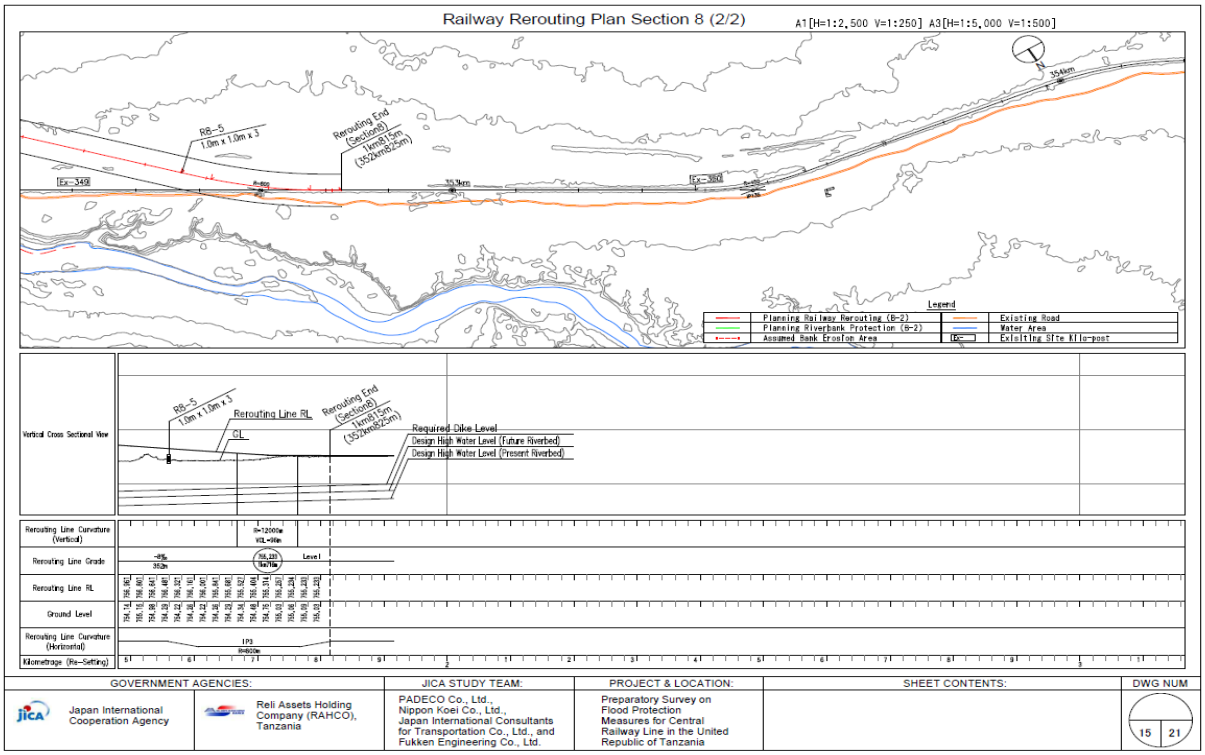
Railway Rerouting Plan Section 8 (2/2)
A1[H=1:2,500 V=1:250] A3[H=1:5,000 V=1:500]
R8-5
1.0m x 1.0m x 3
Rerouting End (Section8)
1km@15m
(362km825m)
Ex-349
Ex-350
Legend
Planning Railway Rerouting (B-2)
Planning Riverbank Protection (B-2)
Assumed Bank Erosion Area
Existing Road
Water Area
Existing Site Kilo-post
Vertical Cross Sectional View
Rerouting Line RL
GL
Required Dike Level
Design High Water Level (Future Riverbed)
Design High Water Level (Present Riverbed)
Rerouting Line Curvature (Vertical)
Rerouting Line Grade
Rerouting Line RL
Ground Level
Rerouting Line Curvature (Horizontal)
Kilometrage (Re-Setting)
GOVERNMENT AGENCIES:
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JICA STUDY TEAM:
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Japan International Consultants for Transportation Co., Ltd., and
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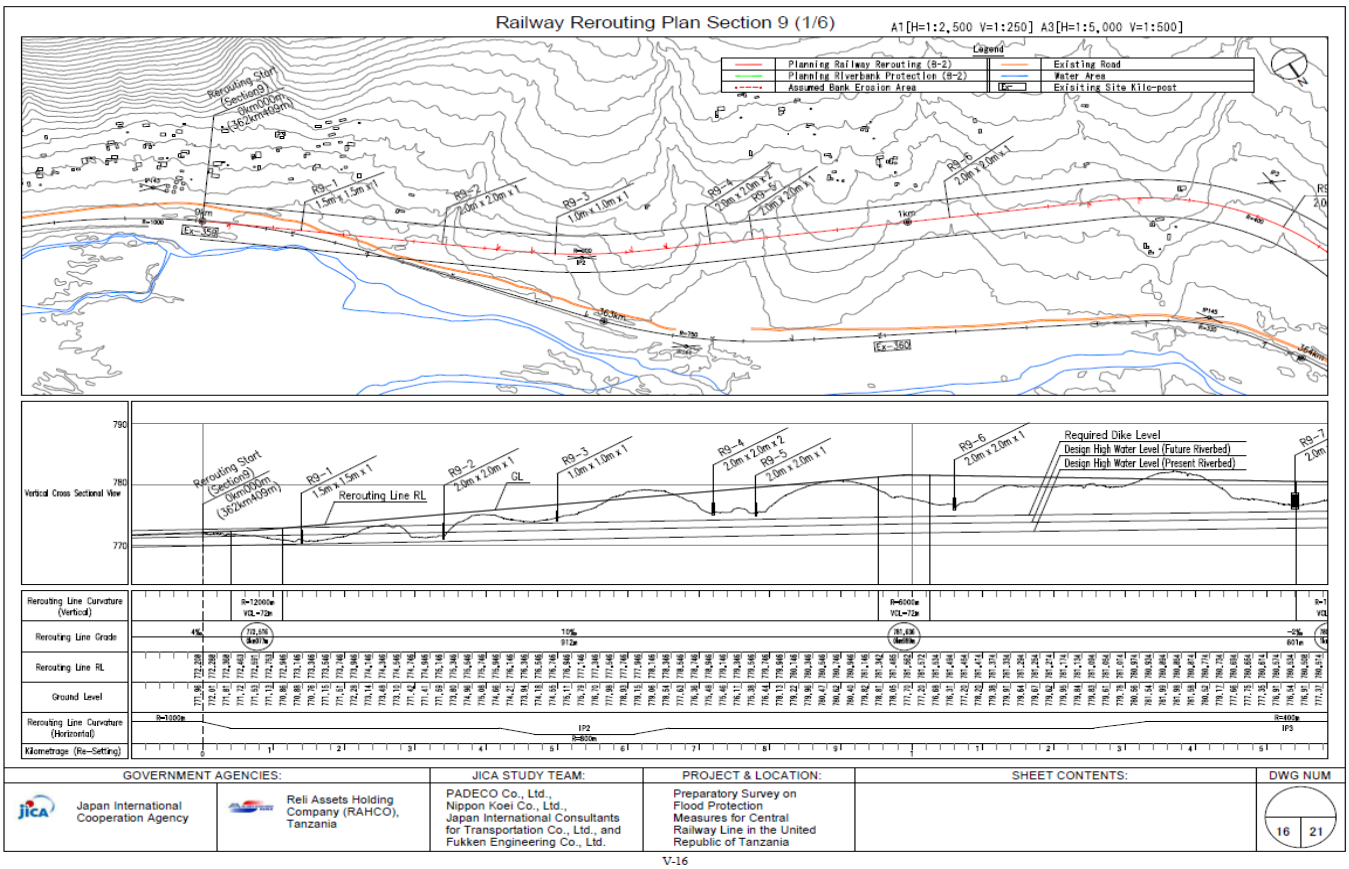
PROJECT & LOCATION:
Preparatory Survey on Flood Protection Measures for Central Railway Line in the United Republic of Tanzania
SHEET CONTENTS:
DWG NUM
15 21

V-15


Railway Rerouting Plan Section 9 (1/6)
A1[H=1:2,500 V=1:250] A3[H=1:5,000 V=1:500]
Legend
Planning Railway Rerouting (B-2)
Planning Riverbank Protection (B-2)
Assumed Bank Erosion Area
Existing Road
Water Area
Existing Site Kilo-post
Rerouting Start (Section9)
0km@00m
(362km409m)
R9-1
1.5m x 1.5m x 1
R9-2
2.0m x 2.0m x 1
R9-3
1.0m x 1.0m x 1
R9-4
2.0m x 2.0m x 2
R9-5
2.0m x 2.0m x 1
R9-6
2.0m x 2.0m x 1
R9-7
2.0m
Ex-350
Vertical Cross Sectional View
Rerouting Line RL
GL
Required Dike Level
Design High Water Level (Future Riverbed)
Design High Water Level (Present Riverbed)
Rerouting Line Curvature (Vertical)
Rerouting Line Grade
Rerouting Line RL
Ground Level
Rerouting Line Curvature (Horizontal)
Kilometrage (Re-Setting)
GOVERNMENT AGENCIES:
Japan International Cooperation Agency
Reli Assets Holding Company (RAHCO), Tanzania
JICA STUDY TEAM:
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Nippon Koei Co., Ltd.,
Japan International Consultants for Transportation Co., Ltd., and
Fukken Engineering Co., Ltd.
PROJECT & LOCATION:
Preparatory Survey on Flood Protection Measures for Central Railway Line in the United Republic of Tanzania
SHEET CONTENTS:
DWG NUM
16 21

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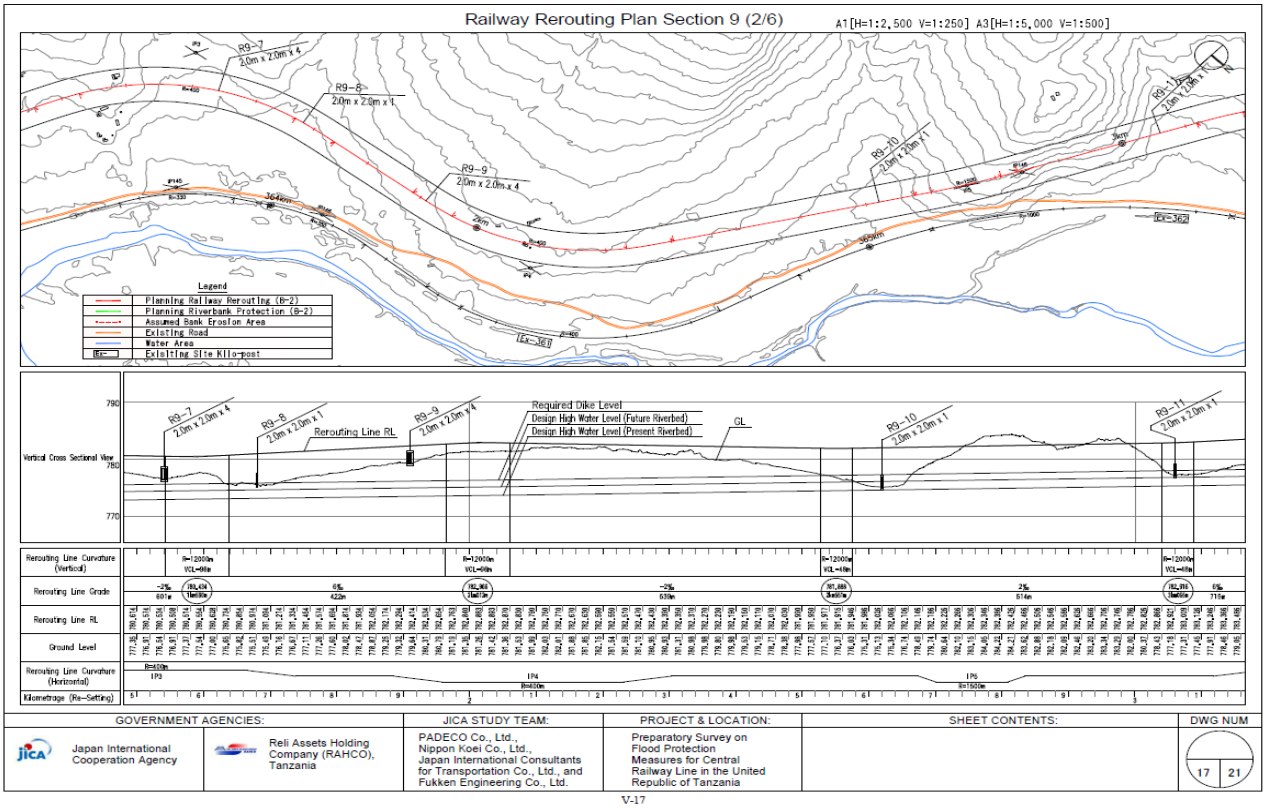

GOVERNMENT AGENCIES:		JICA STUDY TEAM:	PROJECT & LOCATION:	SHEET CONTENTS:	DWG NUM
Japan International Cooperation Agency	Reli Assets Holding Company (RAHCO), Tanzania	PADECO Co., Ltd., Nippon Koei Co., Ltd., Japan International Consultants for Transportation Co., Ltd., and Fukken Engineering Co., Ltd.	Preparatory Survey on Flood Protection Measures for Central Railway Line in the United Republic of Tanzania		17 / 21

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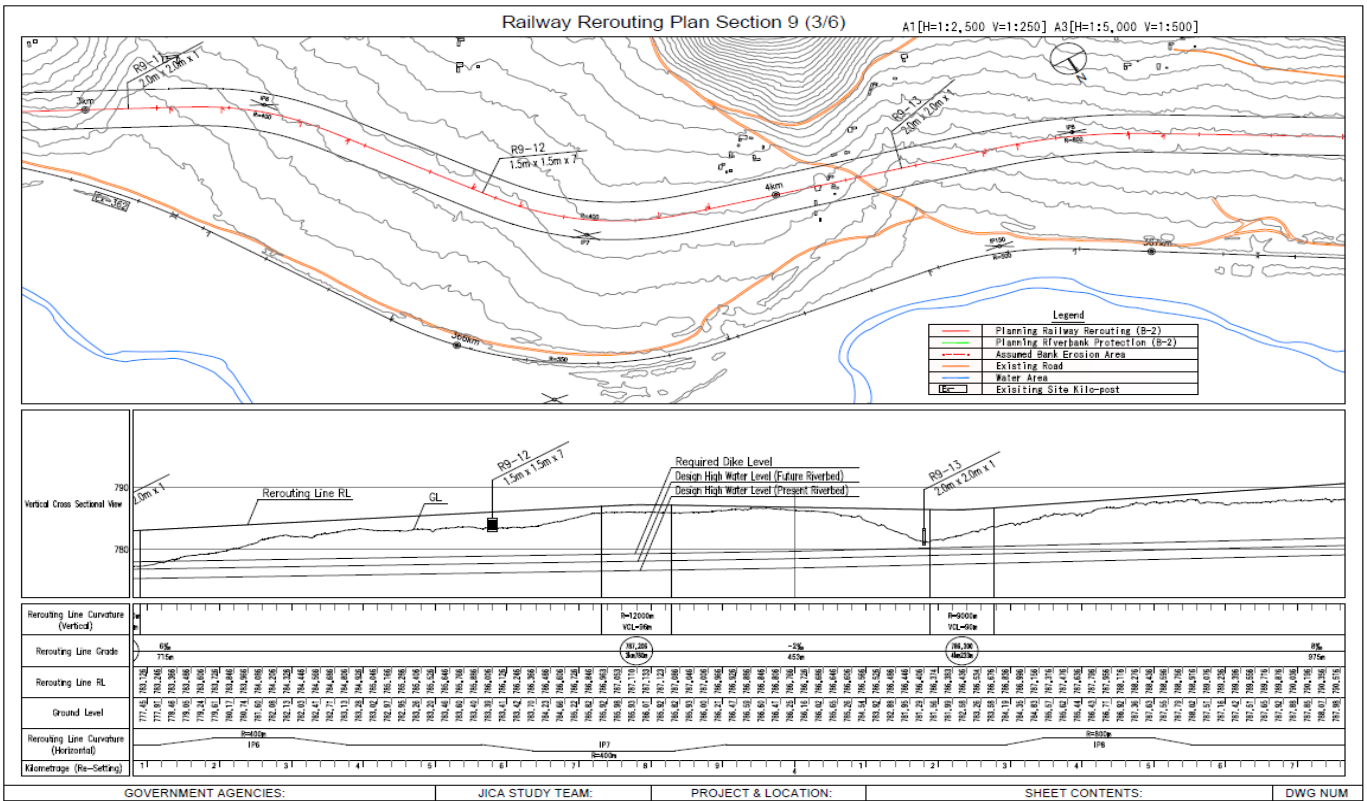

GOVERNMENT AGENCIES:		JICA STUDY TEAM:	PROJECT & LOCATION:	SHEET CONTENTS:	DWG NUM
Japan International Cooperation Agency	Reli Assets Holding Company (RAHCO), Tanzania	PADECO Co., Ltd., Nippon Koei Co., Ltd., Japan International Consultants for Transportation Co., Ltd., and Fukken Engineering Co., Ltd.	Preparatory Survey on Flood Protection Measures for Central Railway Line in the United Republic of Tanzania		18 / 21

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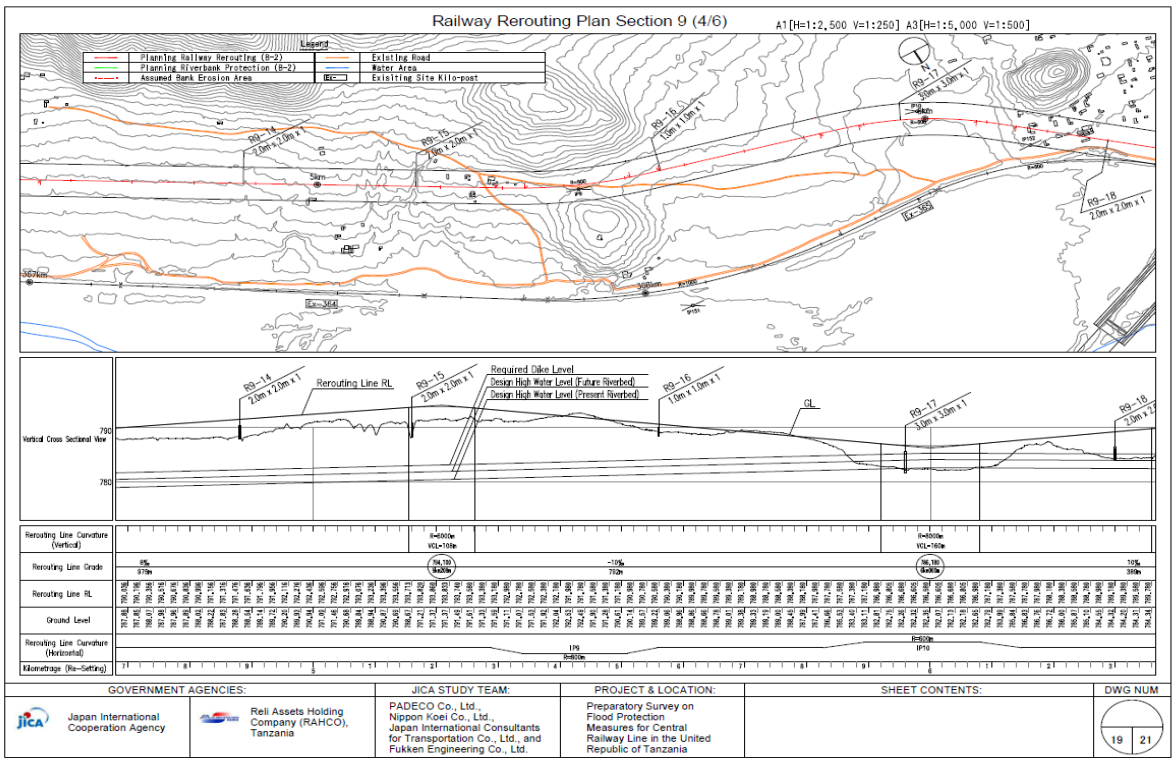
Railway Rerouting Plan Section 9 (4/6)
A1[H=1:2,500 V=1:250] A3[H=1:5,000 V=1:500]
Legend
Planning Railway Rerouting (B-2)
Planning Riverbank Protection (B-2)
Assumed Bank Erosion Area
Existing Road
Water Area
Existing Site Kilo-post
R9-14 2.0m x 2.0m x 1
R9-15 2.0m x 2.0m x 1
R9-16 1.0m x 1.0m x 1
R9-17 3.0m x 3.0m x 1
R9-18 2.0m x 2.0m x 1
Rerouting Line RL
Required Dike Level
Design High Water Level (Future Riverbed)
Design High Water Level (Present Riverbed)
GL
Vertical Cross Sectional View
Rerouting Line Curvature (Vertical)
Rerouting Line Grade
Rerouting Line RL
Ground Level
Rerouting Line Curvature (Horizontal)
Kilometrage (Re-Setting)
GOVERNMENT AGENCIES:
Japan International Cooperation Agency
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JICA STUDY TEAM:
PADECO Co., Ltd., Nippon Koei Co., Ltd., Japan International Consultants for Transportation Co., Ltd., and Fukken Engineering Co., Ltd.
PROJECT & LOCATION:
Preparatory Survey on Flood Protection Measures for Central Railway Line in the United Republic of Tanzania
SHEET CONTENTS:
DWG NUM
19 21

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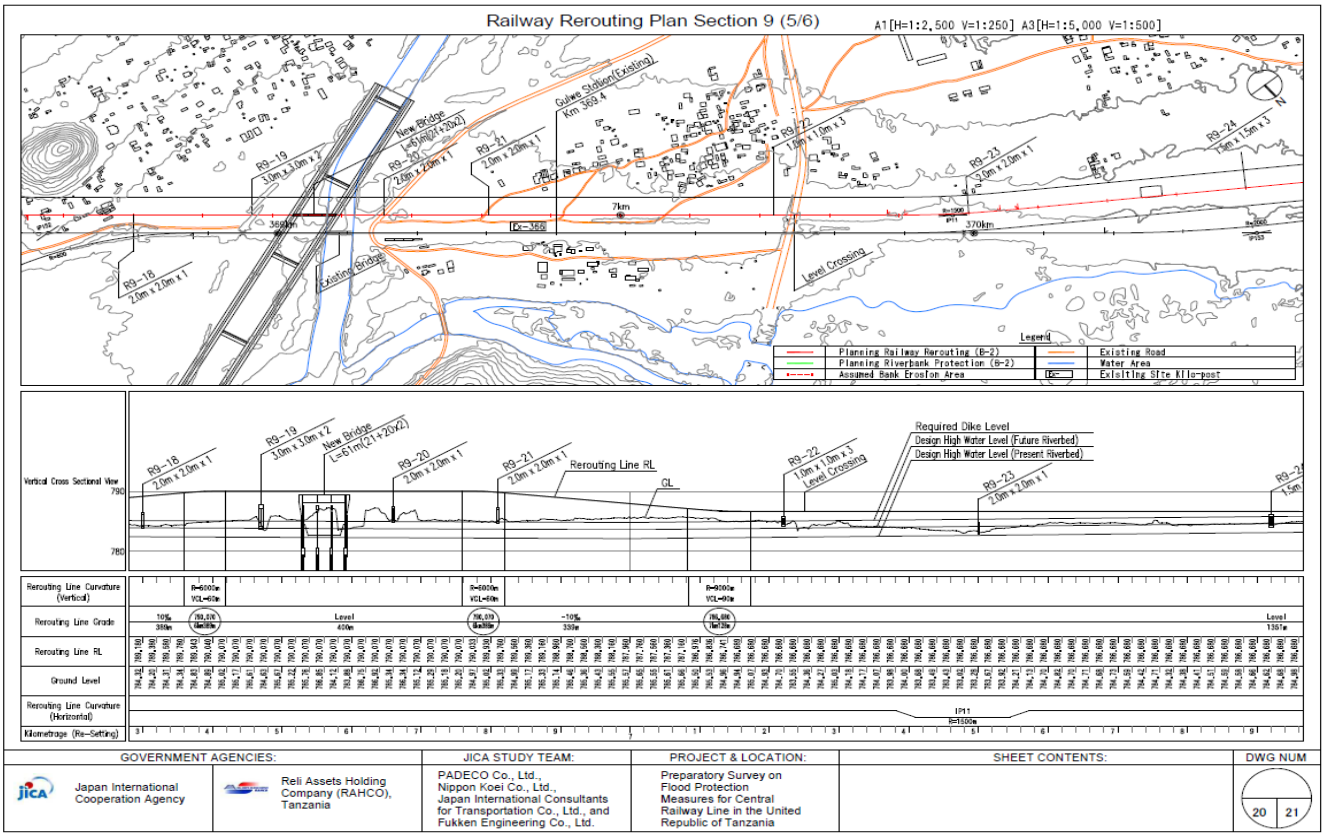
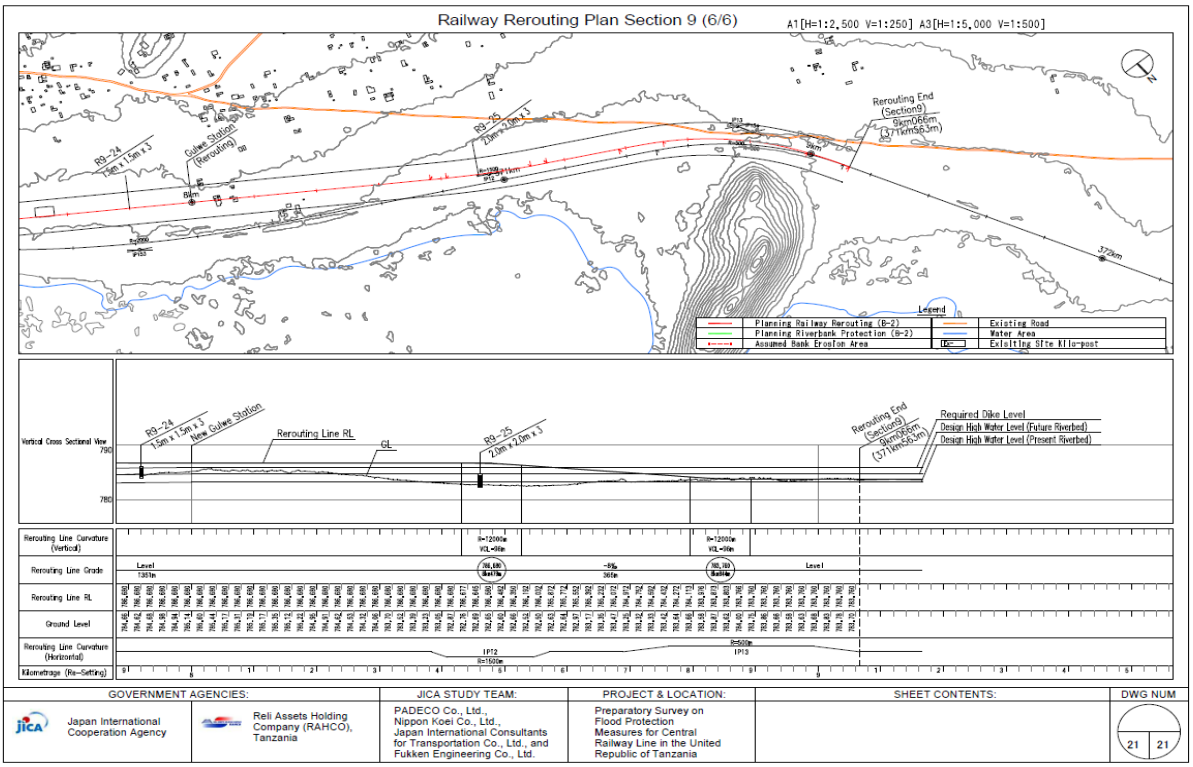

Railway Rerouting Plan Section 9 (5/6)
A1[H=1:2,500 V=1:250] A3[H=1:5,000 V=1:500]
Gulwe Station (Existing) Km 369.4
New Bridge L=61m(21+20x2)
R9-19 3.0m x 1.0m x 2
R9-20 2.0m x 2.0m x 1
R9-21 2.0m x 2.0m x 1
R9-22 1.0m x 1.0m x 3
R9-23 2.0m x 2.0m x 1
R9-24 1.5m x 1.5m x 3
Existing Bridge
Level Crossing
Legend
Planning Railway Rerouting (B-2)
Planning Riverbank Protection (B-2)
Assumed Bank Erosion Area
Existing Road
Water Area
Existing Site Kilo-post
Rerouting Line RL
Required Dike Level
Design High Water Level (Future Riverbed)
Design High Water Level (Present Riverbed)
GL
Vertical Cross Sectional View
Rerouting Line Curvature (Vertical)
Rerouting Line Grade
Rerouting Line RL
Ground Level
Rerouting Line Curvature (Horizontal)
Kilometrage (Re-Setting)
GOVERNMENT AGENCIES:
Japan International Cooperation Agency
Reli Assets Holding Company (RAHCO), Tanzania
JICA STUDY TEAM:
PADECO Co., Ltd., Nippon Koei Co., Ltd., Japan International Consultants for Transportation Co., Ltd., and Fukken Engineering Co., Ltd.
PROJECT & LOCATION:
Preparatory Survey on Flood Protection Measures for Central Railway Line in the United Republic of Tanzania
SHEET CONTENTS:
DWG NUM
20 21

V-20


Railway Rerouting Plan Section 9 (6/6)
A1[H=1:2,500 V=1:250] A3[H=1:5,000 V=1:500]
Rerouting End (Section9) 9km066m (371km963m)
Culvert Station (Rerouting)
RB-24 1.5m x 1.5m x 3
RB-25 2.0m x 2.0m x 3
372km
Legend
Planning Railway Rerouting (B-2)
Planning Riverbank Protection (B-2)
Assumed Bank Erosion Area
Existing Road
Water Area
Existing Site Kilo-post
Vertical Cross Sectional View
RB-24 1.5m x 1.5m x 3
New Culvert Station
Rerouting Line RL
GL
RB-25 2.0m x 2.0m x 3
Rerouting End (Section9) 9km066m (371km963m)
Required Dike Level
Design High Water Level (Future Riverbed)
Design High Water Level (Present Riverbed)
Rerouting Line Curvature (Vertical)
Rerouting Line Grade
Level
Rerouting Line RL
Ground Level
Rerouting Line Curvature (Horizontal)
Kilometrage (Re-Setting)
GOVERNMENT AGENCIES:
Japan International Cooperation Agency
Reli Assets Holding Company (RAHCO), Tanzania
JICA STUDY TEAM:
PADECO Co., Ltd.,
Nippon Koei Co., Ltd.,
Japan International Consultants for Transportation Co., Ltd., and
Fukken Engineering Co., Ltd.
PROJECT & LOCATION:
Preparatory Survey on Flood Protection Measures for Central Railway Line in the United Republic of Tanzania
SHEET CONTENTS:
DWG NUM
21 21

V-21

APPENDIX 4: DETAILED DESCRIPTION OF ISSUES, CONCERNS AND COMMENTS RAISED BY DIFFERENT STAKEHOLDERS GROUPS

CONSULTATIVE MEETING WITH LOCAL LEADERS: MKADAGE WARD MEETING MINUTES

A. DATE: 08th June, 2015

B. TIME: 3:00pm – 5:00pm

C. PRIMARY PURPOSE: Scoping: Environmental and Social Impact Assessment (ESIA) for the Preparatory Survey on Flood Protection Measures for the Central Railway Line –Kilosa to Dodoma Section.

D. SUBJECT: Consultative meeting with local leaders – village level

E. VENUE: In a classroom at Mkadage Primary School

F. RECORDED BY: Ms. Mwajuma Nuru and Mr. Justin Mawingi; **Company:** JSB- EnviDep Ltd.

G. LANGUAGE USED: Primary language: Swahili **Translated to:** English

H. ATTENDEES:

Project Representatives

Name	Position	Company	Contact Info.
Mr. Mugisha Lucius	Consultant (Sociology)	JSB-EnviDep Ltd	+255 714 462 206
Mr. Frank Mbago	Consultant (Botanist)	JSB-EnviDep Ltd	+255 787 879 852 +255 655 650 672
Dr. Benno	Consultant (Aquatic Ecologist) – Team Leader	JSB-EnviDep Ltd	+255 784 474 256 +255 713 350 780
Ms. Mwajuma Nuru	Consultant (Stakeholder Engagement)	JSB-EnviDep Ltd	+255 713 553 558 mwammy82@yahoo.com
Mr. Justin Mawingi	Consultant (Stakeholder Engagement assistant)	JSB-EnviDep Ltd	+255 763 261 919 mawingi.deograsias@yahoo.com
Eng. Leonard Gastory	Consultant (Engineer)	JSB-EnviDep Ltd	+255 715 640 302 leonardgastory@yahoo.com
Mr. Chacha Werema	Consultant (Wildlife Expert)	JSB-EnviDep Ltd	+255 754 407 650
Mr. Mutabazi Francis	Consultant (Geologist)	JSB-EnviDep Ltd	+255 712 703 133 +255 757 463 232
Mr. Elgidius Ichumbakii	Consultant (Archaeologist)	JSB-EnviDep Ltd	+255 713 860 875
Ms. Judith Nzamba	Environmental Management Officer	RAHCO	
Ms. Kyoko Mishima	Expert for Environmental and Social Considerations	JICA Study Team	+255 784 320 246

Stakeholders' attendees[46]

- **Approximate number: 47**

Sign- in sheets will be attached in appendices to show the list of stakeholders who participated in the meetings with Ward leaders.

[46] Sign-in sheet ……..

- **Description of Stakeholders**

Mkadage village Chairperson chaired the meeting with JSB Consultants hosting and facilitating the meeting. Attending were the: representative from Kilosa Municipal Director's office (Community Development officer);Ward Executive Officer (WEO),Village Chairperson; representatives of different village committees (environment, natural resources, community welfare, water, security and HIV/AIDS) Women group representatives (Farmers, entrepreneurs) , representatives of different age groups (youth and elderly), Natural Resource Users (traditional herbalist, hunters, farmers) religious and political leaders.

I. OPENING REMARKS

The meeting came to order at 3:00 pm with welcome remarks by the Mkadage Ward (Mtaa) Chairperson followed by self-introduction by attendees. The Mkadage WEO, Mr. Mohammed Hamisi who was chairperson for the meeting made opening remarks stating the objective of the meeting emphasizing the fact that the leaders are representatives of the rest of the community and responsible for dissemination of issues that will be presented and agreed.

JSB Consultants Team Leader Dr. Benno proceeded to present a brief introduction about the Project Proponent RAHCO, and JICA, plans for the flood protection on the central railway line within Kilosa - Dodoma sections (Flood prone areas). He went on describing the effects of floods on the Central Railway Line plus the control/protection measures which will be undertaken, the need for ESIA and purpose of the scoping phase including requirement to meet with stakeholders. For the meeting with Mkadage Ward leaders he presented the agenda of the meeting as follows:

MEETING AGENDA

1. Opening remarks
2. Subject description
3. Condition and land uses at the project site
4. Stakeholders expectations (project benefits)
5. Negative impacts, risks and challenges
6. Stakeholders roles and responsibilities
7. Grievance redress mechanism
8. Conclusion & closing remarks
9. Next steps.

J. SUBJECT DESCRIPTION

RAHCO representative Ms. Judith Nzamba presented a description of the flood protection measures on the central railway line detailing on the different alternatives to be used (relocation, river banks training and track elevation), scope, and operations activities and management aspects. She concluded by presenting the way forward for the ESIA process and project authorization.

Issues raised and discussed at the meeting

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
Condition and land uses at the project site		
Land at Mkadage village where the railway passes through has different uses.	Land is used for: Agriculture (i.e. cropland), grazing areas and building housing structures. Other uses include: forest (collection of medicinal plants, firewood and building wood etc).	
Stakeholders expectations (project benefits)		
Job opportunities for construction and train operation. It should be prioritized to the local villagers.	Community members expect employment opportunities for unskilled and semi-skilled labour during railway development/ rehabilitation works (i.e. site clearance, construction of gabions, security guards, digging ditches etc.)	Prioritization of job opportunities to the local villagers and the equal distribution through the village government shall be

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
		addressed in the mitigation plan.
Improvement of the railway service for transporting agricultural products.	By protecting the railway line from floods; locals expected an accelerated movement of people/goods to the market as result of a reliable means of transport.	
Side road	The road along the railway to be improved for securing safety and local transportation.	To be discussed the possibilities.
The railway construction/development and rehabilitation works is expected to attract opportunity seekers to areas in its vicinity	During the railway development / construction / rehabilitation activities - are expected to attract people to the area seeking opportunities i.e. employment, trade and service provision. Economic growth of the villages/villagers.	
Crossing road	Roads to cross the railway (with livestock) to be built.	Underpass is to be planned in this study for the section of railway embankment.
Negative impacts, risks and challenges		
Loss of natural vegetation cover due site clearance during the construction works / rehabilitation the railway	The flooded sections (within Mkadage Village) of the railway nearby area is endowed with trees and herbs of local importance i.e. medicinal, building materials and fuel-wood etc. that will be cleared, damaged due to railway development / rehabilitation works i.e. shifting of the existing route and river banks training .	To be addressed in the mitigation plan.
House relocation and land acquisition. It should be compensated properly.	During the rehabilitation phase people might lose their croplands/ pastureland in areas where relocation/ shifting of the existing railway route will occur. Other people might lose their houses.	To be addressed in the CRP.
Kidete Dam should be renovated as the first priority for protecting both agricultural land and the railway from flood.	Heavy siltation on Kidete dam. Previously the dam used to speed down the flow of water (reduced flood pressure – due to the fact that it had a single open gate to allow controlled water flow down the stream/ river). But after siltation the dam is now filled up with soil and other materials - therefore water moves freely and causes flooding to people's farms and the railway infrastructures.	Flood flow prevention shall be addressed in future project such as watershed management project.
Increase in accident events	Locals expected flood free railway line will encourage an increase number of train trips and its consequential increase on the number of accidents to those who use railway as side walk/ ride their motorbike/bicycle by the railway side. Also accidents might occur during construction and may result into loss of some body parts i.e. leg, arm etc.	
Occupational Risks	OHS (Occupational Health and Safety)/worker's insurance	To be addressed in the mitigation plan.
Increase in HIV transmission from / to new comers and local community and consequent increase in AIDS sufferers in project area.	Interactions between project personnel and service providers who have better income than locals have a potential to increase HIV transmission rate and spread of other STDs.	To be addressed in the mitigation plan.
Hiking of prices of goods and services	Traders and service providers within locality are expected to take advantage of the new comers (with higher purchasing power) resulting into inflation in the prices of goods and service.	

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
Disturbance from noise generated by movements of trains and other machineries used in the railway construction.	Noise from different machineries (such as vehicle, earth moving heavy machineries: compacters, fork lifters and other construction equipments) used during railway rehabilitation could be potential sources of nuisance hence disturbing the nearby people.	

K. STAKEHOLDERS INVOLVEMENT IN PROJECT IMPLEMENTATION

Stakeholder's roles and responsibilities

- HIV / AIDS committee: Through the committee, community will be educated on ways of preventing HIV transmission.
- Local government authorities: The authorities will be involved in identification of individuals among the local community who are capable of working (as semi-skilled or unskilled labourers) during railway development, construction and rehabilitation works.

Grievance Redress Mechanism

Normal government reporting procedure was proposed to be used as follows: Community level to ward level, then Municipal level and reporting directly to concerned offices i.e. Land office.

L. CONCLUSION AND CLOSING REMARKS

The Ward Chairperson closed the meeting by thanking JSB EnviDep for organizing the meeting reiterating that the leaders are representatives of the rest of the community and responsible for dissemination of issues that were presented and agreed upon. Further collaboration to the consultants should be given so as to continue with their study in the area.

Next Steps

The consultants informed participants that during the next five days they intended to undertake visits to Munisagara, Muzaganza, Kikundi, Godegode, Gulwe, Ihumwe and Msagali villages to conduct a stakeholder consultations, gathering socio economic and environmental baseline data and information and meeting with different focused groups who have knowledge in: herbal medicine, wild animals, water resources/sources, ritual sites/ cultural heritage and aquatic organisms. A detailed project information brief and public notice with key contact and communication information were handled out to participants.

CONSULTATIVE MEETING WITH LOCAL LEADERS: MUNISAGARA VILLAGE
MEETING MINUTES

A. DATE: 09th June, 2015

B. TIME: 8:30am – 10:45 am

C. PRIMARY PURPOSE: Scoping: Environmental and Social Impact Assessment (ESIA) for the Preparatory Survey on Flood Protection Measures for the Central Railway Line –Kilosa to Dodoma Section.

D. SUBJECT: Consultative meeting with local leaders – village level

E. VENUE: In one of the classroom - Primary School at Munisagara Village

F. RECORDED BY: Ms. Mwajuma Nuru and Mr. Justin Mawingi; **Company:** JSB-EnviDep Ltd.

G. LANGUAGE USED: Primary language: Swahili **Translated to:** English

H. ATTENDEES:

Project Representatives

Name	Position	Company	Contact Info.
Mr. Mugisha Lucius	Consultant (Sociology)	JSB-EnviDep Ltd	+255 714 462 206
Mr. Frank Mbago	Consultant (Botanist)	JSB-EnviDep Ltd	+255 787 879 852 +255 655 650 672
Dr. Benno	Consultant (Aquatic Ecologist) – Team Leader	JSB-EnviDep Ltd	+255 784 474 256 +255 713 350 780
Ms. Mwajuma Nuru	Consultant (Stakeholder Engagement)	JSB-EnviDep Ltd	+255 713 553 558 mwammy82@yahoo.com
Mr. Justin Mawingi	Consultant (Stakeholder Engagement assistant)	JSB-EnviDep Ltd	+255 763 261 919 mawingi.deograsias@yahoo.com
Eng. Leonard Gastory	Consultant (Engineer)	JSB-EnviDep Ltd	+255 715 640 302 leonardgastory@yahoo.com
Mr. Chacha Werema	Consultant (Wildlife Expert)	JSB-EnviDep Ltd	+255 754 407 650
Mr. Mutabazi Francis	Consultant (Geologist)	JSB-EnviDep Ltd	+255 712 703 133 +255 757 463 232
Mr. Elgidius Ichumbaki	Consultant (Archaeologist)	JSB-EnviDep Ltd	+255 713 860 875
Ms. Judith Nzamba	Environmental Management Officer	RAHCO	
Ms. Kyoko Mishima	Expert for Environmental and Social Considerations	JICA Study Team	+255 784 320 246

Stakeholder's attendees[47]

- **Approximate number: 25**

Sign- in sheets will be attached in appendices to show the list of stakeholders who participated in the meetings with village leaders.

- **Description of Stakeholders**

[47] Sign-in sheet ……..

The Masanze Ward Councillor Hon. Jonathan W. Kambikiye chaired the meeting with JSB Consultants hosting and facilitating the meeting. Attending were the: Ward Executive Officer (WEO),Village Executive Officer(VEO), Village Chairperson; representatives of different village committees (environment, natural resources, community welfare, water, security and HIV/AIDS) Women group representatives (Farmers, entrepreneurs) , representatives of different age groups (youth and elderly), Natural Resource Users (traditional herbalist, hunters, farmers ,livestock keepers) religious leaders.

OPENING REMARKS

The meeting came to order at 8:30 am with welcome remarks by the Munisagara Village Executive Officer (VEO) Mr. Bernadi Isack Kimoge followed by self-introduction by attendees. The Masanze Ward Councillor Hon. Jonathan W. Kambikiye who was chairperson for the meeting made opening remarks stating the objective of the meeting emphasizing the fact that the leaders are representatives of the rest of the community and responsible for dissemination of issues that will be presented and agreed.

JSB Consultants Team Leader Dr. Benno proceeded to present a brief introduction about the Project Proponent RAHCO, and JICA, plans for the flood protection on the central railway line within Kilosa - Dodoma sections (Flood prone areas). He went on describing the effects of floods on the Central Railway Line plus the control/protection measures which will be undertaken, the need for ESIA and purpose of the scoping phase including requirement to meet with stakeholders. For the meeting with Munisagara Village leaders he presented the agenda of the meeting as follows:

MEETING AGENDA

1. Opening remarks
2. Subject description
3. Condition and land uses at the project site
4. Stakeholders expectations (project benefits)
5. Negative impacts, risks and challenges
6. Stakeholders roles and responsibilities
7. Grievance redress mechanism
8. Conclusion & closing remarks
9. Next steps.

I. SUBJECT DESCRIPTION

RAHCO representative Judith Nzamba presented a description of flood protection on the central railway line detailing on the different alternatives to be used (relocation, river banks training and track elevation), scope, and operations activities and management aspects. She concluded by presenting the way forward for the ESIA process and project authorization.

Issues raised and discussed at the meeting

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
Condition and land uses at the project site		
Land at Munisagara village where the railway passes through has different uses.	Land is used for: Agriculture (i.e. cropland), grazing areas and building housing structures. Other uses include: forest (collection of medicinal plants, firewood and building wood etc).	
Stakeholders expectations (project benefits)		
Job opportunities for construction and train operation. It should be prioritized to the local villagers.	Community members expect employment opportunities for unskilled and semi-skilled labour during railway development/ rehabilitation works (i.e. site clearance, construction of gabions, security guards, digging ditches etc.)	Prioritization of job opportunities to the local villagers and the equal distribution through the village government shall be addressed in the mitigation plan.

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
Support in construction of infrastructure such as road	Roads to cross the railway (with livestock) to be built. Locals expect to be supported in construction of road along the railway line. They also expected that the routes to be used for the supply of materials during construction works may be used by locals as road.	Underpass is to be planned in this study for the section of railway embankment.
Side road	The road along the railway to be improved for securing safety and local transportation.	To be discussed the possibilities.
Increase in per capita income of individuals	The locals are expecting that during the project implementation; people's income will generally increase (due to income generated from salaries, wages and market for their local produce). This will consequently improve the living standards local people.	
Improvement of the railway service for transporting agricultural products.	By protecting the railway line from floods; locals expected an accelerated movement of people/goods to the market as result of a reliable means of transport.	
The railway construction works is expected to attract opportunity seekers to areas in its vicinity	During the construction / rehabilitation works / after completion of the flood protection measures a reliable means of transport is expected to attract people to the area seeking opportunities i.e. employment, trade and service provision.	
Train services/ operations	Existing station to be operated and rehabilitated.	To be noted for TRL
Negative impacts, risks and challenges		
House relocation and land acquisition. It should be compensated properly.	During the rehabilitation phase people might lose their croplands/ pastureland in areas where relocation/ shifting of the existing railway route will occur. Other people might lose their houses.	To be addressed in the CRP.
Directing the culvert towards peoples' settlement / houses	It is concerned that the culvert improvement might affect downstream agricultural land and peoples' houses by the increased flood flow	To be addressed in the culvert improvement planning at Munisagara
Occupational risks	OHS (Occupational Health and Safety)/worker's insurance	To be addressed in the mitigation plan.
Increase in HIV transmission from / to new comers and local community and consequent increase in AIDS sufferers in project area.	Interactions between project personnel and service providers who have better income than locals have a potential to increase HIV transmission rate and spread of other STDs.	To be addressed in the mitigation plan.
Hiking of prices of goods and services	Traders and service providers within locality are expected to take advantage of the new comers (with higher purchasing power) resulting into inflation in the prices of goods and service.	
Compensation to be done on time	For those whose properties will be affected i.e. land taken for the project / house demolished to pave way for the project; compensation should be should be effected on time - not take so long.	
Regulation to be more strict	Train operation to be regulated more strictly for safety control. (e.g. speed limitation, sounding phone more frequently)	To be noted for TRL.

J. STAKEHOLDERS INVOLVEMENT IN PROJECT IMPLEMENTATION

Stakeholder's roles and responsibilities

- HIV / AIDS committee: Through the committee, community will be educated on ways of preventing HIV transmission.
- Local government authorities: The authorities will be involved in identification of individuals among the local community who are capable of working (as semi-skilled or unskilled labourers) during railway development, construction and rehabilitation works.

Grievance Redress Mechanism

Normal government reporting procedure was proposed to be used as follows: Community level to ward level, then Municipal level and reporting directly to concerned offices i.e. Land office.

K. CONCLUSION AND CLOSING REMARKS

The Ward Chairperson closed the meeting by thanking JSB EnviDep for organizing the meeting reiterating that the leaders are representatives of the rest of the community and responsible for dissemination of issues that were presented and agreed upon. Further collaboration to the consultants should be given so as to continue with their study in the area.

Next Steps

The consultants informed participants that during the next four days they intended to undertake visits to Muzaganza, Kikundi, Godegode, Gulwe, Ihumwe and Msagali villages to conduct a stakeholder consultations, gathering socio economic and environmental baseline data and information and meeting with different focused groups who have knowledge in: herbal medicine, wild animals, water resources/sources, ritual sites/ cultural heritage and aquatic organisms. A detailed project information brief and public notice with key contact and communication information were handled out to participants.

MUNISAGARA COMMUNITY ASSEMBLY

MEETING MINUTES

A. DATE: 09th June, 2015

B. TIME: 11:05 am – 12:30 Pm

C. PRIMARY PURPOSE: Scoping: Environmental and Social Impact Assessment (ESIA) for the Preparatory Survey on Flood Protection Measures for the Central Railway Line –Kilosa to Dodoma Section.

D. SUBJECT: Munisagara Community Assembly

E. VENUE: In one of the classroom - Primary School at Munisagara Village

F. RECORDED BY: Ms. Mwajuma Nuru and Mr. Justin Mawingi; **Company:** JSB-EnviDep Ltd.

G. LANGUAGE USED: Primary language: Swahili **Translated to:** English

H. ATTENDEES:

Project Representatives

Name	Position	Company	Contact Info.
Mr. Mugisha Lucius	Consultant (Sociology)	JSB-EnviDep Ltd	+255 714 462 206
Mr. Frank Mbago	Consultant (Botanist)	JSB-EnviDep Ltd	+255 787 879 852 +255 655 650 672
Dr. Benno	Consultant (Aquatic Ecologist) – Team Leader	JSB-EnviDep Ltd	+255 784 474 256 +255 713 350 780
Ms. Mwajuma Nuru	Consultant (Stakeholder Engagement)	JSB-EnviDep Ltd	+255 713 553 558 mwammy82@yahoo.com
Mr. Justin Mawingi	Consultant (Stakeholder Engagement assistant)	JSB-EnviDep Ltd	+255 763 261 919 mawingi.deograsias@yahoo.com
Eng. Leonard Gastory	Consultant (Engineer)	JSB-EnviDep Ltd	+255 715 640 302 leonardgastory@yahoo.com
Mr. Chacha Werema	Consultant (Wildlife Expert)	JSB-EnviDep Ltd	+255 754 407 650
Mr. Mutabazi Francis	Consultant (Geologist)	JSB-EnviDep Ltd	+255 712 703 133 +255 757 463 232
Mr. Elgidius Ichumbaki	Consultant (Archaeologist)	JSB-EnviDep Ltd	+255 713 860 875
Ms. Judith Nzamba	Environmental Management Officer	RAHCO	
Ms. Kyoko Mishima	Expert for Environmental and Social Considerations	JICA Study Team	+255 784 320 246

Stakeholder's attendees[48]

- **Approximate number: 72**

Sign- in sheets will be attached in appendices to show the list of stakeholders who participated in the general assembly.

- **Description of Stakeholders**

[48] Sign-in sheet ……..

The Masanze Ward Councillor Hon. Jonathan W. Kambikiye chaired the meeting with JSB Consultants hosting and facilitating the meeting. Attending were the: Ward Executive Officer (WEO),Village Executive Officer(VEO), Village Chairperson; representatives of different village committees (environment, natural resources, community welfare, water, security and HIV/AIDS) Women group representatives (Farmers, entrepreneurs) , representatives of different age groups (youth and elderly), Natural Resource Users (traditional herbalist, hunters, farmers ,livestock keepers) religious leaders and members from the general public/ local community.

I. OPENING REMARKS

The meeting came to order at 11:05 am with welcome remarks by the Munisagara Village Executive Officer (VEO) Mr. Bernadi Isack Kimoge followed by self-introduction by attendees. The Masanze Ward Councillor Hon. Jonathan W. Kambikiye who was chairperson for the meeting made opening remarks stating the objective of the meeting emphasizing the fact that the leaders are representatives of the rest of the community and responsible for dissemination of issues that will be presented and agreed.

JSB Consultants Team Leader Dr. Benno proceeded to present that during the morning hours we had a meeting with your village leaders and we had a discussion concerning the project on various issues and now we have come to confirm from you on what your leaders have raised and your opinion on the same. . Also he gave a brief introduction about the Project Proponent RAHCO and JICA, plans for the flood protection on the central railway line within Kilosa - Dodoma sections (Flood prone areas). He went on describing the effects of floods on the Central Railway Line plus the control/protection measures which will be undertaken, the need for ESIA and purpose of the scoping phase including requirement to meet with stakeholders. The meeting agenda were as follows:

MEETING AGENDA

1. Opening remarks
2. Subject description
3. Condition and land uses at the project site
4. Stakeholders expectations (project benefits)
5. Negative impacts, risks and challenges
6. Stakeholders roles and responsibilities
7. Grievance redress mechanism
8. Conclusion & closing remarks
9. Next steps.

J. SUBJECT DESCRIPTION

RAHCO representative Judith Nzamba presented a description of flood protection on the central railway line detailing on the different alternatives to be used (relocation, river banks training and track elevation), scope, and operations activities and management aspects. She concluded by presenting the way forward for the ESIA process and project authorization.

Issues raised and discussed during the community assembly

In the general assembly all the issues, concerns and comments that were raised by the local leaders were read out to the local community to confirm if they seconded to or they have something to add on. All the issues raised by the local leaders were supported by the locals. Below is a list of issues raised by local community to add on to the list of issues raised by the local leaders.

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
Condition and land uses at the project site		
Land at Munisagara village where the railway passes through has different uses.	Land is used for: Agriculture (i.e. cropland), grazing areas and building housing structures. Other uses include: forest (collection of medicinal plants, firewood and building wood etc).	
Stakeholders expectations (project benefits)		
Job opportunities for construction and train	Community members expect employment opportunities for unskilled and semi-skilled labour during railway	Prioritization of job opportunities to the

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
operation. It should be prioritized to the local villagers.	development/ rehabilitation works (i.e. site clearance, construction of gabions, security guards, digging ditches etc.)	local villagers and the equal distribution through the village government shall be addressed in the mitigation plan.
Support in construction of infrastructure such as road	Roads to cross the railway (with livestock) to be built. Locals expect to be supported in construction of road along the railway line. They also expected that the routes to be used for the supply of materials during construction works may be used by locals as road.	Underpass is to be planned in this study for the section of railway embankment.
Increase in per capita income of individuals	The locals are expecting that during the project implementation; people's income will generally increase (due to income generated from salaries, wages and market for their local produce). This will consequently improve the living standards local people.	
Improvement of the railway service for transporting agricultural products.	By protecting the railway line from floods; locals expected an accelerated movement of people/goods to the market as result of a reliable means of transport.	
The railway construction works is expected to attract opportunity seekers to areas in its vicinity	During the construction / rehabilitation works / after completion of the flood protection measures a reliable means of transport is expected to attract people to the area seeking opportunities i.e. employment, trade and service provision.	
Negative impacts, risks and challenges		
House relocation and land acquisition. It should be compensated properly.	During the rehabilitation phase people might lose their croplands/ pastureland in areas where relocation/ shifting of the existing railway route will occur. Other people might lose their houses.	To be addressed in the CRP.
Directing the culvert towards peoples' settlement / houses	It is concerned that the culvert improvement might affect downstream agricultural land and peoples' houses by the increased flood flow	To be addressed in the culvert improvement planning at Munisagara
Occupational risks	OHS (Occupational Health and Safety)/worker's insurance	To be addressed in the mitigation plan.
Increase in accidental events	Locals expected flood free railway line will encourage an increase number of train trips and its consequential increase on the number of accidents to those who use railway as side walk/ ride their motorbike/bicycle by the railway side. Also accidents might occur during construction and may result into loss of some body parts i.e. leg, arm etc.	
Increase in HIV transmission from / to new comers and local community and consequent increase in AIDS sufferers in project area.	Interactions between project personnel and service providers who have better income than locals have a potential to increase HIV transmission rate and spread of other STDs.	To be addressed in the mitigation plan.
Hiking of prices of goods and services	Traders and service providers within locality are expected to take advantage of the new comers (with higher purchasing power) resulting into inflation in the prices of goods and service.	
Compensation to be done on time	For those whose properties will be affected i.e. land taken for the project / house demolished to pave way for the	

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
	project; compensation should be should be effected on time - not take so long.	
Regulation to be more strict	Train operation to be regulated more strictly for safety control. (e.g. speed limitation, sounding phone more frequently)	To be noted for TRL.

K. STAKEHOLDERS INVOLVEMENT IN PROJECT IMPLEMENTATION

Stakeholder's roles and responsibilities

- HIV / AIDS committee: Through the committee, community will be educated on ways of preventing HIV transmission.
- Local government authorities: The authorities will be involved in identification of individuals among the local community who are capable of working (as semi-skilled or unskilled labourers) during railway development, construction and rehabilitation works.

Grievance Redress Mechanism

Normal government reporting procedure was proposed to be used as follows: Community level to ward level, then Municipal level and reporting directly to concerned offices i.e. Land office.

L. CONCLUSION AND CLOSING REMARKS

The Ward Chairperson closed the meeting by thanking JSB EnviDep for organizing the meeting reiterating that the leaders are representatives of the rest of the community and responsible for dissemination of issues that were presented and agreed upon. Further collaboration to the consultants should be given so as to continue with their study in the area.

Next Steps

The consultants informed participants that during the next four days they intended to undertake visits to Muzaganza, Kikundi, Godegode, Gulwe, Ihumwe and Msagali villages to conduct a stakeholder consultations, gathering socio economic and environmental baseline data and information and meeting with different focused groups who have knowledge in: herbal medicine, wild animals, water resources/sources, ritual sites/ cultural heritage and aquatic organisms. A detailed project information brief and public notice with key contact and communication information were handled out to participants.

CONSULTATIVE MEETING AT MUZAGANZA VILLAGE
MEETING MINUTES

A. DATE: 09th June, 2015

B. TIME: 14:30Pm – 16:30pm

C. PRIMARY PURPOSE: Scoping: Environmental and Social Impact Assessment (ESIA) for the Preparatory Survey on Flood Protection Measures for the Central Railway Line –Kilosa to Dodoma Section.

D. SUBJECT: Consultative meeting at Muzaganza Village

E. VENUE: In one of the classroom - Primary School at Muzaganza Village

F. RECORDED BY: Justin Mawingi; **Company:** JSB-EnviDep Ltd.

G. LANGUAGE USED: Primary language: Swahili **Translated to:** English

H. ATTENDEES:

Project Representatives

Name	Position	Company	Contact Info.
Mr. Mugisha Lucius	Consultant (Sociology)	JSB-EnviDep Ltd	+255 714 462 206
Mr. Frank Mbago	Consultant (Botanist)	JSB-EnviDep Ltd	+255 787 879 852 +255 655 650 672
Dr. Benno	Consultant (Aquatic Ecologist) – Team Leader	JSB-EnviDep Ltd	+255 784 474 256 +255 713 350 780
Ms. Mwajuma Nuru	Consultant (Stakeholder Engagement)	JSB-EnviDep Ltd	+255 713 553 558 mwammy82@yahoo.com
Mr. Justin Mawingi	Consultant (Stakeholder Engagement assistant)	JSB-EnviDep Ltd	+255 763 261 919 mawingi.deograsias@yahoo.com
Eng. Leonard Gastory	Consultant (Engineer)	JSB-EnviDep Ltd	+255 715 640 302 leonardgastory@yahoo.com
Mr. Chacha Werema	Consultant (Wildlife Expert)	JSB-EnviDep Ltd	+255 754 407 650
Mr. Mutabazi Francis	Consultant (Geologist)	JSB-EnviDep Ltd	+255 712 703 133 +255 757 463 232
Mr. Elgidius Ichumbaki	Consultant (Archaeologist)	JSB-EnviDep Ltd	+255 713 860 875
Ms. Judith Nzamba	Environmental Management Officer	RAHCO	
Ms. Kyoko Mishima	Expert for Environmental and Social Considerations	JICA Study Team	+255 784 320 246

Stakeholder's attendees[49]

- **Approximate number: 140**

Sign- in sheets will be attached in appendices to show the list of stakeholders who participated in the meetings.

- **Description of Stakeholders**

The Muzaganza Councillor Hon. Ramadhani Hussein chaired the meeting with JSB Consultants hosting and facilitating the meeting. Attending were the: Ward Executive Officer (WEO),Village Executive Officer(VEO),

[49] Sign-in sheet ……..

Village Chairperson; representatives of different village committees (environment, natural resources, community welfare, water, security and HIV/AIDS) Women group representatives (Farmers, entrepreneurs) , representatives of different age groups (youth and elderly), Natural Resource Users (traditional herbalist, hunters, farmers ,livestock keepers) religious leaders and members from the general public/ local community.

I. OPENING REMARKS

The meeting came to order at 8:30 am with welcome remarks by the Muzaganza Ward Executive Officer (WEO) Mr. Julius M. Kisomeko followed by self-introduction by attendees. The Muzaganza Councillor Hon. Ramadhani Hussein who was chairperson for the meeting made opening remarks stating the objective of the meeting.

JSB Consultants Team Leader Dr. Benno proceeded to present a brief introduction about the Project Proponent RAHCO, and JICA, plans for the flood protection on the central railway line within Kilosa - Dodoma sections (Flood prone areas). He went on describing the effects of floods on the Central Railway Line plus the control/protection measures which will be undertaken, the need for ESIA and purpose of the scoping phase including requirement to meet with stakeholders. The meeting agenda were as follows:

MEETING AGENDA

1. Opening remarks
2. Subject description
3. Condition and land uses at the project site
4. Stakeholders expectations (project benefits)
5. Negative impacts, risks and challenges
6. Stakeholders roles and responsibilities
7. Grievance redress mechanism
8. Conclusion & closing remarks
9. Next steps.

J. SUBJECT DESCRIPTION

RAHCO representative Judith Nzamba presented a description of flood protection on the central railway line detailing on the different alternatives to be used (relocation, river banks training and track elevation), scope, and operations activities and management aspects. She concluded by presenting the way forward for the ESIA process and project authorization.

Issues raised and discussed at the meeting

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
Condition and land uses at the project site		
Land at Muzaganza village where the railway passes through has different uses.	Land is used for: Agriculture (i.e. cropland), mineral extraction sites (copper extraction at Machengula) footpaths worship sites, grazing areas and building housing structures. Other uses include: forest (collection of medicinal plants, firewood and building wood etc).	
Stakeholders expectations (project benefits)		
Job opportunities for construction and train operation. It should be prioritized to the local villagers.	Community members expect employment opportunities for unskilled and semi-skilled labour during railway development/ rehabilitation works (i.e. site clearance, construction of gabions, security guards, digging ditches etc.)	Prioritization of job opportunities to the local villagers and the equal distribution through the village government shall be addressed in the mitigation plan.

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
Flood Protection measures	Kidete Dam should be renovated as the first priority for protecting both agricultural land and the railway from flood. For the safety of the railway line locals advised that the dams to be rehabilitated to control the speed of flowing/moving water downstream (Kimagai, Msagani and Homboro dams).	Flood flow prevention shall be addressed in future project such as watershed management project.
Support in construction of infrastructure such as road	Roads to cross the railway (with livestock) to be built. Locals expect to be supported in construction of road along the railway line. They also expected that the routes to be used for the supply of materials during construction works may be used by locals as road.	Underpass is to be planned in this study for the section of railway embankment.
Side road	The road along the railway to be improved for securing safety and local transportation.	To be discussed the possibilities.
Improvement of the railway service for transporting agricultural products.	By protecting the railway line from floods; locals expected an accelerated movement of people/goods to the market as result of a reliable means of transport.	
The railway construction works is expected to attract opportunity seekers to areas in its vicinity	During the construction / rehabilitation works / after completion of the flood protection measures a reliable means of transport is expected to attract people to the area seeking opportunities i.e. employment, trade and service provision.	
Negative impacts, risks and challenges		
House relocation and land acquisition. It should be compensated properly.	During the rehabilitation phase people might lose their croplands/ pastureland in areas where relocation/ shifting of the existing railway route will occur. Other people might lose their houses.	To be addressed in the CRP.
Track elevation will cause an interruption on the availability of water for irrigation	General feelings that by designing track elevation will result into blockage or interfering with the availability of water for irrigation to those on the other side of the railway/ downstream. Flow of water for irrigating the farms will be can also be redirected to other areas.	
Increase in accidental events	Locals expected flood free railway line will encourage an increase number of train trips and its consequential increase on the number of accidents to those who use railway as side walk/ ride their motorbike/bicycle by the railway side. Also accidents might occur during construction and may result into loss of some body parts i.e. leg, arm etc.	
Increase in HIV transmission from / to new comers and local community and consequent increase in AIDS sufferers in project area.	Interactions between project personnel and service providers who have better income than locals have a potential to increase HIV transmission rate and spread of other STDs.	To be addressed in the mitigation plan.

K. STAKEHOLDERS INVOLVEMENT IN PROJECT IMPLEMENTATION

Stakeholder's roles and responsibilities

- HIV / AIDS committee: Through the committee, community will be educated on ways of preventing HIV transmission.
- Local government authorities: The authorities will be involved in identification of individuals among the local community who are capable of working (as semi-skilled or unskilled labourers) during railway development, construction and rehabilitation works.

Grievance Redress Mechanism
Normal government reporting procedure was proposed to be used as follows: Community level to ward level, then Municipal level and reporting directly to concerned offices i.e. Land office.

L. CONCLUSION AND CLOSING REMARKS

The Ward Councillor closed the meeting by thanking JSB EnviDep for organizing the meeting reiterating that the leaders are representatives of the rest of the community and responsible for dissemination of issues that were presented and agreed upon. Further collaboration to the consultants should be given so as to continue with their study in the area.

Next Steps
The consultants informed participants that during the next three days they intended to undertake visits to Kikundi, Godegode, Gulwe, Ihumwe and Msagali villages to conduct a stakeholder consultations, gathering socio economic and environmental baseline data and information and meeting with different focused groups who have knowledge in: herbal medicine, wild animals, water resources/sources, ritual sites/ cultural heritage and aquatic organisms. A detailed project information brief and public notice with key contact and communication information were handled out to participants.

CONSULTATIVE MEETING WITH LOCAL LEADERS: KIKUNDI VILLAGE LEADERS

MEETING MINUTES

A. DATE: 10th June, 2015

B. TIME: 9:20am – 11:00 am

C. PRIMARY PURPOSE: Scoping: Environmental and Social Impact Assessment (ESIA) for the Preparatory Survey on Flood Protection Measures for the Central Railway Line –Kilosa to Dodoma Section.

D. SUBJECT: Consultative meeting with local leaders – village level

E. VENUE: In one of the classroom - Primary School at Kikundi Village

F. RECORDED BY: Justin Mawingi; **Company:** JSB-EnviDep Ltd.

G. LANGUAGE USED: Primary language: Swahili **Translated to:** English

H. ATTENDEES:

Project Representatives

Name	Position	Company	Contact Info.
Mr. Mugisha Lucius	Consultant (Sociology)	JSB-EnviDep Ltd	+255 714 462 206
Mr. Frank Mbago	Consultant (Botanist)	JSB-EnviDep Ltd	+255 787 879 852 +255 655 650 672
Dr. Benno	Consultant (Aquatic Ecologist) – Team Leader	JSB-EnviDep Ltd	+255 784 474 256 +255 713 350 780
Ms. Mwajuma Nuru	Consultant (Stakeholder Engagement)	JSB-EnviDep Ltd	+255 713 553 558 mwammy82@yahoo.com
Mr. Justin Mawingi	Consultant (Stakeholder Engagement assistant)	JSB-EnviDep Ltd	+255 763 261 919 mawingi.deograsias@yahoo.com
Eng. Leonard Gastory	Consultant (Engineer)	JSB-EnviDep Ltd	+255 715 640 302 leonardgastory@yahoo.com
Mr. Chacha Werema	Consultant (Wildlife Expert)	JSB-EnviDep Ltd	+255 754 407 650
Mr. Mutabazi Francis	Consultant (Geologist)	JSB-EnviDep Ltd	+255 712 703 133 +255 757 463 232
Mr. Elgidius Ichumbaki	Consultant (Archaeologist)	JSB-EnviDep Ltd	+255 713 860 875
Ms. Judith Nzamba	Environmental Management Officer	RAHCO	
Ms. Kyoko Mishima	Expert for Environmental and Social Considerations	JICA Study Team	+255 784 320 246

Stakeholder's attendees[50]

- **Approximate number: 24**

Sign- in sheets will be attached in appendices to show the list of stakeholders who participated in the meetings with village leaders.

- **Description of Stakeholders**

[50] Sign-in sheet ……..

The Kikundi Village chairperson chaired the meeting with JSB Consultants hosting and facilitating the meeting. Attending were the: Ward Executive Officer (WEO),Village Executive Officer(VEO), Village Chairperson; representatives of different village committees (environment, natural resources, community welfare, water, security and HIV/AIDS) Women group representatives (Farmers, entrepreneurs) , representatives of different age groups (youth and elderly), Natural Resource Users (traditional herbalist, hunters, farmers ,livestock keepers) religious leaders.

OPENING REMARKS

The meeting came to order at 9:20am with welcome remarks by the Kikundi Village Executive Officer (VEO) Mr. Abdalah Lipika followed by self-introduction by attendees. The Kikundi village chairperson Mr. Madanganyo Magawa who was chairperson for the meeting made opening remarks stating the objective of the meeting emphasizing the fact that the leaders are representatives of the rest of the community and responsible for dissemination of issues that will be presented and agreed.

JSB Consultants Team Leader Dr. Benno proceeded to present a brief introduction about the Project Proponent RAHCO, and JICA, plans for the flood protection on the central railway line within Kilosa - Dodoma sections (Flood prone areas). He went on describing the effects of floods on the Central Railway Line plus the control/protection measures which will be undertaken, the need for ESIA and purpose of the scoping phase including requirement to meet with stakeholders. For the meeting with Kikundi Village leaders he presented the agenda of the meeting as follows:

MEETING AGENDA

1. Opening remarks
2. Subject description
3. Condition and land uses at the project site
4. Stakeholders expectations (project benefits)
5. Negative impacts, risks and challenges
6. Stakeholders roles and responsibilities
7. Grievance redress mechanism
8. Conclusion & closing remarks
9. Next steps.

I. SUBJECT DESCRIPTION

RAHCO representative Ms. Judith Nzamba presented a description of flood protection on the central railway line detailing on the different alternatives to be used (relocation, river banks training and track elevation), scope, and operations activities and management aspects. She concluded by presenting the way forward for the ESIA process and project authorization.

Issues raised and discussed at the meeting

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
Condition and land uses at the project site		
Land at Kikundi village where the railway passes through has different uses.	Land is used for: Agriculture (i.e. cropland), grazing areas and building housing structures. Other uses include: forest (collection of medicinal plants, firewood and building wood etc). burial sites(i.e. Usagarani, Magulu, Loliondo and Kidai Moja) and pathways	
Stakeholders expectations (project benefits)		
Job opportunities for construction and train operation. It should be prioritized to the local villagers.	Community members expect employment opportunities for unskilled and semi-skilled labour during railway development/ rehabilitation works (i.e. site clearance, construction of gabions, security guards, digging ditches etc.)	Prioritization of job opportunities to the local villagers and the equal distribution through the village government shall be addressed in the mitigation plan.
Increase in per capita income of individuals	The locals are expecting that during the project implementation; people's income will generally	

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
	increase (due to income generated from salaries, wages and market for their local produce). This will consequently improve the living standards local people.	
Flood protection measures	Kidete Dam should be renovated as the first priority for protecting both agricultural land and the railway from flood.	Flood flow prevention shall be addressed in future project such as watershed management project.
Side road	The road along the railway to be improved for securing safety and local transportation.	To be discussed the possibilities.
Improvement of the railway service for transporting agricultural products.	By protecting the railway line from floods; locals expected an accelerated movement of people/goods to the market as result of a reliable means of transport.	
Negative impacts, risks and challenges		
House relocation and land acquisition. It should be compensated properly.	During the rehabilitation phase people might lose their croplands/ pastureland in areas where relocation/ shifting of the existing railway route will occur. Other people might lose their houses.	To be addressed in the CRP.
Loss of natural vegetation cover and contained valuable wildlife due site clearance during flood protection measures / construction works	The flooded sections (within Kikundi Village) of the railway nearby area is endowed with trees, herbs and wildlife of local importance i.e. medicinal, building materials, fuel-wood and animal protein etc. that will be cleared, damaged or caused to move away from the area due to railway development / rehabilitation works i.e. relocation/ shifting of the existing route and river banks training .	
Directing the culvert towards peoples' settlement / houses	General feelings that the contractors might design culverts that are directed to flow their waters towards peoples' houses / farms. This water can cause damage to cultivated crops and houses.	
Noise emission from operations	Noise pollution emanated from machinery and from explosives which will be used while sourcing material such as stones.	
Increase in accidental events	Locals expected flood free railway line will encourage an increase number of train trips and its consequential increase on the number of accidents to those who use railway as side walk/ ride their motorbike/bicycle by the railway side. Also accidents might occur during construction and may result into loss of some body parts i.e. leg, arm etc.	
Increase in HIV transmission from / to new comers and local community and consequent increase in AIDS sufferers in project area.	Interactions between project personnel and service providers who have better income than locals have a potential to increase HIV transmission rate and spread of other STDs.	To be addressed in the mitigation plan.
Air pollution due railway line development activities	Air pollution as a result of moving vehicles and other earth moving machinery during the construction / rehabilitation phase will affect the community at vicinity.	To be addressed in the mitigation plan.
Interfering with the village settlement patterns and the landscape in general	The original landscape of the village will be interfered with; i.e. shifting of the railway to another location might separate the village	To be addressed in the mitigation plan.

J. STAKEHOLDERS INVOLVEMENT IN PROJECT IMPLEMENTATION

Stakeholder's roles and responsibilities

- HIV / AIDS committee: Through the committee, community will be educated on ways of preventing HIV transmission.
- Local government authorities: The authorities will be involved in identification of individuals among the local community who are capable of working (as semi-skilled or unskilled labourers) during railway development, construction and rehabilitation works.

Grievance Redress Mechanism

Normal government reporting procedure was proposed to be used as follows: Community level to ward level, then Municipal level and reporting directly to concerned offices i.e. Land office.

K. CONCLUSION AND CLOSING REMARKS

The Village Chairperson closed the meeting by thanking JSB EnviDep for organizing the meeting reiterating that the leaders are representatives of the rest of the community and responsible for dissemination of issues that were presented and agreed upon. Further collaboration to the consultants should be given so as to continue with their study in the area.

Next Steps

The consultants informed participants that during the next two days they intended to undertake visits to Godegode, Gulwe, Ihumwe and Msagali villages to conduct a stakeholder consultations, gathering socio economic and environmental baseline data and information and meeting with different focused groups who have knowledge in: herbal medicine, wild animals, water resources/sources, ritual sites/ cultural heritage and aquatic organisms. A detailed project information brief and public notice with key contact and communication information were handled out to participants.

KIKUNDI COMMUNITY ASSEMBLY

MEETING MINUTES

A. DATE: 10th June, 2015

B. TIME: 11:00 am – 12: 30pm

C. PRIMARY PURPOSE: Scoping: Environmental and Social Impact Assessment (ESIA) for the Preparatory Survey on Flood Protection Measures for the Central Railway Line –Kilosa to Dodoma Section.

D. SUBJECT: Kikundi Community Assembly

E. VENUE: Open space in a Primary School at Kikundi Village

F. RECORDED BY: Justin Mawingi; **Company:** JSB-EnviDep Ltd.

G. LANGUAGE USED: Primary language: Swahili **Translated to:** English

H. ATTENDEES:

Project Representatives

Name	Position	Company	Contact Info.
Mr. Mugisha Lucius	Consultant (Sociology)	JSB-EnviDep Ltd	+255 714 462 206
Mr. Frank Mbago	Consultant (Botanist)	JSB-EnviDep Ltd	+255 787 879 852 +255 655 650 672
Dr. Benno	Consultant (Aquatic Ecologist) – Team Leader	JSB-EnviDep Ltd	+255 784 474 256 +255 713 350 780
Ms. Mwajuma Nuru	Consultant (Stakeholder Engagement)	JSB-EnviDep Ltd	+255 713 553 558 mwammy82@yahoo.com
Mr. Justin Mawingi	Consultant (Stakeholder Engagement assistant)	JSB-EnviDep Ltd	+255 763 261 919 mawingi.deograsias@yahoo.com
Eng. Leonard Gastory	Consultant (Engineer)	JSB-EnviDep Ltd	+255 715 640 302 leonardgastory@yahoo.com
Mr. Chacha Werema	Consultant (Wildlife Expert)	JSB-EnviDep Ltd	+255 754 407 650
Mr. Mutabazi Francis	Consultant (Geologist)	JSB-EnviDep Ltd	+255 712 703 133 +255 757 463 232
Mr. Elgidius Ichumbaki	Consultant (Archaeologist)	JSB-EnviDep Ltd	+255 713 860 875
Ms. Judith Nzamba	Environmental Management Officer	RAHCO	
Ms. Kyoko Mishima	Expert for Environmental and Social Considerations	JICA Study Team	+255 784 320 246

Stakeholder's attendees[51]

- **Approximate number: 80**

Sign- in sheets will be attached in appendices to show the list of stakeholders who participated in the meetings with local community.

- **Description of Stakeholders**

[51] Sign-in sheet ……..

The Kikundi Village chairperson chaired the meeting with JSB Consultants hosting and facilitating the meeting. Attending were the: Ward Executive Officer (WEO),Village Executive Officer(VEO), Village Chairperson; representatives of different village committees (environment, natural resources, community welfare, water, security and HIV/AIDS) Women group representatives (Farmers, entrepreneurs) , representatives of different age groups (youth and elderly), Natural Resource Users (traditional herbalist, hunters, farmers ,livestock keepers) religious leaders and members from the general public/ local community

OPENING REMARKS

The meeting came to order at 9:20am with welcome remarks by the Kikundi Village Executive Officer (VEO) Mr. Abdalah Lipika followed by self-introduction by attendees. The Kikundi village chairperson Mr. Madanganyo Magawa who was chairperson for the meeting made opening remarks stating the objective of the meeting emphasizing the fact that the leaders are representatives of the rest of the community and responsible for dissemination of issues that will be presented and agreed.

JSB Consultants Team Leader Dr. Benno proceeded to present a brief introduction about the Project Proponent RAHCO, and JICA, plans for the flood protection on the central railway line within Kilosa - Dodoma sections (Flood prone areas). He went on describing the effects of floods on the Central Railway Line plus the control/protection measures which will be undertaken, the need for ESIA and purpose of the scoping phase including requirement to meet with stakeholders. For the meeting with Kikundi Village leaders he presented the agenda of the meeting as follows:

MEETING AGENDA

1. Opening remarks
2. Subject description
3. Condition and land uses at the project site
4. Stakeholders expectations (project benefits)
5. Negative impacts, risks and challenges
6. Stakeholders roles and responsibilities
7. Grievance redress mechanism
8. Conclusion & closing remarks
9. Next steps.

I. SUBJECT DESCRIPTION

RAHCO representative Ms. Judith Nzamba presented a description of flood protection on the central railway line detailing on the different alternatives to be used (relocation, river banks training and track elevation), scope, and operations activities and management aspects. She concluded by presenting the way forward for the ESIA process and project authorization.

Issues raised and discussed during the community assembly

In the general assembly all the issues, concerns and comments that were raised by the local leaders were read out to the local community to confirm if they seconded to or they have something to add on. All the issues raised by the local leaders were supported by the locals. Below is a list of issues raised by local community to add on to the list of issues raised by the local leaders.

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
Condition and land uses at the project site		
Land at Kikundi village where the railway passes through has different uses.	Land is used for: Agriculture (i.e. cropland), grazing areas and building housing structures. Other uses include: forest (collection of medicinal plants, firewood and building wood etc). burial sites(i.e. Usagarani, Magulu, Loliondo and Kidai Moja) and pathways	
Stakeholders expectations (project benefits)		
Job opportunities for construction and train operation. It should be prioritized to the local villagers.	Community members expect employment opportunities for unskilled and semi-skilled labour during railway development/	Prioritization of job opportunities to the local villagers and the equal

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
	rehabilitation works (i.e. site clearance, construction of gabions, security guards, digging ditches etc.)	distribution through the village government shall be addressed in the mitigation plan.
Increase in per capita income of individuals	The locals are expecting that during the project implementation; people's income will generally increase (due to income generated from salaries, wages and market for their local produce). This will consequently improve the living standards local people.	
Flood protection measures	Kidete Dam should be renovated as the first priority for protecting both agricultural land and the railway from flood.	
Side road	The road along the railway to be improved for securing safety and local transportation.	
Improvement of the railway service for transporting agricultural products.	By protecting the railway line from floods; locals expected an accelerated movement of people/goods to the market as result of a reliable means of transport.	
Negative impacts, risks and challenges		
House relocation and land acquisition. It should be compensated properly.	During the rehabilitation phase people might lose their croplands/ pastureland in areas where relocation/ shifting of the existing railway route will occur. Other people might lose their houses.	To be addressed in the CRP.
Loss of natural vegetation cover and contained valuable wildlife due site clearance during flood protection measures / construction works	The flooded sections (within Kikundi Village) of the railway nearby area is endowed with trees, herbs and wildlife of local importance i.e. medicinal, building materials, fuel-wood and animal protein etc. that will be cleared, damaged or caused to move away from the area due to railway development / rehabilitation works i.e. relocation/ shifting of the existing route and river banks training .	
Directing the culvert towards peoples' settlement / houses	General feelings that the contractors might design culverts that are directed to flow their waters towards peoples' houses / farms. This water can cause damage to cultivated crops and houses.	
Noise emission from operations	Noise pollution emanated from machinery and from explosives which will be used while sourcing material such as stones.	
Increase in accidental events	Locals expected flood free railway line will encourage an increase number of train trips and its consequential increase on the number of accidents to those who use railway as side walk/ ride their motorbike/bicycle by the railway side. Also accidents might occur during construction and may result into loss of some body parts i.e. leg, arm etc.	
Increase in HIV transmission from / to new comers and local community and consequent increase in AIDS sufferers in project area.	Interactions between project personnel and service providers who have better income than locals have a potential to increase HIV transmission rate and spread of other STDs.	To be addressed in the mitigation plan.
Air pollution due railway line development activities	Air pollution as a result of moving vehicles and other earth moving machinery during the	To be addressed in the mitigation plan.

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
	construction / rehabilitation phase will affect the community at vicinity.	
Interfering with the village settlement patterns and the landscape in general	The original landscape of the village will be interfered with; i.e. shifting of the railway to another location might separate the village	To be addressed in the mitigation plan.

J. STAKEHOLDERS INVOLVEMENT IN PROJECT IMPLEMENTATION

Stakeholder's roles and responsibilities

- HIV / AIDS committee: Through the committee, community will be educated on ways of preventing HIV transmission.
- Local government authorities: The authorities will be involved in identification of individuals among the local community who are capable of working (as semi-skilled or unskilled labourers) during railway development, construction and rehabilitation works.

Grievance Redress Mechanism

Normal government reporting procedure was proposed to be used as follows: Community level to ward level, then Municipal level and reporting directly to concerned offices i.e. Land office.

K. CONCLUSION AND CLOSING REMARKS

The Ward Chairperson closed the meeting by thanking JSB EnviDep for organizing the meeting reiterating that the leaders are representatives of the rest of the community and responsible for dissemination of issues that were presented and agreed upon. Further collaboration to the consultants should be given so as to continue with their study in the area.

Next Steps

The consultants informed participants that during the next two days they intended to undertake visits to Godegode, Gulwe, Ihumwe and Msagali villages to conduct a stakeholder consultations, gathering socio economic and environmental baseline data and information and meeting with different focused groups who have knowledge in: herbal medicine, wild animals, water resources/sources, ritual sites/ cultural heritage and aquatic organisms. A detailed project information brief and public notice with key contact and communication information were handled out to participants.

GODEGODE COMMUNITY ASSEMBLY

MEETING MINUTES

A. DATE: 10th June, 2015

B. TIME: 3:00pm – 5:00pm

C. PRIMARY PURPOSE: Scoping: Environmental and Social Impact Assessment (ESIA) for the Preparatory Survey on Flood Protection Measures for the Central Railway Line –Kilosa to Dodoma Section.

D. SUBJECT: Godegode Community Assembly

E. VENUE: Open space in a Primary School at Godegode Village

F. RECORDED BY: Justin Mawingi; **Company:** JSB-EnviDep Ltd.

G. LANGUAGE USED: Primary language: Swahili **Translated to:** English

H. ATTENDEES:

Project Representatives

Name	Position	Company	Contact Info.
Mr. Mugisha Lucius	Consultant (Sociology)	JSB-EnviDep Ltd	+255 714 462 206
Mr. Frank Mbago	Consultant (Botanist)	JSB-EnviDep Ltd	+255 787 879 852 +255 655 650 672
Dr. Benno	Consultant (Aquatic Ecologist) – Team Leader	JSB-EnviDep Ltd	+255 784 474 256 +255 713 350 780
Ms. Mwajuma Nuru	Consultant (Stakeholder Engagement)	JSB-EnviDep Ltd	+255 713 553 558 mwammy82@yahoo.com
Mr. Justin Mawingi	Consultant (Stakeholder Engagement assistant)	JSB-EnviDep Ltd	+255 763 261 919 mawingi.deograsias@yahoo.com
Eng. Leonard Gastory	Consultant (Engineer)	JSB-EnviDep Ltd	+255 715 640 302 leonardgastory@yahoo.com
Mr. Chacha Werema	Consultant (Wildlife Expert)	JSB-EnviDep Ltd	+255 754 407 650
Mr. Mutabazi Francis	Consultant (Geologist)	JSB-EnviDep Ltd	+255 712 703 133 +255 757 463 232
Mr. Elgidius Ichumbaki	Consultant (Archaeologist)	JSB-EnviDep Ltd	+255 713 860 875
Ms. Judith Nzamba	Environmental Management Officer	RAHCO	
Ms. Kyoko Mishima	Expert for Environmental and Social Considerations	JICA Study Team	+255 784 320 246

Stakeholder's attendees[52]

- **Approximate number: 98**

Sign- in sheets will be attached in appendices to show the list of stakeholders who participated in the meetings with local community.

- **Description of Stakeholders**

[52] Sign-in sheet ……..

The Godegode Village chairperson chaired the meeting with JSB Consultants hosting and facilitating the meeting. Attending were the: Ward Executive Officer (WEO),Village Executive Officer(VEO), Village Chairperson; representatives of different village committees (environment, natural resources, community welfare, water, security and HIV/AIDS) Women group representatives (Farmers, entrepreneurs) , representatives of different age groups (youth and elderly), Natural Resource Users (traditional herbalist, hunters, farmers ,livestock keepers) religious leaders and members from the general public/ local community

OPENING REMARKS
The meeting came to order at 3:00pm with welcome remarks by the Godegode Village Executive Officer (VEO) Mr. Salehe Kuziganika followed by self-introduction by attendees. The Godegode village chairperson Mr. Charles Ngalali who was chairperson for the meeting made opening remarks stating the objective of the meeting.

JSB Consultants Team Leader Dr. Benno proceeded to present a brief introduction about the Project Proponent RAHCO, and JICA, plans for the flood protection on the central railway line within Kilosa - Dodoma sections (Flood prone areas). He went on describing the effects of floods on the Central Railway Line plus the control/protection measures which will be undertaken, the need for ESIA and purpose of the scoping phase including requirement to meet with stakeholders. For the meeting with Godegode local community he presented the agenda of the meeting as follows:

MEETING AGENDA
1. Opening remarks
2. Subject description
3. Condition and land uses at the project site
4. Stakeholders expectations (project benefits)
5. Negative impacts, risks and challenges
6. Stakeholders roles and responsibilities
7. Grievance redress mechanism
8. Conclusion & closing remarks
9. Next steps.

I. SUBJECT DESCRIPTION

RAHCO representative Ms. Judith Nzamba presented a description of flood protection on the central railway line detailing on the different alternatives to be used (relocation, river banks training and track elevation), scope, and operations activities and management aspects. She concluded by presenting the way forward for the ESIA process and project authorization.

Issues raised and discussed during the community assembly
In the general assembly all the issues, concerns and comments that were raised by the local leaders were read out to the local community to confirm if they seconded to or they have something to add on. All the issues raised by the local leaders were supported by the locals. Below is a list of issues raised by local community to add on to the list of issues raised by the local leaders.

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
Condition and land uses at the project site		
Land at Godegode village where the railway passes through has different uses.	Land is used for: Agriculture (i.e. cropland), grazing areas and building housing structures. Other uses include: forest (collection of medicinal plants, firewood and building wood etc). burial sites(i.e. Chang'ombe and Chamwino), source of water for domestic use and for irrigation (Kinyasungwi river) pathways and mining areas (around Genge 6 and 7)	
Stakeholders expectations (project benefits)		
Job opportunities for construction and train	Community members expect employment opportunities for unskilled and semi-skilled labour	Prioritization of job opportunities to the local

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
operation. It should be prioritized to the local villagers.	during railway development/ rehabilitation works (i.e. site clearance, construction of gabions, security guards, digging ditches etc.)	villagers and the equal distribution through the village government shall be addressed in the mitigation plan.
Increase in per capita income of individuals	The locals are expecting that during the project implementation; people's income will generally increase (due to income generated from salaries, wages and market for their local produce). This will consequently improve the living standards local people.	
Knowledge transfer from newcomers to local community.	Transfer of knowledge and skills from newcomers (i.e. contractors) to the local community.	
Improvement of the railway service for transporting agricultural products.	By protecting the railway line from floods; locals expected an accelerated movement of people/goods to the market as result of a reliable means of transport.	
Flood protection measures	Flood flow from Kibakwe Dam should be renovated as the first priority for protecting both agricultural land and the railway from flood.	Flood flow prevention shall be addressed in future project such as watershed management project.
Train services/ operations	Existing station to be operated and rehabilitated.	To be noted for TRL.
Negative impacts, risks and challenges		
House relocation and land acquisition. It should be compensated properly.	During the rehabilitation phase people might lose their croplands/ pastureland in areas where relocation/ shifting of the existing railway route will occur. Other people might lose their houses.	To be addressed in the CRP.
Loss of natural vegetation cover due site clearance during flood protection measures / construction works	The flooded sections (within Godegode Village) of the railway nearby area is endowed with trees and herbs of local importance i.e. medicinal, building materials and fuel-wood etc. that will be cleared, damaged due to railway development / rehabilitation works i.e. relocation/ shifting of the existing route and river banks training .	
Directing the culvert towards peoples' settlement / houses	Locals have general feelings that contractors might design culverts that are directed to flow their waters towards peoples' houses / farms. This water can cause damage to cultivated crops and houses.	
Noise emission from operations	Noise pollution emanated from machinery and from explosives which will be used while extracting material such as stones.	To be addressed in the mitigation plan.
Increase in accident events	Locals expected flood free railway line will encourage an increase number of train trips and its consequential increase on the number of accidents to those who use railway as side walk/ ride their motorbike/bicycle by the railway side. Also accidents might occur during construction and may result into loss of some body parts i.e. leg, arm etc.	
Increase in HIV transmission from / to new comers and local community and consequent increase in AIDS sufferers in project area.	Interactions between project personnel and service providers who have better income than locals have a potential to increase HIV transmission rate and spread of other STDs.	To be addressed in the mitigation plan.
Air pollution due railway line development activities	Air pollution as a result of moving vehicles and other earth moving machinery during the construction /	To be addressed in the mitigation plan.

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
	rehabilitation phase will affect the community at vicinity.	
Interfering with the village settlement patterns and the landscape in general	The original landscape of the village will be interfered with; i.e. shifting of the railway to another location might separate the village	To be addressed in the mitigation plan.

J. STAKEHOLDERS INVOLVEMENT IN PROJECT IMPLEMENTATION

Stakeholder's roles and responsibilities

- HIV / AIDS committee: Through the committee, community will be educated on ways of preventing HIV transmission.
- Local government authorities: The authorities will be involved in identification of individuals among the local community who are capable of working (as semi-skilled or unskilled labourers) during railway development, construction and rehabilitation works.

Grievance Redress Mechanism

Normal government reporting procedure was proposed to be used as follows: Community level to ward level, then Municipal level and reporting directly to concerned offices i.e. Land office.

K. CONCLUSION AND CLOSING REMARKS

The Village Chairperson closed the meeting by thanking JSB EnviDep for organizing the meeting reiterating that the leaders are representatives of the rest of the community and responsible for dissemination of issues that were presented and agreed upon. Further collaboration to the consultants should be given so as to continue with their study in the area.

Next Steps

The consultants informed participants that during the next two days they intended to undertake visits to Gulwe, Ihumwe and Msagali villages to conduct stakeholder consultations, gathering socio economic and environmental baseline data and information and meeting with different focused groups who have knowledge in: herbal medicine, wild animals, water resources/sources, ritual sites/ cultural heritage and aquatic organisms. A detailed project information brief and public notice with key contact and communication information were handled out to participants.

CONSULTATIVE MEETING WITH LOCAL LEADERS: GULWE VILLAGE LEADERS

MEETING MINUTES

A. DATE: 11th June, 2015

B. TIME: 1300 - 1500 Hours

C. PRIMARY PURPOSE: Scoping: Environmental and Social Impact Assessment (ESIA) for the Preparatory Survey on Flood Protection Measures for the Central Railway Line –Kilosa to Dodoma Section.

D. SUBJECT: Consultative meeting with local leaders – village level

E. VENUE: Local government offices - Gulwe Village

F. RECORDED BY: Justin Mawingi; **Company:** JSB-EnviDep Ltd.

G. LANGUAGE USED: Primary language: Swahili **Translated to:** English

H. ATTENDEES:

Project Representatives

Name	Position	Company	Contact Info.
Mr. Mugisha Lucius	Consultant (Sociology)	JSB-EnviDep Ltd	+255 714 462 206
Mr. Frank Mbago	Consultant (Botanist)	JSB-EnviDep Ltd	+255 787 879 852 +255 655 650 672
Dr. Benno	Consultant (Aquatic Ecologist) – Team Leader	JSB-EnviDep Ltd	+255 784 474 256 +255 713 350 780
Ms. Mwajuma Nuru	Consultant (Stakeholder Engagement)	JSB-EnviDep Ltd	+255 713 553 558 mwammy82@yahoo.com
Mr. Justin Mawingi	Consultant (Stakeholder Engagement assistant)	JSB-EnviDep Ltd	+255 763 261 919 mawingi.deograsias@yahoo.com
Eng. Leonard Gastory	Consultant (Engineer)	JSB-EnviDep Ltd	+255 715 640 302 leonardgastory@yahoo.com
Mr. Chacha Werema	Consultant (Wildlife Expert)	JSB-EnviDep Ltd	+255 754 407 650
Mr. Mutabazi Francis	Consultant (Geologist)	JSB-EnviDep Ltd	+255 712 703 133 +255 757 463 232
Mr. Elgidius Ichumbaki	Consultant (Archaeologist)	JSB-EnviDep Ltd	+255 713 860 875
Ms. Judith Nzamba	Environmental Advisor	RAHCO	
Ms. Kyoko Mishima	Environmental Advisor	JICA	+255 784 320 246

Stakeholder's attendees[53]

- **Approximate number: 31**

Sign- in sheets will be attached in appendices to show the list of stakeholders who participated in the meetings with village leaders.

- **Description of Stakeholders**

[53] Sign-in sheet ……..

The Gulwe Village chairperson chaired the meeting with JSB Consultants hosting and facilitating the meeting. Attending were the: Ward Executive Officer (WEO),Village Executive Officer(VEO), Village Chairperson; representatives of different village committees (environment, natural resources, community welfare, water, security and HIV/AIDS) Women group representatives (Farmers, entrepreneurs) , representatives of different age groups (youth and elderly), Natural Resource Users (traditional herbalist, hunters, farmers ,livestock keepers) religious leaders.

OPENING REMARKS

The meeting came to order at 1300 Hours with welcome remarks by the Gulwe Village Executive Officer (VEO) Mr. Cyprian G. Mwangosi followed by self-introduction by attendees. The Gulwe village chairperson Mr. Peter Sogodi who was chairperson for the meeting made opening remarks stating the objective of the meeting emphasizing the fact that the leaders are representatives of the rest of the community and responsible for dissemination of issues that will be presented and agreed.

JSB Consultants Team Leader Dr. Benno proceeded to present a brief introduction about the Project Proponent RAHCO, and JICA, plans for the flood protection on the central railway line within Kilosa - Dodoma sections (Flood prone areas). He went on describing the effects of floods on the Central Railway Line plus the control/protection measures which will be undertaken, the need for ESIA and purpose of the scoping phase including requirement to meet with stakeholders. For the meeting with Gulwe Village leaders he presented the agenda of the meeting as follows:

MEETING AGENDA

1. Opening remarks
2. Subject description
3. Condition and land uses at the project site
4. Stakeholders expectations (project benefits)
5. Negative impacts, risks and challenges
6. Stakeholders roles and responsibilities
7. Grievance redress mechanism
8. Conclusion & closing remarks
9. Next steps.

I. SUBJECT DESCRIPTION

RAHCO representative Ms. Judith Nzamba presented a description of flood protection on the central railway line detailing on the different alternatives to be used (relocation, river banks training and track elevation), scope, and operations activities and management aspects. She concluded by presenting the way forward for the ESIA process and project authorization.

Issues raised and discussed at the meeting

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
Condition and land uses at the project site		
Land at Gulwe village where the railway passes through has different uses.	Land is used for: Agriculture (i.e. cropland), grazing areas and building housing structures. Other uses include: forest (collection of medicinal plants, firewood and building wood etc), burial sites (i.e. Majengo and Kilimani), ritual/worship sites (at a hill - Genge tisa) and pathways.	
Stakeholders expectations (project benefits)		
Job opportunities for construction and train operation. It should be prioritized to the local villagers.	Community members expect employment opportunities for unskilled and semi-skilled labour during railway development/ rehabilitation works (i.e. site clearance, construction of gabions, security guards, digging ditches etc.)	Prioritization of job opportunities to the local villagers and the equal distribution through the village government shall be addressed in the mitigation plan.
Flood control measures on the railway will also have a	Flood flow from Kimagai and Kidete Dams should be renovated as the first priority for protecting both	Flood flow prevention shall be addressed in future

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
multiplier effect – on flood control on local peoples' farms	agricultural land and the railway from flood.	project such as watershed management project.
Knowledge transfer from newcomers to local community	Transfer of knowledge and skills from newcomers (i.e. contractors) to the local community.	
Increase in per capita income of individuals	The locals are expecting that during the project implementation; people's income will generally increase (due to income generated from salaries, wages and market for their local produce). This will consequently improve the living standards local people.	
Improvement of the railway service for transporting agricultural products.	By protecting the railway line from floods; locals expected an accelerated movement of people/goods to the market as result of a reliable means of transport.	
Negative impacts, risks and challenges		
House relocation and land acquisition. It should be compensated properly.	During the rehabilitation phase people might lose their croplands/ pastureland in areas where relocation/ shifting of the existing railway route will occur. Other people might lose their houses.	To be addressed in the CRP.
Loss of natural vegetation cover due site clearance during flood protection measures / construction works	The flooded sections of the railway nearby area is endowed with trees and herbs of local importance i.e. medicinal, building materials and fuel-wood etc. that will be cleared or damaged due to railway development / rehabilitation works i.e. relocation/ shifting of the existing route and river banks training .	
School drop out	Students may leave their studies to seek employment.	To be addressed in the mitigation plan.
Noise emission from operations	Noise pollution emanated from machinery and from explosives which will be used while sourcing material such as stones.	
Increase in accidental events	Locals expected flood free railway line will encourage an increase number of train trips and its consequential increase on the number of accidents to those who use railway as side walk/ ride their motorbike/bicycle by the railway side. Also accidents might occur during construction and may result into loss of some body parts i.e. leg, arm etc.	
Increase in HIV transmission from / to new comers and local community and consequent increase in AIDS sufferers in project area.	Interactions between project personnel and service providers who have better income than locals have a potential to increase HIV transmission rate and spread of other STDs.	To be addressed in the mitigation plan.
Air pollution due railway line development activities	Air pollution as a result of moving vehicles and other earth moving machinery during the construction / rehabilitation phase will affect the community at vicinity.	To be addressed in the mitigation plan.
Interfering with the village settlement patterns and the landscape in general	The original landscape of the village will be interfered with; i.e. shifting of the railway to another location might separate the village	To be addressed in the mitigation plan.

As a result of the above negative impacts that are associated with the project at Gulwe. The locals are requesting to be supported in community projects like building a secondary school/ dispensary.

J. STAKEHOLDERS INVOLVEMENT IN PROJECT IMPLEMENTATION

Stakeholder's roles and responsibilities

- HIV / AIDS committee: Through the committee, community will be educated on ways of preventing HIV transmission.
- Local government authorities: The authorities will be involved in identification of individuals among the local community who are capable of working (as semi-skilled or unskilled labourers) during railway development, construction and rehabilitation works.

Grievance Redress Mechanism

Normal government reporting procedure was proposed to be used as follows: Community level to ward level, then Municipal level and reporting directly to concerned offices i.e. Land office.

K. CONCLUSION AND CLOSING REMARKS

The Village Chairperson closed the meeting by thanking JSB EnviDep for organizing the meeting reiterating that the leaders are representatives of the rest of the community and responsible for dissemination of issues that were presented and agreed upon. Further collaboration to the consultants should be given so as to continue with their study in the area.

Next Steps

The consultants informed participants that during the next one day they intended to undertake visits to Ihumwe and Msagali villages to conduct stakeholder consultations, gathering socio economic and environmental baseline data and information and meeting with different focused groups who have knowledge in: herbal medicine, wild animals, water resources/sources, ritual sites/ cultural heritage and aquatic organisms. A detailed project information brief and public notice with key contact and communication information were handled out to participants.

GULWE COMMUNITY ASSEMBLY

MEETING MINUTES

A. DATE: 11th June, 2015

B. TIME: 1500 – 1700 Hrs

C. PRIMARY PURPOSE: Scoping: Environmental and Social Impact Assessment (ESIA) for the Preparatory Survey on Flood Protection Measures for the Central Railway Line –Kilosa to Dodoma Section.

D. SUBJECT: Gulwe Community Assembly

E. VENUE: Local government offices - Gulwe Village

F. RECORDED BY: Justin Mawingi; **Company:** JSB-EnviDep Ltd.

G. LANGUAGE USED: Primary language: Swahili **Translated to:** English

H. ATTENDEES:

Project Representatives

Name	Position	Company	Contact Info.
Mr. Mugisha Lucius	Consultant (Sociology)	JSB-EnviDep Ltd	+255 714 462 206
Mr. Frank Mbago	Consultant (Botanist)	JSB-EnviDep Ltd	+255 787 879 852 +255 655 650 672
Dr. Benno	Consultant (Aquatic Ecologist) – Team Leader	JSB-EnviDep Ltd	+255 784 474 256 +255 713 350 780
Ms. Mwajuma Nuru	Consultant (Stakeholder Engagement)	JSB-EnviDep Ltd	+255 713 553 558 mwammy82@yahoo.com
Mr. Justin Mawingi	Consultant (Stakeholder Engagement assistant)	JSB-EnviDep Ltd	+255 763 261 919 mawingi.deograsias@yahoo.com
Eng. Leonard Gastory	Consultant (Engineer)	JSB-EnviDep Ltd	+255 715 640 302 leonardgastory@yahoo.com
Mr. Chacha Werema	Consultant (Wildlife Expert)	JSB-EnviDep Ltd	+255 754 407 650
Mr. Mutabazi Francis	Consultant (Geologist)	JSB-EnviDep Ltd	+255 712 703 133 +255 757 463 232
Mr. Elgidius Ichumbaki	Consultant (Archaeologist)	JSB-EnviDep Ltd	+255 713 860 875
Ms. Judith Nzamba	Environmental Management Officer	RAHCO	
Ms. Kyoko Mishima	Expert for Environmental and Social Considerations	JICA Study Team	+255 784 320 246

Stakeholder's attendees[54]

- **Approximate number: 87**

Sign- in sheets will be attached in appendices to show the list of stakeholders who participated in the general assembly.

- **Description of Stakeholders**

[54] Sign-in sheet ……..

The Gulwe Village chairperson chaired the meeting with JSB Consultants hosting and facilitating the meeting. Attending were the: Ward Executive Officer (WEO),Village Executive Officer(VEO), Village Chairperson; representatives of different village committees (environment, natural resources, community welfare, water, security and HIV/AIDS) Women group representatives (Farmers, entrepreneurs) , representatives of different age groups (youth and elderly), Natural Resource Users (traditional herbalist, hunters, farmers ,livestock keepers) religious leaders and members from the general public/ local community

OPENING REMARKS

The meeting came to order at 1500 Hours with welcome remarks by the Gulwe Village Executive Officer (VEO) Mr. Cyprian G. Mwangosi followed by self-introduction by attendees. The Gulwe village chairperson Mr. Peter Sogodi who was chairperson for the meeting made opening remarks stating the objective of the meeting.

JSB Consultants Team Leader Dr. Benno proceeded to present a brief introduction about the Project Proponent RAHCO, and JICA, plans for the flood protection on the central railway line within Kilosa - Dodoma sections (Flood prone areas). He went on describing the effects of floods on the Central Railway Line plus the control/protection measures which will be undertaken, the need for ESIA and purpose of the scoping phase including requirement to meet with stakeholders. For the meeting with Gulwe Village local community he presented the agenda of the meeting as follows:

MEETING AGENDA

1. Opening remarks
2. Subject description
3. Condition and land uses at the project site
4. Stakeholders expectations (project benefits)
5. Negative impacts, risks and challenges
6. Stakeholders roles and responsibilities
7. Grievance redress mechanism
8. Conclusion & closing remarks
9. Next steps.

I. SUBJECT DESCRIPTION

RAHCO representative Ms. Judith Nzamba presented a description of flood protection on the central railway line detailing on the different alternatives to be used (relocation, river banks training and track elevation), scope, and operations activities and management aspects. She concluded by presenting the way forward for the ESIA process and project authorization.

Issues raised and discussed during the community assembly

In the general assembly all the issues, concerns and comments that were raised by the local leaders were read out to the local community to confirm if they seconded to or they have something to add on. All the issues raised by the local leaders were supported by the locals. Below is a list of issues raised by local community to add on to the list of issues raised by the local leaders.

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
Condition and land uses at the project site		
Land at Gulwe village where the railway pass through have different uses.	Land is used for: Agriculture (i.e. cropland), grazing areas and building housing structures. Other uses include: forest (collection of medicinal plants, firewood and building wood etc), burial sites (i.e. Majengo and Kilimani), ritual/worship sites (at a hill - Genge tisa) and pathways.	
Stakeholders expectations (project benefits)		
Job opportunities for construction and train operation. It should be	Community members expect employment opportunities for unskilled and semi-skilled labour during railway development/ rehabilitation works (i.e.	Job opportunities for construction and train operation. It should be

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
prioritized to the local villagers.	site clearance, construction of gabions, security guards, digging ditches etc.)	prioritized to the local villagers.
Flood control measures on the railway will also have a multiplier effect – on flood control on local peoples' farms	Flood flow from Kimagai and Kidete Dams should be renovated as the first priority for protecting both agricultural land and the railway from flood.	Flood control measures on the railway will also have a multiplier effect – on flood control on local peoples' farms
Knowledge transfer from newcomers to local community	Transfer of knowledge and skills from newcomers (i.e. contractors) to the local community.	Knowledge transfer from newcomers to local community
Increase in per capita income of individuals	The locals are expecting that during the project implementation; people's income will generally increase (due to income generated from salaries, wages and market for their local produce). This will consequently improve the living standards local people.	Increase in per capita income of individuals
Improvement of the railway service for transporting agricultural products.	By protecting the railway line from floods; locals expected an accelerated movement of people/goods to the market as result of a reliable means of transport.	Improvement of the railway service for transporting agricultural products.
Negative impacts, risks and challenges		
House relocation and land acquisition. It should be compensated properly.	During the rehabilitation phase people might lose their croplands/ pastureland in areas where relocation/ shifting of the existing railway route will occur. Other people might lose their houses.	To be addressed in the CRP.
Loss of natural vegetation cover due site clearance during flood protection measures / construction works	The flooded sections of the railway nearby area is endowed with trees and herbs of local importance i.e. medicinal, building materials and fuel-wood etc. that will be cleared or damaged due to railway development / rehabilitation works i.e. relocation/ shifting of the existing route and river banks training .	
School drop out	Students may leave their studies to seek employment.	To be addressed in the mitigation plan.
Noise emission from operations	Noise pollution emanated from machinery and from explosives which will be used while sourcing material such as stones.	To be addressed in the mitigation plan.
Increase in accidental events	Locals expected flood free railway line will encourage an increase number of train trips and its consequential increase on the number of accidents to those who use railway as side walk/ ride their motorbike/bicycle by the railway side. Also accidents might occur during construction and may result into loss of some body parts i.e. leg, arm etc.	
Increase in HIV transmission from / to new comers and local community and consequent increase in AIDS sufferers in project area.	Interactions between project personnel and service providers who have better income than locals have a potential to increase HIV transmission rate and spread of other STDs.	To be addressed in the mitigation plan.
Air pollution due railway line development activities	Air pollution as a result of moving vehicles and other earth moving machinery during the construction / rehabilitation phase will affect the community at vicinity.	To be addressed in the mitigation plan.
Interfering with the village settlement patterns and the landscape in general	The original landscape of the village will be interfered with; i.e. shifting of the railway to another location might separate the village	To be addressed in the mitigation plan.

As a result of the above negative impacts that are associated with the project at Gulwe. The locals are requesting to be supported in community projects like building a secondary school/ dispensary.

J. STAKEHOLDERS INVOLVEMENT IN PROJECT IMPLEMENTATION

Stakeholder's roles and responsibilities

- HIV / AIDS committee: Through the committee, community will be educated on ways of preventing HIV transmission.
- Local government authorities: The authorities will be involved in identification of individuals among the local community who are capable of working (as semi-skilled or unskilled labourers) during railway development, construction and rehabilitation works.

Grievance Redress Mechanism

Normal government reporting procedure was proposed to be used as follows: Community level to ward level, then Municipal level and reporting directly to concerned offices i.e. Land office.

K. CONCLUSION AND CLOSING REMARKS

The Village Chairperson closed the meeting by thanking JSB EnviDep for organizing the meeting reiterating that the leaders are representatives of the rest of the community and responsible for dissemination of issues that were presented and agreed upon. Further collaboration to the consultants should be given so as to continue with their study in the area.

Next Steps

The consultants informed participants that during the next two days they intended to undertake visits to Ihumwe and Msagali villages to conduct stakeholder consultations, gathering socio economic and environmental baseline data and information and meeting with different focused groups who have knowledge in: herbal medicine, wild animals, water resources/sources, ritual sites/ cultural heritage and aquatic organisms. A detailed project information brief and public notice with key contact and communication information were handled out to participants.

CONSULTATIVE MEETING WITH LOCAL LEADERS: MSAGALI VILLAGE MEETING MINUTES

A. DATE: 12th June, 2015

B. TIME: 8:30 am – 10:30 am

C. PRIMARY PURPOSE: Scoping: Environmental and Social Impact Assessment (ESIA) for the Preparatory Survey on Flood Protection Measures for the Central Railway Line –Kilosa to Dodoma Section.

D. SUBJECT: Consultative meeting with local leaders – village level

E. VENUE: Local government offices - Msagali Village

F. RECORDED BY: Justin Mawingi; **Company:** JSB-EnviDep Ltd.

G. LANGUAGE USED: Primary language: Swahili **Translated to:** English

H. ATTENDEES:

Project Representatives

Name	Position	Company	Contact Info.
Mr. Mugisha Lucius	Consultant (Sociology)	JSB-EnviDep Ltd	+255 714 462 206
Mr. Frank Mbago	Consultant (Botanist)	JSB-EnviDep Ltd	+255 787 879 852 +255 655 650 672
Dr. Benno	Consultant (Aquatic Ecologist) – Team Leader	JSB-EnviDep Ltd	+255 784 474 256 +255 713 350 780
Ms. Mwajuma Nuru	Consultant (Stakeholder Engagement)	JSB-EnviDep Ltd	+255 713 553 558 mwammy82@yahoo.com
Mr. Justin Mawingi	Consultant (Stakeholder Engagement assistant)	JSB-EnviDep Ltd	+255 763 261 919 mawingi.deograsias@yahoo.com
Eng. Leonard Gastory	Consultant (Engineer)	JSB-EnviDep Ltd	+255 715 640 302 leonardgastory@yahoo.com
Mr. Chacha Werema	Consultant (Wildlife Expert)	JSB-EnviDep Ltd	+255 754 407 650
Mr. Mutabazi Francis	Consultant (Geologist)	JSB-EnviDep Ltd	+255 712 703 133 +255 757 463 232
Mr. Elgidius Ichumbaki	Consultant (Archaeologist)	JSB-EnviDep Ltd	+255 713 860 875
Ms. Judith Nzamba	Environmental Management Officer	RAHCO	
Ms. Kyoko Mishima	Expert for Environmental and Social Considerations	JICA Study Team	+255 784 320 246

Stakeholder's attendees[55]

- **Approximate number: 18**

Sign- in sheets will be attached in appendices to show the list of stakeholders who participated in the meetings with village leaders.

- **Description of Stakeholders**

[55] Sign-in sheet ……..

The Msagali Councillor chaired the meeting with JSB Consultants hosting and facilitating the meeting. Attending were the: Ward Executive Officer (WEO),Village Executive Officer(VEO), Village Chairperson; representatives of different village committees (environment, natural resources, community welfare, water, security and HIV/AIDS) Women group representatives (Farmers, entrepreneurs) , representatives of different age groups (youth and elderly), Natural Resource Users (traditional herbalist, hunters, farmers ,livestock keepers) religious leaders.

OPENING REMARKS

The meeting came to order at 8:30am with welcome remarks by the Msagali Village Executive Officer (VEO) Mr. Yohana D. Mganda followed by self-introduction by attendees. The Msagali Ward Councillor Hon. Nehemiah Kongawadodo who was chairperson for the meeting made opening remarks stating the objective of the meeting emphasizing the fact that the leaders are representatives of the rest of the community and responsible for dissemination of issues that will be presented and agreed.

JSB Consultants Team Leader Dr. Benno proceeded to present a brief introduction about the Project Proponent RAHCO, and JICA, plans for the flood protection on the central railway line within Kilosa - Dodoma sections (Flood prone areas). He went on describing the effects of floods on the Central Railway Line plus the control/protection measures which will be undertaken, the need for ESIA and purpose of the scoping phase including requirement to meet with stakeholders. For the meeting with Msagali Village leaders he presented the agenda of the meeting as follows:

MEETING AGENDA

1. Opening remarks
2. Subject description
3. Condition and land uses at the project site
4. Stakeholders expectations (project benefits)
5. Negative impacts, risks and challenges
6. Stakeholders roles and responsibilities
7. Grievance redress mechanism
8. Conclusion & closing remarks
9. Next steps.

I. SUBJECT DESCRIPTION

RAHCO representative Ms. Judith Nzamba presented a description of flood protection on the central railway line detailing on the different alternatives to be used (relocation, river banks training and track elevation), scope, and operations activities and management aspects. She concluded by presenting the way forward for the ESIA process and project authorization.

Issues raised and discussed at the meeting

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
Condition and land uses at the project site		
Land at Msagali village where the railway passes through has different uses.	Land is used for: Agriculture (i.e. cropland), grazing areas, play grounds and building housing structures. Other uses include: forest (collection of medicinal plants, firewood and building wood etc), burial sites and pathways.	
Stakeholders expectations (project benefits)		
Job opportunities for construction and train operation. It should be prioritized to the local villagers.	Community members expect employment opportunities for unskilled and semi-skilled labour during railway development/ rehabilitation works (i.e. site clearance, construction of gabions, security guards, digging ditches etc.)	Job opportunities for construction and train operation. It should be prioritized to the local villagers.
Flood control measures	Number of culvert under the railway needs to be increased to discharge flood flow from agriculture land (near Musagali station).	To be addressed in the future improvement plan
Knowledge transfer from newcomers to local community	Transfer of knowledge and skills from newcomers (i.e. contractors) to the local community.	

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
Improvement of the railway service for transporting agricultural products.	By protecting the railway line from floods; locals expected an accelerated movement of people/goods to the market as result of a reliable means of transport.	Improvement of the railway service for transporting agricultural products.
Negative impacts, risks and challenges		
House relocation and land acquisition. It should be compensated properly.	During the rehabilitation phase people might lose their croplands/ pastureland in areas where relocation/ shifting of the existing railway route will occur. Other people might lose their houses.	To be addressed in the CRP.
Noise emission from operations	Noise pollution emanated from machinery and from explosives which will be used while sourcing material such as stones.	To be addressed in the mitigation plan.
Increase in accidental events	Locals expected flood free railway line will encourage an increase number of train trips and its consequential increase on the number of accidents to those who use railway as side walk/ ride their motorbike/bicycle by the railway side. Also accidents might occur during construction and may result into loss of some body parts i.e. leg, arm etc.	
Increase in HIV transmission from / to new comers and local community and consequent increase in AIDS sufferers in project area.	Interactions between project personnel and service providers who have better income than locals have a potential to increase HIV transmission rate and spread of other STDs.	To be addressed in the mitigation plan.
Air pollution due railway line development activities	Air pollution as a result of moving vehicles and other earth moving machinery during the construction / rehabilitation phase will affect the community at vicinity.	To be addressed in the mitigation plan.

J. STAKEHOLDERS INVOLVEMENT IN PROJECT IMPLEMENTATION

Stakeholder's roles and responsibilities

- HIV / AIDS committee: Through the committee, community will be educated on ways of preventing HIV transmission.
- Local government authorities: The authorities will be involved in identification of individuals among the local community who are capable of working (as semi-skilled or unskilled labourers) during railway development, construction and rehabilitation works.

Grievance Redress Mechanism

Normal government reporting procedure was proposed to be used as follows: Community level to ward level, then Municipal level and reporting directly to concerned offices i.e. Land office.

K. CONCLUSION AND CLOSING REMARKS

The Councillor closed the meeting by thanking JSB EnviDep for organizing the meeting reiterating that the leaders are representatives of the rest of the community and responsible for dissemination of issues that were presented and agreed upon. Further collaboration to the consultants should be given so as to continue with their study in the area.

Next Steps

The consultants informed participants that during the rest of the day they intended to undertake visits to Ihumwe and Igandu villages to conduct stakeholder consultations, gathering socio economic and environmental baseline data and information and meeting with different focused groups who have knowledge in: herbal medicine, wild animals, water resources/sources, ritual sites/ cultural heritage and aquatic organisms. A detailed project

information brief and public notice with key contact and communication information were handled out to participants.

CONSULTATIVE MEETING WITH LOCAL LEADERS: IGANDU VILLAGE MEETING MINUTES

A. DATE: 12th June, 2015

B. TIME: 12:00 pm – 13:30 pm

C. PRIMARY PURPOSE: Scoping: Environmental and Social Impact Assessment (ESIA) for the Preparatory Survey on Flood Protection Measures for the Central Railway Line –Kilosa to Dodoma Section.

D. SUBJECT: Consultative meeting with local leaders – village level

E. VENUE: Local government offices - Igandu Village

F. RECORDED BY: Justin Mawingi; **Company:** JSB-EnviDep Ltd.

G. LANGUAGE USED: Primary language: Swahili **Translated to:** English

H. ATTENDEES:

Project Representatives

Name	Position	Company	Contact Info.
Mr. Mugisha Lucius	Consultant (Sociology)	JSB-EnviDep Ltd	+255 714 462 206
Mr. Frank Mbago	Consultant (Botanist)	JSB-EnviDep Ltd	+255 787 879 852 +255 655 650 672
Dr. Benno	Consultant (Aquatic Ecologist) – Team Leader	JSB-EnviDep Ltd	+255 784 474 256 +255 713 350 780
Ms. Mwajuma Nuru	Consultant (Stakeholder Engagement)	JSB-EnviDep Ltd	+255 713 553 558 mwammy82@yahoo.com
Mr. Justin Mawingi	Consultant (Stakeholder Engagement assistant)	JSB-EnviDep Ltd	+255 763 261 919 mawingi.deograsias@yahoo.com
Eng. Leonard Gastory	Consultant (Engineer)	JSB-EnviDep Ltd	+255 715 640 302 leonardgastory@yahoo.com
Mr. Chacha Werema	Consultant (Wildlife Expert)	JSB-EnviDep Ltd	+255 754 407 650
Mr. Mutabazi Francis	Consultant (Geologist)	JSB-EnviDep Ltd	+255 712 703 133 +255 757 463 232
Mr. Elgidius Ichumbaki	Consultant (Archaeologist)	JSB-EnviDep Ltd	+255 713 860 875
Ms. Judith Nzamba	Environmental Management Officer	RAHCO	
Ms. Kyoko Mishima	Expert for Environmental and Social Considerations	JICA Study Team	+255 784 320 246

Stakeholder's attendees[56]

- **Approximate number: 21**

Sign- in sheets will be attached in appendices to show the list of stakeholders who participated in the meetings with village leaders.

- **Description of Stakeholders**

The Igandu Councillor chaired the meeting with JSB Consultants hosting and facilitating the meeting. Attending were the: Councillor ,Ward Executive Officer (WEO),Village Executive Officer(VEO), Village Chairperson; representatives of different village committees (environment, natural resources, community welfare, water,

[56] Sign-in sheet ……..

security and HIV/AIDS) Women group representatives (Farmers, entrepreneurs) , representatives of different age groups (youth and elderly), Natural Resource Users (traditional herbalist, hunters, farmers ,livestock keepers) religious leaders.

OPENING REMARKS

The meeting came to order at 12:00 pm with welcome remarks by the Igandu Village Executive Officer (VEO) Mr. Aron J. Nkinda followed by self-introduction by attendees. The Igandu Ward Councillor Hon. Peter who was chairperson for the meeting made opening remarks stating the objective of the meeting emphasizing the fact that the leaders are representatives of the rest of the community and responsible for dissemination of issues that will be presented and agreed.

JSB Consultants Team Leader Dr. Benno proceeded to present a brief introduction about the Project Proponent RAHCO, and JICA, plans for the flood protection on the central railway line within Kilosa - Dodoma sections (Flood prone areas). He went on describing the effects of floods on the Central Railway Line plus the control/protection measures which will be undertaken, the need for ESIA and purpose of the scoping phase including requirement to meet with stakeholders. For the meeting with Igandu Village leaders he presented the agenda of the meeting as follows:

MEETING AGENDA

1. Opening remarks
2. Subject description
3. Condition and land uses at the project site
4. Stakeholders expectations (project benefits)
5. Negative impacts, risks and challenges
6. Stakeholders roles and responsibilities
7. Grievance redress mechanism
8. Conclusion & closing remarks
9. Next steps.

I. SUBJECT DESCRIPTION

RAHCO representative Ms. Judith Nzamba presented a description of flood protection on the central railway line detailing on the different alternatives to be used (relocation, river banks training and track elevation), scope, and operations activities and management aspects. She concluded by presenting the way forward for the ESIA process and project authorization.

Issues raised and discussed at the meeting

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
Condition and land uses at the project site		
Land at Igandu village where the railway passes through has different uses.	Land is used for: Agriculture (i.e. cropland), grazing areas, play grounds and building housing structures. Other uses include: forest (collection of medicinal plants, firewood and building wood etc), burial sites and pathways.	
Stakeholders expectations (project benefits)		
Job opportunities for construction and train operation. It should be prioritized to the local villagers.	Community members expect employment opportunities for unskilled and semi-skilled labour during railway development/ rehabilitation works (i.e. site clearance, construction of gabions, security guards, digging ditches etc.)	Job opportunities for construction and train operation. It should be prioritized to the local villagers.
Improvement of the railway service for transporting agricultural products.	By protecting the railway line from floods; locals expected an accelerated movement of people/goods to the market as result of a reliable means of transport.	Improvement of the railway service for transporting agricultural products.
Increase in per capita income of individuals	The locals are expecting that during the project implementation; people's income will generally increase (due to income generated from salaries, wages and market for their local produce). This will consequently improve the living standards local	

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
	people.	
Negative impacts, risks and challenges		
House relocation and land acquisition. It should be compensated properly.	During the rehabilitation phase people might lose their croplands/ pastureland in areas where relocation/ shifting of the existing railway route will occur. Other people might lose their houses.	To be addressed in the CRP.
Noise emission from operations	Noise pollution emanated from machinery and from explosives which will be used while sourcing material such as stones.	To be addressed in the mitigation plan.
Increase in accidental events	Locals expected flood free railway line will encourage an increase number of train trips and its consequential increase on the number of accidents to those who use railway as side walk/ ride their motorbike/bicycle by the railway side. Also accidents might occur during construction and may result into loss of some body parts i.e. leg, arm etc.	
Increase in HIV transmission from / to new comers and local community and consequent increase in AIDS sufferers in project area.	Interactions between project personnel and service providers who have better income than locals have a potential to increase HIV transmission rate and spread of other STDs.	To be addressed in the mitigation plan.
Air pollution due railway line development activities	Air pollution as a result of moving vehicles and other earth moving machinery during the construction / rehabilitation phase will affect the community at vicinity.	To be addressed in the mitigation plan.
Regulation to be more strict	Train operation to be regulated more strictly for safety control. (e.g. speed limitation, sounding phone more frequently)	To be noted for TRL.

J. STAKEHOLDERS INVOLVEMENT IN PROJECT IMPLEMENTATION

Stakeholder's roles and responsibilities

- HIV / AIDS committee: Through the committee, community will be educated on ways of preventing HIV transmission.
- Local government authorities: The authorities will be involved in identification of individuals among the local community who are capable of working (as semi-skilled or unskilled labourers) during railway development, construction and rehabilitation works.

Grievance Redress Mechanism

Normal government reporting procedure was proposed to be used as follows: Community level to ward level, then Municipal level and reporting directly to concerned offices i.e. Land office.

K. CONCLUSION AND CLOSING REMARKS

The Village Chairperson closed the meeting by thanking JSB EnviDep for organizing the meeting reiterating that the leaders are representatives of the rest of the community and responsible for dissemination of issues that were presented and agreed upon. Further collaboration to the consultants should be given so as to continue with their study in the area.

Next Steps

The consultants informed participants that during the rest of the day they intended to undertake visit to Ihumwa village to conduct stakeholder consultations, gathering socio economic and environmental baseline data and information and meeting with different focused groups who have knowledge in: herbal medicine, wild animals, water resources/sources, ritual sites/ cultural heritage and aquatic organisms. A detailed project information brief and public notice with key contact and communication information were handled out to participants.

CONSULTATIVE MEETING WITH LOCAL LEADERS: IHUMWA WARD MEETING MINUTES

A. DATE: 12th June, 2015

B. TIME: 15:00 pm – 17:00 pm

C. PRIMARY PURPOSE: Scoping: Environmental and Social Impact Assessment (ESIA) for the Preparatory Survey on Flood Protection Measures for the Central Railway Line –Kilosa to Dodoma Section.

D. SUBJECT: Consultative meeting with local leaders – village level

E. VENUE: Primary School – classroom; Ihumwa Ward

F. RECORDED BY: Justin Mawingi; **Company:** JSB-EnviDep Ltd.

G. LANGUAGE USED: Primary language: Swahili **Translated to:** English

H. ATTENDEES:

Project Representatives

Name	Position	Company	Contact Info.
Mr. Mugisha Lucius	Consultant (Sociology)	JSB-EnviDep Ltd	+255 714 462 206
Mr. Frank Mbago	Consultant (Botanist)	JSB-EnviDep Ltd	+255 787 879 852 +255 655 650 672
Dr. Benno	Consultant (Aquatic Ecologist) – Team Leader	JSB-EnviDep Ltd	+255 784 474 256 +255 713 350 780
Ms. Mwajuma Nuru	Consultant (Stakeholder Engagement)	JSB-EnviDep Ltd	+255 713 553 558 mwammy82@yahoo.com
Mr. Justin Mawingi	Consultant (Stakeholder Engagement assistant)	JSB-EnviDep Ltd	+255 763 261 919 mawingi.deograsias@yahoo.com
Eng. Leonard Gastory	Consultant (Engineer)	JSB-EnviDep Ltd	+255 715 640 302 leonardgastory@yahoo.com
Mr. Chacha Werema	Consultant (Wildlife Expert)	JSB-EnviDep Ltd	+255 754 407 650
Mr. Mutabazi Francis	Consultant (Geologist)	JSB-EnviDep Ltd	+255 712 703 133 +255 757 463 232
Mr. Elgidius Ichumbaki	Consultant (Archaeologist)	JSB-EnviDep Ltd	+255 713 860 875
Ms. Judith Nzamba	Environmental Management Officer	RAHCO	
Ms. Kyoko Mishima	Expert for Environmental and Social Considerations	JICA Study Team	+255 784 320 246

Stakeholder's attendees[57]

- **Approximate number: 20**

Sign- in sheets will be attached in appendices to show the list of stakeholders who participated in the meetings with village leaders.

- **Description of Stakeholders**

The Ihumwa Councillor chaired the meeting with JSB Consultants hosting and facilitating the meeting. Attending were the: Ward Executive Officer (WEO),Village Executive Officer(VEO), Village Chairperson; representatives of different village committees (environment, natural resources, community welfare, water, security and HIV/AIDS) Women group representatives (Farmers, entrepreneurs) , representatives of different

[57] Sign-in sheet ……..

age groups (youth and elderly), Natural Resource Users (traditional herbalist, hunters, farmers ,livestock keepers) religious leaders.

OPENING REMARKS

The meeting came to order at 15:00 pm with welcome remarks by the Ihumwa Village Executive Officer (VEO) Mr. Lister Sakalani followed by self-introduction by attendees. The Ihumwa Ward Councillor Hon. Willium J. Njilimuyi who was chairperson for the meeting made opening remarks stating the objective of the meeting emphasizing the fact that the leaders are representatives of the rest of the community and responsible for dissemination of issues that will be presented and agreed.

JSB Consultants Team Leader Dr. Benno proceeded to present a brief introduction about the Project Proponent RAHCO, and JICA, plans for the flood protection on the central railway line within Kilosa - Dodoma sections (Flood prone areas). He went on describing the effects of floods on the Central Railway Line plus the control/protection measures which will be undertaken, the need for ESIA and purpose of the scoping phase including requirement to meet with stakeholders. For the meeting with Ihumwa Ward leaders he presented the agenda of the meeting as follows:

MEETING AGENDA

1. Opening remarks
2. Subject description
3. Condition and land uses at the project site
4. Stakeholders expectations (project benefits)
5. Negative impacts, risks and challenges
6. Stakeholders roles and responsibilities
7. Grievance redress mechanism
8. Conclusion & closing remarks
9. Next steps.

I. SUBJECT DESCRIPTION

RAHCO representative Ms. Judith Nzamba presented a description of flood protection on the central railway line detailing on the different alternatives to be used (relocation, river banks training and track elevation), scope, and operations activities and management aspects. She concluded by presenting the way forward for the ESIA process and project authorization.

Issues raised and discussed at the meeting

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
Condition and land uses at the project site		
Land at Ihumwa village where the railway passes through has different uses.	Land is used for: Agriculture (i.e. cropland), grazing areas, play grounds and building housing structures. Other uses include: forest (collection of medicinal plants, firewood and building wood etc), burial sites and pathways.	
Stakeholders expectations (project benefits)		
Job opportunities for construction and train operation. It should be prioritized to the local villagers.	Community members expect employment opportunities for unskilled and semi-skilled labour during railway development/ rehabilitation works (i.e. site clearance, construction of gabions, security guards, digging ditches etc.)	Job opportunities for construction and train operation. It should be prioritized to the local villagers.
Road cross	Roads to cross the railway (with livestock) to be built.	Underpass is to be planned in this study for the section of railway embankment.
Increase in per capita income of individuals	The locals are expecting that during the project implementation; people's income will generally increase (due to income generated from salaries, wages and market for their local produce). This will consequently improve the living standards local people.	

ISSUE / COMMENT RAISED	DETAILS	RESPONSE FROM PROJECT REPRESENTATIVE
Negative impacts, risks and challenges		
Increase in accident events	Locals expected flood free railway line will encourage an increase number of train trips and its consequential increase on the number of accidents to those who use railway as side walk/ ride their motorbike/bicycle by the railway side. Also accidents might occur during construction and may result into loss of some body parts i.e. leg, arm etc.	
Increase in HIV transmission from / to new comers and local community and consequent increase in AIDS sufferers in project area.	Interactions between project personnel and service providers who have better income than locals have a potential to increase HIV transmission rate and spread of other STDs.	To be addressed in the mitigation plan.
Air pollution due railway line development activities	Air pollution as a result of moving vehicles and other earth moving machinery during the construction / rehabilitation phase will affect the community at vicinity.	To be addressed in the mitigation plan.

J. STAKEHOLDERS INVOLVEMENT IN PROJECT IMPLEMENTATION

Stakeholder's roles and responsibilities

- HIV / AIDS committee: Through the committee, community will be educated on ways of preventing HIV transmission.
- Local government authorities: The authorities will be involved in identification of individuals among the local community who are capable of working (as semi-skilled or unskilled labourers) during railway development, construction and rehabilitation works.

Grievance Redress Mechanism

Normal government reporting procedure was proposed to be used as follows: Community level to ward level, then Municipal level and reporting directly to concerned offices i.e. Land office.

K. CONCLUSION AND CLOSING REMARKS

The Ward Councillor closed the meeting by thanking JSB EnviDep for organizing the meeting reiterating that the leaders are representatives of the rest of the community and responsible for dissemination of issues that were presented and agreed upon. Further collaboration to the consultants should be given so as to continue with their study in the area.

APPENDIX 5: RESULTS OF TIME-CONSTRAINED SEARCHES FOR AMPHIBIANS AND REPTILES BETWEEN KILOSA AND GULWE (SECTIONS 1 – 9)

Common Name	Species Name	Class	Total	Re-routing	Individuals/ Man hour	Method
Southern foam nest frog	*Chiromantis xerampelina*	Amphibia	1	Access road near section 8	0.67	Day search
Anchieta's ridged frog	*Ptychadena anchietae*	Amphibia	3	Access road near section 8	2.00	Day search
East African puddle frog	*Phrynobatrachus acridoides*	Amphibia	32	Section 1	21.33	Night search
Mitchell's reed frog	*Hyperolius mitcheli*	Amphibia	22	Section 1	14.67	Night search
Tinker reed frog	*Hyperolius tuberilinguis*	Amphibia	24	Section 1	16.00	Night search
Yellow-spotted tree frog	*Leptopelis flavomaculatus*	Amphibia	18	Section 1	12.00	Night search
Marble snout-burrower	*Hemisus marmoratus*	Amphibia	1	Section 1	0.67	Night search
Guttural toad	*Amietophrynus gutturalis*	Amphibia	6	Section 1	4.00	Night search and day search
East African puddle frog	*Phrynobatrachus acridoides*	Amphibia	5	Section 3	1.67	Day search
Common Squeaker	*Arthroleptis stenodactylus*	Amphibia	1	Section 9	0.17	Day search
Guttural toad	*Amietophryanus gutturalis*	Amphibia	36	Section 9	6.00	Day search
Flat-backed toad	*Amietophrynus maculatus*	Amphibia	32	Section 9	16.00	Night search
Southern foam nest frog	*Chiromantis xerampelina*	Amphibia	8	Section 9	4.00	Night search
Schilluk grass frog	*Ptychadena shillukorum*	Amphibia	31	Section 9	15.50	Night search
Anchieta's ridged frog	*Ptychadena anchietae*	Amphibia	28	Section 9	14.00	Night search
Rainbow skink	*Trachylepis margaritifer*	Reptilia	16	Access road near kidete	5.33	Day search
Tropical House Gecko	*Hemidactylus mabouia*	Reptilia	4	Access road near kidete	1.33	Day search
Red-headed rock Agama	*Agama agama*	Reptilia	18	Access road near kidete	6.00	Day search
Cape Dwarf Gecko	*Lygodactylus capensis*	Reptilia	1	Access road near kidete	0.33	Day search
Variable skink	*Trachylepis varia*	Reptilia	2	Access road near kidete	0.67	Day search

Common Name	Species Name	Class	Total	Re-routing	Individuals/ Man hour	Method
Southern long-tailed lizards	*Latastia longicaudata*	Reptilia	3	Access road near kidete	1.00	Day search
Spotted bush snake	*Philothamnus semivariegatus*	Reptilia	1	Access road near kidete	0.33	Day search
Red-headed rock Agama	*Agama agama*	Reptilia	3	Access road near section 8	2.00	Day search
Southern long-tailed lizards	*Latastia longicaudata*	Reptilia	2	Access road near section 8	1.33	Day search
Variable skink	*Trachylepis varia*	Reptilia	5	Section 1	1.45	Day search
Red-headed rock Agama	*Agama agama*	Reptilia	1	Section 1	0.29	Day search
Cape Dwarf Gecko	*Lygodactylus capensis*	Reptilia	3	Section 1	0.87	Day search
Tropical House Gecko	*Hemidactylus mabouia*	Reptilia	6	Section 1	1.74	Day search
Tree Gecko	*Hemidactylus platycephalus*	Reptilia	3	Section 1	0.87	Day search
White-throated savanna monitor	*Varanus albigularis*	Reptilia	1	Section 1	0.29	Day search
Speckle-lipped Skink	*Trachylepis maculilabris*	Reptilia	1	Section 1	0.29	Day search
Yellow-Headed Dwarf Gecko	*Lygodactylus luteopicturatus*	Reptilia	6	Section 2	1.20	Day search
Variable skink	*Trachylepis varia*	Reptilia	3	Section 2	0.60	Day search
Nile Monitor	*Varanus niloticus*	Reptilia	1	Section 2	0.20	Day search
Tropical House Gecko	*Hemidactylus mabouia*	Reptilia	7	Section 2	1.40	Day search
Red-headed rock Agama	*Agama agama*	Reptilia	11	Section 2	2.20	Day search
Speke's sand lizard	*Heliobolus spekii*	Reptilia	1	Section 2	0.20	Day search
Striped skink	*Trachylepis striata*	Reptilia	1	Section 2	0.20	Day search
Cape Dwarf Gecko	*Lygodactylus capensis*	Reptilia	2	Section 2	0.40	Day search
Wahlberg's snake eyed skink	*Panaspis wahlbergii*	Reptilia	1	Section 2	0.20	Day search
Red-headed rock Agama	*Agama agama*	Reptilia	6	Section 3	2.00	Day search
Rainbow skink	*Trachylepis margaritifer*	Reptilia	9	Section 3	3.00	Day search
Striped skink	*Trachylepis striata*	Reptilia	3	Section 3	1.00	Day search
Southern long-tailed lizards	*Latastia longicaudata*	Reptilia	6	Section 3	2.00	Day search
White-throated savanna monitor	*Varanus albigularis*	Reptilia	1	Section 5	0.29	Day search

Common Name	Species Name	Class	Total	Re-routing	Individuals/ Man hour	Method
Brown House snake	*Boaedon Fuliginosus*	Reptilia	1	Section 5	0.29	Day search
Red-headed rock Agama	*Agama agama*	Reptilia	9	Section 5	2.57	Day search
Yellow-Throated plated lizards	*Gerrhosaurus flavigularis*	Reptilia	1	Section 5		Opportunistic
Yellow-headed Dwarf Gecko	*Lygodactylus luteopicturatus*	Reptilia	2	Section 5	0.57	Day search
Tropical House Gecko	*Hemidactylus mabouia*	Reptilia	8	Section 7	2.67	Day search
Tree Gecko	*Hemidactylus platycephalus*	Reptilia	5	Section 7	1.67	Day search
Southern long-tailed lizards	*Latastia longicaudata*	Reptilia	5	Section 7	1.67	Day search
Turner's thick-toed Gecko	*Pachydactylus turneri*	Reptilia	3	Section 7	1.00	Day search
Blue-headed tree Agama	*Acanthocercus atricolis*	Reptilia	1	Section 8	0.40	Day search
Southern long-tailed lizards	*Latastia longicaudata*	Reptilia	4	Section 8	1.60	Day search
Tropical Spiny Agama	*Agama armata*	Reptilia	4	Section 8	1.60	Day search
Red-headed rock Agama	*Agama agama*	Reptilia	3	Section 8	1.20	Day search
Cape Dwarf Gecko	*Lygodactylus capensis*	Reptilia	3	Section 9	0.50	Day search
Yellow-headed Dwarf Gecko	*Lygodactylus luteopicturatus*	Reptilia	1	Section 9	0.17	Day search
Red-headed rock Agama	*Agama agama*	Reptilia	22	Section 9	3.67	Day search
Rainbow skink	*Trachylepis margaritifer*	Reptilia	7	Section 9	1.17	Day search
Tropical House Gecko	*Hemidactylus mabouia*	Reptilia	9	Section 9	1.50	Day search
Tree Gecko	*Hemidactylus platycephalus*	Reptilia	3	Section 9	0.50	Day search
Southern-long tailed lizards	*Latastia longicaudata*	Reptilia	8	Section 9	1.33	Day search
Tropical Spiny Agama	*Agama armata*	Reptilia	3	Section 9	0.50	Day search
Southern-long tailed lizards	*Latastia longicaudata*	Reptilia	6	Section 9	1.00	Day search
Nile Monitor	*Varanus niloticus*	Reptilia	1	Section 9	0.50	Night search
Cape wolf snake	*Lycophidion capense*	Reptilia	1	Section 9	0.50	Night search
Puff adder	*Bitis arietans*	Reptilia	1	Section 9		Opportunistic

APPENDIX 6: DENSITIES (PER SQUARE KILOMETRE) OF DIFFERENT BIRD SPECIES OBSERVED IN THE PROJECT AREA. X = SPECIES OBSERVED OPPORTUNISTICALLY. 1 - 9 INDICATE RE-ROUTING SURVEY SECTIONS

		Rerouting survey sections							Access road
		1	2	3	5	7	8	9	
African Openbill	*Anastomus lamelligerus*					x		x	
Cattle Egret	*Bubulcus ibis*							x	
Harmerkop	*Scopus umbretta*								x
Hadada Ibis	*Bostrichia hagedash*					11.58			
Palmnut Vulture	*Gypohierax angolensis*	x							
African Goshawk	*Accipiter tachiro*				12.74				
Augur Buzzard	*Buteo augur*			x					
Black-chested Snake Eagle	*Circaetus pectoralis*							x	
Brown Snake Eagle	*Circaetus cinereus*			x					
Lizard Buzzard	*Kaupifalco monogrammicus*				12.74				
Long Crested Eagle	*Lophaetus occipitalis*							x	
Grey Kestrel	*Falco ardosiaceus*			x				x	
Coqui Francolin	*Peliperdix coqui*					23.16			
Helmeted Guineafowl	*Numida meleagris*								x
Red-necked Spurfowl	*Pternistes afer*					46.32	63.69	x	
Small Button-Quail	*Turnix sylvatica*	13.41				11.58		4.25	
Water Think-knee	*Burhinus vermiculatus*								x
Three Banded Plover	*Charadrius tricollaris*	x							
African Mourning Dove	*Streptopelia decipiens*			25.48					
Emerald Spotted Wood Dove	*Turtur chalcospilos*	53.64	38.22	84.93	127.4	46.32	21.23	21.23	x
African Green Pigeon	*Treron calvus*	13.41	31.85						
Laughing Dove	*Streptopelia senegalensis*			25.48	50.96	370.58	467.09	123.14	x
Namaqua Dove	*Oena capensis*					11.58			x

		Rerouting survey sections							Access road
		1	2	3	5	7	8	9	
Red-eyed Dove	*Streptopelia semitorquata*	87.16	44.59	67.94	12.74	11.58	138	25.48	x
Ring-necked Dove	*Streptopelia capicola*				38.22	23.16		8.49	
Tamborine Dove	*Turtur tympanistria*		6.37						
Brown Parrot	*Poicephalus meyeri*		25.48				10.62	16.49	
Fisher's Lovebird	*Agapornis fischeri*					57.9	21.23	38.22	x
Diderick Cuckoo	*Chrysococcyx caprius*						x		x
Klaas Cuckoo	*Chrysococcyx klaas*							12.74	
Red-chested Cuckoo	*Cuculus solitarius*						31.85	25.48	x
White-browed Coucal	*Centropus superciliosus*	40.23			38.22	11.58	10.62	8.49	
Little Swift	*Apus affinis*						x		
Blue-naped Mousebird	*Urocolius macrourus*	26.82			344	220.03	10.62	118.9	x
Speckled Mousebird	*Colius striatus*	x	31.85		38.22		138	38.22	x
Brown-hooded Kingfisher	*Halcyon albiventris*	x			12.74		10.62	8.49	
Grey-headed Kingfisher	*Halcyon leucocephala*	x						x	
Little Bee-eater	*Merops pusillus*	26.82	57.32	118.9	76.43	173.71	84.93	29.72	x
Rufous-crowned Roller	*Coracias naevius*					11.58	10.62		
Lilac-breasted Roller	*Coracias caudatus*			8.49		23.16		38.22	
Abyssinian Scimitarbill	*Rhinopomastus minor*			16.99					
African Hoopoe	*Upupa africana*							x	
Green Wood Hoopoe	*Phoeniculus purpureus*				38.22				
Crowned Hornbill	*Tockus alboterminatus*	x		8.49					
Tanzania Red-billed Hornbill	*Tockus ruahae*			x		11.58		101.91	
Trumpeter Hornbill	*Bycanistes bucinator*			8.49					
Von der Deckens Hornbill	*Tockus deckeni*							8.49	
Black-coloured Barbet	*Lybius torquatus*								x

		Rerouting survey sections							Access road
		1	2	3	5	7	8	9	
Brown-breasted Barbet	*Lybius melanopterus*			8.49					
Red-fronted Tinkerbird	*Pogoniulus pusillus*			16.99	38.22			4.25	x
Spot-flanked Barbet	*Tricholaema lacrymosa*			33.97	63.69	34.74	21.23	38.22	x
Greater Honeyguide	*Indicator indicator*								x
Cardinal Woodpecker	*Dendropicos fuscescens*	20.11						8.49	
Fisher's Sparrowlark	*Eremopterix leucopareia*					69.48	31.85	38.22	
Flappet Lark	*Mirafra rufocinnamomea*						21.23	16.99	
Barn Swallow	*Hirundo rustica*			16.99			31.85		
Lesser-stripped Swallow	*Hirundo abyssinica*	20.11	101.91	67.94	63.69	138.97	21.23		x
Mosque Swallow	*Hirundo senegalensis*					x	x		
African Pied Wagtail	*Motacilla aguimp*			3397				4.25	
Dark-capped Bulbul	*Pycnonotus tricolor*	160.9	127.39	271.76	203.8	81.07	169.85	110.4	x
Grey-olive Greenbul	*Phyllastrephus cerviniventris*	x							
Terrestrial Brownbul	*Phyllastrephus terrestris*						42.46	12.74	
Yellow-bellied Greenbul	*Chlorocichla flaviventris*	13.41		25.48	114.7				
Zanzibar Sombre Greenbul	*Andropadus importunus*	67.05	19.11				31.85		
Eastern Nicator	*Nicator gularis*	13.41	6.37						
Kurrichane Thrush	*Turdus libonyanus*		6.37			11.58			
Red-capped Robin Chat	*Cossypha natalensis*	13.41	x						
Spotted Morning Thrush	*Cichladusa guttata*							25.48	x
Thrush Nightngale	*Luscinia luscinia*	x							
White-browed Robin Chat	*Cossypha heuglini*	80.46	19.11			34.74	42.46		
White-browed Scrub Robin	*Cercotrichas leucophrys*		31.35	67.94	63.69	11.58	42.46	16.99	x
Grey-backed Camaroptera	*Camaroptera brevicaudata*	40.23	19.11	50.96	89.17	34.74	74.31	38.22	x
Moustached Grass Wabler	*Melocichla mentalis*	26.82							

		Rerouting survey sections							Access road
		1	2	3	5	7	8	9	
Rattling Cisticola	*Cisticola chiniana*	26.82	101.91	101.91	114.7	92.65	63.69	110.4	x
Tawny-flanked Prinia	*Prinia subflava*	80.46	57.32				31.85	4.25	x
Yellow-breasted Apalis	*Apalis flavida*							25.48	
African Grey Flycatcher	*Bradornis microrhynchus*	20.11		8.49	38.22	34.74	10.62	4.25	x
Chinspot Batis	*Batis molitor*				12.74	11.58		4.25	x
African Yellow White-eye	*Zosterops senegalensis*				458.6			8.49	x
Arrow Marked Babbler	*Turdoides jardineii*	40.23	70.06						
Beautiful Sunbird	*Cynnyris pulchella*		12.74			34.74	10.62	33.97	x
Collared Sunbird	*Hedydipna collaris*	46.93	6.37		50.96				
Eastern Violate-backed Sunbird	*Anthreptes orientalis*		12.74	16.99	25.84		21.23	42.46	x
Malachite Sunbird	*Nectarinia famosa*		6.37						
Scarlet-chested sunbird	*Chalcomitra senegalensis*	6.7	19.11			x			
Black-backed Puffback	*Dryoscopus cubla*	33.52	12.74	16.99	38.22	81.07	10.62	16.99	x
Black-crowned Tchagra	*Tchagra senegala*	13.41		x				x	
Brown-crowned Tchagra	*Tchagra australis*	13.41	6.37	16.99	63.69	23.16	31.45	21.23	x
Brubru	*Nilaus afer*					11.58	21.23		x
Grey-headed Bushshrike	*Malaconotus blanchoti*	6.7	6.37						
Orange-breasted Bush-Shrike	*Telophorus sulfureopectus*	20.11							x
Slate Coloured Boubou	*Laniarius funebris*				140.1	92.65	63.69	38.22	x
Tropical Boubou	*Laniarius aethiopicus*	93.87	76.43	25.48	25.48	23.16	x		x
Nothern-white Crowned Helmer Shrike	*Eurocephalus rueppelli*						10.62	16.99	
Fork-tailed Drongo	*Dicrurus adsimilis*					23.16	31.85	4.25	x
Pied Crow	*Corvus albus*					23.16			
Black-headed Oriole	*Oriolus larvatus*	x							
Red-billed Oxypecker	*Buphagus erythrorhynchus*							12.74	

		Rerouting survey sections							Access road
		1	2	3	5	7	8	9	
Ashy Starling	*Cosmopsarus unicolor*					231.62			x
Superb Starling	*Lamprotornis superbus*					57.9			
Variable Sunbird	*Cinnyris venustus*		25.48	25.48		57.9	31.85		x
Violet-backed Starling	*Cinnyricinclus leucogaster*		x						
House Sparrow	*Passer domesticus*							x	
Swahili Sparrow	*Passer suahelicus*			8.49	76.43	208.45	10.62	50.96	x
Golden-backed Weaver	*Ploceus jacksoni*	13.41							
Grossbeak Weaver	*Amblyospiza albifrons*		6.37						
Red-billed Quelea	*Quelea quelea*							246.28	
Spectacled Weaver	*Ploceus ocularis*		19.11						
Village Weaver	*Ploceus cuculatus*	13.41	108.28	161.36	280.3	92.65	21.23		x
Vitelline Masked Weaver	*Ploceus velatus*	13.41	x				x		x
White-winged Widowbird	*Euplectes albonotatus*	x							
Yellow Bishop	*Euplectes capensis*	6.7							
White-bellied Canary	*Serinus dorsostriatus*	6.7					191.08	42.46	
Yellow-rumped Seedeater	*Serinus reichenowi*				50.96				x
Pin-tailed Whydah	*Vidua macroura*			8.49					
Purple Glenardier	*Granatina ianthinogaster*								x
Red-billed Firefinch	*Lagonosticta senegala*	53.64	19.11	84.93			74.31	8.49	x
Village Indigobird	*Vidua chalybeata*								
Bronze Mannikin	*Spermestes cucullatus*	167.6	95.54					42.46	
Common Waxbill	*Estrilda estrild*		25.48						
Eastern Paradise Whydah	*Vidua paradisaea*							x	
Blue-cheecked Cordonbleu	*Uraeginthus cyanocephalus*		12.74		92.65	69.48			x
Green-winged Pytilia	*Pytilia melba*		12.74		25.48	23.16	10.62	16.99	

		Rerouting survey sections							Access road
		1	2	3	5	7	8	9	
Peter's Twinspot	*Hypergos niveogutatus*	46.93							
Zebra Waxbill	*Amandava subflava*			237.79					
Cinnamon-breasted Rock Bunting	*Emberiza tahapisi*			8.49				x	

APPENDIX 7: EXECUTIVE SUMMARY OF CRP

INTRODUCTION

This report describes a Preliminary Resettlement Action Plan (PRAP), i.e**.** resettlement action and livelihood restoration proposals for persons who will be affected by the Flood Protection Measures on the Central Railway Line, Between Kilosa and Gulwe Section. That is, the main objective of this PRAP is to provide ground work (e.g. identification of potentially affected people, cost estimation, etc.) for the RAP during Detailed Design to be decided thereafter. Specifically, it (this PRAP) is a preliminary identification of people who could potentially be affected by the proposed project. The actual individuals shall be identified after the project corridor has been affirmed, and a decision to implement the project has been made.

To accomplish preparation of the PRAP, a census survey of the potentially project affected persons and inventory and valuation of their assets were carried out by JSB, in accordance with Tanzania national laws and regulations, JICA Regulations/World Bank Operation Policy 4.12, regarding acquisition of land and other assets, compensation and restoration of livelihoods of displaced people. Equally, key stakeholders, namely, potential Project Affected Persons (PAPs) (families, households and local institutions); relevant government authorities at regional, district and village levels, and representatives from RAHCO (the project proponent) and a representative of JICA Study Team were involved in preparation of this PRAP.

SCOPE AND OBJECTIVES OF RAP

The Proposed Project for Flood Protection Measures on the Central Railway Line, Between Kilosa and Gulwe will involve various upgrading, (flood protection) activities at different sections on the central railway line between Kilosa town in Morogoro Region and Gulwe in Mpwapwa, Dodoma Region. The affected area lies between the 294 km point of the existing railway line at Munisagara village in Kilosa and the 372 km point at Gulwe in Mpwapwa District.

Consequently, the main objective of this Preliminary Resettlement Action Plan (PRAP) is to provide a ground work for the RAP during Detailed Design which would entail agreed plan for the resettlement, compensation and livelihood restoration for Project Affected Persons (PAPs) affected by the proposed Flood Protection Measures on the Central Railway Line, Between Kilosa and Gulwe Project. The final RAP will provide a road map for the manner in which displacement; resettlement and compensation issues would be resolved.

On behalf of GoT /JICA therefore, JSB was commissioned to prepare this PRAP so as to assist the project developers understand the conditions of PAPs and value of their assets. This information would enable project developers GoT/JICA to make key decisions regarding the next stages of project.

INSTITUTIONAL AND LEGAL FRAMEWORK

The PRAP has reviewed the legal and institutional arrangement that will have bearing on the proposed project. Of interest to this project are provisions on land acquisition, valuation of assets, compensation, resettlement procedures and conflict/grievance resolution mechanism. These include: The Land Act No 4 of 1999, The Village Land Act No 5 of 1999 and Land Acquisition Act No. 47 of 1967; Land Disputes Courts Act. No. 2 of 2002, which were complemented by JICA resettlement Guidelines. Specifically, provisions of Tanzanian law were predominantly applied except in few areas where they conflicted with JICA Guidelines. In cases of conflicting provisions, e.g. cash compensation (Tanzanian) land for land compensation (JICA), consideration of depreciation (Tanzanian) vs. un-depreciated valuation (JICA) in valuation of structures, compensation for development on encroached land (JICA) vs. non compensation (Tanzanian), the JICA Guidelines prevailed.

OVERVIEW OF THE PROJECT AFFECTED AREA

Economic activities in the area: Farming is the main economic activity in the study area followed by livestock keeping. Other economic activities include bee keeping and fruit gathering (especially baobab fruits in Mpwapwa). Incidences of food insecurity were reported especially in Mpwapwa due to drought conditions compared to Kilosa where rains are bimodal probably/partly due to hilly geography. Kilosa's hilly geography however, makes road transport in the villages of Muzaganza and Munisagara difficult.

Resource acquisition and tenure systems are a blend of formal (traditional) and formal (statutory) acquisition mechanisms. Informal mechanisms of land acquisition include: (i) inheritance, (ii) buying and selling of land, and (iii) grabbing idly lying land. The dominant land tenure system in the study area is customary rights of occupancy (whereby the village is entitled to manage village land) on behalf of village members. In this case, households occupy small plots ranging from averagely two acres to medium size farms raging from eight (8) to fifteen (15) acres. Moreover, cultural resources especially graves are owned either by individual households or members of a clan.

Forests in all the villages are commonly used according to regulations set be local government authorities (village and district councils). According to these regulations harvesting fresh trees for timber (for commercial or subsistence purposes) one has to get a permit from the district council and submit it to the village council for consideration. Moreover commonly owned uncultivated lands are used as pasturelands.

***Education, health and communication Facilities*:** Schools are available. Every village community has at least one primary school and every ward has at least one secondary school. Enrollment of pupils into class one in regions where the study area is located is 77.3% in Morogoro Region and 70.8% in Dodoma Region. Health facilities are also available at least in every ward, though people were complaining that these dispensaries did not have reliable services. Kilosa communities being in the valley of River Mkondoa, have access to only one mobile communication network AIRTEL while areas in Dodoma have access to VODACOM, TIGO, AIRTEL, TTCL and Halotel.

Characteristics of PAPs: The population in the study area is as follows: Kilosa (438,175), Mpwapwa (305,056), Kidete Ward (11,329) and Gulwe ward (103,685). And, the household size is as follows Kilosa (4.2); Mpwapwa (4.6), Kidete Ward (4.0) and Gulwe ward 4.5).

Ethnicity: on one hand, in Kilosa, there is a multiplicity of ethnic groups, namely: the Hehe, the Ha, the Sagara, the Kaguru, the Gogo, the Sukuma/Nyamwezi and the pastoralist Maasai and Mang'ati, the majority being the Sagara and the Kaguru. On the other hand, Mpwapwa is dominated by the one ethnic group: the Gogo and some minority ethnic groups such as the Hehe, the Nyamwezi, etc. Generally, there is a sense of harmony among various ethnic groups in the study area.

VALUATION AND COMPENSATION POLICIES

Principles of valuation: The valuation of assets was done according to the Tanzanian laws, including allowances, with the exception of valuation of structures which was done without depreciation. As such, market price method was the dominant one in valuation of assets. Some of the valuation results are presented in tables below.

PAHs, their Respective Properties and Villages

Village	PAHs to lose Land	PAHs to lose Structures
Gulwe	56	31
Godegode	26	2
Kisisi	4	2
Kikundi	37	28
Muzaganza	32	27
Munisigara	35	19
Total	**190**	**109**

Properties (land and structures) to be acquired

Structures		Land (in sq. meters)	
Residential structures	263	Public	719,073
Warehouses:	21	Private	1,427,544
Animal sheds:	27		
Total	**311**		
grave yards	6		
Total	**317**		**2,146,617**

Principles of compensation: JICA guidelines were the main basis for determining compensation. That is, land for land compensation would be preferred, developments on encroached/illegally occupied land were included for compensation, special assistance will be given to PAPs who belong to vulnerable groups and finally

resettlement assistance and livelihood restoration activities would be carried out by the project proponent (RAHCO). The principle of replacement cost will be mainly used and potential total compensation amounts are presented in last section of this summary.

Computation of compensation for assets was as follows: Compensation for land was computed basing on location, size, and use. Land in the project is for agricultural production and pasture. Compensation was computed at 200Tsh. per square meter. Compensation for structures is was computed using the un-depreciated replacement cost method. And, compensation amount would depend on type of structure and purpose/use, details of construction (wall, floor, and roofing materials), and accommodation characteristics (number of rooms). The table below is illustrative:

Table: Unit Cost for Structures

Type	Modern	Mixed modern and ultra modern	Ultra modern	Mixed traditional & modern	Traditional	others
Unit (Tsh. per sq. meter)	180,000.00	150,000.00	130,000.00	120,000.00	60,000.00	50,000.00

Moreover, compensation for crops was based on earnings approach to assess the market value of crops assessment.

Table: Unit Cost for Agricultural Crops

TYPE OF CROP	UNIT	VALUE (TSH)
*Mwembe (***Mango)**	Plant	60,000
*Ndizi (***Bananas)**	Plant	38,000
*Mahindi (***Maize)**	Acre	585,000

Cut-off date: According to Tanzania law, this is the date of completion of the completion of the census survey and inventorying after which no further developments within six (6) months are allowed in the project area. As such, the PRAP has set a preliminary cut-off date (date of completion of census for this PRAP, i.e. 9th December, 2015) to discourage influx of people in anticipation of compensation when the decision will be made to implement the project. The local government leaders especially at village level were asked not to allow any individuals/groups to occupy or use the project area. Real cut-off date will be set the date when the proper census survey and inventorying of the RAP during Detailed Design is completed.

CENSUS AND SOCIOECONOMIC CONDITIONS OF PAPs

Census and Socio-Economic Condition of PAPs: Detailed record of project affected persons (PAPs) and their project affected households (PAHs) were taken using questionnaire. Information collected was individual bio-data information, number of people s/he claims as household dependents, amount of land available to the individual or household at the time of the census, living conditions: standard of house and household services noting those that will be affected, level of income and of production, and access to social and economic services: roads, schools, health facility etc. The census of the PAPs / Project Affected Households (PAHs) and Affected Community was coupled with inventorying of their holdings. The table below summarizes the key results for census survey.

Table: Summary of Socioeconomic Conditions of PAPs

Variable	Output			
PAH and PAPs	No. of PAH	Encroachers	No. PAPs	Community Assets
	201	11	952	11
Household head	Male		Female	
	148 (73.6%)		47 (23.3%)	
HH Demographic characteristics	≥ 6 members		≤ 7 members	
	152 (75.6%)		46 (22.8%)	
HH Head Age Structure	≥ 25 years		26-64 years	≤ 65 years
	16 (8%)		146 (72.6%)	39 (19.4%)
HH marital status	Married	Divorced	widow	unmarried
	132 (65.6%)	19 (9.4%)	5 (2.5%)	21 (10.4%)

HH education Level	Illiterate	Primary	Secondary		Vocational training
	30 (14.9%)	176 (87.5%)	5.4%		4 (2%)
Occupation	farmers	Artisanal workers	Fishermen/women		Extension officers
	184 (91.5%)	2 (0.9%)	2(0.9%)		2(0.9%)
Residence tenure	Permanent (owner)		Tenant		
	177 (88%)		11 (5.4%)		
Location of asset (encroachment)	Within the existing line		Both within and outside the existing line		
	4 (2%)		7 (3.5%)		
Vulnerability	Sick	widow	Elderly	orphan	Women heads
	4	5	39	2	47
Preferred mode of payment	Cash		Land for land		
	108		27		

LIVELIHOOD RESTORATION PROGRAM

There is neither legal requirement nor regulation for restoring livelihoods or providing assistance towards the restoration of such livelihoods in Tanzania, the Livelihood Restoration Program (LRP) for those affected people. As such, PAPs were asked to outline the kind of assistance they would need and the responses were twofold. Some requested for assistance in agricultural production, namely training modern farming methods, access to credit and markets. Others especially youths requested non-agricultural such training in poultry, beekeeping, masonry, tailoring, access to credit for small enterprise etc.

INSTITUTIONAL ARRANGEMENTS FOR RAP IMPLEMENTATION

Institutional arrangement for implementation of RAP remains incomplete in this PRAP. For instance, the RAP team was not formed during this PRAP, though some members are known. It will be subject of deep analysis during detailed RAP study.

GRIEVANCE REDRESS MECHANINSMS

Administrative and or legal procedures would be followed in redressing grievances. Administrative procedure starts at village level to ward, to district and lastly to regional level. Going to the next level is when the previous level fails to address the grievance at hand. If at regional level the grievance is not addressed, then it is lodged for judicial producers.

MONITORING PROGRAM

Monitoring will also have to be done during and after the implementation of the RAP. The intention is to ensure that RAP is properly implemented. Indicators are selected to monitor PAPs' conditions (e.g. housing, food security, access to social services, etc.) of life in comparison to pre-project conditions.

BUDGET AND SCHEDULE

Cost/budget estimates for implementation and monitoring

S/N	Resettlement Activity	cost (Tsh)	Contingency (Tsh)	Activity Cost (Tsh)	Source of fund/ Responsibility	Timeline/ Deadlines
1	Compensation costs for Crops and Trees	**14,415,000**	1,441,500	15,856,500	RAHCO	Feb.,2018
2	Compensation costs for Land	**439,569,200**	43,956,920	483,526,120	RAHCO	Feb.,2018

3	Compensation costs for Housing Structures	**691,569,615**	69,156,962	760,726,577	RAHCO	Feb.,2018
4	Transport allowance	**3,300,000**	330,000	3,630,000	RAHCO	Feb.,2018
5.	Disturbance allowance	**57,277,691**	5,727,769	63,005,460	RAHCO	Feb.,2018
6.	Accommodation allowance	**76,946,000**	7,694,600	84,640,600	RAHCO	Feb.,2018
7.	Resettlement Assistance	100,000,000	10,000,000	110,000,000	RAHCO	Feb.,2018
8.	Livelihood Restoration Programme	1,200,000,000	120,000,000	1,320,000,000	RAHCO	Mar.,2018 – Feb.,2020
9.	Grievance handling	12,000,000	13,200,000	13,200,000	RAHCO	Oct.,2017-
10.	Management & administration	80,000,000	8,000,000	88,000,000	RAHCO	Sep.,2017-
11	Monitoring & evaluation (internal & external)	200,000,000	20,000,000	220,000,000	RAHCO	Feb.,2018-Jan.,2021
TOTAL COST						**3,162,585,257**

Note: contingency is estimated as 10% of the cost.

APPENDIX 8: DISCLUSURE MEETINGS

1. Introduction

JSB-EnviDep Ltd carried out environmental and social impact assessment between June and December 2015. The impact assessment involved the following main steps:

- Literature review
- Initial baseline survey including stakeholder/public consultations
- Scoping Report and Terms of Reference preparation
- Detailed baseline survey
- Preliminary Resettlement and Compensation Planning including PAPs identification.

During EIA study, potential stakeholders including public were consulted. A number of environmental and social management issues were raised by the public, documented and analyzed. The EIS proposed mitigation measures to deal with those issues. The JICA policy related to EIA study requires the Consultant to disclose to the public the results of public consultation through feedback meetings with consulted stakeholders. This report describes the feedback meetings conducted at the five consulted villages namely Munisagara, Muzaganza and Kikundi Villages in Kilosa District and Godegode and Gulwe villages in Mpwapwa District. The meetings were held between 22nd and 24th, February 2016.

2. Approach and Methodology

The summary (extracted from the main EIS) of key results of public consultation was prepared for public disclosure. Courtesy calls were made to the District Executive Directors in Kilosa and Mpwapwa Districts. Briefly meetings were held with staff from Community Development departments in both two districts for the discussion on feedback meetings and proposed livelihood restoration program to the communities that will be relocated. The meetings with village leaders and community representatives (15 – 20 people) were conducted in the targeted villages mentioned above. In the village meetings, a summary of key EIA findings and recommendation were presented and hard copies distributed to each participant. The lists of participant are provided in Annex 1. Additional concerns/issues and comments were received from participants during the meetings and detailed clarification/responses were given. The results of feedback meetings are provided in this report.

3. The Feedback Team

The team participated in the feedback meetings comprised the following members:

S/N	Name	Institution
1	Eng. Leonard Gastory	JSB EnviDep Ltd
2	Mr. Evody Ndumiwe	JSB EnviDep Ltd
3	Kyoko Mishima	JICA Study Team
4	Mr. Michael Mchome	JICA Study Team
5	Eng. Felix Nlalio	RAHCO
6	Mr. Alex	Mpwapwa District Council
7	Mr. Benjamini	Kilosa District Council

4. Results of Feedback Meetings

Village	Issue/Concern/Remark
Munisagara	o There was concern raised by Mr. Athuman Manonga that the service of local shuttle trains (pick-up train - locally known as “punguza”) should be re-established to serve communities located away from the existing main railway stations and who haven’t any other means of reliable transport. This concern was replied by Eng. Felix from RAHCO that the plans will be put in place to resume the services of the shuttle train during operation phase; o Generally, the results of public consultation were very well accepted and approved for public disclosure and use in the final EIS.
Muzaganza	o Participants acknowledged that all keys issues/concerns that were raised by community members during consultation have been well captured and addressed;

Village	Issue/Concern/Remark
	o The results of public consultation were highly accepted and approved for public disclosure and use in the final EIS.
Kikundi	o Ms. Janeth Sendeha had concern that heavy truck and equipment that will be used during construction phase will cause environmental degradation particularly to the existing flora and fauna. It was responded that appropriate mitigation measures have been put in place to mitigate all environmental impacts including degradation of existing flora and fauna in the project area; o There was a concern raised by Mr. Madanganyo Magawa that the currently work on rehabilitation of railway line conducted by RAHCO causes environmental degradation, so who will be responsible for compensation of the current existing environmental degradation? It was clarified that the ongoing activities are not part of the current JICA intervention and the ongoing EIA study. Under the proposed rehabilitation project appropriate measures to control environmental degradation have been proposed in the EIS to mitigate all potential impacts. o Yusuf Msigala requested JICA to provide financial assistance for construction of new school and dispensary at Kikundi Village. Ms. Kyoko replied that the JICA policy clearly state that compensation shall be made only to all properties which will be affected by the project. Therefore if existing school and dispensary will be affected they shall be compensated. She also clarified that JICA recognize water as one of important basic needs. Therefore people who will be relocated into the new settlement to be prepared by JICA shall be provided with clean and safe water infrastructures. o Mr. Soud Ligonja insisted that all water sources should be protected and therefore all construction activities should not be done within 60m buffer zone of all water sources. It was clarified that appropriate mitigation measures have been put in place to protect water sources during all phases of project implementation. o Generally, the presented results of public consultation were very well accepted and approved for public disclosure and use in the final EIS; o At Kikundi Village, significant number of households will be relocated into the new area. The proposed new possible areas for relocation were visited at the end of the meeting;
Godegode	o The presented results of public consultation were very well accepted and approved for public disclosure and use in the final EIS; o Mr. Waziri Ramadhani requested the access roads to be used during rehabilitation works be left for public use. It was replied that all access roads will be left for public use after completion of construction phase; o Mr. Cyprian Charles insisted on the protection of water sources and wanted to know which laws will be used for protection of water sources. It was responded that measures have been put in place to protect water sources and all policy and laws/regulation relevant for water protection have been identified, reviewed and incorporated in the EIS; o Mr. Charles Ngalali noted that there is water scarcity in Godegode village, thus requested the Contractor to be engaged to build water well as compensation for taking construction materials within the village area. It was advised that village government should discuss and see the possibility of this matter with the Contractor prior to commencement of construction works; o Mr. Steven Mmary wanted to know if there is possibility for Contractor to be

Village	Issue/Concern/Remark
	engaged to facilitate improvement of existing dispensary since it might also offer medical care to the construction crews during construction phase. It was advised that village government should discuss with the Contractor to be engaged during early stages of project implementation. Moreover, the Contractor will implement measures proposed in the EIS to ensure health and safety of its staff and surrounding community
Gulwe	o Generally, the presented results of public consultation were very well accepted and approved for public disclosure and use in the final EIS; o Mr. Peter Sogodi asked if there will be provision of access path across the railway line for livestock since there is significant number of pastoralists. It was replied that the technical design team will consider this concern by putting in place the culverts to be used as access way for livestock; o Mr. Peter Sogoti also asked if there will be any physical properties left for village use after project construction phase. It was replied that Consultant camp site might be left for village use at the end of construction phase, but this will be discussed and agreed at the end of project implementation. Also livelihood restoration shall be provided only to the affect people; o Hon. Gabriel M. Kazile had concern that the upstream area of Mzase River is misbehaving, currently it is taking a new course which might affect even the new railway, he asked if the upstream sections were included in the technical study. It was responded that the Hydrological survey has covered large area including Mzase River and its proximities. Appropriate measures will be put in place to control Mzase River. o Hon. Gabriel M. Kazile also asked if valuation and compensation will consider village land and properties. It was replied that initial assessment has considered village land and properties and they shall be compensated for if affected by the project activities; o Hon. Gabriel M. Kazile had also concern that there might be conflict between Contractor and village government on issue of payment of village levy for construction materials. It was responded that Contractor shall abide and follow all local government by-laws and regulation including the payment of all relevant levy. Contractor shall also source construction materials at authorized areas in order to avoid conflicts with local communities and environmental degradation. o There was concern from Ms Moteswa Mnyambwa that heavy trucks and equipments will damage the existing local roads during mobilization and construction phases. It was clarified that some of existing local roads will be rehabilitated and used as access road and sections of existing roads that will damaged will be rehabilitated by the Contractor.
Ministry of Water and Irrigation	o The Consultant wanted to know the status of dams at Kidete. o The Assistant Director of (ADWR) Dr .George Lugomela reported that the construction of Kidete dam has been suspended since 2013 and there are no plans for resumption due to some issues such as the source of project finance, an organizational set-up for implementation, etc.
TANROADS	o The Consultant met the Director of Maintenance Eng. Emmanuel Msumba o TANROAD is concern with the current state of transporting cargo using roads which are being constructed at a very high cost, but they don't last. o TANROAD welcomes this initiative and hopes that the rehablitation of this difficult stretch, coupled with the current Government thinking of using railway to traport cargo will protect the trunkroads
PMO-Disaster Management Department	o The Consultant met Mr Edgar Senga of the PMO Disaster Management Department. o The Department acknowledges the recurrence nature of flooding of the area and

Village	Issue/Concern/Remark
	washing away of railway line which always puts the railway persengers at risk o The PMO Disaster Management Department welcome the initiative and encourages to project proponent to look other sections of the railway line which are not covered by this project so that protection measaures can also be put in place

APPENDIX 9 LISTS OF PARTICIPANTS

List of Participant at Munisagara Village

Environmental and Social Impact Assessment for the Preparatory survey on flood protection measures for Central Railway Line – Kilosa to Dodoma Section

Feedback Meeting – Registration Form

Village MUNISAGARA Date 22/02/2016

SN	Name (Jina)	Gender (Jinsia)	Position (Wadhifa)	Contacts (Simu)	Signature (Saini)
1	DONALD Y. MGULAMBWA	M	VEO	0682-060193	Mgambwa
2	ML ALHASSANI	M	M/KITI MUDA	0786095663	M Alassani
3	JOSEPHINA OMARY	K (F)	MJUMBE		JOMARY
4	APORONIA GABRIEL	K (F)	MJUMBE		A. GABRIELI
5	HADIA MAESRUKI	K (F)	MJUMBE		H. MAESRUKI
6	SHELA ADAMU	K (F)	MJUMBE		S. ADAMU
7	YUSUFU ISSA	M	MW/KITONGOJI		FIVABONGA
8	PIUSI JOHN CLEMENCE	ME	MW/KITONGOJI	—	
9	BERNADI ANDREA	M	M/KITONGOJI		
10	MICHAEL F. MICHAEL	M	11		Mfanasi
11	HAMISI MTENGWA	ME	11	0688 490491	
12	ATHUMANI MANGUNGU	ME	11	0712854380	
13	ANTELO SEKENI	ME	MJUMBE	0745 527716	
14	FIKIRI KAGENDA	ME	11	0788611732	FIKIRI ALFANI
15	MICHAEL GEORGE	ME	11	0788611732	
16	SHAURI HASSAN	ME	11	—	
17	DAMIANI JOHN MATHUWA	ME	11	0783643532	
18	PLUKERIA RAPHAEL	K(F)	MJUMBE	—	P. RAPHAELI

List of Participant at Muzaganza Village

Environmental and Social Impact Assessment for the Preparatory survey on flood protection measures for Central Railway Line – Kilosa to Dodoma Section

Feedback Meeting – Registration Form

Village MUZAGANZA Date 22/02/2016

SN	Name (Jina)	Gender (Jinsia)	Position (Wadhifa)	Contacts (Simu)	Signature (Saini)
1	ATHANAS ABDALA	ME	MWIKI	0688661445	ABJ
2.	DOMINICK MFAUME	ME.	VEO	0682339905	
3.	PIUS C. MASHEMA	ME	MWL-MKUU	0784988404	
4.	SELEMANI CHABONGA	ME	M/KITI KITONGOJI	0782170017	
5	SIMON KUSUPA	ME	M/KITI KITONGOJI	0687278229	
6	HAGAI -ALEDI	ME	MJUMBE	0784048189	
7	GERALD FABIAN	ME	MJUMBE	0784035956	
8.	MSAFIRI B. KILHOZA	ME.	K/KATA U.V.CCM.	0785 637370	
9	PATRICK KITARU	ME	M/KITONGOJI	0689925336	
10	WILLIAM MSITAFA	ME	M/KITONGOJI		WILIAM. M
11	CHRISTINA SEPEU	KE	M/H/KIJIJI	0688985469	
12.	MARIONI ADRIANI	KE	M/KITONGOJI	0787469876	M. Adriani
13	AMINA YUSUFU	KE	MJUMBE	0789478891	
14	JUMA GEORGE	ME	MJUMBE	0686319134	
15	EVANZ. D. RISALUNI	ME	MJUMBE	0784903033	
16	SAMSON JAKOB.	ME	MJUMBE	0787300829	

List of Participant at Kikundi Village

Environmental and Social Impact Assessment for the Preparatory survey on flood protection measures for Central Railway Line – Kilosa to Dodoma Section

Feedback Meeting – Registration Form

Village KIKUNDI Date 23/02/2016

SN	Name (Jina)	Gender (Jinsia)	Position (Wadhifa)	Contacts (Simu)	Signature (Saini)
1	MADANGANYO MAGAL	ME	MW/KITI KIJIJI	0782431307	[signature]
2	YUSUFU S. MSIGALA	ME	VEO	0783978107	Y. Msigala
3	ABDALAH LIPINGA	ME	MZEE	0685593480	[signature]
4	ZABLON, SAGALI	ME	Mjumbe H/Kijiji	0788355166	Z Sagali
5	ISAYA EZEKIELI	ME	MW/KITI-KITONGOJI	0683424561	E. MOMBO.
6	ROCKI ABDU	ME	JUMBE	0783001747	[signature]
7	RAMADHANI OMAL	ME	MJUMBE		R. Ngosha
8	JANETI S. SENDEHA	KE	MJUMBE	0788482618	Janeti sole
9	SOUD LIGONJA	ME	K/JUMUIYA MKONDOA	0784738925	Ligonja
10	MSUMI MGUMILA	ME	VEO OFISI YA VEO	0783668514	Mgumila
11	HUSNA JENGA	KE	MJUMBE	0788178707	[signature]
12	RASHIDI S. ATHUMANI	ME	MJUMBE	0688985952	Rashidi

List of Participant at Godegode and Kisisi Villages

Environmental and Social Impact Assessment for the Preparatory survey on flood protection measures for Central Railway Line – Kilosa to Dodoma Section

Feedback Meeting – Registration Form

Village GODEGODE AND KISISI Date 24/02/2016

SN	Name (Jina)	Gender (Jinsia)	Position (Wadhifa)	Contacts (Simu)	Signature (Saini)
1	DEO K. MODEST	ME	WEO – GODEGODE	0713-380888	
2	CHARSE NGAIAI	ME	MKT. GODEGODE	–	
3	HADIJA A MASOMO	KE	AFISA AFYA GODEGODE	0717107031	
4	EVA JOCTHIANI	KE	MJUMBE GODEGODE	0653425368	E. JOCKTIANI
5	SAMWES CHIHONGW	ME	MW/KITI KISISI	0716991965	
6	CYPRIAN CHACESI	ME	MJUMBE GG	0628957867	
7.	ALLY SAID	ME	K/ECM KISISI	0712724328	
8	BERNARD ZAKALIA	ME	MJUMBE S/UJIJI	–	
9.	NOEL MASUKA	ME	MW/KITI-KIKO-GODE	0714333 271	
10.	WAZIRI RAMADHANI	ME	MKAZI-GODEGODE	0717474298	
11.	FELIGUS MNYANGALI	ME	MZEE-GODEGODE	0744696778	
12.	OJICIA WILLIAM	KE	MKAZI GODEGODE	0718554544	
13	EVELINA AHIZULI	KE	MZEE-GODEGODE	0714333471	E. AHIZULI
14	MFUNDO H. GUNAIH	ME	MJUMBE GODEGODE	0652979354	
15	STEVEN Y. MMARY	ME	MKAZI-GODEGODE	0718678062	
16	ISAYA NYAGWESI	ME	VEO KISISI	0717618652	
17	SOFIA MANYEMBA	KE	KISISI	0714486611	Smanyemba
18	FLOLA SADALA	KE	KISISI	–	F. SADALA
19	HILIDA		KISISI		
20	RAJABU CHIMAGANI LUBE	ME	KISISI	0652740790	RTC

List of Participant at Gulwe Village

Environmental and Social Impact Assessment for the Preparatory survey on flood protection measures for Central Railway Line – Kilosa to Dodoma Section

Feedback Meeting – Registration Form

Village GULWE Date 24/02/2016

SN	Name (Jina)	Gender (Jinsia)	Position (Wadhifa)	Contacts (Simu)	Signature (Saini)
01	PETER SOGODI	ME	M/KITI-KIJIJI	0629115122	[signature]
02.	CYPRIAN MWANGOSI	ME	MTENDAJI KIJIJI	0628615854	Cmwangosi
03	GABRIEL M. KAZIGE	ME	M.H. Afya Gulwe	0789348383	Gkazige
04	MOTESWA MNYAMBWA	KE	MTENDAJI KATA	0629293733	[signature]
05	ESTER MGOMBELE	KE	MUUGUZI	0785-278878	[signature]
6	OLIPA TARUMBETA	KE		0629296197	O. tarumbeta
7	MWANAISHA MKAMBA	KE		0682665409	M. mkamba
8	SELAPHINO SOGODI	ME	MJUMBE	0629294486	[signature]
9	SAIMON LUNGWA	ME	MJUMBE	0628619195	[signature]
10	NOEL ROBERT	ME	MW/KITI KANTI-9	0629294039	N. Robert
11	LORANY MUHAWI	ME	MW/KITI ARDHI	0716906202	[signature]
12	KITETI MADOBANGA	ME	MW/KITI/MAJENGO	0628405129	[signature]
13	HELENIA Ndegeulaya	KE	MJUMBE. Kijiji	0762118565	H. Ndegeulay
14	JACKSON SUMISUMI	ME	MW/KITI Chahumbi	0628968081	J. Sumisumi
15	JESCA SIMANGO	KE	KATIBU ARDHI	0714355842	J. Simango
16	CECILIA CHILANGAZI	KE	MWALIMU	0628628216	C. Chilangazi
17.	OLIPA KUDELI	KE	MJUMBE		O. KUDELI
18	HAROUN MNYAUSI	ME	MWKITI PANDAMBILI	0712438532	[signature]

19	CHRISTOPHER MKUYA	ME	MW/KAII/KIKIMANI	0786017080	
20	ENAS! NYONGIA	ME	MW/AKITI KIMELA	- - - - -	Enyongia

Photo Gallery

Meeting with Mpwapwa DED

Meeting with community development staff in Kilosa

Meeting with community development staff in Mpwapwa

Feedback meeting at Munisagara Village

Feedback meeting at Muzaganza Village

Feedback meeting at Kikundi Village

Feedback meeting at Gulwe Village

Feedback meeting at Godegode Village

Visiting proposed area for establishment of new settlements for households to be relocated at Kikundi Village

Visiting section of flooded area Mzase Rive at Gulwe Village