Chapter 3 Strategies for Freight Transport Development

3.1 Overarching Goals and Vision

The *Freight Transport Network of Tanzania Leading the Growth of EAC Countries and Tanzania* called for:

(i) A transport network that stimulates the growth of various parts of Tanzania; and
(ii) A transport network that supports the growth of neighbouring countries as a regional hub.

Vision 2025, launched in 1999, set a goal for Tanzania to become a middle-income country with a per capita income of USD 3,000 by the target year. In order to address some of the negative impacts of Vision 2025 particularly on the country's poor, the National Strategy for Growth and Reduction of Poverty (NSGRP, or MKUKUTA in its Kiswahili acronym) was later issued. In 2009 and 2010, the government reviewed the changes made since such the plans were published. The review pointed out that (i) progress in poverty reduction has been only marginal, particularly in rural areas, and (ii) Tanzania's promising opportunities from its rich natural resources and advantageous geographic location were not adequately exploited due to weak infrastructure, particularly in power and transport, the latter of which should be a comparative advantage considering the country's strategic location as a regional trade gateway and a regional hub.

Figure 3.1 shows the national boundaries of the countries of the East African Community (EAC) and beyond, as well as regional development corridors as defined by the EAC. It demonstrates that Tanzania's coast is indeed the hub of the EAC region since many of development corridors converge on the east coast of Tanzania. The country should fully exploit this geographic advantage with an effort to develop into the regional transport hub. In other words, these international corridors need to be strengthened to make Tanzania's east coast a "window" for the EAC region.

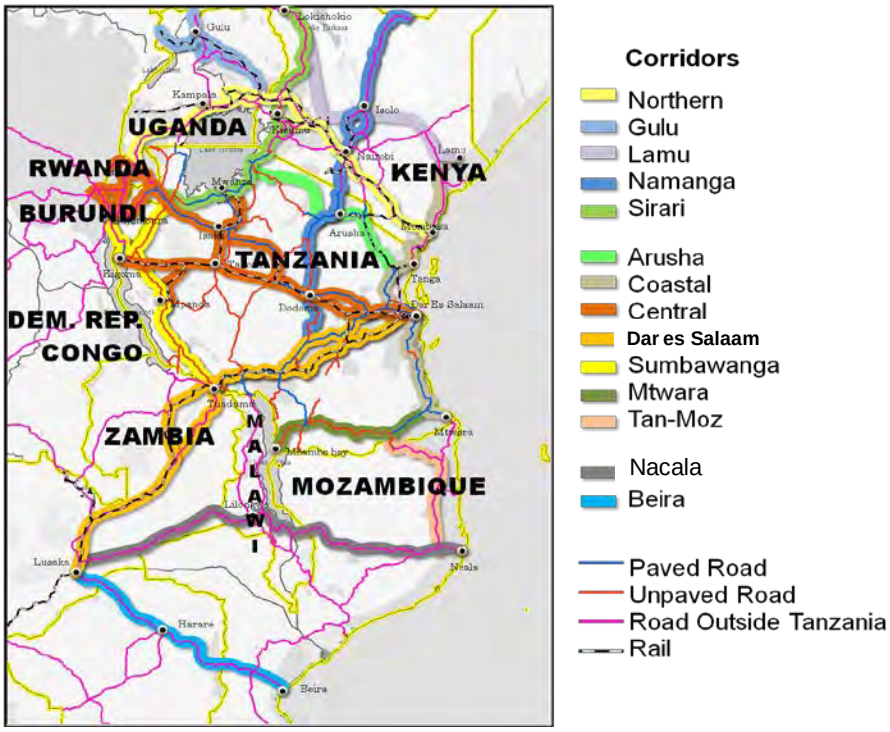


Figure 3.1: Convergence of Most EAC Development Corridors on Tanzania

Figure 3.1 also shows that Tanzania occupies a large area, extending long distances in both east-west and north-south directions. And in the case of Tanzania, the geographical spread is not limited to a territorial sense. Unlike many countries in which the largest city, usually the capital city, accounts for a large proportion of the country's population (so-called primate cities), the population of Dar es Salaam accounts for only 7.4% of the national total. Tanzania is one of a few countries in Africa with its population widely dispersed across its national territory.

However, historically population centres widely spread across Tanzania have not been well connected with each other and to ocean gateways along the coast. Long-distance, international transport lines were developed as a means of hauling extracted or harvested resources straight from the production areas to the ocean gateway for export and areas in between were neglected, resulting in the underutilization of the natural and human resources of these areas. Figure 1.1 showed the transport network at present. Many regional centres are not served by paved roads.

By 2030, all regional centres will be connected by paved road and another major port will be in operation. This will take on the role of the transport hub of the EAC region in combination with Dar es Salaam port, as well as with strengthened international corridors as was shown in Figure 1.2. By then, the freight transport network in Tanzania will be an integrated network that stimulates economies in various parts of Tanzania as well as in neighbouring countries.

To achieve these overarching goals and vision, the following five strategies are put forward in this study and discussed in the subsequent subsections:

(i) Strategy 1: Strengthening of International Corridors;
(ii) Strategy 2: Establishing a Comprehensive Transport Network with a Balanced Modal Mix;
(iii) Strategy 3: Meeting Domestic Transport Demand;
(iv) Strategy 4: Alleviating Bottlenecks in the Dar es Salaam Area; and
(v) Strategy 5: Establishing a Clear Regulatory/Financing Framework.

This combination of strategies represents the result of the Strategic Environmental Assessment (SEA) in accordance with the SEA Regulation 2008, in which it is stipulated that all strategies and (master) plans in Tanzania are subjected to undergo SEA for authorization. SEA, with regard to this subjected master plan, took place from early April, 2013 until mid-February, 2014, in which stakeholder consultations in the related regions, and nation-wide stakeholder meetings at the scoping & SEA-TOR stage and the draft SEA stage were held to select the best combination of strategies out of 4 different strategic combinations of alternatives put forth, along with the zero-option (no master plan alternative), in respect of the assumed environmental, social and economic impacts. After reflecting the comments from the stakeholders, the Final SEA Report was approved by the State Minister responsible for Environment in February, 2014.

The considered mitigation measures to countermeasure the assumed impacts, as summarized in Appendix 22 of the attached SEA Final Report (Appendix 3 of this study report) should be taken into account during each of the project's Environmental Impact Assessment (EIA) stage, as well as in the monitoring plan of each phase throughout the implementation stage of this Master Plan.

3.2 Strategy 1: Strengthening of International Corridors and Connections to the Domestic Transport Network

The aim is to provide faster and cheaper transport along international corridors in comparison with competing corridors outside of Tanzania (e.g., through elimination of non-tariff barriers).

That said, it is important to focus on the corridors that will provide the greatest economic benefits (i.e., the Central and Dar es Salaam Corridors).[1]

Tanzania is intersected by several international corridors that converge on its sea coast. Landlocked and coastal countries have different perspectives on such international corridors, with the difference particularly pronounced when the countries involved have economies that rely on the export of agricultural products and mineral resources. On one hand, landlocked countries seek multiple outlets to ocean routes since having only one route is risky and tends to make trade conditions poor because of the lack of alternatives. They also want to haul their cargo directly to a seaport without stops in between. On the other hand, countries with direct access to the sea sometimes monopolize the outlet to maximize profit and promote the development of areas along the corridor to the sea.

Over the long run, the countries of the EAC will strengthen the regional market through increased internal exchanges facilitated by policy coordination. International corridors in the region should be developed to establish an EAC-wide commodity trade market from individual resource export or import channels to and from landlocked countries. International corridors will be transformed from routes for transiting traffic to routes that are well connected to domestic and intra-EAC transport networks. For that purpose, the improvement of network nodes is important as well as the improvement of mainline linkages.

Although Tanzania has a strategic location in the EAC and is naturally its hub, its international corridors face competition from corridors located on the periphery, as seen in Figure 3.1. An analysis of corridor competition was carried out and is presented in Chapter 1. For example, Table 3.1 summarizes what would take place in terms of the share and the volume of the Central Corridor in transporting transit cargo of the surrounding countries if all the projects included in this Master Plan are implemented.

Table 3.1: Expansion of Central Corridor in Transporting Transit Cargo To/From Landlocked Countries

Share (%)

	Network	Base		Master Plan	
Country	Corridor Import/ Export	Northern Corridor (Kenya)	Central Corridor (Tanzania)	Northern Corridor (Kenya)	Central Corridor (Tanzania)
Uganda	Import	99.3%	0.7%	95.2%	4.8%
	Export	100.0%	0.0%	86.6%	13.4%
Rwanda	Import	42.8%	57.2%	40.8%	59.2%
	Export	81.4%	18.6%	69.4%	30.6%
Burundi	Import	9.9%	90.1%	9.3%	90.7%
	Export	62.5%	37.5%	50.7%	49.3%

[1] Generally, less emphasis should be accorded corridors offering less economic benefits (e.g., the Tanga–Arusha–Musoma Corridor, considering that even under much improved conditions Tanzania can capture only a small part of Ugandan transit traffic; the Mtwara to Bamba Bay Corridor, the planned railway of which can be justified only if major exploitable and marketable minerals are found; the planned 500 km road from Tanga to Singida through the Masai Steppe, including Tanga Port, which should only be considered after 2030).

Volume (thousands of tonnes)

	Network	Base (2010)		Master Plan (2030, Target Growth)	
Country	Corridor Import/ Export	Northern Corridor (Kenya)	Central Corridor (Tanzania)	Northern Corridor (Kenya)	Central Corridor (Tanzania)
Uganda	Import	4,482	33	24,981	1,267
	Export	690	0	2,836	437
Rwanda	Import	195	261	850	1,231
	Export	50	11	168	74
Burundi	Import	36	328	139	1,351
	Export	23	14	78	76

Note: It is expected that an increasing amount of transit cargo to/from Zambia will divert from the Dar es Salaam Corridor to the North-South Corridor, and not pass through Tanzania.
Source: JICA Study Team

It is expected that the Master Plan Network will improve roads, railways, and ports, while significantly reducing non-tariff barriers (e.g., inefficiencies in cargo clearance/ inspections/declarations at the border posts, data tracking/sharing and payment/settlement of charges), which are all reflected in Table 3.1. The effects of improvements in the Tanzanian transport network through implementation of the Master Plan will be greater for export cargo than for import cargo. Nevertheless, a significant shift from the Northern Corridor in Kenya to the Central Corridor in Tanzania would take place if the road and rail transport systems in Tanzania were improved in line with the Master Plan.

Also, potential freight growth along the Central Corridor, as a result of implementing the Master Plan, exceeds that for the Dar es Salaam Corridor (Table 3.2). This, along with the number of countries and the size of the population benefitting from the Central Corridor, implies that there is a potential demand large enough to justify the allocation of fiscal resources for this purpose over the next two decades.

Table 3.2: Estimated Total Freight Volume by Corridor

2010: Estimation

Corridor	Origin - Destination	Domestic		Transit		Total
		to DAR	from DAR	Import	Export	
Dar es Salaam Corridor	DAR - Mbeya, Zambia, DRC, Malawi	1,705	992	1,536	304	4,537
Kigoma Line	DAR - Kigoma, Burundi, DRC	473	276	603	83	1,434
Central Corridor	DAR - Shinyanga, Rwanda	575	1,364	261	11	2,212
	DAR - Mwanza, Uganda	1,427	2,242	33	0	3,702

2030: 'With' Case (8% Growth)

Corridor	Origin - Destination	Domestic		Transit		Total	Growth ftom 2010
		to DAR	from DAR	Import	Export		
Dar es Salaam Corridor	DAR - Mbeya, Zambia, DRC, Malawi	7,667	9,068	6,825	2,145	25,706	467%
Kigoma Line	DAR - Kigoma, Burundi, DRC	2,727	3,090	2,590	644	9,051	531%
Central Corridor	DAR - Shinyanga, Rwanda	6,483	7,194	1,231	74	14,982	577%
	DAR - Mwanza, Uganda	8,718	11,789	1,267	437	22,211	500%

Source: JICA Study Team

Another aspect of such corridor development is the direct or indirect benefits to the domestic economy. In other words, it will not simply benefit the neighbouring landlocked countries by providing transport routes. As detailed in the next strategy, domestic transport cost will also be reduced due to increases in freight volume and provision of the most optimal combination of

different modes. Corridor development is also expected to enable domestic transport businesses to generate revenues, as well as to create jobs in relevant sectors within Tanzania. The development of international corridors should benefit Tanzania not only in political/symbolic terms, but also in tangible economic terms.

3.3 Strategy 2: Establishing a Comprehensive Transport Network with a Balanced Modal Mix

The key to the second strategy is clear roles and a functional division of different modes.

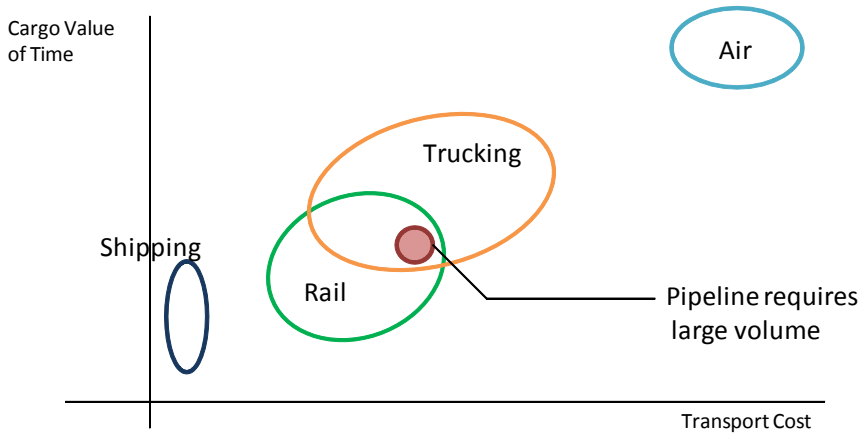
When a shipper or a forwarder chooses a transport mode (and a corridor) to deliver goods to a destination, many factors need to be taken into account, e.g., the availability/frequency of service, freight rates charged by the transporter/forwarder, the length of time for delivery, the size of consignment, any transshipment requirement, punctuality, risk of damage, risk of theft, the business relationship with the forwarder/transporter. There are many modes to choose among, e.g., trucking by road, railway, lake shipping, ocean shipping, pipeline, and air transport, and each transport mode has advantages and disadvantages in certain areas because of its cost structure and operational constraints.

Table 3.3 summarizes the characteristics of each mode compared to others in broad terms. Every time a shipper chooses a mode (and a corridor), the criteria are considered one by one, although often without conscious effort. The choice is made by the shipper, not by transport mode operator or by a decree issued by the state. Figure 3.2 illustrates the likely area of such choices for the combination of transport cost and the value of time of the goods in a generalized form. The general implications of this assessment can be summarized as follows: railways may be preferred for long-distance traffic, roads for shorter and/or higher-value traffic, ports as a gateway and transport hub, air transport for high-value traffic, and pipelines for seeking economies of scale.

Table 3.3: Inherent Characteristics by Mode as Seen by Shippers

Mode	Cost	Trip Time	Consign-ment Size	Frequency	Punctuality	Trans-shipment	Damage Risk	Theft Risk
Road	High	Fast	Small	High	Low	No	High	High
Rail	Low	Slow	Large	Low	High	Yes	Low	Med
Air	Very high	Very Fast	Small	Low	Med	Yes	Low	Low
Pipeline	High	Fast	Large	High	High	Yes	Nil	Nil
Lake Shipping	Very Low	Very Slow	Large	Low	Low	Yes	Low	Med

Note: The table indicates "inherent" characteristics of each mode as compared to other modes. However, at present in Tanzania, some modes cannot provide services with the characteristics shown above. For example, conditions regarding punctuality and the risk of theft for the railway are currently not any better than that of road transport.
Source: JICA Study Team



Source: JICA Study Team

Figure 3.2: Choice of Transport Mode

It is important to make various alternatives available to the shipper as the requirements for a particular shipment may differ depending on the circumstances. In this way, demand will not be suppressed and the economy can be stimulated.

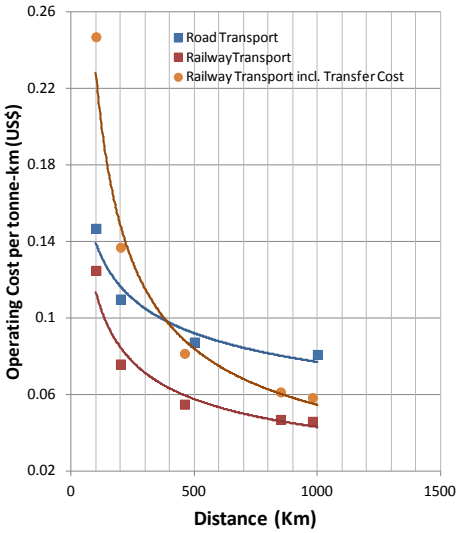
When a certain mode has clear cost advantages over others in certain areas, yet the mode is underutilized, there is a net loss to the national economy. The railway in Tanzania is a case in point. From its peak of 1.56 million tonnes of traffic in 2003, Tanzania Railways Limited (TRL) lost cargo to trucking and hauled only 256,000 tonnes in 2010, largely due to the lack of spare parts to maintain locomotives. The typical cost of truck transport in Tanzania is estimated to be USD 0.08 per tonne-km (assuming the use of a typical 6-axle truck trailer for an average hauling distance of 1,150 km), whereas the cost by TRL is estimated at USD 0.05 per tonne-km (using the calculation for the total tonnage level of 2003 and average hauling distance of 1,100 km). By transferring that much cargo to road transport, Tanzania has lost USD 156 million, and this is without considering the extra road maintenance costs.[2]

Generally, truck transport has cost advantages for short-distance trips over railway even when other considerations such as time value of cargo are not taken into account. Figure 3.3 shows such a comparison using the estimated tonne-km cost of a typical truck (6-axle truck-trailer, blue line) and railway (red and orange lines) in Tanzania in a case where rail carries 345,000 tonnes per annum over varying distances. At this volume, rail is cheaper even over a short distance. For rail transport, however, the cost of transferring cargo to/from the rail to trucks or transfer facility that carries it to the final destination or from the origin such as the port must be added. Such transfer cost per tonne-km becomes smaller as the distance increases since the transfer takes place at both ends only. Including transfer costs[3] at both ends, the lines for rail shift upward (orange line) and cross with the line for road at around 400 km in Figure 3.3.

Thus transport cost to the shipper to use railways in Tanzania can be less than using trucks for distances longer than 400 km. Figure 3.4 shows unit costs per tonne-km of road and rail transport in Tanzania against total hauling amount for a given distance of 1,020 km. Again, for any hauling amount, railway has a decisive cost advantage over road transport. For railway, the

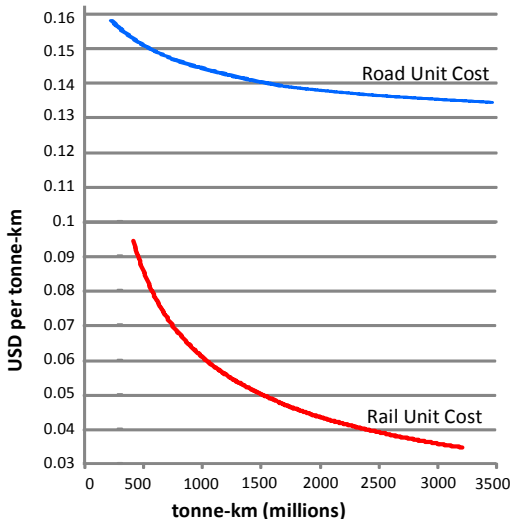
[2] Calculations were made with approximate assumptions.
[3] Transfer cost deriver form handling charge data within ports in Tanzania. Three transfer operations within the port are typically done. One third of average handling charge per TEU US$ was used as the rail-to-truck and truck –to-rail transfer cost. Data source: TPA, Corridor Diagnostics Study and TICTS(Tanzania International Container Terminal Services)

unit cost declines sharply with increasing total tonne-km, whereas for trucks, greater tonne-km simply require more vehicles and there is no dramatic change to the unit cost. In Tanzania railways are so underutilized at present that they can take large increases in cargo without massive construction costs; only rehabilitation is needed to carry a substantially increased volume. That is why unit costs for railway transport shown in the figures below are much lower than those for road transport. Railway should therefore be utilized for long-distance trips as much as capacity allows. The first priority should be for railway to regain its proper role in the freight transport system in Tanzania. When this goal has been achieved, railway may expand its role to take on shorter-distance trips, thereby stimulating the economy in various parts of the country.



Source: JICA Study Team

Figure 3.3: Unit Cost vs. Hauling Distance, Comparison between Rail and Road Excluding Transfer Cost (Case of Hauling 345,000 Tonnes Over Varying Distances)

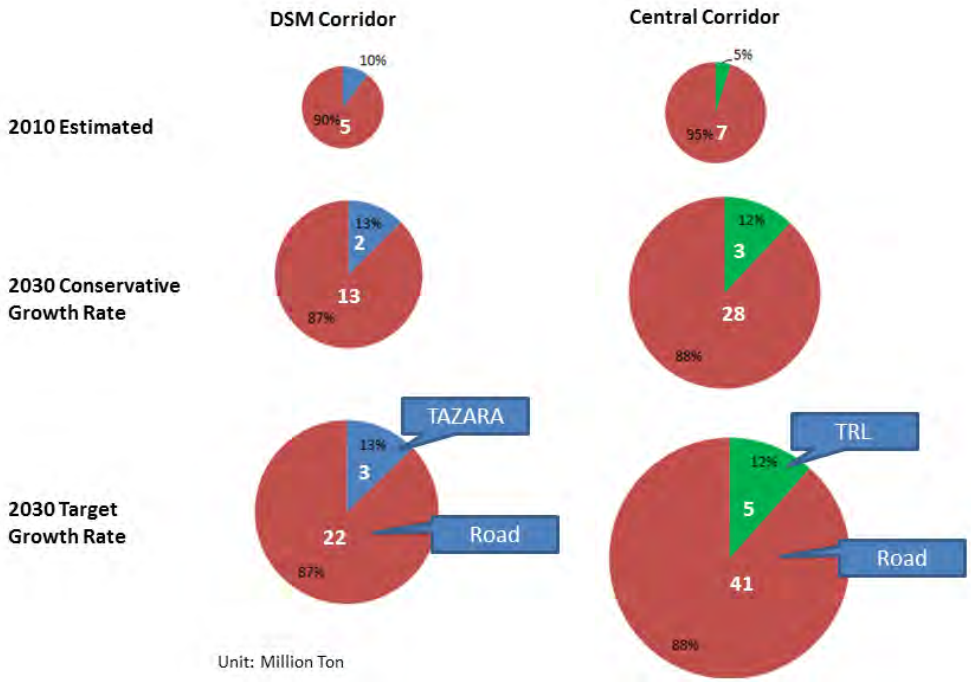


Note: Rail haulage is expected to reach 3.2 billion tonne-km by 2030
Source: JICA Study Team

Figure 3.4: Unit Cost vs. Total Haulage, Road and Rail (Excluding Transfer Cost)

It is important that there be "equal footing" or "a level playing field" between/among modes. At present, a railway operator is expected to pay infrastructure capital cost, while a large majority of road construction cost is paid by the state. The cost curves shown in the above figures do not include the costs of constructing and maintaining road infrastructure. When the cost of such infrastructure is included, the costs for road transport would be higher than shown in the graphs.

Figure 3.5 illustrates what would happen to freight transport that utilizes the Central and Dar es Salaam Corridors if all the projects recommended in the Master Plan were implemented. In the case of the Central Corridor, the total volume of freight would increase fourfold between 2010 and 2030 under the assumption of the conservative economic growth scenario of 5% per annum. In the meantime, TRL's share of this market would increase from 5% to 12%. If the economy grows by 8% per annum, freight volume would increase more than 5.8 times and TRL will capture 12% of the market, transporting more than 14 times of the amount it transported in 2010.



Source: JICA Study Team

Figure 3.5: Projected Cargo Volumes and Modal Shares of the Central and the Dar es Salaam (DSM) Corridors

The projected increase in the railway share will result in a reduction in the total cost of transport (monetary and time) and a reduction in total emissions of CO_2 and other harmful gases since railway transport overall has lower costs and emissions compared with road transport. More specifically, such a reduction in cost has been estimated at USD 2,141 million equivalent in terms of net present value.

Some of Tanzania's growing region (e.g., Mwanza) will demand air cargo facilities as incomes increase and industries requiring high time value commodities grow. This development is likely to be especially prominent in Tanzania since (as noted above) its regional cities are large relative to the capital (compared to the ratio in most other African and developing countries). While Julius Nyerere International Airport in Dar es Salaam is a national gateway for both passengers and freight, no immediate expansion is necessary, although one will be needed as the economy grows.

Pipelines should be constructed whenever the hauling volume justifies the shift from other modes. Such a decision can best be made by the private sector and in this respect the role of the state is to encourage rather than discourage. In Tanzania, pipelines are in the hands of the private sector although the construction cost is quite significant. Such a shift would not only result in the direct reduction of the cost of transporting oil or gas but also in a reduction of congestion of the mode that previously transported the material and indirect cost reduction for other goods that continue to be transported by the original mode.

The 1,710 km Tanzania Zambia Mafuta [TANZAMA] Pipeline, used primarily for transporting crude oil to a refinery in Ndola, Zambia, will reach its capacity by 2018. Its future will have to be determined by the Governments of Tanzania and Zambia.

3.4 Strategy 3: Meeting Domestic Transport Demand

Historically, meeting domestic transport demand in Tanzania has been somewhat sidelined to meeting international transport demand through international corridors considering due the location of Tanzania's seaports as the hub of international corridors, a relatively limited level of domestic market integration and, to some extent, a relative lack of data on domestic transport (data on international transport movements can be obtained by examining trade records easily obtained through international organizations).

Planning for domestic transport movements in Tanzania is important for two reasons. First, as has been noted, Tanzania's population is widely dispersed across the country, unlike many countries where the capital city accounts for a disproportionate share of the total national population. The population of Dar es Salaam region is only 7.4% of the national total and is likely to remain at around that proportion. The Mwanza region, which is located more than 1,000 km from Dar es Salaam, has a larger population than does Dar es Salaam region. Out of 21[4] regions in Tanzania, 13 have a population more than one half of that of Dar es Salaam. This distribution of population results in greater transport demand than in a country where a relatively large proportion of the total population resides in a primate city.[5] Second, regions that have largely been self-contained with subsistence agriculture typically require more exchanges with other parts of the country as their economy grows. Conversely, if Tanzania's transport system does not provide for adequate links between regions, the economic growth of the regions will be suppressed. This study has forecast that domestic transport demand will grow faster than the international transport demand, as shown in Chapter 1.

Significant factors for the growth of domestic transport demand include the cargo flows between Dar es Salaam region and regions that supply materials such as food and construction materials for consumption and investment in Dar es Salaam region and environs. The target growth rate of 8% per year toward 2030 implies rapid urbanization, most of which will take place in and around Dar es Salaam. The emergence of the Southern Agricultural Corridor Development of Tanzania (SAGCOT), which will serve as a major supplier of food and other agricultural products for Dar es Salaam region and other parts of Tanzania as well as for export, is consistent with this finding.

Also, urbanization will accelerated in major cities close to international borders, e.g., Arusha, Mbeya, and Mwanza. In addition to expanding cross-border transport movements through accelerated trade facilitation between/among EAC countries, domestic transport demand in these cities will increase.

Transport services provided by railways, even after their rehabilitation as recommended in this report, will be limited to only certain of the regions since their networks have been mainly designed to serve international corridors rather than scattered population centres. Indeed, it is not economically justified to construct railway links to connect population centres not located along such corridors, at least within the planning period of this master plan. Therefore, the task of connecting regions that are not along international corridors with the growing national economy must be borne by the road transport. First, road networks should be reinforced to connect regional cities with Dar es Salaam region and with each other. Second, road networks should be improved within each region, especially to connect district centres. These networks should be supported by continued improvement and maintenance of the district roads to connect

[4] In this report, the number of the regions is indicated as 21 according to the number of when this Study was started instead of dividing into present 25 regions.
[5] In the jargon of urban geography, a primate city is the leading city in its country or region, disproportionately larger than any others in the urban hierarchy.

district centres and elsewhere within respective districts. In this manner, the domestic market will be more closely integrated and expanded.

Figure 3.6 illustrates the growth of freight volumes for domestic, import/export, and domestic demand in the case of the target GDP growth rate of 8% per annum.[6] Domestic demand is and will be much larger than the other two and is expected to grow faster than transit. The overall picture is similar for the case of the "conservative" (i.e., low) GDP growth rate of 5% per annum, although the volumes will be somewhat less.

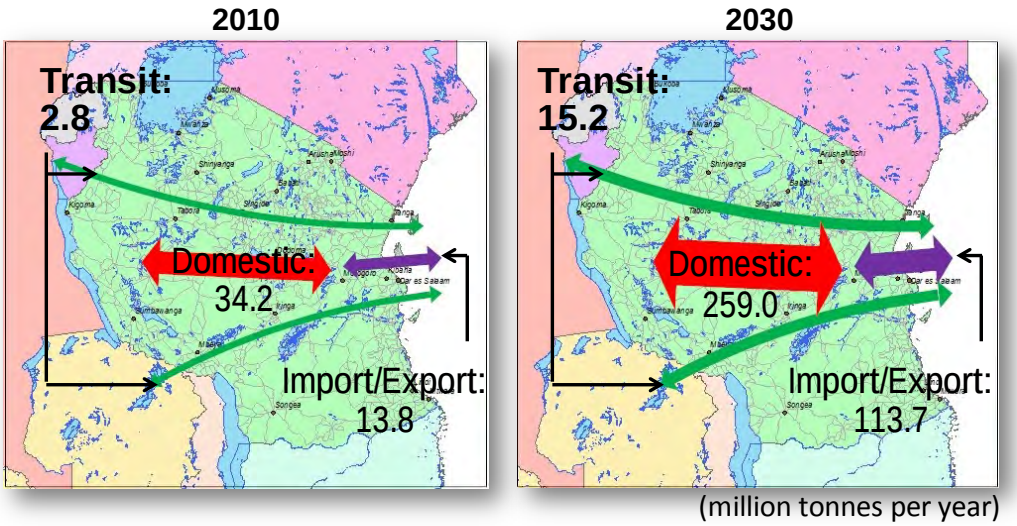


Figure 3.6: Growth of Domestic, Import/Export, and Transit Freight

While focusing on the improvement of road transport, as recommended in this Master Plan, it is important to be selective in meeting domestic transport demand. For example, paving all trunk roads by 2018, as is currently planned, may be unrealistic and unneeded. Some trunk roads may be of doubtful economic benefit (e.g., the Mbeya–Rungwe–Manyoni Road, Rungwe–Tabora Road, and the planned Tanga–Singida Road) and need not be paved until later. Accordingly, this study has been selective and strategic, sometimes deviating from official plans. The estimated USD 18.3 billion required for this Master Plan (about USD 1.0 billion per year over the 18-year planning horizon) is considered realistic, but it focuses on what is needed rather than what is not.

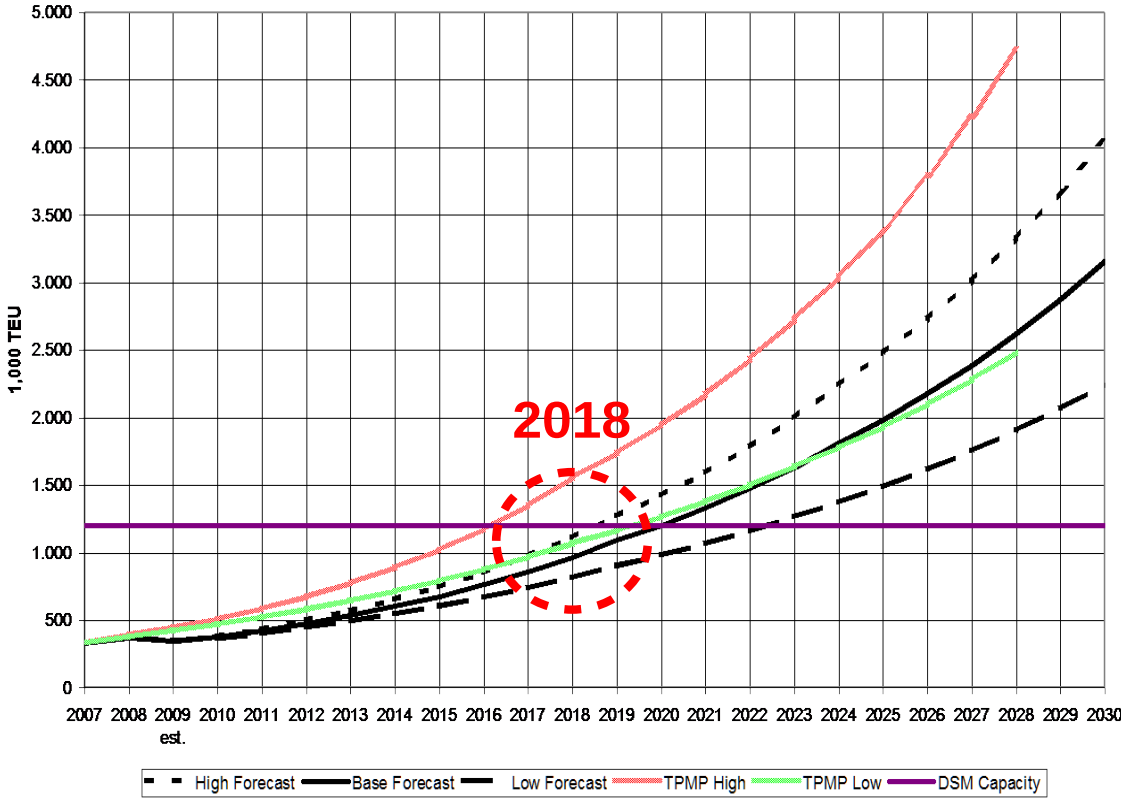
3.5 Strategy 4: Alleviating Bottlenecks in the Dar es Salaam Area

As the role of Dar es Salaam as a window for the nation and for the landlocked neighbouring economies grows, the current capacity of its infrastructure is likely to become insufficient to meet demand. This capacity constraint regarding Dar es Salaam Port and the urban road network is addressed below.

Regarding the ***port sector***, it has been established that Dar es Salaam Port cannot accept cargo exceeding twice the amount it handled in 2011 due to the natural constraints of its having a narrow and shallow entrance channel and the lack of space for expansion. Various studies have found that the port will reach its absolute maximum capacity around 2020 or even earlier considering the growth of the economies of Tanzania and surrounding countries (see Figure 3.7). In the meantime, oceangoing vessels, particularly container ships, have become larger and this trend will continue or even accelerate. Only relatively small vessels can call at the port, whereas

[6] Freight transport requirements within Dar es Salaam are mentioned regarding the following strategy.

current mainline container ships exceed 6,000 TEUs and even 18,000-TEU ships have started operation. If Tanzania does not develop a new port that provides additional port capacity and can receive modern large vessels, international shipping lines will divert their services away from Tanzania. This would have a devastating effect on the national economy. Tanzania needs a new port that is comparable to the present Dar es Salaam port.



Source: High, base, and low forecasts cited in the Mbegani-Bagamoyo Port Feasibility Study prepared by Hamburg Port Consulting; high and low forecasts from the Tanzania Ports Master Plan Plan prepared by Royal Haskoning

Figure 3.7: Container Traffic Forecasts and the Capacity of Dar es Salaam Port

The government is keenly aware of this issue and has been considering the Mbegani-Bagamoyo area, about 60 km from the centre of Dar es Salaam, as a site satisfying the requirements for a deep sea port. A feasibility study was completed for the port and the surrounding area for a Special Economic Zone/Export Processing Zone (SEZ/EPZ), and another feasibility study is being prepared for the SEZ/EPZ. The choice of the site is appropriate since the vast majority of non-transit cargo passing through Dar es Salaam port is destined to locations within Dar es Salaam city and its vicinity. Table 3.4 presents the results of an origin-destination survey undertaken by the JICA Study Team. For import cargo through Dar es Salaam port, 56.1% are destined to Dar es Salaam and surrounding areas, 5.7% to other parts of Tanzania, and 38.1% are in transit to surrounding countries. For export cargo 36.9% originate in Dar es Salaam and environs, 15.5% in other parts of Tanzania, and 47.5% are in transit from surrounding countries. These proportions of transit cargo broadly match those in the statistics of the Tanzania Ports Authority.

Table 3.4: Origin/Destination of Cargo through the Dar es Salaam Port

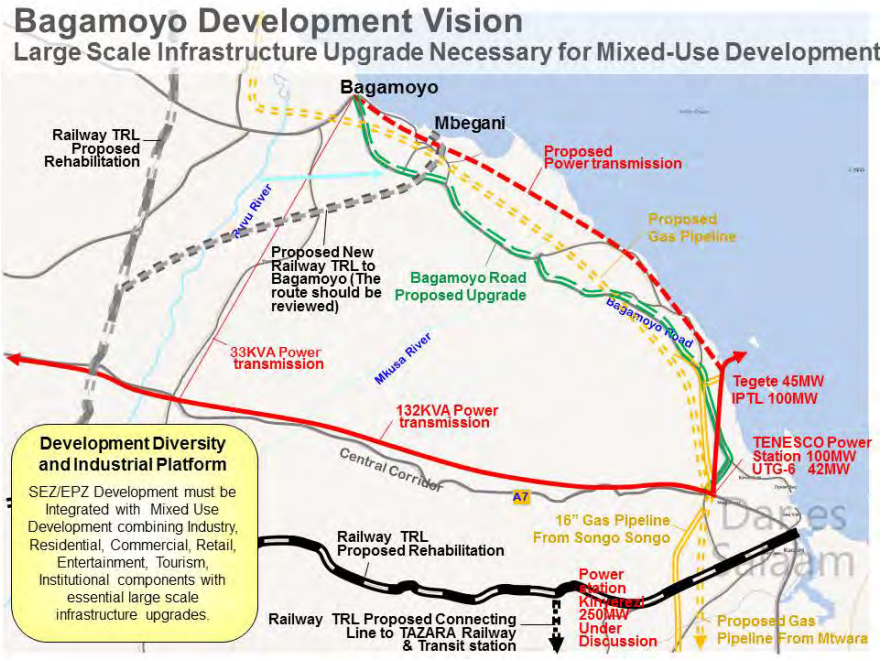
Roadside OD Survey Results
Based on the OD survey data (tonnes/day)

From \ To	DSM Port	DSM and Environs	Other Tanzania	Transit	All	To %
DSM Port		1,370	140	931	2,442	
DSM and environs	347				347	36.9%
Other Tanzania	146				146	15.5%
Transit	447				447	47.5%
All	940	1,370	140	931	3,382	
From %		56.1%	5.7%	38.1%		
			61.9%	38.1%		

Abbreviations: DSM = Dar es Salaam, OD = origin-destination
Note: A certain amount of cargo first stops at ICDs around the DSM area and are then distributed to other regions in Tanzania.
Source: Cargo Origin and Destination OD Survey undertaken by the JICA Study Team

Factories and warehouses in the city of Dar es Salaam will continue to be the origin/destination of the majority of cargo originating in or destined to Tanzania for some time. The new port should be close to Dar es Salaam even though factories and commercial entities in the new EPZ will generate a significant amount of cargo traffic in the future. Otherwise, inefficient long-distance, in-country transport will have to be undertaken.

Throughput of the new port will be comparative to that of Dar es Salaam port or even larger. The future freight transport network of Tanzania must be planned with this large addition as the central concern. An efficient connection to roads and railways is essential for the new port to function as well as provides for the efficient operation of road and rail transport. Figure 3.8 illustrates a development vision of Bagamoyo with possible connections to transport as well as other essential infrastructure.



Source: JICA Study Team

Figure 3.8: Bagamoyo Development Vision

Regarding the ***road sector***, congestion within and around the Dar es Salaam area is already a bottleneck for freight exiting Dar es Salaam and the problem is likely to worsen as the metropolitan population approaches 6 million in 2030, particularly with development south of Dar es Salaam in Kigamboni. Considering that the flow of freight is affected not only by freight traffic itself but also by passenger traffic (which is much heavier than in rural areas), constraints in urban road infrastructure will significantly affect the function of Dar es Salaam as a regional transport hub. The Master Plan therefore addresses the alleviation of road congestion through such measures as widening of existing roads and developing outer ring roads and bypasses.[7]

Julius Nyerere International Airport is the major gateway of Tanzania for passengers as well as air freight. It handles 75% of international air cargo and 30% of domestic air cargo. Immediate expansion of its air cargo handling facility does not seem necessary, although when it receives large cargo aircraft several times a month, peak volume already exceeds its capacity. Without major expansion it will become a bottleneck for Tanzania.

Short-distance petroleum product pipelines that emanate from Dar es Salaam Port are owned and operated by private petrol companies. These companies plan to expand their facilities in to meet expanding demand and it seems unlikely that they will become bottlenecks for the distribution of petrol products.

3.6 Strategy 5: Establishing Clear Regulatory/Financing Frameworks

For the Tanzanian economy to take full advantage of the strategies set out above, the regulatory as well as the financing frameworks need to be clear and reasonable, at the very least to avoid any bottlenecks resulting from inefficiencies that prevent the flow of goods and money. Indeed, the lack of such frameworks may even be a larger impediment to the sector than the lack of infrastructure. It is critically important to ensure that the necessary projects are financed appropriately, and that the benefits of the developed infrastructure are fully gained. There are three main components to achieve this objective.

The first component is ***trade facilitation***, with a view toward overcoming existing inefficiencies in cargo clearance/inspections/declarations, data tracking/sharing, and payment/settlement of charges. Closely related to investments in ports and border facilities are institutional developments, including streamlining the procedures for cargo clearance at the borders though integrating the necessary steps and coordinating regulatory agencies. Regarding customs, an automated system, with a single window structure, will facilitate speedier inspections/ declarations as well as the integrated issuance of permits. For related institutions, payment and settlement systems in the banking sector, as well as coordination between/among regulatory and operational bodies are important. Also, further joint efforts toward procedural improvements in connection with one-stop border posts with neighbouring countries is required.

The second component is to ***facilitate private sector participation***, in order to avoid another failure in PPP as seen in the case of Tanzania Railways Limited (TRL). In designing the regulatory structure and incentive mechanisms to promote private sector participation, it will be important to clearly identify "to what extent" or "in which part of the infrastructure management" the private sector should be invited with "what kind of public support" for the parts that are not commercially viable. The government could remove itself from operations and focus on policy

[7] The development of an outer ring road is especially important. It would connect Bagamoyo Port (and a future Bagamoyo Airport), Morogoro Road, the Kisarawe Freight Centre, Julius Nyerere International Airport, the existing port, and Kigamboni. It should be planned as a multi-lane, limited-access, grade-separated road. It could be a candidate for a privately financed toll road. The planning for this road must begin as soon as possible and the right-of-way secured considering that delays could make development of the road prohibitively expensive.

setting, strategic planning, and oversight.[8] In identifying for private sector participation, it is also important to put infrastructure development within the greater context of national/regional economic development. For this purpose, the planning of strategic projects needs to be discussed not only within the Ministry of Transport but across ministries, as a part of the greater framework for the national development plan. In the context of attracting more investment from outside the country, it is also recommended that the remaining regulatory/administrative ambiguities be removed for EPZ/SEZ operations (e.g., foreign ownership, profit repatriation).

Finally, the last component is to further strengthen the ***fiscal framework*** for financing projects, through streamlining the existing multiple planning frameworks, as well as clearly identifying financing sources. In other words, existing inefficiencies should be minimized with a view to financing the unprecedented scale of infrastructure investments over the next two decades. For this purpose, four measures are proposed: (i) further aligning the different fiscal planning frameworks with overlaps and inconsistencies to eliminate possible fiscal redundancies, (ii) additional efforts toward cost recovery in each subsector, (iii) diversifying and/or expanding the revenue source of the Government of Tanzania (e.g., more effective capturing of tax revenues and revenues from natural resource development), and (iv) further expanding the financing sources (e.g., developing investable products and a greater role for the private sector).

3.7 Relationship between the Five Strategies and Sector Policies

These strategies (#1-5) can be further broken down to the sector policies and strategies as summarized in Table 3.5.

For ***inland ports*** (where the transport demand is expected to increase by 926% between 2010 and 2030), the prime focuses are the contribution to strengthening international corridors (Strategy #1) and meeting domestic transport demand (#3). Relevant measures to these strategies include network expansion between the ports, greater private sector involvement and development of the key ports for international trade (i.e. Kigoma and Kasanga). This contrasts with the strategy for the ***sea port*** sector (with 186% demand increase for the same period), which stresses the importance of alleviating the bottlenecks in Dar es Salaam area, to serve the Strategy #4 (and eventually #1 and #3).

For the ***road*** sector (with 661% demand increase), the core contribution to the domestic network (#3) can be further broken down to the development of the network and capacity/service level improvement. Also better connection with other modes is expected to play a critical role in optimizing the modal share (#2).

The measures/strategies listed for the ***railway*** sector (with 920% demand increase), such as network rehabilitation and expansion, has a greater contribution to strengthening international corridors (#1), given its nature as more of a long-distance 'transit' transport. Also cost reduction effort is expected to contribute to improving the financial viability of the railway operations (#5).

[8] Competition between private operators between and within modes would assist in reducing costs and increasing efficiency (high transport costs is a major impediment in the sector). For example, the Tanzania Ports Authority (TPA) is a landlord by law, but has been reluctant to let go of operations other than the container terminal. In the railway sector, the Reli Assests Holding Company (RAHCO), which represents the Government of Tanzania as the owner the rail infrastructure, could lease out the use of tracks to private freight operators that would them compete against each other.

Both ***aviation*** and ***pipeline*** sectors (with 302% and 370% demand increase, respectively) focus on alleviating bottlenecks in Dar es Salaam area, while the pipelines' role will be more on the domestic side. For ***institutions***, upgrading border facilities will definitely contribute to the international corridors (#1), whereas other measures/strategies are related more to the planning framework (#5). Further facilitating PPPs, on the other hand, is expected to play an important role across five strategies.

The details of the respective policies are introduced and further examined in the following chapters by sector.

Table 3.5: Sector Policies and Relevant Strategies

Sector	Sectoral Strategy	Strategy				
		1. Strengthening international corridors	2. Developing infrastructure for the optimal modal share	3. Meeting the domestic transport demand	4. Alleviation of bottlenecks in DSM area	5. Clear regulatory / financing framework
Inland Port	Network Expansion to meet the transport demand between Inland Port	○		○		
	Encouragement of the private sector to provide more services to inaccessible area	○		○		
	Development of Kigoma and Kasanga as international trade ports	○	○			
	Implovemnet of the regulation to ensure navigation safety			○		○
	Implementation of the service on the lake transport route	○		○		
Sea Port	Development of Dar es Salaam Port			○	○	
	Inland Container Depot Development to reduce the dwell time		○		○	
	New Port Development (Bagamoyo–Mbegani)	○			○	
	Development of large-scale port operations very close to the city centre			○		
Road	Road Network Strengthening	○		○		
	Capacity Expansion and Service Level Improvement			○	○	
	Coordinated Development with Other Modes		○			
	Access Controlled Expressway Network.			○		
Rail	Rehabilitation of Existing Network	○	○	○		
	Capacity Expansion and Cost Reduction on Existing Network			○		○
	Network Expansion and Upgrading	○			○	
	Construction of Standard Gauge Track in Tanzania	○		○		
Air	Capacity expansion and enhancement of service level of cargo facility and equipment	○	○		○	
Pipeline	Developing infrastructure for the optimal modal share		○			
	Alleviation of bottlenecks in Dar es Salaam area			○	○	
Institution	Border facilities	○				
	Implementation of PPP regulation / incentives	○	○	○	○	○
	Streamlining the planning framework					○
	Expanding revenue sources					○
	Expanding financing sources					○

Chapter 4 Port Sector Development Strategies

4.1 Process of Sector Planning and Project Identification

The basic points of departure for conducting sector planning and identifying projects in the port sector were the analyses of current and future transport demand in Chapter 1, and the assessments of Chapter 2 for moving from the demand forecasts to corridor/sector strategies. Building on these basic points of departure, the following considerations were taken into account:

(i) Table 2.1 (Summary of Transport Demand Growth and Resource Allocation) forecast throughputs from 2010 to 2030 to increase by 186% (from 4.67 million tonnes to 13.34 million tonnes) at Dar es Salaam (DSM) Port, by 809% (from 0.07 million tonnes to 0.60 million tonnes) at Kigoma Port, and by 1080% (from 0.05 million tonnes to 0.59 million tonnes) at Mwanza (South) Port.

(ii) Other recent forecasts were also taken into account. Traffic forecasts for the Tanzania Ports Master Plan (TPMP), prepared in 2008 based on 2007 data, including a high forecast of throughput at Dar es Salaam Port in 2028 of 15.550 million tonnes and a low forecast of 8.978 million tonnes (see Table 4.3). A 2009-10 feasibility study of a new port at Bagamoyo–Mbegani conducted by Hamburg Port Consulting GmbH (HPC) adopted a base forecast broadly equivalent equal to the low TPMP forecast as a consequence of the global recession that began in 2008 (see Figure 4.3). An April 2011 update of these studies prepared the latest sector-specific traffic forecast for Dar es Salaam Port, estimating throughput of 14.659 million tonnes in its high forecast and 9.326 million tonnes in its low forecast (2028). The forecast prepared in this master plan study, 11.99 million tonnes in 2030, is virtually the same as midpoint of the high and low forecasts for 2028 in the April 2011 study (also 11.99 million tonnes. As noted in subsection 4.1.5, relevant issues regarding Dar es Salaam Port include the sharp increase in containerization, insufficient container storage, the high berth occupancy rate, and long dwell times.

(iii) Tanzania Ports Authority (TPA) forecast throughputs at Kigoma to reach 0.36 million tonnes in 2030 (Table 4.20), which is somewhat higher than the forecast in this master plan study (0.32 million tonnes).

(iv) TPA forecast throughputs at Mwanza South Port to reach 0.27 million tonnes in 2030 (Table 4.16), which is equal to the forecast in this master plan study (0.27 million tonnes).

(v) As noted subsection 4.1.4 and as stated in the TPMP, future investment planning should be based on annually updated (five-year) forecasts prepared with an appropriate substantiation and stakeholder involvement.

The remainder of this chapter presents in turn the detailed assessment of seaports and maritime transport (including port-related ICDs (4.2) and that of lake ports and lake transport (4.3).

4.2 Seaports and Maritime Transport (including Port-Related ICDs)

4.2.1 Development Strategies: Overview

The following overall development strategies are presented in Chapter 2 for the Comprehensive Transport and Trade System Development of Tanzania.

Strategy 1: Strengthening international corridors
Strategy 2: Establishing a comprehensive transport network within a balanced modal mix
Strategy 3: Meeting domestic transport demand
Strategy 4: Alleviation of bottlenecks in Dar es Salaam area

Strategy 5: Establishing a clear regulatory/financing framework

In order to establish seaport development strategies, the following facts should be stressed and understood.

(i) Dar es Salaam Port plays an important role as a gateway that not only handles cargo for Tanzania but also handles transit cargo for neighbouring landlocked countries. Transit cargo accounts for 35% of total cargo.

(ii) The volume of container traffic handled at Dar es Salaam Port increased from 142,000 TEUs in 2001 to 477,000 in 2011. This is an increase by a factor of 3.4 times over the last decade, which is equivalent to an annual average rate of increase of 13%. [1]If the volume of container cargo continues to increase at a comparable rate, Dar es Salaam Port will reach its capacity within the next decade. Therefore, capacity expansion of the existing Dar es Salaam Port is a pressing need.

(iii) To cope with the potential growth of container traffic, capacity will be increased through construction of additional container terminals (berths 13 and 14). With this new berth construction, Dar es Salaam Port will be able to secure an additional 500,000–650,000 TEUs per annum. Moreover, the new berths will be able to cater to full-length Panamax vessels with capacities of 4,800 TEUs.

(iv) In addition to the construction of the new berths (13 and 14), a new inland container depot (ICD) needs to be constructed at Kisarawe in order to supplement the storage capacity for containers outside the port since securing a container yard behind the existing berth would be difficult due to the narrow terminal depth. The new ICD is expected to be linked with the existing lines of Tanzania Railway Limited (TRL) and the Tanzania Zambia Railway (TAZARA), therefore, new railway lines will be needed to connect the existing TRL and TAZARA lines to the new Kisarawe ICD.

(v) In view of the foregoing, development of the existing Dar es Salaam Port should be an urgent priority as it has already reached its capacity and handles almost 90% of total Tanzanian cargo, while also serving as a gateway for landlocked countries. However, the capacity of Dar es Salaam Port will be limited even if the existing terminal is expanded with the construction of new berths (13 and 14). Thus, a new port should be developed in the vicinity of Dar es Salaam to accommodate future cargo growth.

Taking into these facts into account and in line with the overall development strategies, seaport development strategies are detailed in Section 4.2.6.

4.2.2 Marine Transport

(1) Current Status

Since the late 1990s, super large container ships have been rapidly introduced worldwide to serve maritime container traffic. This trend has also expanded to Asia/Europe routes exploiting economies of scale.

Although ship building costs for such large container ships are higher than for standard sized ones, shipping companies are willing to deploy large container ships since the operational costs per unit can be reduced. Since 2008, more than 200 super-large container ships have been

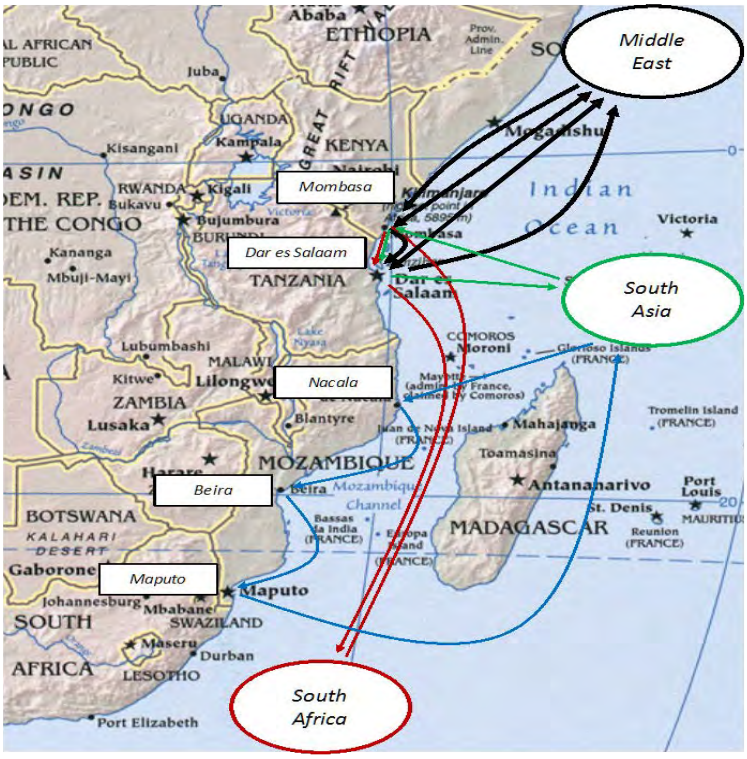
[1] In 2012, DSM port's container throughput is 540,000 TEU according to TPA's statistics. The annual increase is 14.8%.

deployed at sea along Asia/Europe routes as well as other key routes. The largest container ships currently in operation have a capacity of 11,000–14,000 TEUs; such ships are scheduled to be built continually in the future as well.

On the other hand, middle- and small-sized container ships are deployed on other routes, such as the Middle East–East Africa routes. The deployment of container ships is coordinated primarily by the volume of cargo on the route and the physical conditions of the ports of call, such as the width of entrance channels and water depths of the container berths.

The service routes of shipping companies' ports of call in East Africa are shown in Figure 4.1. The vessels that are deployed in the trade routes range from 1,000 to 3,000 TEUs, with an average of 2,000 TEUs. The main shipping companies that provide these services are Maersk Line, Mediterranean Shipping Company (MSC), and CMA CGM (a French container transport and shipping company). Details are explained below:

- The routes in black cover Dar es Salaam, Mombasa, and hub ports in the Middle East that hich relay the cargo from Asia-Europe Route to East Africa. The relay ports are Jebel Ali, Salalh, and Shard.
- The routes in red indicated that cargos are switched to East Africa from Asia via South Africa. The relay ports are Durban, Port Elizabeth, or Cape Town in South Africa.
- Routes in blue and green directly connect East Africa with South Asia.



Source: JICA Study Team

Figure 4.1: Shipping Line Routes to East Africa

(2) Future Prospects

Container handling volume at the ports of Dar es Salaam, Mombasa, and Durban are shown in Table 4.1.

Table 4.1: Container Handling Comparison

unit: 1,000 TEU

	2006	2007	2008	2009	2010
Durban	2,335	2,511	2,560	2,380**	2,500**
Mombasa	479	585	615	619	696
Dar es Salaam	273	334	374	354	412

Sources: 1) Tanzania Ports Authority and Kenya Ports Authority; 2) ** JICA Study Team's estimate

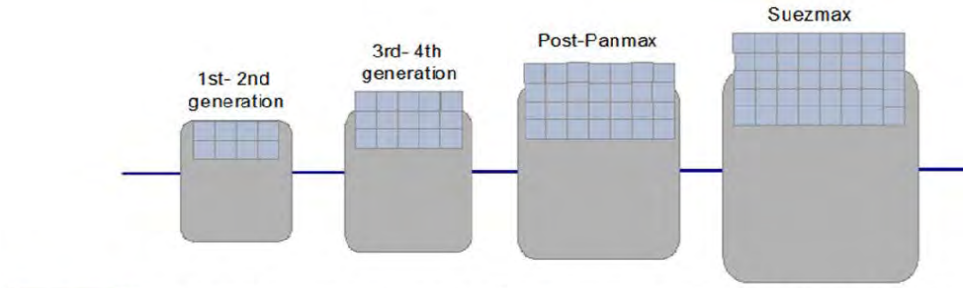
Container handling volume at Durban Port is very large compared to the other two ports, due to the difference in the size of the nations' economies. Container traffic at Dar es Salaam Port is expected to reach 1.0 million TEUs within the next decade and more than 2 million TEUs over the next 20 years if the current economic growth in Tanzania continues.

As indicated in Table 4.2, Durban Port has advantages compared to others in terms of container quay length and depths; therefore, large container ships with a capacity of 5,000 TEUs can call at the port. Figure 4.2 illustrates the various sizes of container ships for reference.

Table 4.2: Comparison of Current Port Conditions

	Dar es Salaam	Mombasa	Durban
Entrance Channel Depth	9.5 m	14 m	13 m
Container Quay Depth	10.5 m	11 m	13 m
Container Quay Length	720 m	964 m	2,814 m

Sources: Tanzania Ports Master Plan and Hamburg Port Consulting GmbH



TEU	1,000 – 2,000	3,000 – 4,700	4,700 – 9,000	12,000 – 14,000
Length	170 – 190 m	240 – 295 m	300 – 330 m	360 – 400 m
Draft	10 – 11.5 m	12.5 m	13.5 – 14.5 m	15.5 – 16.5 m
Width	28 m	32 m	39 – 43 m	58 m

Source: Hamburger Hafen und Logistik AG

Figure 4.2: Sizes of Container Ships

The ports of Dar es Salaam and Mombasa have the capacity to receive middle-sized container ships ranging from 2,000 TEUs to 3,000 TEUs. However, at present, container ships larger than 3,000 TEUs are not able to call due to insufficient water depths at the container berths.

While the current feeder routes will not be changed in the near future, considering the long-term perspective, the water depth of container berths should be made deep enough to receive Post Panamax container ships in the future. This would allow larger container ships to call at Dar es Salaam or Mombasa on the way to Asia or the Middle East from Durban, and vice versa, once the trade volumes of East African countries' increase. As a result, the two ports will be able to take advantage of their geographic locations when transporting to Asia or the Middle East from Durban, and vice versa.

4.2.3 Port Management and Operation

Most Tanzanian ports (terminals) are operated by the Tanzania Ports Authority (TPA), while the container terminal at Dar es Salaam Port is operated by Tanzania International Container Terminal Services (TICTS). TPA became a landlord port authority under the Port Act of 2004, implying that port operations are to be handed over to private terminal operators. However, investment in port infrastructure by the private sector is still low.[2]

Private firms bear some project implementation costs to realize sufficiently profitable PPP projects and potential investors will participate in an appropriate PPP project with suitable project funds and technologies. To achieve this objective, TPA will have to gradually step back its role as supervising authority and let go of operational control. Ownership of equipment and facilities and employment of operational staff for terminals will need to be transferred from TPA to private terminal operators under a concession agreement. A further shift is required for TPA to let go of (operational) control, in the confidence that the market forces of free competition and return on investment will drive efficiency improvements and cargo growth in the port.

TPA should therefore further focus on this shift towards the landlord port concept in order to increase efficiency, attract private capital, and increase its market share. The first step would be to give concessions to private operators for all newly developed terminals (such as planned berths 13/14 at Dar es Salaam). The next step would be to segregate operations in the existing port areas and give terminal operation concessions to one or more private entities[3].

TPA has placed a long-term priority on personnel training. To have a better-trained middle management and skilled labour force to achieve good management and operations, TPA should establish a series of programmes aimed at expanding managerial and operational capabilities to meet the increasing traffic demand.

4.2.4 Traffic Forecast for Dar es Salaam Port

(1) Past Cargo Traffic Forecast

Tanzania Ports Master Plan

The Tanzania Ports Master Plan (TPMP), formulated in February 2009 for all ports in Tanzania, includes a commodity-wise traffic forecast up to 2028 using base year traffic figures from 2007 for trend analysis. The traffic forecasts applied in this master plan assume a continuation of past GDP growth rates of 6%–8% per annum in Tanzania and neighbouring countries. Even though the short-term forecasts for 2013 were affected by the global recession, the impact of the recession was comparatively less and slower than that on developed countries. Therefore, Tanzania, having a good chance of a speedy recovery, can make the timing of port development the main issue rather than its form. These traffic forecasts were based on trend analysis, interviews with leading business organizations, and studies of individual issues such as:

- Macro-economic growth and the restructuring of the economy;
- Agriculture, forestry, and fisheries resources;
- Energy policy;
- Mining projects;
- Economic development zones;

[2] Many PPP opportunities have not yet been taken (e.g., the single point mooring, Berths 13 and 14).
[3] Nevertheless, TPA called for EOI in April 2013 for "Strengthening and Deepening of Berth 1–7 and Construction of RoRo Berth," "Installation of Conveyor Belts for bulk cargo handling" and "Development of Bulk Liquid Custody Transfer Tank Farm at Ras Mjimwema" on EPC contract basis.

- Corridor development plans;
- Road and rail infrastructure; and
- Transit traffic, including competition from ports in other countries.

Both low and high forecasts were made for individual ports. The Master Plan emphasized the need for investment planning to be based on annually updated five-year forecasts with an appropriate level of substantiation and stakeholder involvement. Table 4.3 shows high and low forecasts for Dar es Salaam Port.

Table 4.3: Cargo Traffic Forecast for Dar es Salaam Port

	2008	2013	2018	2023	2028
High forecast					
Liquid bulks	2,262	3,724	4,820	6,099	7,652
Dry Bulk	1,434	2,449	3,693	4,779	6,056
Break Bulk	457	655	934	1,317	1,842
Total ('000 tons)	**4,153**	**6,828**	**9,447**	**12,195**	**15,550**
Containers ('000 TEU)	395	775	1,554	2,728	4,719
Vehicles ('000 units)	46	81	143	230	370
Ferry Passengers ('000 units)	769	981	1,253	1,599	2,040
Cruise Passengers	-	3	18	28	50
Low forecast					
Liquid bulks	2,214	2,824	3,251	3,790	4,260
Dry Bulk	1,402	2,020	2,624	3,245	3,726
Break Bulk	432	424	551	741	992
Total ('000 tons)	**4,048**	**5,268**	**6,426**	**7,776**	**8,978**
Containers ('000 TEU)	384	649	1,074	1,637	2,486
Vehicles ('000 units)	45	69	106	155	228
Ferry Passengers ('000 units)	751	849	961	1,087	1,230
Cruise Passengers	-	1	8	12	23

Source: TPMP

Forecast in the Bagamoyo–Mbegani New Port Study

The TPMP concluded that a new port will be necessary that can handle up to 650,000 TEUs per year regardless of the construction of the two berths (13 and 14) and the existing TICTS Terminal. The location of the new port was selected to be in the Bagamoyo region to handle containers and vehicles that overspill from Dar es Salaam Port due to its handling capacity limit. In order to review the TPMP and carry out a more in-depth study, Hamburg Port Consulting GmbH (HPC) was appointed to conduct a feasibility study in 2009–2010[4].

Figure 4.3 depicts the results of the container traffic forecast in comparison with the TPMP projection. Mainly due to the anticipated impact of the global recession 2008–09, the revised Base Forecast was equivalent to the Low Forecast value of TPMP.

[4] In March 2013, Tanzania and China signed an agreement for China to finance a port and other infrastructure projects at Bagamoyo. TPA and its Chinese counterpart are reportedly discussing the development details of the port.

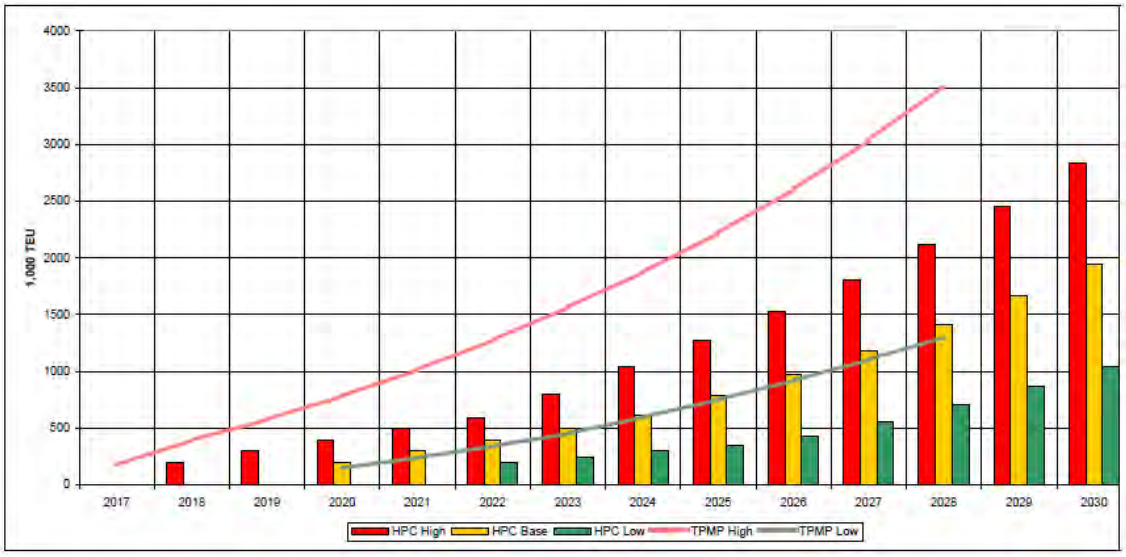


Figure 4.3: Container Traffic Forecast at Bagamoyo–Mbegani (TPMP and HPC)

(2) Traffic Forecast

The traffic forecasts underlying the Tanzania Ports Master Plan were prepared in 2008 based on the 2007 data. Since then, there has been a global recession and consequently, the estimates of future traffic growth generated by several other studies have been significantly different. In April 2011, another update of cargo traffic at Dar es Salaam Port was issued comparing previous studies, such as the TPMP and Bagamoyo–Mbegani new port study (HPC). Table 4.4 presents the latest traffic forecasts for Dar es Salaam Port.

Table 4.4: Cargo Traffic Forecast for Dar es Salaam Port

HIGH FORECAST

	2009	2010	2011	2012	2013	2014	2015	2018	2023	2028
IMPORTS										
Liquid bulks	2,739	3,081	3,043	3,255	3,532	3,682	3,735	4,128	5,232	6,832
Dry bulks	1,230	1,284	1,531	1,682	1,849	2,037	2,246	3,032	4,662	6,930
Break bulks	412	242	371	383	395	409	425	477	596	762
Total: '000 tons	4,382	4,606	4,945	5,319	5,777	6,129	6,405	7,637	10,490	14,524
Containers ('000 TEU)										
Full	165	198	226	254	291	333	381	565	953	1,600
Empty	2	-	3	4	4	5	6	9	15	25
Vehicles ('000 units)	52	58	65	73	81	91	102	143	231	372
EXPORTS										
Liquid bulks	43	56	75	75	75	75	75	75	75	75
Dry bulks	-	-	-	-	-	-	-	-	-	-
Break bulks	60	11	60	60	60	60	60	60	60	60
Total: '000 tons	103	67	135	135	135	135	135	135	135	135
Containers ('000 TEU)										
Full	64	70	80	91	105	120	138	204	345	580
Empty	106	126	135	150	171	196	223	330	558	937
Vehicles ('000 units)	-	-	-	-	-	-	-	-	-	-
TOTAL										
Liquid bulks	2,782	3,137	3,118	3,330	3,607	3,757	3,810	4,203	5,307	6,907
Dry bulks	1,230	1,284	1,531	1,682	1,849	2,037	2,246	3,032	4,662	6,930
Break bulks	472	253	431	443	455	469	485	537	656	822
Total: '000 tons	4,485	4,673	5,080	5,454	5,912	6,264	6,540	7,772	10,625	14,659
Containers ('000 TEU)										
Full	229	268	306	345	396	453	519	769	1,299	2,180
Empty	108	126	138	154	175	201	229	339	573	962
Transhipment (one way)	16	8	10	10	10	20	20	30	50	84
Total	353	402	454	509	581	674	768	1,138	1,922	3,226
Vehicles ('000 units)	52	58	65	73	81	91	102	143	231	372
Ferry passengers ('000)	745	799	839	881	925	971	1,019	1,180	1,506	1,922
Cruise passengers ('000)	-	-	2	2	3	5	7	18	28	50

LOW FORECAST

	2009	2010	2011	2012	2013	2014	2015	2018	2023	2028
IMPORTS										
Liquid bulks	2,739	3,081	2,949	3,043	3,166	3,343	3,463	3,714	4,161	4,737
Dry bulks	1,230	1,284	1,366	1,471	1,584	1,706	1,839	2,306	3,031	3,997
Break bulks	412	242	299	309	319	329	340	368	433	522
Total: '000 tons	4,382	4,606	4,615	4,823	5,069	5,379	5,642	6,388	7,624	9,256
Containers ('000 TEU)										
Full	165	198	220	238	263	292	325	402	585	840
Empty	2	-	3	4	4	4	5	6	9	13
Vehicles ('000 units)	52	56	61	67	73	80	87	112	165	242
EXPORTS										
Liquid bulks	43	56	40	40	40	40	40	40	40	40
Dry bulks	-	-	-	-	-	-	-	-	-	-
Break bulks	60	11	30	30	30	30	30	30	30	30
Total: '000 tons	103	67	70	70	70	70	70	70	70	70
Containers ('000 TEU)										
Full	64	70	77	83	92	101	111	137	200	287
Empty	106	126	93	116	122	132	143	177	257	370
Vehicles ('000 units)	-	-	-	-	-	-	-	-	-	-
TOTAL										
Liquid bulks	2,782	3,137	2,989	3,083	3,206	3,383	3,503	3,754	4,201	4,777
Dry bulks	1,230	1,284	1,366	1,471	1,584	1,706	1,839	2,306	3,031	3,997
Break bulks	472	253	329	339	349	359	370	398	463	552
Total: '000 tons	4,485	4,673	4,685	4,893	5,139	5,449	5,712	6,458	7,694	9,326
Containers ('000 TEU)										
Full	229	268	297	321	355	393	436	540	785	1,127
Empty	108	126	96	120	126	136	148	183	266	382
Transhipment	16	8	5	5	5	5	5	6	9	13
Total	353	402	398	446	486	534	589	729	1,060	1,522
Vehicles ('000 units)	52	56	61	67	73	80	87	112	165	242
Ferry passengers ('000)	745	799	819	839	860	882	904	973	1,101	1,246
Cruise passengers ('000)	-	-	-	1	1	2	4	8	12	23

Source: Update of Forecast Traffic Volumes for Dar es Salaam Port (TPA, 2011)[5]

[5] In 2012, the cargo handled at DSM port is 12.051 million tonnes

4.2.5 Relevant Issues

(1) Sharp Increase of Container Throughput

Dar es Salaam Port is the gateway for both the Dar es Salaam Development Corridor and the Central Corridor, handling liquid, dry bulk, break bulk cargoes, containers, and vehicles equivalent to almost 90% of Tanzania's import and export cargo. The port also links with the existing TAZARA and TRL railway lines.

Container traffic at Dar es Salaam Port has been increasing rapidly, as presented in Table 4.5. The average growth rate per year during 2001–2011 was 13%. In 2009, the container traffic at Dar es Salaam Port decreased from the previous year due to the global recession. However, container traffic recovered in 2010 and reached about 477,000 TEUs in 2011[6].

Table 4.5: Past Container Throughput at Dar es Salaam Port

Unit: TEU

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Import	68,921	73,090	90,135	105,594	115,215	121,471	160,100	180,654	167,578	209,560	235,553
Export	66,519	68,297	77,663	93,730	113,513	120,776	145,065	173,699	169,744	194,904	231,105
Transshipment	6,280	12,409	18,319	27,790	29,661	30,453	28,815	19,195	16,416	7,946	10,128
Total	141,720	153,796	186,117	227,114	258,389	272,700	333,980	373,548	353,738	412,410	476,786

Source: TPA

While analyzing the data, it should be noted that almost 60% to 65% of the export containers are empty. So, there is an unbalance between the import and the export volumes in terms of tonnage. Also, about 25% of the containers are for transit to landlocked countries.

In 2006, there were 30,000 containers transshipped at the port. However, the volume has been declining since then, possibly to avoid congestion at the port.

(2) Insufficient Container Storage

Dar es Salaam is expected continue to play an important role in Tanzania's seaborne trade in the future. However, the existing Dar es Salaam Port has almost reached its capacity considering the existing port facilities, especially the narrowly located container yard behind the quaywalls inside the port.

Originally, the capacity of the TICTS Terminal was set at 250,000 TEUs. In 2005, the actual handling volume surpassed the capacity. Currently, there are four ship-to-shore gantry cranes in Dar es Salaam Port for container handling along with another gantry crane that was to be installed in 2012. It is practically possible to increase the container handling productivity by installing additional quayside gantry cranes. [7]However, the problem is where to stock containers inside the port since the terminal is very small; even at present some spots behind the general cargo berths are used to stock containers.

(3) High Berth Occupancy Ratio

Berth occupancy ratio (BOR) is the percentage of time that a berth is occupied by a vessel. A high BOR indicates that the berth, or the terminal, has reached its limit, which results in a long waiting time for the vessels and, consequently, high demurrage costs. As shown in Table 4.6, BORs at the container terminal (TICTS) have been high for the last four years compared to the international standards of berth occupancy ratios of the United Nations Conference on Trade and Development (UNCTAD): BOR for one container berth, 50%; BOR for two container

[6] The throughput in 2012 is 547,364 TEUs.
[7] After two STS gantry cranes (SSGC) are delivered by 4th quarter of 2014. TICTS will reportedly have a total of seven SSGCs and 15 RTGCs in 2014.

berths, 65%, BOR for three container berths, 70%; and BOR for four or more container berths, 75 %.

Table 4.6: Berth Occupancy Ratios at Dar es Salaam Port

Unit: TEU

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Container Terminal	43.5	47.5	48.5	46.3	53.8	59.2	71.2	88.7	83.2	80.3	83.0
General Cargo Terminal	33.4	40.6	32.4	46.6	32.7	43.6	47.1	47.2	51.1	47.2	43.3
Overall	38.5	44.1	40.4	46.5	43.3	51.4	59.2	67.9	67.1	63.7	63.1

Source: TPA

(4) Long Dwell Times

The dwell time for containers is an important factor directly affecting the stacking capacity of containers at a terminal. The longer the dwell time is, the lower the stacking capacity will be when measured in terms of annual throughput. Historic dwell times for imported containers handled at Dar es Salaam Port are presented in Table 4.7, which shows a considerable increase in dwell time in 2008. However, since 2008, the dwell time has been decreasing as a result of efforts to move containers from the terminal to ICDs.

Table 4.7: Dwell Time for Import Containers at Dar es Salaam Port

Unit: Days

Year	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Tanzania	19.1	19.8	16.7	16.6	19.7	19.7	17.3	22.0	17.8	12.3	8.8
Zambia	16.3	10.4	13.5	19.0	19.6	19.7	19.8	32.7	19.5	17.2	19.7
Burundi	12.6	10.4	14.6	23.8	36.3	32.9	30.4	31.8	19.3	18.5	16.3
Rwanda	13.8	11.4	12.8	17.5	29.2	24.4	19.3	27.3	13.8	11.9	13.1
DR Congo	30.5	13.1	13.3	18.2	28.1	28.5	26.3	33.3	25.0	18.2	19.1
Malawi	5.1	6.3	8.0	11.6	21.1	20.7	22.7	38.6	25.4	15.3	20.5
Uganda	11.3	10.6	12.2	15.9	32.5	20.3	13.5	23.3	26.7	16.8	14.1
Overall	16.7	16.7	17.0	17.1	20.2	22.2	19.8	25.4	18.8	13.9	11.5

Source: TPA

4.2.6 Strategies for Seaport Development

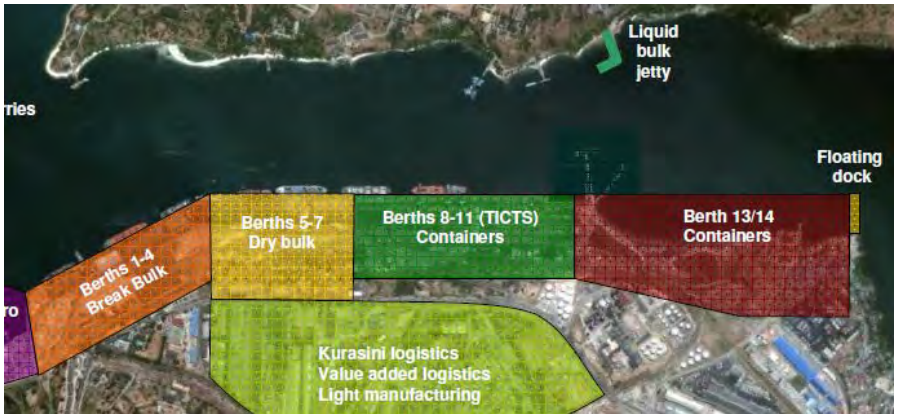
(1) Development of Dar es Salaam Port

Berths 13 and 14

a) Present Status

Construction of two additional container berths (13 and 14) has been considered as a solution to the current congestion and to meet future growth in container handling at Dar es Salaam Port. Berths 13 and 14 are situated south of the existing TICTS Terminal as shown in Figure 4.4; therefore, the present Kurasini Oil Jetties (KOJ) should be relocated to another place or their trestles should be shortened for navigational and operational safety and to assure minimum disruption of port operations during construction[8].

[8] The KOJ will remain where they are at present, according to TPA.



Source: TPMP

Figure 4.4: Location of Berths 13 and 14

b) Capacity

Berths 13 and 14 will have an overall quay wall length of 750 m with a target vessel size of 50,000 DWT maximum. Assuming three quayside gantry cranes per berth are employed for container handling, with each crane having a handling capacity of 25 boxes per hour and the container vessel having a handling capacity of 75 container boxes per hour, about 100 TEUs can be loaded/unloaded at the new container berth. However, this calculation is only for the productivity of the quayside and does not take into consideration any landside capacity, such as in the container yard. The handling capacity of a container terminal primarily depends on the following three activities: Handling capacity at berth using quayside cranes or ship's gears; stacking capacity in the container yard; and dwell times of containers in the container yard.

Berths 13 and 14 can receive a maximum of 650,000 TEUs of containers and, therefore, Dar es Salaam Port can handle 1.2 million TEUs of containers in total and will reduce bottlenecks in Dar es Salaam Port accordingly.

c) Implementation Schedule

The feasibility study and design for development of Berths 13 and 14 were prepared by a Chinese contractor in 2010; the environmental impact assessment (EIA) was also completed and certified in the same year. Originally, the construction of berths 13 and 14 was to commence in 2009, according to the Port Master Plan. However, since the loan agreement was delayed, the construction of Berths 13 and 14 is not expected to start until 2013. The construction of the two berths will take about three years[9].

Meanwhile, further expansion to the west bank of the creek (next to Berths 13 and 14) would be possible. However, substantial dredging would be required due to the shallow depths of the expansion area. Also, port development on the Kigamboni side, opposite the existing port, may be considered another option for further expansion, especially considering that construction of a bridge connecting the Dar es Salaam Port site and Kigamboni is now under construction; however, expansion of the port on the Kigamboni side was rejected in the TPA Master Plan considering traffic congestion in the metropolitan area and the JICA Study Team concurs with that conclusion[10].

[9] In February 2014, the construction of Berths 13 and 14 has not been commenced.
[10] According to the World Bank's "Tanzania Economic Update" May 2013, one of the key proposals addressed by the concerned organization including TPA is to update the master plan for new capacity requirements, including study on new terminals at Vijibwen/Kigamboni, Tanga and Bagamoyo.

Cargo Handling System

Dar es Salaam Port acts as a gateway, not only for Tanzania, but also for neighbouring landlocked countries (Zambia, Democratic Republic of Congo, Burundi, Rwanda, Malawi, and Uganda). Table 4.8 shows the imported container volumes during 2007–2011 at Dar es Salaam Port, by destination country[11].

Table 4.8: Number of Containers Imported at Dar es Salaam Port (TEUs)

	2007	2008	2009	2010	2011
Tanzania	95,754	114,718	118,293	138,849	153,072
Zambia	17,930	14,838	11,133	17,017	23,792
DRC	16,791	18,862	12,432	26,856	30,268
Burundi	14,191	18,285	8,006	9,575	9,567
Rwanda	5,977	7,398	13,196	11,552	13,519
Malawi	2,513	2,005	1,391	2,599	2,948
Uganda	2,543	2,126	1,282	1,758	1,087
Others and Empty	4,401	2,422	1,845	1,354	1,300
Total	160,109	180,664	167,586	209,570	235,565

Source: TPA

TPA managed to resolve the issue of long dwell times for import containers since congestion at Dar es Salaam Port became serious in 2005. As shown in Table 4.9, dwell times for import containers improved over the last few years because of the implementation of various countermeasures (e.g., additional ICDs, installation of a new cargo handling equipment, application of a higher tariff system for container storage).

Table 4.9: Handling Volume, Dwelling Time, and Berth Occupancy

	2007	2008	2009	2010	2011
Container (boxes)	223,256	253,796	248,009	294,384	339,903
Dwell time (days)	19.8	25.4	18.8	13.9	11.5
Berth Occupancy (%)	71.2	88.7	83.2	80.3	83.0

Source: TPA

Container handling volume at Dar es Salaam Port is projected to steadily increase as a result of economic development in Tanzania and the neighbouring landlocked countries[12]. Consequently, the following improvement measures should be implemented for efficient cargo handling:

- At present, the capacity of the existing container yard is not sufficient to meet increased handling volumes in the future (see Photo 4.1). Therefore, in order to maximize utilization of the yard space, several dispersed small yards should be consolidated and the old sheds should be renovated to expand the yard space[13].
- Inventory data/information on ICDs should be consistently updated by use of an electronic data interchange (EDI) system. To effectively utilize space, some of the import containers should be moved to ICDs, as swiftly as possible, based on the updated information.

[11] The total import containers including transit at DSM port is 281,301 TEUs in 2012.
[12] DRC is included.
[13] TPA called for EOI in April 2013 for "Strengthening and Deepening of Berth 1-7 and Construction of RoRo Berth" on EPC contract basis.

- Cargo handling equipment for break bulk and dry bulk cargo at the General Cargo Berths should be timely rehabilitated to improve the efficiency of loading and unloading operation[14].
- When the new container berths 13 and 14 are operational, Berths 1–7 should be exclusively used for dry bulk and break bulk cargo handling[15].

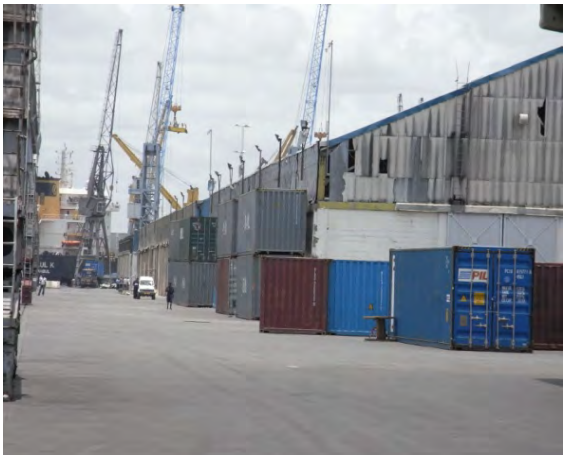


Photo 4.1: Scattered Containers in the Yard

(2) Inland Container Depot Development

As mentioned, the container yards are currently unable to accommodate the rapidly increasing container traffic in the existing Dar es Salaam Port, even though dwell times for imported containers have decreased over the years. Once Berths 13 and 14 are operational, a maximum of another 650,000 TEUs of containers will be handled at the new terminal; however, it will be difficult to create sufficient yard space inside the terminal for the containers. Consequently, there will be a need to secure ICDs outside of Dar es Salaam Port.

The solution is to shuttle containers between Dar es Salaam Port and the Kisarawe ICD by rail. All containers between Dar es Salaam Port and the ICD are planned to be transported by rail using both rail systems, but some transport by truck can also be expected. Inland transport to/from the neighbouring landlocked countries will be by road and rail.

A pre-feasibility study conducted as part of this project reviewed a number of potential sites and collected data on the land, the condition of infrastructure, connectivity to road and rail, and social/environmental aspects. The criteria applied to identify the most suitable site included:

- availability of land;
- accessibility;
- market demand for the container freight station (CFS);
- social and employment issues;
- proximity to service providers;
- construction cost;

[14] TPA called for EOI in April 2013 for "Installation of Conveyor Belts for bulk cargo handling" on EPC contract basis.

[15] In March 2013, INROS LACKNER AG submitted the final report titled "Modernizing Berths 1–7." The report proposed Berths 1–7 be developed, from the north, as Break bulk Terminal (1 berth), Fertilizer/Cement Terminal (1 berth), Grain Terminal (1 berth) and Container Terminal (2 berths). It also proposed a RoRo Terminal be constructed at the north of Berth 1.

- safety; and
- environmental conditions at the site.

The planned Kisarawe Freight Station (KFS) is located 11 km north of the town of Kisarawe and 2 km south of Morogoro Road, as shown in Figure 4.5. Figure 4.6 presents the proposed layout of the KFS.

Source: Feasibility Study for Kisarawe ICD

Figure 4.5: Location of the Planned KFS

The following principal facilities are required:

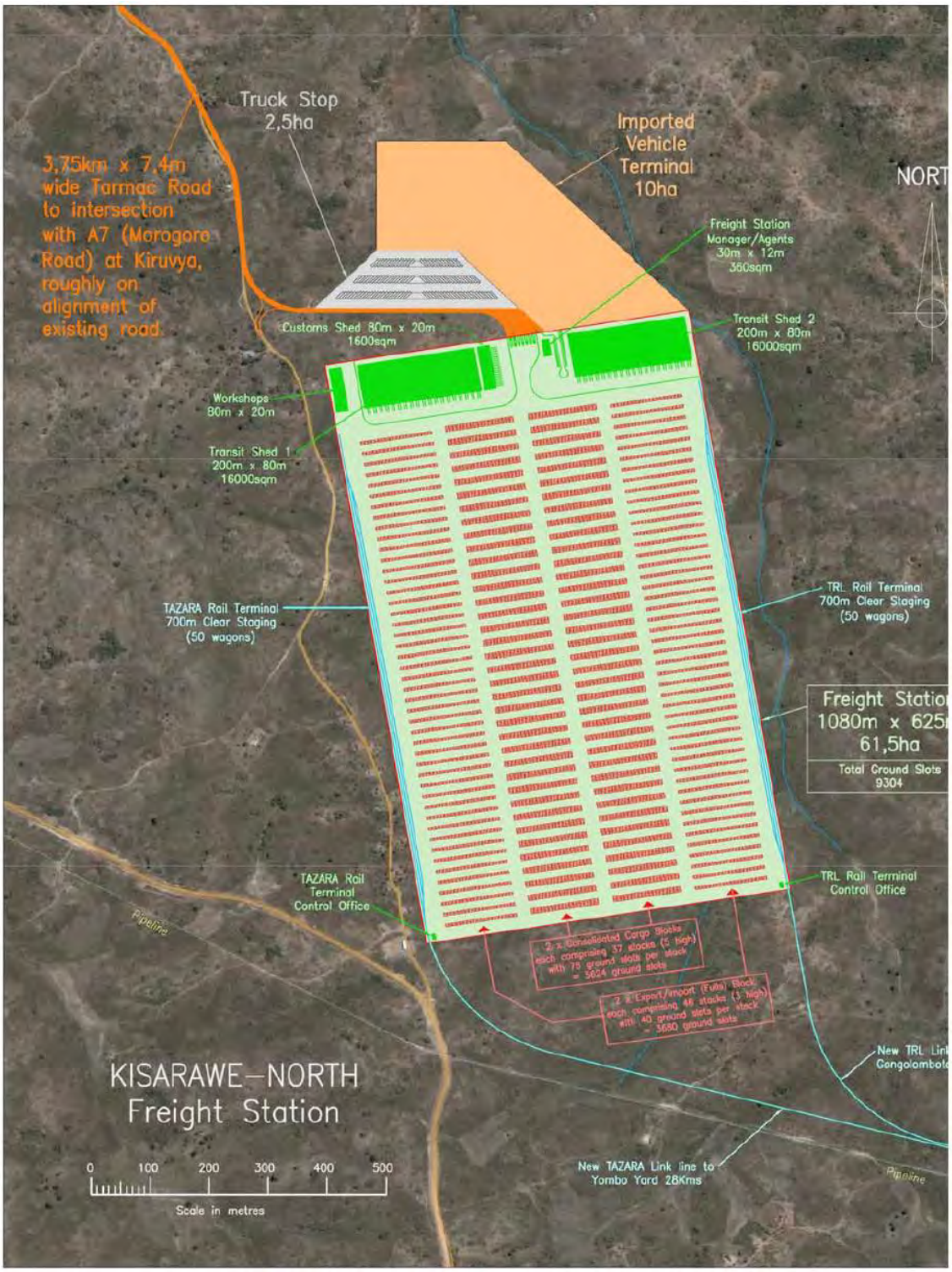
- container stacking area;
- rail loading/offloading lines for both TAZARA and TRL;
- CFS sheds;
- an import vehicle park;
- a truck stop/waiting area outside the terminal;
- access control gates for both the container and vehicle terminals;
- offices and staff facilities; and
- a workshop for equipment maintenance.

The terminal is designed to be operated with reach stackers for vertical lifts and terminal tractors for horizontal transport of containers. To provide optimum flexibility, full containers for import and export are to be stacked in blocks, two containers wide and three containers high. Empty containers are to be stacked in blocks, four containers wide and five containers high. Provision is also to be made for reefer (refrigerated) containers.

A total of 9,092 terminal ground slots (TGS) is to be provided as detailed below:

- Tanzanian imports: 2,853
- Transit imports: 1,232
- Tanzanian exports: 1,223

- Transit exports: 808
- Reefers: 90
- Empties: 2,886



Source: Pre-Feasibility Study for KFS

Figure 4.6: Proposed Layout of the KFS

(3) New Port Development (Bagamoyo–Mbegani)

As presented in the previous sections, cargo traffic at Dar es Salaam Port is expected to increase at growth rates higher than those for gross domestic product growth for Tanzania and landlocked countries. To cope with such increasing traffic demand at Dar es Salaam Port, there will be an inevitable need to construct a new port in the vicinity of Dar es Salaam since the existing Dar es Salaam Port is expected to reach its capacity by 2020 the construction of berths 13 and 14 notwithstanding.

Background

The Government of the United Republic of Tanzania intends to implement a multi-sectoral project in Mbegani, south of Bagamoyo town, comprised of: (i) an export processing zone (EPZ), (ii) an ultramodern deep-sea port, (iii) a road and railway transport system, and (iv) an airport.

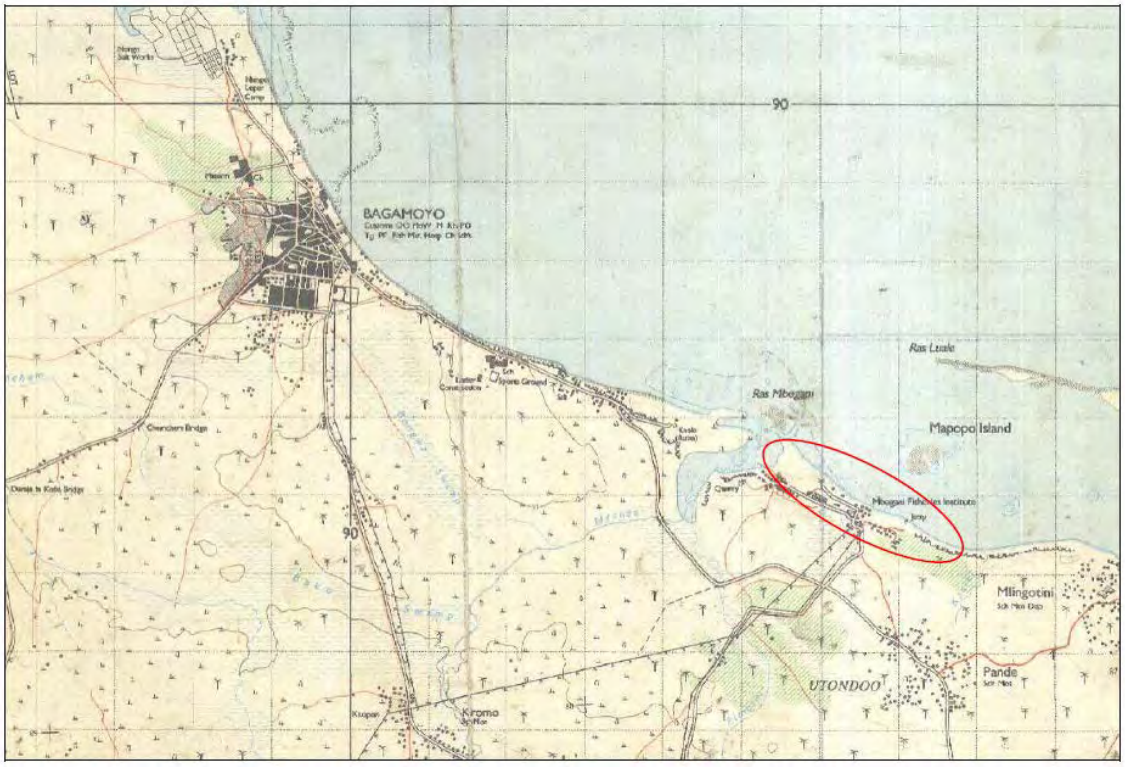
Hamburg Port Consulting GmbH conducted a feasibility study for the proposed port at Mbegani–Bagamoyo in 2009-2010, addressing the following factors:

- physical conditions at the proposed site;
- market and competition analysis;
- development perspectives for Mbegani–Bagamoyo;
- required port facilities at Mbegani–Bagamoyo;
- preliminary port layout plans;
- preliminary engineering design;
- financial and economic analysis on the project level;
- public private partnership; and
- possible environmental and socio-economic impacts.

In the short to medium term, capacity expansion of Dar es Salaam Port is to be within the existing port perimeter (or "footprint") predominantly. Once this extended capacity is exhausted, surplus traffic is to be handled at two new port developments sites, Mbegani–Bagamoyo and Mwambani Bay (near Tanga). The former is to be developed for the handling of containers and vehicle imports, while the latter will serve all Northern Tanzania cargo including dry bulk, break bulk, and limited container volumes.

Physical Conditions of the Proposed Mbegani–Bagamoyo Port

The proposed location for the new port at Mbegani-Bagamoyo is about 7 km east of Bagamoyo and west of Mlingotini Village along Luale Bay, as shown in Figure 4.7. Mapopo Island is located inside Luale Bay. The Mbagani Fisheries Development Centre is located at the proposed site of the new port and so, will need to be relocated.



Source: Feasibility Study of Proposed Port at Mbegani-Bagamoyo

Figure 4.7: Location of Mbegani–Bagamoyo New Port

Photographs of the location of Mbegami–Bagamayo Port are presented below (Photo 4.2 and 4.3). They were taken at the jetty of the Mbegani Fisheries Development Centre in October 2011. The proposed new port area is well protected from eastern waves by Lazy Lagoon Island, which functions as a natural breakwater and provides calm water inside the lagoon.

Photo 4.2:
Proposed New Port Location

Photo 4.3:
Lazy Lagoon Island

Although there is no natural deep-water access to Luale Bay, a natural channel, with maximum water depths of 8–9 m below channel depth and a width of 150–250 m, passes between Mapopo Island and Ras Mbegani and ends up in the vicinity of the pier of the Mbegani Fisheries Centre. Water depths drop considerably outside this channel with very shallow areas in the bay that fall dry during low spring tides.

The proposed new port has a tidal fluctuation of 4.5 m, which can be used for vessels entering the access channel. A survey in February 2010 found that maximum velocities are 0.8–1.3 m/s within the natural channel and 0.4–1.0 m/s in the vicinity of the shoreline.

There is a modern two-lane asphalt road connecting Bagamayo with Dar es Salaam. From the proposed port site, a local asphalted road (about 5 km) in poor condition connects with Bagamoyo Road.

Development Perspectives

The planned new port at Mbegani–Bagamoyo is a good location with significant growth potential for container and vehicle handling, as shown in the strengths, weaknesses, opportunities, and threats (SWOT) analysis presented in Table 4.10.

Table 4.10: SWOT Anlaysis for Mbegani–Bagamoyo Port

Strength	Weakness
1. Good navigational access with 13-15m draught after dredging 2. Sufficiently long berths for large 8,000 TEU vessels 3. New state of the art container terminal with ideal layout and modern equipment 4. Sufficiently container storage capacity close to the berths 5. The best location compared with other alternative potential port locations in Tanzania outside DSM 6. Modern facilities for handling of vehicles 7. Offers additional port capacity close to the economic centre Dar es Salaam with large expansion possibilities	1. Require substantial dredging and reclamation by use of dredged material in an environmentally sensitive area 2. All auxiliary infrastructure must be newly created 3. Road and railway connections must be upgraded and newly constructed 4. Difficult to get a good rail connection to the TAZARA railway line to Zambia
Opportunities	**Threats**
1. Economic Development Zone planned which is expected to attract new investments in logistics and production facilities 2. Will encourage the decentralization of commercial activities from Dar es Salaam 3. The development of a custom-built satellite port at 50-100 km distance from the commercial city centre offer large development potentials 4. Possibility to develop to a transshipment hub 5. Integrated development of the port and infrastructure through cooperation between ministries, municipality and stakeholders	1. Risk that major shipping line will not move to the new port initially ("Old habits die hard") 2. Mombasa Port has comprehensive expansion plans with planned investments in two new container terminals and then Mombasa Port might gain improved access to the Burundi market 3. Planned upgrading of infrastructure in the region (rail in Kenya and highways and rail projects in Mozambique) can result in better connectivity of competing ports

Source: Final Report of the Feasibility Study of a Proposed Port at Mbegani–Bagamoyo

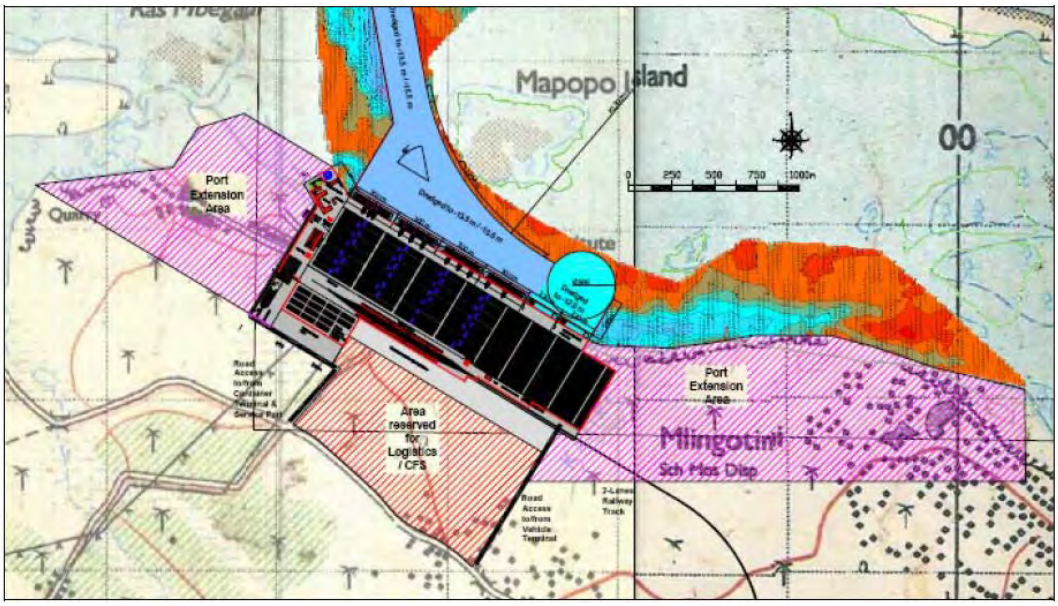
Dar es Salaam Port will reach a maximum capacity of 1.2 million TEUs once Berths 13 and 14 are developed with optimized yard handling. The base case forecast is for container traffic to reach 1.2 million TEUs in 2020, which indicates that the proposed new port at Mbegani-Bagamoyo should be operational by then.

New Port Development at Mbegani–Bagamoyo

The planned new port at Mbegani–Bagamoyo was selected from some alternative sites and the layout of the port was prepared with due consideration of the need to minimize dredging costs and secure calm waters in front of the new berths. The originally planned location has been shifted in order to minimise the dredging volume.

The alignment of the access channel starts northeast of Lazy Lagoon Island with natural water depths of 15–16 m. A dredging volume of 16.5–21.6 million m^3 (including the harbour basin, and depending on the intended access channel depth) is expected. Also projecting the future maintenance dredging volume is important to estimate the expected maintenance costs although it was not estimated by use of numerical simulations, which would be crucial in the subsequent feasibility study.

Figure 4.8 presents the proposed layout of the new port.



Source: Final Report of the Feasibility Study for the Proposed Port at Mbegani–Bagamoyo

Figure 4.8: Location of Proposed New Port at Mbegani–Bagamoyo

Table 4.11 shows the port facilities and equipment requirements envisaged for the proposed new port at Mbegani–Bagamoyo.

Table 4.11: Port Facilities and Equipment

Facilities/Equipment	Dimensions/System	Remarks
Channel	Length	4,460 m
	Width	230 m
	Depth	−15.5 m CD
Outer Turning Basin	Diameter	560 m
Container Berth	Depth	−14.5 m CD
	Length of one berth	300 m
Ro-Ro Berth	Depth	−12.0 m CD
	Length of one berth	220 m
Service Berth	Depth	−4.0 CD
	Length	200 m
Tugboat	Bollard Pull	45 to 55 tonnes
Ship-to-Shore Container Crane	Type	Post Panamax
Full Container Stacking	Rubber-Tyred Gantry Crane	16 wheel
	Container Stacking Height	One over five
	Rows within Portal	Seven plus one
Empty Container Handler	Stacking Height	Five

Abbreviation: CD = channel depth
Source: Final Report of the Feasibility Study for the Proposed Port at Mbegani-Bagamoyo

The required quay-wall length for Phase I (2020–2024) is about 1 km, which includes two container berths (300 m × 2), one Ro-Ro berth (220 m × 1), and one ancillary craft berth (200 m × 1). Phase II (2024–2028) and Phase III (2028–2030) will require additional quay-wall lengths of 1,320 m for five berths and 1,620 m for seven berths, respectively. Figure 4.9 shows the proposed layout of the New Port Mbegani–Bagamoyo.

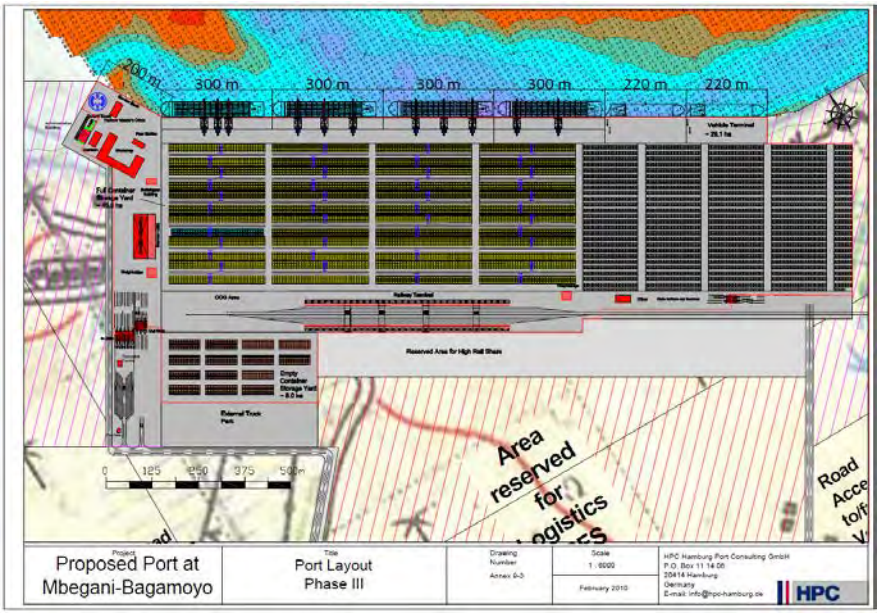


Figure 4.9: Proposed Layout of New Port at Mbegani–Bagamoyo

The New Port is expected to be expanded phase-wise to meet future traffic demand. The Ro-Ro berths are situated next to the container berths. It was planned that the Ro-Ro berths would be replaced by the new container berths when expanded in the next phase. However, the design vessels and loading conditions are different and the yard utilization is also different. Therefore, the orientation of the berth layout should be modified.

Project Costs

Due to insufficient geotechnical information, the feasibility study could not provide recommendation on the preferable quay-wall structure, concluding that additional soil investigations are required to obtain more reliable soil information.

Table 4.12 presents dredging and civil works construction costs estimated based on available information and facility requirements based on the demand forecast.

Table 4.12: Costs of Dredging and Civil Works

Unit: USD million

	2017–2019	2023–2024	2027–2028
Dredging (−15.5 m)	186.5	11.9	23.8
Dredging (−13.5 m)	150.1	10.4	23.8
Berths	79.5	27.5	47.7
Terminal Yard	174.4	86.9	103.8
Building and Facilities	21.9		0.8
Total (dredging −15.5 m)	462.3	126.4	176.1
Total (dredging −13.5 m)	425.9	124.9	176.1

Source: Final Report of the Feasibility Study of the Proposed Port at Mbegani-Bagamoyo

Dredging works, which relate to channel depths, account for about 30% of the total investment cost in the first four project years (2017–2020). A piled deck type quay-wall structure was assumed. It was also assumed that dredging/construction will start in 2017 to ensure commencement of port operation in 2020.

Other cost items including land acquisition, navigation aids, watercraft, and land equipment (e.g., cargo handling equipment) were estimated along with operating costs, including maintenance/renewal, repair, and administration expenses. However, the new port development at Mbegani–Bagamoyo should be implemented in association with the railway development, connecting to the existing railway and railway siding inside the container terminal plus access road development to the existing Bagamoyo and Morogoro Roads.

Public Private Partnership[16]

A PPP should be applied in developing the new port at Mbegani–Bagamoyo by splitting investments, responsibilities, and activities between TPA and a private operator in order to reduce public investment. There would be three main objectives of the PPP:

- Reduction of the financial burden on the public sector, in particular on the central government, through use of private sector resources to replace those of the public sector with the aim of generating increased revenue for the government and the participating private entity;
- Improvement of the management capability and deployment and transfer of advanced technology with the aim of improved productivity and increased efficiency; and
- Enhancement of the quality of service offered to users and, hence, reduction of the costs associated with cargo clearance.

It was recommended that TPA should privatise some port facilities via a lease scheme. The lease option is recommended since TPA will need to retain some key functionalities and operations for both the national interest and revenue generation for further development of ports in Tanzania.

TPA should be responsible for the investment and maintenance of:

- all marine structures[17], i.e., the access channel, harbour basin, and aids to navigation; and
- quay wall and all land infrastructure including public services, roads, and storage area pavements, buildings, and fences.

Also, the following marine operations are recommended to come under TPA:

- tugs and towage;
- pilotage; and
- mooring/berthing.

It is proposed that the private company will acquire, maintain, and operate at its own cost all landside equipment, including:

[16] In March 2013, Tanzania and China signed an agreement for China to finance a port and other infrastructure projects at Bagamoyo. TPA and its Chinese counterpart are reportedly discussing the development details of the port and the port will be operated by an entity jointly made by a Chinese company and TPA.
[17] It is reported that the Chinese finace does not cover the marine structure.

- ship-to-shore gantry cranes;
- container tractors and trailers;
- rubber-tyred gantry cranes;
- empty container handlers;
- reach stacker; and
- forklifts.

In addition, considering the preliminary recommendations above, more in-depth study on a possible public private partnership should be implemented.

Environmental Considerations

Since the site for the proposed new port at Mbegani–Bagamoyo is considered an ecologically sensitive area because of coral reefs and mangroves, the construction of a new port on the site requires a full EIA. So that this EIA process can be of maximum benefit, it should be incorporated into the planning process at the earliest possible stage, i.e., as soon as the project is shown to be feasible. The EIA study should ensure that

- relevant natural resources, inhabitants, and ecosystems likely to be affected are identified;
- major issues and the most serious impacts and their timescale are considered (both during construction and operation); and
- direct, indirect, and cumulative impacts are identified and any particularly vulnerable groups or species (e.g., coral reefs), both in the project area and in the surrounding area, are highlighted.

In particular, issues to be assessed in the EIA include:

- resettlement or relocation;
- coastal change;
- traffic issues;
- marine ecosystems; and
- tourism and cultural sites.

Also, all necessary mitigation measures should be described in the EIA as well as possibilities to incorporate them into the project's design or realisation. Furthermore, the EIA should set out the monitoring and evaluation activities that are required to ensure that mitigation measures are implemented and ecological problems are avoided. In the following study, more options should be prepared and compared considering the scale of the new port development at Mbegani–Bagamoyo.

(4) Other Ports Development

Mwambani Port Development Project[18]

Since Tanga Port is located near the city centre and houses, and since municipal facilities are located adjacent to the port, very limited expansion is possible. Development of large-scale port operations very close to the city centre would increase city traffic with consequent negative environmental impact.

[18] In April 2013, TPA called for EOI for "Development of new deeper port at Mwambani bay" on BOT contract basis.

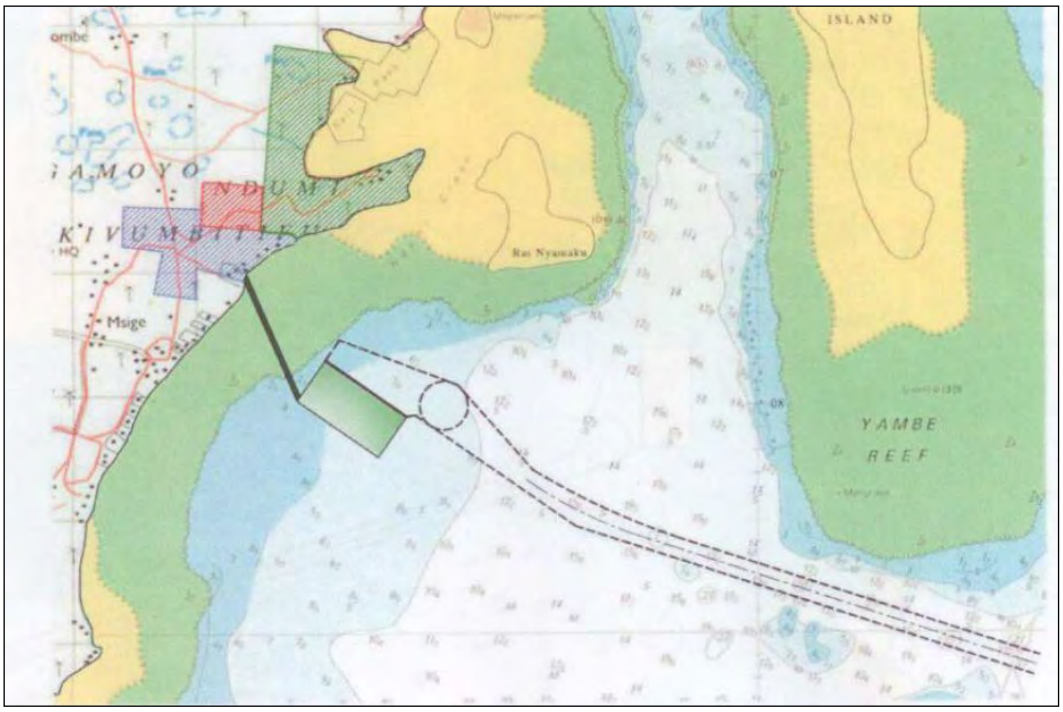
Upgrading the existing port to accommodate direct calls would require deepening of the port to −12 m (CD) in navigational areas and −13 m (CD) at the berth. However, further deepening of the existing Tanga Port would be costly although it is technically possible. Moreover, rock material is reported at a depth of −7 m (CD), which would require rock dredging with high costs.

The Tanzania Ports Master Plan in 2009 recommended that a new port be constructed in Mwambani Bay to the south of Tanga for general cargo, dry bulk cargo, and containers, mainly to serve Northern Tanzania. Also, it should be noted that cargo movement in Northern Tanzania from/to Mombasa will be expected to increase in the future considering that a container terminal at Mombasa Port is under development and the Arusha–Voi Road will also be constructed.

One site under consideration for the new port is located about 6 km south of the existing Tanga Port. A feasibility study is currently being carried out by a UK-based consulting firm to assess the proposed new port's economic, financial, social, technical, and environmental viability. This study is examining 19 options to prepare a suitable layout for the new port taking into account the following considerations:

- distance from land;
- wave disturbance at berth;
- dredging requirement;
- reclamation;
- location along shoreline'
- marine areas; and
- intertidal zone.

The interim report of this study concluded that the option shown in Figure 4.10 is the most suitable site and plan based on current circumstances.



Source: Interim Report of the Feasibility Study for the Proposed Port at Mwambani

Figure 4.10: Proposed Option for New Mwambani Port

Mtwara Port Expansion[19]

From a geological perspective, the hinterland of Mtwara Port is endowed with tremendous mineral wealth including iron ore reserves (31 million tonnes assumed) at Liganga and coal at Muchuma (377 million tonnes assumed).

A coal-fired power plant is planned by TANESCO. An iron ore deposit is to contribute to establishing domestic iron and steel related industries (most steel products are currently imported). Recently, exploitation of these mineral resources has become commercially attractive even taking into account the costs of railway construction.

In addition to exploitation of the natural resources mentioned above, the following projects are also proposed for the corridor.

- Gas pipeline and gas-related infrastructure;
- Fertilizer;
- Cement;
- Ship breaking industry;
- Large-scale agro-business;
- Other mineral products – uranium, nickel;
- International transit cargo;
- Forest products (woodchip/pulp)
- Fish farm and processing facility;
- Eco-hotels and tourism;
- Gypsum mining and processing plant;
- Marble mining and processing; and
- Petrochemical industries.

TPA has provided a concession for part of the Mtwara Port facilities to a company that has a production sharing agreement with the Government of Tanzania to conduct oil and gas exploration activities in the areas offshore of Mtwara. The company, in partnership with the Tanzania Petroleum Development Corporation, has established an oilfield supply base to conduct deepwater drilling operations. The use of Mtwara Port as an oil supply base will significantly increase the utilization of Mtwara Port, which is currently underutilized. It will boost revenue and traffic through Mtwara Port and, eventually, lead to the use of Mtwara Port by other companies prospecting for oil in the Indian Ocean. New bulk cargoes such as cement, coal, and iron ore are projected to reach about 25 million tons in 2030 while about 41,000 TEUs of containers are expected. (The bulk cargo traffic would be realized upon the construction of railway from the inland reserves to Mtwara Port.)

A feasibility study to establish the requirements of Mtwara Port as a critical node in the Mtwara Development Corridor (MtDC) initiative is being conducted by a UK-based consultant at present. The outcome of the study will address the following issues in relation to the future development of Mtwara Port:

- Integration of major projects along the MtDC with the port development within short-, medium-, and long-term horizons;

[19] In April 2013, TPA called for EOI for "Construction of Four (4) additional berths" and "Development of Portside (Free Zone)" on BOT contract basis. According to "Project Information" prepared by TPA, these projects are initiated by the development of the offshore gas field.

- Development of the port as a gateway for the Southern African Development Community (SADC) member countries of Mozambique, Malawi, and Zambia under the MtDC;
- Management and operational improvements; and
- Completion of a master plan for 2,650 ha owned by TPA earmarked for an export development zone.

4.2.7 Mitigation Measures for the Impact on Environment and Social Consideration

The SEA survey was conducted, and impact on environment and social considerations has been evaluated in this study. Table 4.13 shows the potential impact on each component.

Table 4.13: Potential Impact of the Seaport Project on Each Component

COMPONENTS / POTENTIAL IMPACTS	Total Score	Biodiversity, Flora and Fauna	Population, Health & Safety	Soil	Water	Air	Climatic Factors	Material Assets	Cultural Heritage	Landscape
Reduced cargo condition and increased handling capacity	3		3							
Faster movement of freight / cargo due to reduced dwell time	3		3							
Increased access to domestic and external markets	3		3							
Increased access to social services	3		3							
Resettlement of people and loss of due to land acquisition	-6		-3					-3		
Destruction of natural vegetation	-3	-3								
Landscape alteration due to reclamation works	-3									-3
Increased water pollution due to construction activities	-2				-2					
Soil disturbance and pollution due to construction works (new sea ports)	-2			-2						
Increased emission of GHG due increased number of large ships	-5					-3	-2			
Destruction of cultural sites and recreational areas	-2								-2	
Creation of employment and income generation opportunities	3		3							
Rise in health and safety risks	-1		-1							

Note: the level of evaluation is categorised as follows. -3; High -Ve impact, -2: Medium -Ve impact, -1: Low -Ve impact, 0: Neutral or Negligible impact, 1: Low +Ve impact, 2: Medium +Ve impact, 3: High +Ve impact

It is noteworthy that there are high negative impacts in terms of resettlement and land acquisition, and emission of GHG due to increase in the number of large scale shipment. Meanwhile, there is high positive impact of increased efficiency of freight transport, access to social services and creation of employment.

Considering the above listed evaluations and further details on the impact of the seaport project on specific areas described in chapter 10, the following mitigation measures need to be taken into account to implement sea port development.

1. Avoid landscapes with special or unique characteristics.
2. Minimize soil erosion through good construction practices and restoration of disturbed areas
3. Follow safeguard policies of World Bank and JICA on Involuntary resettlement
4. Avoid development activities within ecologically valuable natural vegetation and environmentally sensitive areas.

4.2.8 Project Sheets for Selected Projects

In summary, the following projects have been proposed in the seaport sector:

Short Term Projects:

1. Development of New Container Terminal (Berths 13 and 14)
2. Establishment of a Cargo Freight Station (CFS) at Kisarawe
3. Strengthening/Upgrading of General Cargo Berths 1–7 and Modernization of General Cargo Operation

Medium and Long Term Projects:

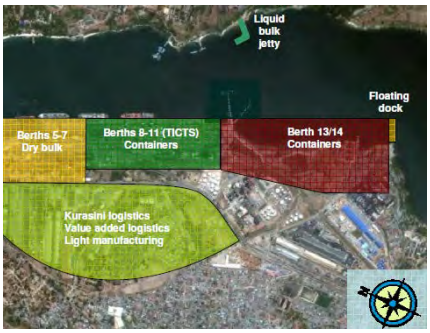
1. Development of New Port at Mbegani–Bagamoyo
2. Development of Deep Water Port at Mwambani Tanga
3. Expansion of Mtwara Port

Detailed project descriptions are presented in Table 4.14 to 4.19.

Table 4.14: Development of New Container Terminal (Berths 13 and 14)

Project Name		**Development of New Container Terminal (Berths 13 and 14)**
(1)	Location (Project Area)	Dar es Salaam
(2)	Executing Agency	Tanzania Ports Authority (TPA)
(3)	Background	Dar es Salaam Port has been experiencing congestion due to growth in containerized traffic and the narrow terminal, which limits development of container stock yards. Dar es Salaam Port handles not only Tanzanian domestic cargo but also transit cargo for landlocked countries. Therefore, expanding the capacity of Dar es Salaam Port has been a pressing need to accommodate future cargo growth.
(4)	Type of Project	Construction of new berths Dredging of access channel
(5)	Objectives	To increase cargo handling capacity and productivity To serve post-Panamax size vessels To develop the container yard
(6)	Proposed Work Components	Two new container berths (13 and 14) Reclamation for container yard development Dredging of the existing access channel (widening and deepening)
(7)	Project Justification	Containerized traffic at Dar es Salaam Port has been increasing at average annual growth rates of 13% over the last 10 years (2001–2011). With development of a new container terminal, the capacity of Dar es Salaam Port will increase and ship waiting times and dwell times will decrease. Larger vessels importing and exporting containers with reduced sea transport costs will be able to use the port.
(8)	Project Timing	Short term
(9)	Implementation Work Duration	3 years
(10)	Total Project Cost	USD 524 million
(11)	Implementation Scheme	TPA/Loan A concessionaire will be selected to operate the new terminal. The private sector will participate in implementation of the project providing partial financing.
(12)	Investment Plan	The Government of the People's Republic of China is expected to finance 85% of the total construction costs.
(13)	Donor Funds	Government of the People's Republic of China
(14)	Land Acquisition	No resettlement will be needed.
(15)	Environmental Impact	Low (there will be almost no air/water quality problem and no waste material generated)
(16)	Social Impact	Low
(17)	EIA Status	Completed and certificate granted on 22 November 2010
(18)	Expected Benefit	Increase cargo handling productivity Reduce ship waiting time Reduce sea transport cost Reduce dwell time
(19)	Documents Available	N.A.
(20)	Connection with Other Modes	Connection with truck transport: cargo transfer and vehicle movement verification procedures need to be designed to minimize delay. A railway connection from the port to the planned new ICD should be established to order to secure sufficient space for container storage.

Project Location Map



Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 4.15: Establishment of Cargo Freight Station (CFS) at Kisarawe

Project Name	**Establishment of Cargo Freight Station (CFS) at Kisarawe**	
(1)	Location (Project Area)	Dar es Salaam
(2)	Executing Agency	Tanzania Ports Authority (TPA)
(3)	Background	There is an urgent need to increase backup services to support the projected traffic growth and relieve congestion at Dar es Salaam Port. Also, Dar es Salaam Port is serving an increased volume of car imports. Even though a multi-story car park building is expected to be built at the port, it is hardly sufficient to accommodate projected traffic in the future.
(4)	Type of Project	Construction of a new CFS
(5)	Objectives	To facilitate decongestion of Dar es Salaam Port and the City To expand/extend Dar es Salaam Port
(6)	Proposed Work Components	Container Freight Station Connection with TRL and TAZARA lines
(7)	Project Justification	Containerized traffic at Dar es Salaam Port has been increasing at an average annual growth rate of 13% over the last 10 years (2001–2011). Even if Berths 13 and 14 are constructed in the near future, the shortage of container yard space at the port will still be a problem. Constructing a cargo freight station outside of the port can ease congestion and meet future containerized traffic demand.
(8)	Project Timing	Short term
(9)	Implementation Work Duration	4 Years
(10)	Total Project Cost	USD120 million
(11)	Implementation Scheme	PPP
(12)	Investment Plan	N.A.
(13)	Donor Funds	No commitment
(14)	Land Acquisition	N.A.
(15)	Environmental Impact	Low (almost no air quality problem, no waste material generated)
(16)	Social Impact	Low
(17)	EIA Status	N.A. (an EIA has not been carried out yet)
(18)	Expected Benefit	Create additional storage space for containers and vehicles Reduce dwell times Decongest in roads in the DSM area Improve ship turnaround time Provide a cost-effective transport logistic chain
(19)	Documents Available	Prefeasibility study and a review of PPP options and recommendations concerning the optimum option for establishment of a Container Freight Station in Dar es Salaam
(20)	Connection with Other Modes	Connection with the TRL and TAZARA lines

Project Location Map

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 4.16: Strengthening/Upgrading of General Cargo Berths 1–7 and Modernisation of General Cargo Operation

Project Name	**Strengthening/Upgrading of General Cargo Berths 1–7 and Modernisation of General Cargo Operation**	
(1)	Location (Project Area)	Dar es Salaam
(2)	Executing Agency	Tanzania Ports Authority (TPA)
(3)	Background	Dar es Salaam Port has 11 berths. Berths 8 to 11 serve as a container terminal operated by **Tanzania International Container Terminal Services Ltd** (TICTS) while the rest are for general cargo handling. Berth 8 is now used for the container terminal, and this has reduced the number of berths available for handling general cargo. Thus, the existing General Cargo Berths 1–7 serving bulk traffic should be strengthened/ improved for more efficient bulk cargo handling.
(4)	Type of Project	Improvement of existing berths and installation of cargo handling equipment
(5)	Objectives	To increase productivity of bulk cargo handling To accommodate larger vessels
(6)	Proposed Work Components	Deepening of the draft of existing berths Structural strengthening of existing berths Procurement of cargo handling equipment
(7)	Project Justification	With the strengthening and upgrading the existing general cargo berths, larger vessels can be accommodated, with a consequent improvement in productivity.
(8)	Project Timing	Short term
(9)	Implementation Work Duration	3 years
(10)	Total Project Cost	USD 150 million
(11)	Implementation Scheme	TPA/Loan
(12)	Investment Plan	N.A.
(13)	Donor Funds	No commitment
(14)	Land Acquisition	Nil (inside Dar es Salaam Port)
(15)	Environmental Impact	Low (installation of cargo handling equipment will improve productivity of dry bulk cargo handling, preventing dispersal of dust; almost no waste materials will be generated)
(16)	Social Impact	Low
(17)	EIA Status	N.A.
(18)	Expected Benefit	Reduce ship waiting time Increase cargo handling volume with the efficient use of berths Accommodate larger vessels Generate more revenue Provide a cost-effective total logistical chain
(19)	Documents Available	N.A.
(20)	Connection with Other Modes	N.A.

Project Location Map

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

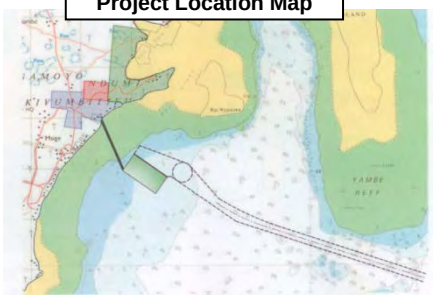
Table 4.17: Development of New Port at Mbegani-Bagamoyo

Project Name	**Development of New Port at Mbegani-Bagamoyo**	
(1)	Location (Project Area)	Bagamoyo (vicinity of Dar es Salaam)
(2)	Executing Agency	Tanzania Ports Authority (TPA)
(3)	Background	The development of a new port in the Mbegani-Bagamoyo area is one of the key components of TPA's Ports Master Plan. The development of suitable sites for deep water berths at Mbegani-Bagamoyo will complement the port facilities at Dar es Salaam. TPA's initial concept is to have at least 14 m berths, not requiring the provision of breakwaters.
(4)	Type of Project	Construction of new berths Dredging of access channel
(5)	Objectives	To construct new berths for containers and vehicles To dredge the access channel To construct onshore civil facilities and buildings
(6)	Proposed Work Components	Container berths Ro-Ro berths Channel dredging
(7)	Project Justification	Due to congestion at Dar es Salaam Port and expected growth in traffic over the coming years, construction of a new port can function as a substitute for the existing Dar es Salaam Port. The site for the new port, Mbegani, offers a good location with calm waters.
(8)	Project Timing	Medium to Long Term
(9)	Implementation Work Duration	16 years Design and Tender: 2015 - 2016, Phase I: 2017 - 2020, Phase II: 2023 - 2026, Phase III: 2027 - 2030. Each phase covers procurement of cargo handling equipment.
(10)	Total Project Cost	USD 1,200 million
(11)	Implementation Scheme	BOT/Loan/PPP
(12)	Investment Plan	N.A.
(13)	Donor Funds	Not committed
(14)	Land Acquisition	N.A.
(15)	Environmental Impact	Medium (dredging of about 20 million cubic meters anticipated for channel excavation may cause dispersal of dredged material)
(16)	Social Impact	Medium
(17)	EIA Status	N.A.
(18)	Expected Benefit	Provide a solution to traffic growth at Dar es Salaam Port Achieve high levels of port performance efficiency and productivity Improve ship turnaround time Decongest the DSM area as a whole
(19)	Documents Available	Hydrographical surveys Feasibility study (2010)
(20)	Connection with Other Modes	A new railway and access road should be constructed to connection with the existing railway lines and roads in parallel with the new port construction

Project Location Map

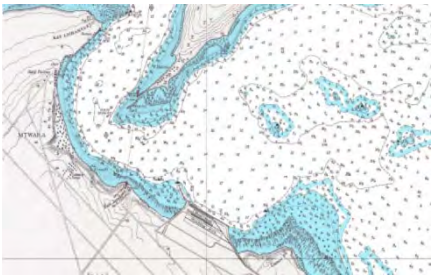
Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 4.18: Development of Deep Water Port at Mwambani Tanga

Project Name	**Development of Deep Water Port at Mwambani Tanga**	
(1)	Location (Project Area)	Tanga **Project Location Map** 
(2)	Executing Agency	Tanzania Ports Authority (TPA)
(3)	Background	Tanga Port is a typical lighterage port due to insufficient water depths along the quays. Double cargo handling results in high costs. Thus, deeper berths are needed to accommodate large vessels providing cost-effective sea transport.
(4)	Type of Project	Construction of a new port Dredging of access channel
(5)	Objectives	To transfer cargo at Dar es Salaam Port to the Tanga area To accommodate large vessels
(6)	Proposed Work Components	New quay wall Dredging of access channel
(7)	Project Justification	Timely development of sufficient capacity is indispensable for Tanga Port. However, Tanga cannot be recommended for expansion due to its shallow water depth and a lack of space. Therefore, construction of a new port is planned.
(8)	Project Timing	Medium to Long Term
(9)	Implementation Work Duration	4 years
(10)	Total Project Cost	USD 300 million
(11)	Implementation Scheme	PPP/BOT
(12)	Investment Plan	N.A.
(13)	Donor Funds	Not committed
(14)	Land Acquisition	Completed (since the new port will be constructed by reclamation, no resettlement is anticipated)
(15)	Environmental Impact	Medium (channel dredging and land reclamation anticipated may affect water quality of the site.)
(16)	Social Impact	Medium
(17)	EIA Status	N.A.
(18)	Expected Benefit	Introduce large ships Generate more revenues Provide cost-effective transport logistic chain
(19)	Documents Available	Feasibility study (2011)
(20)	Connection with Other Modes	Connection with existing railway lines and roads

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 4.19: Expansion of Mtwara Port

Project Name	**Expansion of Mtwara Port**		
(1)	Location (Project Area)	Mtwara	**Project Location Map** 
(2)	Executing Agency	Tanzania Ports Authority (TPA)	
(3)	Background	Mtwara Port has a natural basin with depths of more than 10 m and an access channel with a width of 250–270 m, serving as the gateway to the Mtwara Development Corridor (MtDC). Mtwara Port handles an average of 150,000 tons per annum but the traffic is seasonal. The MtDC area is rich in natural resources and provides a large potential market, which can generate large volumes of traffic to the port.	
(4)	Type of Project	Construction of new berths Channel dredging	
(5)	Objectives	To enhance Mtwara port capacity To facilitate Mtwara Corridor projects and an economic development zone (EDZ)	
(6)	Proposed Work Components	Construction of new berths Reclamation Channel dredging EDZ development	
(7)	Project Justification	The road to the port is in fairly good condition. The port is connected to Mozambique through the recently built Umoja bridge. There is no railway connection to the port and the surrounding area of the MtDC. However, several investors have shown interest in financing rail links to mining areas along Lake Nyasa (800 km) to allow for the export of coal through Mtwara.	
(8)	Project Timing	Short and Medium Term	
(9)	Implementation Work Duration	2012–2018	
(10)	Total Project Cost	USD 1,500.00 million (USD 1.500 billion)	
(11)	Implementation Scheme	BOT/Loan/PPP	
(12)	Investment Plan	N.A.	
(13)	Donor Funds	N.A.	
(14)	Land Acquisition	N.A.	
(15)	Environmental Impact	Middle (channel dredging and land reclamation may degrade the water quality of the expansion site)	
(16)	Social Impact	N.A.	
(17)	EIA Status	Not Certified	
(18)	Expected Benefit	Reduce sea transport costs Promote regional economic development	
(19)	Documents Available	A feasibility study is underway (started in 2011).	
(20)	Connection with Other Modes	There is a vision to connect Mtwara Port with the inland mining area by rail to transport coal and iron ore for export.	

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

4.3 Lake Ports and Lake Transport

4.3.1 Development Strategy: Overview

From the results of the demand forecast, transit cargo volume in 2030 to and from Uganda via Lake Victoria was estimated at 438,000 tonnes (413,000 tonnes outbound and 25,000 tonnes inbound) with conservative growth and 635,000 tonnes (596,000 tonnes outbound and 39,000 tonnes inbound) at the target growth rate. Likewise, the transit cargo volume in 2030 to be transported to and from Burundi via Lake Tanganyika is estimated at 362,000 tonnes (355,000 tonnes outbound and 7,000 tonnes inbound) with conservative growth and 405,000 tonnes (397,000 tonnes outbound and 8,000 tonnes inbound) with the target growth rate. Maritime transport on these two lakes is important in view of the strategy to strengthen the international corridors and their connection to the TRL railway network. In this regard, proper transport modal shift at the relevant ports, i.e. Mwanza South Port on Lake Victoria and Kigoma Port on Lake Tanganyika, must strategically be provided.

On Lake Victoria, the private sector with mostly have RoRo vessels and berths competes with Marine Services Co., Ltd. (MSCL), which operates conventional cargo-passenger vessels. The share of the private sector both in cargo transport and passenger transport has been increasing. In this regard, on Lake Victoria it is strategically necessary to encourage the private sector to take on an enhanced role in maritime transport and regulate safe navigation.

On Lake Tanganyika, the private sector occasionally provides services for cargo transport by dhows mainly to/from DRC and Burundi from/to Kibirizi beach at Kigoma. They do not provide scheduled services either for cargo or passengers.

On Lake Nyasa, lake transport is the only means for the inhabitants along the lakeshore to travel or carry cargo along the eastern shore of the lake in Tanzania. For such people, the fleet of MSCL and port facilities of TPA, although basic, provide a lifeline. For safe and faster maritime transport, MSCL should deploy RoRo vessels and TPA should refurbish the port facilities to meet the domestic demand.

4.3.2 Mitigation Measures for the Impact on Environment and Social Considerations

The SEA survey was conducted, and impact on environment and social considerations has been evaluated in this study.

Table 4.20 shows the potential impact of the project on each component.

Table 4.20: Potential Impact of the Lake Port Project on Each Component

COMPONENTS / POTENTIAL IMPACTS	Total Score	Biodiversity, Flora and Fauna	Population, Health & Safety	Soil	Water	Air	Climatic Factors	Material Assets	Cultural Heritage	Landscape
Improved access to domestic and external markets	3		3							
Reduced transportation costs	3		3							
Increased freight / cargo handling capacity	3		3							
Rise in health and safety risks	-1		-1							
Destruction of aquatic flora and fauna	-3	-3								
Landscape alterations due to reclamation works	-3									-3
Destruction of cultural heritage sites	-2								-2	
Temporary soil disturbance and pollution	-2			-2						
Temporary water pollution	-2				-2					
Resettlement of people and loss of assets due to land acquisition	-4		-2					-2		
Improved access to social services due to access roads	-2		-2							
Creation of employment and income generation opportunities	3		3							
Emission of greenhouse gases	-4					-2	-2			
Destruction of aquatic habitat due to reclamation works	-3	-3								

Note: the level of evaluation is categorised as follows. -3; High -Ve impact, -2: Medium -Ve impact, -1: Low -Ve impact, 0: Neutral or Negligible impact, 1: Low +Ve impact, 2: Medium +Ve impact, 3: High +Ve impact

It is noteworthy that there are high negative impacts in terms of resettlement and land acquisition and emission of greenhouse gasses. Meanwhile, there are high positive impacts of reduced transportation costs, increased freight / cargo handling capacity and access to domestic and external markets, and creation of employment.
Considering the above listed evaluations and further details on the impact of the project on specific areas described in chapter 10, the following mitigation measures need to be taken into account to implement lake port development.

1. Avoid landscapes with special or unique characteristics.
2. Avoid development activities within ecologically valuable natural vegetation and environmentally sensitive areas.
3. Follow safeguard policies of World Bank and JICA on Involuntary resettlement.
4. Enforce emission standards.

4.3.3 Relevant Issues

(1) Lake Victoria

Since it is located between the East and West Great Rift Valleys, Lake Victoria has been formed with rainwater surrounded by mountains that gently slope thus creating gentle hills along its shore. Geologically, the hills are mainly covered with weathered granite and fresh granite is exposed at hilltops, peninsulas, and islands. These conditions make the shoreline complex and consequently perimeter roads around the lake must meander to avoid many bays, estuaries, and rivers. This complex topography of the shoreline has been a factor in delaying road construction around the lake. Naturally, marine transport has been the main means of transport for both cargo and passengers for a long time.

In addition, as the countries surrounding the lake (Kenya, Tanzania, and Uganda) were once governed by one jurisdiction, cargo and passengers could be transported over the lake in an economical manner. Since the road network was not developed and almost all cargo and passengers were transported by railway, rail wagon ferries serving the major lake ports were indispensable. Mwanza South Port was one of these major ports in Tanzania, along with Port Bell in Uganda and Kisumu Port in Kenya. Other ports such as Kemondo Bay Port and Musoma Port were provided with rail link spans for the shipping of agricultural produce such as coffee beans and cotton even though they were not on a railway line.

As the road network has gradually developed around Lake Victoria, cargo and passengers have increasingly shifted to trucks and buses, respectively. At the same time, the cargo of TRL dramatically decreased; first, short-distance hauling decreased, and later long-distance hauling also decreased. The latter was mainly caused by a shortage of spare parts and lack of maintenance, which were likely due to the decrease in revenue from short-distance hauling. At present, there is virtually no rail wagon transport among the ports on Lake Victoria, which are equipped with the rail link spans including Mwanza.

MSCL is an active player in lake transport. MSCL mainly owns cargo-passenger ships, which require a considerable amount of time for loading and unloading of cargo. This cargo loading/unloading makes it difficult for the MSCL ships to provide scheduled daily service and thus deters passengers from choosing this option over bus transport. At present, MV Victoria is serving the route between Mwanza Port and Bukoba Port via Kemondo Bay Port every two days since the distance (requiring nine hours of navigation) does not seem competitive for the private sector to deploy their RoRo ships along this marine route. MSCL's wagon ferry, MV Umoja, virtually stopped service because of the poor performance of the TRL railway.[20]

[20] Mwanza South Port was observed to be inactive in 2011 as reported in Chapter 2 of Volume 2 of this report. On 20 September 2012, a few members of the JICA Study Team visited the port on the way to Kigoma. They observed that the port was much more active than in 2011:

1. According to the TPA office at Mwanza South Port, transit cargo bound for Uganda has increased. The cargo consists of bagged rice and wheat. Azam, a Tanzanian conglomerate, has been using the port for cargo shipment.
2. The transit shed on the wharf was full of bagged wheat, which had been transported from Dar es Salaam and bound for Uganda according to the TPA office. There were trailers loaded with cargo and train wagons with Azam's logo painted on the wall.
3. A Ugandan RoRo vessel, Jinja Kawawa, was horse-hitched to the quay wall and each labourer carried on the back one bag of maize from the ship to the truck waiting on the quay.
4. A Kenyan RoRo vessel was moored in parallel with the barge that was used as an apron between the quay wall and the RoRo vessel. Labourers were carrying on their shoulders cartons of Kenyan-made soaps from the ship to the truck waiting on the quay.
5. One of the two floating docks was active. A RoRo vessel, FB Chacha registered at Mwanza, was under repair.

From the above observations on 20 September 2012, the JICA Study Team evaluated the change as follows:

1. The reason why transport of the transit cargo of Uganda via Dar es Salaam and Lake Tanganyika has become competitive was the enforcement of the regulation against overloaded trucks along the Northern Corridor from Mombasa to Uganda,

Figure 4.11 shows the location of major ports on Lake Victoria.

Figure 4.11: Major Ports on Lake Victoria

As there are still many towns and villages with no proper road access, the private sector deploys many RoRo ships to serve the marine routes to/from Mwanza. The private sector built a simple jetty and access road for their RoRo ships to berth or de-berth. As cargo loading and unloading can be quickly carried out through a movable ramp with which RoRo ships are equipped, scheduled service is implemented. Therefore, many trucks and passengers are now using RoRo ships owned and operated by the private sector. Marine transport services of MSCL are becoming less important, except for the long-distance haulage of bulky cargo such as bananas and large-sized consumer goods.

Based on the strategy to strengthen the international corridor between Dar es Salaam and Kampala, Mwanza South Port should be refurbished to serve this corridor as the node between railway and maritime transport. In this regard, Mwanza South Port should have a container terminal to meet transit cargo demand, almost all of which will be containerized in near future.

2. The change between 2011 and 2012 indicates that should regulations against overloaded trucks be strengthened and the TRL railway between Dar es Salaam and Mwanza be rehabilitated, transit cargo to and from Uganda will probably shift from the Northern Corridor to the Central Corridor.

The counterpart port of Uganda, Port Bell, should likewise be developed to have a container terminal. TPA is planning for TRL to transport by railway transit containers of Uganda between Dar es Salaam Port and Mwanza South Port.

In the long run, the Government of Tanzania is planning to extend the railway from Arusha to Musoma so that the import cargo of Uganda can be transported from Tanga Port to Musoma Port, from where it will be transported by ship to Port Bell in Uganda.

Taking into consideration the above-described situation of lake transport, the strategy to develop marine transport on Lake Victoria is as follows:

I. TPA and MSCL to meet the transport demand between Mwanza South Port and Port Bell Port;
II. TPA to encourage the private sector to provide more services to towns and villages that are not accessible by road;
III. The Surface and Marine Transport Regulatory Authority (SUMATRA) to continue to regulate lake transport to ensure navigation safety, since private sector entities may compete with each other to the extent of neglecting safety; and
IV. MSCL to provide service on the route for which the private sector cannot compete.

Actions recommended to be undertaken by TPA, SUMATRA, and MSCL are as follows:

I. TPA to refurbish Mwanza South Port to have a container terminal;
II. TPA to build a jetty to accommodate RoRo ships on towns and villages that are not accessible by road;
III. SUMATRA to periodically or at random inspect services provided by the private sector to ensure navigation safety and impose safety regulations on private sector operations;
IV. MSCL to deploy container ships to meet the demand for transit containers of Uganda transported by railway to Mwanza Port from Dar es Salaam Port; and
V. MSCL in cooperation with TPA to deploy RoRo ships appropriate for their hauling distance and passenger demand where the private sector cannot compete.

Accordingly, in the short term, Mwanza South Port should be refurbished to accommodate container ships for lake transport on Lake Victoria[21]. In the long term, it has been agreed upon by both the Governments of Tanzania and Uganda to extend the Tanga–Arusha railway to Musoma to create an optional transport route between the coast of the Indian Ocean and Uganda, crossing Lake Victoria. The refurbishment of Mwanza Port and development of a new Musoma Port will be discussed in this report.

(2) Lake Tanganyika

Unlike Lake Victoria, Lake Tanganyika is located along the West Great Rift Valley. The shape of the lake is long in the north-south direction extending approximately 650 km and short in the east-west direction extending between 40 to 50 km. The lake is very deep at approximately 1,400 m and the bottom elevation is about 700 m lower than sea level. On the eastern and western shore, there are escarpments created by the orogenic movement of the West Great Rift Valley. On the northern tip, there is a flat diluvial plain along the Rusizi River flowing from Lake Kivu. On the southern tip of the lake, two mountain chains on the east and west shores come closer.

[21] In April 2013, TPA called for EOI for "Modernization of Mwanza South Port" on EPC contract basis. According to TPA's project information, the contractor will be free to design and optimize the port facilities.

Kigoma Port was built as a terminal for the TRL railway on Lake Tanganyika and was used to load and unload cargo to/from Burundi and DRC. Kasanga Port was built in 1966 to mainly ship agricultural produce cultivated in the hinterlands and cement produced at Mbeya. There are many cluster ports that are the lifeline of the people living along the shore, where the escarpment prohibits road access from land. When Belgium governed the northern and western shores in 1950s, they built two major ports: Bujumbura Port in Burundi and Kalemie Port in DRC. Bujumbura Port is the major counterpart port to Kigoma Port and was used to import goods from abroad via Kigoma Port and TRL railway. However, due to the poor performance of the TRL railway, lake transport between Kigoma Port and Bujumbura Port has virtually been suspended. The lake transport between Kigoma Port and Kalemie Port remains minimal not only because of the poor performance of the TRL railway but also due to the deterioration of facilities at Kalemie Port.

Based on the strategy to strengthen the international corridor between Dar es Salaam and Bujumbura (Burundi) via Lake Tanganyika as the most economical transport means, Kigoma Port should be refurbished to serve this corridor as the node between railway and maritime transport. In this regard, Kigoma Port should serve the transit cargo demand.

Figure 4.12 presents ports along Lake Tanganyika.

Figure 4.12: Ports on Lake Tanganyika

To lower the transport cost and enhance the economic growth of Tanzania and its neighbouring landlocked countries, EAC member countries concur that the TRL railway must be revitalized and used as an economically viable means of transport. In this regard, this study concludes that a container block train should be operated between Dar es Salaam Port and Kigoma Port from 2015 onwards and Kigoma Port should be refurbished to enable the handling of containers. At Kigoma Port, TPA has requested Japanese grant aid to upgrade the passenger terminal. As a long-term project, TPA envisages the expansion of Kigoma Port on the northern shore in the direction towards Kibirizi Beach. The refurbishment is of a high priority for long-term development in view of the commencement of container block train operation in 2015[22].

TPA implemented a Community Service Project to improve several cluster ports on Lake Tanganyika and Kiwira Port on Lake Nyasa using its own budget. On Lake Tanganyika, the improvement project is being implemented for six cluster ports: Kagunga, Kibirizi, Lagosa, Kayla, Karema, and Kipili. The project at each site consists of the construction of a jetty, cargo shed, approach road, fence, gate, and other facilities. The project for these six ports was to be completed by the end of 2012.

TPA is also planning to expand Kasanga Port, which is located on the east shore near the southern tip of the lake. Kasanga Port has a 20 m quay wall that was built with Norwegian grant aid in 1996. TPA has completed two warehouses to store cement and maize/maize flour separately. The port has neither inbound cargo nor unloading equipment at present. Ship's gear is used to load bagged maize/maize flour and a shoot is used to load bagged cement. TPA has provided a concession for the port operation to a private company. Implementation of the expansion of Kasanga Port is planned in three phases: Phase I for the improvement of basic amenities; Phase II for road construction, warehouses, power supply, and the procurement of cargo handling equipment; and Phase III for the accommodation of RoRo ships to meet containerization.

In view of the foregoing, the strategy to develop marine transport on Lake Tanganyika is as follows:

I. TPA and MSCL to meet the transport demand between Kigoma Port and Bujumbura Port;
II. TPA to develop Kigoma and Kasanga as international trade ports;
III. TPA to ensure lake transport as a lifeline for the people living on the eastern shore of the lake; and
IV. MSCL to improve lake transport for the convenience of the people living on the eastern shore of the lake.

Actions recommended for TPA and MSCL are as follows:

I. TPA to refurbish Kigoma Port as a hub port on the lake for international container transport between Dar es Salaam Port and Burundi and, in the long term, the western shore of the lake in DRC[23];
II. TPA to develop Kasanga Port as the gateway to southeastern DRC; and
III. MSCL to deploy RoRo ships when MV Liemba and MV Mwngozo become obsolete.[24]

[22] In June 2013, TPA called for EOI for "Consultancy Services for Undertaking Feasibility Study of TPA to Invest in Block Train Operations" which is intended for TPA to invest in Block Train Operation in order to achieve seamless transport logistic chain efficiency.
[23] In August 2013, TPA called for the tender for "Rehabilitation of Rail Mounted Gantry Crane for Kigoma Port." TPA is planning to rehabilitate the cargo terminal of the port.
[24] In February 2012, the Danish Ambassador in Dar es Salaam informed MOT that the Danish International Development Agency (DANIDA) was interested in the provision of a soft loan for the renovation of MV Liemba as

Refurbishment of Kigoma Port to meet container cargo demand will be discussed in this report. As Kasanga Port is strategically important for Tanzania and DRC, the long-term development of Kasanga Port is also discussed.

(3) Lake Nyasa

Like Lake Tanganyika, Lake Nyasa is located along the West Great Rift Valley. The lake is long in the north-south direction extending approximately 560 km and short in the east-west direction at a maximum of only 75 km. The depth is about 700 m and the bottom elevation is about 250 m below sea level. The lake is surrounded by Tanzania, Malawi, and Mozambique. Roads have been developed along the shore in the territory of Malawi and Mozambique, but in Tanzanian territory on the eastern shore no roads have been developed. Escarpment of the Livingstone Mountains created by the orogenic movement of the West Great Rift Valley makes it very difficult to develop roads along the shore. Figure 4.13 shows the location of ports on Lake Nyasa.

Figure 4.13: Ports on Lake Nyasa

well as other inland navigation projects and that DANIDA intended to contact KfW (the German government-owned development bank, based in Frankfurt) seemingly because the MV Liemba was originally built in Germany in 1913, rebuilt in Tanzania in 1914, and launched on Lake Tanganyika in 1916. The Government of Denmark has reportedly issued a letter of interest for DANIDA, which is already engaged in the modernization of the MSCL fleet. However, it is unknown whether the renovation of MV Liemba will be carried out by Denmark or Germany.

On the northern tip of the lake in Tanzanian territory, there is a diluvial flat plain where two ports, Itungi Port and Kiwira Port, are situated. These ports are the shipping points of consumer goods supplied to the people living on the eastern shore; they are an important lifeline for these people. TPA is planning to develop Kiwira Port under its Community Service Project by constructing a jetty, approach road, and other infrastructure. MSCL owns two cargo-passenger ships, MV Songea and MV Iringa, the cargo holds of which (40 tonnes and 5 tonnes, respectively) is a reasonable size to serve many cluster ports on the eastern shore of Tanzania. However, the MV Iringa is too small to navigate on Lake Nyasa, since strong southerly trade winds often suspend its navigation. When these ships become obsolete, RoRo ships should gradually be put into scheduled service.

As described above, there are no short-term infrastructure projects for lake transport on Lake Nyasa. The strategy to develop marine transport is considered as follows:

I. TPA to ensure the availability of lake transport as a lifeline for the people living on the eastern shore of the lake; and
II. MSCL to improve lake transport for the convenience of the people living on the eastern shore of the lake.

Actions recommended to be undertaken by TPA and MSCL are as follows:

I. TPA to continue its Community Service Project on the eastern shore of the lake; and
II. MSCL to deploy RoRo ships when MV Songea and MV Iringa become obsolete.[25]

4.3.4 Selected Projects

(1) Introduction

The Tanzania Ports Authority (TPA) formulated a plan for the development of lake ports in its Tanzania Ports Master Plan in February 2009.

The key recommended actions for Lake Victoria are set out in Table 4.21. As discussed in Chapter 5 (Rail Sector Development Strategy), operation of a container block train between Dar es Salaam Port and Mwanza South Port will start in 2015, and therefore development of a container terminal at Mwanza South Port is urgently required. A railway extension from Arusha to Musoma will soon be studied. Container block train operation is taken into account for this extension project. Therefore, the development of container terminals at Mwanza South Port and Musoma are discussed in the following sections.

[25] The Danish International Development Agency (DANIDA) reportedly completed a feasibility study in September 2012 and concluded to buy a ferry having capacity to carry 320 passengers and 180 tonnes of cargo to be procured for Lake Nyasa. The construction of the new ship is expected to commence in 2013 and be completed by 2015.

Table 4.21: Key Recommended Actions for Lake Victoria

Key Action	Short Term 2009–11	Medium Term 2012–18	Long Term 2019–28
Mwanza South Port			
Develop new oil jetty		✓	✓
Relocate of rail yard			✓
Develop container terminal		✓	
Purchase container handling equipment		✓	✓
Mwanza North Port			
Initiate dredging program	✓		
Maintenance and rehabilitation	✓	✓	
Develop new RoRo berth and passenger terminal		✓	
Bukoba			
Develop additional quay		✓	
Kemondo Bay	No action		
Nansio			
Modify existing berth to allow level (dis)embarkation and cargo handling	✓		
Musoma	No action		

Note: Bold letters indicate the actions discussed in the following sections.
Source: TPA

Table 4.22 presents key recommended actions for Lake Tanganyika. As discussed in Chapter 5, operation of a container block train between Dar es Salaam Port and Kigoma Port will start in 2015, and therefore container terminal development at Kigoma Port is urgently required (as is discussed in the following sections). Also discussed is the potential expansion of Kasanga Port as a gateway to the southeastern region of DRC.

Table 4.22: Key Recommended Actions for Lake Tanganyika

Key Action	Short Term 2009–11	Medium Term 2012–18	Long Term 2019–28
Kigoma			
Upgrading of the roads - Nyankanazi to Kigoma - Mpanda, Uvinza to Kigoma	✓		
Tunduma to Sanga and Kasanga			
Allow adequate time for soil investigations, land aacquisition, and permits **Develop container and break bulk terminals ahead of demand**		✓	✓
Kasanga			
Complete hinterland connection	✓		
Develop additional handling facilities	✓	✓	

Note: Bold letters indicate actions discussed in the following sections
Source: TPA

Table 4.23 presents key recommended actions for Lake Nyasa. As mentioned in section 3.2 (Development Strategy of Lake Ports), TPA is currently carrying out a Community Service Project, which includes the development of Itungi Port. Therefore, there are no projects on Lake Nyasa to be discussed in this report.

Table 4.23: Key Recommended Actions for Lake Nyasa

Key Action	Short Term 2009–11	Medium Term 2012–18	Long Term 2019–28
Itungi			
Develop hinterland access road	✓		
Develop basic facilities in Kiwira	✓	✓	
Expand facilities in Kiwira, developing supply ahead of demand		✓	
Monitor and promote corridor developments and act on it when required			✓
Mbamba Bay			
Expand quays and terminals based on demand		✓	
Monitor and promote corridor developments and act on it when required		✓	✓
Create proper road access to the port		✓	

Source: TPA

(2) Development of Mwanza South Port[26]

(a) Objectives

The maritime transport route on Lake Victoria between Port Bell and Mwanza was previously an important transport route for the United Kingdom to export products from its former colony across the Indian Ocean. The railway was the main means of transporting cargo and three wagon ferries were active during the colonial era. The railways were interconnected by the wagon ferries plying Lake Victoria. After division of the colony into three countries, i.e., Tanzania, Uganda, and Kenya, the wagon ferries and the railways were taken over by the respective independent countries. At present, the majority of the import cargo of Uganda via Dar es Salaam Port is transported by truck on Route B8 along the western shore of Lake Victoria. Only one wagon ferry, the MV Umoja owned by MSCL, is operational but it is not active because of the poor performance of TRL between Dar es Salaam and Mwanza and road development along the western shore of Lake Victoria. The poor performance of the railway has accelerated the modal shift of the transit cargo of Uganda from railway to truck. However, the Government of Uganda desires that the transport route via Dar es Salaam Port serve as an alternative to the route through Kenya via Mombasa Port. The demand forecast also indicates that a considerable volume of cargo will be transported on Lake Victoria, as it is considered that the combination of railway and maritime transport can potentially reduce transport cost.

Thus, the objectives of the development of Mwanza South Port are as follows:

- To ensure the maritime transport of transit containers of Uganda via Dar es Salaam Port passing across Lake Victoria; and
- To make lake transport competitive with road transport in terms of cost and security.

In order to realize these objectives, a container terminal to be built should be able to handle international containers efficiently and securely. Efficiency is required not only for the loading and unloading of containers on/off ships and railway wagons but also for their stacking and moving. Security is required for the reliability demanded by international shippers. The container terminal should be planned and equipped to satisfy these requirements. Port Bell in Uganda should have such a terminal as a counterpart port of Mwanza South Port.

[26] In April 2013, TPA called for EOI for "Modernization of Mwanza South Port" on EPC contract basis. According to TPA's project information, the contractor will be free to design and optimize the port facilities.

(b) Demand for Containerized Cargo

Based on the TPA forecast, the JICA Study Team estimated the transit containers to Uganda landed at Dar es Salaam Port, transported by railway to Mwanza South Port and shipped to Port Bell, both yearly and daily, as shown in Table 4.24. Meanwhile, according to the demand forecast, the volume of outbound transit cargo at Mwanza South Port except for fuel/petroleum and transportation (used cars) is estimated to be 262,000 tonnes under assumptions of conservative growth and 380,000 tonnes in the target growth scenario. The total import volume of containerized cargo in 2030 in the table (273,200 tonnes) is in between these two estimated demand figures.

Table 4.24: Containers to Be Transported between Mwanza South Port and Port Bell

		2015	2020	2025	2030
Imports	1000 tonnes	29.2	115.6	182.8	273.2
	TEUs	2,494	9,877	15,627	23,350
	Boxes	1,459	5,778	9,142	13,660
	20 footer	924	3,658	5,787	8,647
	40 footer	535	2,121	3,355	5,013
Exports	1000 tonnes	0.0	0.0	0.0	0.0
	TEUs				
	Boxes				
	20 footer				
	40 footer				
Empties	TEUs	2,494	9,877	15,627	23,350
	Boxes	1,459	5,778	9,142	13,660
	20 footer	924	3,658	5,787	8,647
	40 footer	535	2,121	3,355	5,013
Throughput per Year	TEUs	4,988	19,754	31,254	46,701
	Boxes	2,918	11,556	18,283	27,320
	20 footer	1,848	7,316	11,574	17,294
	40 footer	1,070	4,242	6,710	10,026
Throughput per Day	TEUs	14	54	86	128
	Boxes	8	32	50	75
	20 footer	5	20	32	47
	40 footer	3	12	18	27

Since export containers from Uganda via Dar es Salaam Port decreased from 267 TEUs in 2008 to 5 TEUs in 2011, it was assumed that no export containers from Uganda will be transported via Dar es Salaam Port in the future. The weight of cargo per TEU of the import containers of Uganda via Dar es Salaam Port was assumed to average 11.7 tons, based on statistics from 2007 to 2011.

From the above table, it was concluded that the wagon ferry system will be insufficient in 2020, since only one wagon ferry with 19-wagon capacity (38 TEUs) is workable at present and it may need two days to ply between Mwanza South Port and Port Bell. Therefore, new container ships of a 60-TEU capacity should be built and deployed on Lake Victoria to transport transit containers of Uganda.

(c) Alternative Container Terminal Sites

With rail access taken into account, there are two potential alternative sites to build a container terminal at Mwanza: one is within the premises of Mwanza South Port (Alternative 1) and the other is north of Mwanza South Port (Alternative 2). Figure 4.14 shows the potential sites.

Figure 4.14: Potential Alternative Sites for the Mwanza Container Terminal

(d) Layout of the New Container Terminal

Figure 4.15 and 4.16 show Alternatives 1 and 2, respectively. Alternative 1 entails the refurbishment of the existing Mwanza South Port, while Alternative 2 involves completely new construction except for road access.

Figure 4.15: Mwanza Container Terminal Alternative 1

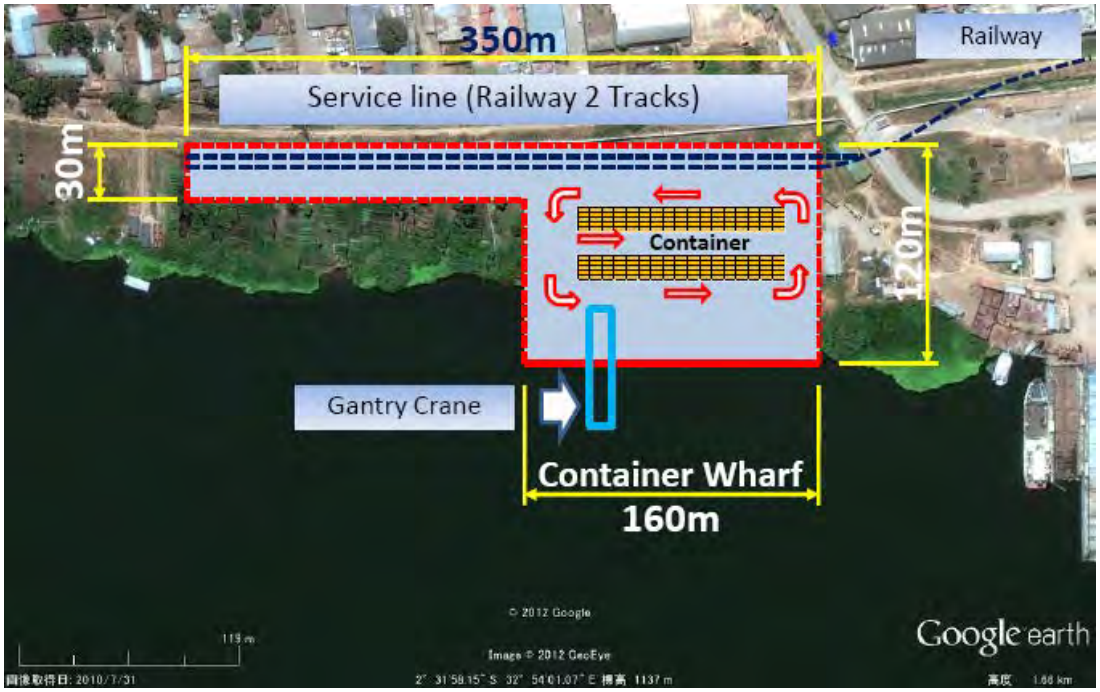


Figure 4.16: Mwanza Container Terminal Alternative 2

The technical advantages and disadvantages of each alternative are set out below:

Alternative 1

Advantages:	Utilization of the existing port premises
Disadvantages:	Demolition of many existing facilities
	Difficulty in handling break bulk cargo
	Difficulty for container ships to berth and de-berth

Alternative 2

Advantages:	Retention of almost all the existing port facilities
	Continued handling of break bulk and bulk cargo
Disadvantages:	Necessity of acquiring additional land
	Necessity of dredging and reclamation

Considering the advantages and disadvantages, Alternative 2 appears technically preferable. The construction costs of the alternatives are compared in the following section.

(e) Cost Comparison between Alternatives

The construction costs of each alternative were broadly estimated for comparison purposes. The cost estimates are tabulated in Table 4.25 and 4.24 for Alternatives 1 and 2. As shown in the tables, the construction cost for Alternatives 1 and 2 are USD 47.8 million and USD 33.4 million, respectively. Alternative 1 costs about 40% more than Alternative 2. Therefore, it is recommended that the new container terminal at Mwanza South Port be built to the north of the existing port premises.

(f) Environmental Considerations

The development site of the recommended alternative is in a vegetation area and some reclamation is required. Therefore, the environmental impacts of the project, particularly to fowl and mammals that may be living in the vegetation area, as well as to aquatic and benthic organisms that may be affected by the reclamation, should be assessed in accordance with the

environmental laws and regulations of Tanzania or, in case such are not available, in accordance with acceptable standards to be applied for the lake environment.

No habitants are living at the selected site. No environmental assessment for social impacts may be necessary.

Table 4.25: Construction Cost of Alternative 1 for the Mwanza Container Terminal

Item	Description	Unit	Quantity	Rate (USD)	Amount (USD)	Remarks
	Refurbishment Work	sum	1.0		47,787,324.0	(Mwanza(1))
1	Relocation work					12,870,900.0
	1) Temp. Work (leveling)	sum	1.0	150,000.0	150,000.0	
	2) Warehouse(80 * 25 m)	Build.	3.0	400,000.0	1,200,000.0	includes removal costs
	3) office (40 * 20 m)	Build.	800.0	500.0	400,000.0	includes removal costs
	4) Quay wall (Steel Sheet pile & Tie Rod type)	m	160.0	28,000.0	4,480,000.0	
	5) Coping Concrete (RC)	m	160.0	7,560.0	1,209,600.0	
	6) Rubber Fenders (V-Type)	no	40.0	33,600.0	1,344,000.0	
	7) Bollard & Bit	sum	1.0	112,000.0	112,000.0	
	8) Co. Pavement (10 m * 160 m)	m^2	1,600.0	420.0	672,000.0	
	9) As. Pavement (50 m * 160 m)	m^2	8,000.0	168.0	1,344,000.0	
	10) Railway (Service line 450 m * 3))	m	1,350.0	910.0	1,228,500.0	
	11) Elevating of Service line)	m^2	2,400.0	168.0	403,200.0	(160 m * 3 line * 5 m)
	12) Drainage of Wharf	m	450.0	728.0	327,600.0	
2	Dredging of port basin					336,000.0
	1) Dredging and dispose	m^3	12,000.0	28.0	336,000.0	
3	Container Wharf					12,980,180.0
	1) Temp. Work (Temporary loading facilities)	sum	1.0	25,000.0	25,000.0	
	2) Quay wall (Steel Sheet pile & Tie Rod type)	m	160.0	28,000.0	4,480,000.0	
	3) Coping Concrete (RC)	m	160.0	7,560.0	1,209,600.0	
	4) Rubber Fenders (V-Type)	nos	40.0	33,600.0	1,344,000.0	
	5) Bollard & Bit	sum	1.0	112,000.0	112,000.0	
	6) Installation of Crane rail (2 line)	line	2.0	56,000.0	112,000.0	
	7) Co. Pavement (10 m * 160 m)	m^2	1,600.0	420.0	672,000.0	
	8) As. Pavement (110 m * 160 m)	m^2	17,600.0	168.0	2,956,800.0	
	9) Railway (Service line 350 m *2))	m	700.0	910.0	637,000.0	
	10) Elevating of Service line)	m^2	3,500.0	168.0	588,000.0	(350 m * 2 line * 5 m)
	11) Drainage of Wharf	m	560.0	728.0	407,680.0	
	12) Lighting	unit	4.0	42,000.0	168,000.0	
	13) Power Supply	m	1,000.0	140.0	140,000.0	
	14) Access Road (10 * 100 m)	m^2	1,000.0	128.1	128,100.0	
4	Equipment					10,572,400.0
	1) Gantry Crane	unit	1.0	6,000,000	6,000,000	
	2) Reach Stacker (35 ton, 3 tiers)	unit	2.0	1,330,000	2,660,000	
	3) Multi-purpose Forklift (3–5 ton)	unit	2.0	84,000.0	168,000.0	
	4) Tractor Head	unit	5.0	196,000.0	980,000.0	
	5) Terminal Chassis	unit	7.0	109,200.0	764,400.0	
	Sub Total	sum			36,759,480.0	
5	General Expense	%	30		11,027,844.0	(Sub*0.3)

Table 4.26: Construction Cost of Alternative 2 for the Mwanza Container Terminal

Item	Description	Unit	Quantity	Rate (USD)	Amount (USD)	Remarks
	Development of new Container Wharf	sum	1.0		33,384,754.0	(Mwanza (2))
1	Dredging of port basin					280,000.0
	1) Dredging and dispose	m^3	10,000.0	28.0	280,000.0	
2	Container Wharf					14,828,180.0
	1) Temp. Work (Temporary loading facilities)	sum	1.0	25,000.0	25,000.0	
	2) Earth Works (Exavation and Filling)	m^3	24,000.0	77.0	1,848,000.0	Including leveling
	3) Quay wall (Steel Sheet pile & Tie Rod type)	m	160.0	28,000.0	4,480,000.0	
	4) Coping Concrete (RC)	m	160.0	7,560.0	1,209,600.0	
	5) Rubber Fenders (V-Type)	no	40.0	33,600.0	1,344,000.0	
	6) Bollard & Bit	sum	1.0	112,000.0	112,000.0	
	7) Installation of Crane rail (2 line)	line	2.0	56,000.0	112,000.0	
	8) Co. Pavement (10 m*160 m)	m^2	1,600.0	420.0	672,000.0	
	9) As. Pavement (110m*160 m)	m^2	17,600.0	168.0	2,956,800.0	
	10) Railway (Service line 350 m*2))	m	700.0	910.0	637,000.0	
	11) Elevating of Service line)	m^2	3,500.0	168.0	588,000.0	(350 m *2 line * 5 m)
	12) Drainage of Wharf	m	560.0	728.0	407,680.0	
	13) Lighting	unit	4.0	42,000.0	168,000.0	
	14) Power Supply	m	1,000.0	140.0	140,000.0	
	15) Access Road (10*100 m)	m^2	1,000.0	128.1	128,100.0	
4	Equipment					10,572,400.0
	1) Gantry Crane	unit	1.0	6,000,000.0	6,000,000.0	
	2) Reach Stacker (35 ton, 3 tiers)	unit	2.0	1,330,000.0	2,660,000.0	
	3) Multi-purpose Forklift (3–5 ton)	unit	2.0	84,000.0	168,000.0	
	4) Tractor Head	unit	5.0	196,000.0	980,000.0	
	5) Terminal Chassis	unit	7.0	109,200.0	764,400.0	
	Sub Total	sum			25,680,580.0	
5	General Expense	%	30		7,704,174.0	(Sub*0.3)

(3) Development of Musoma Container Port

(a) Project Background

An old idea of constructing a railway line between Arusha and Musoma was reconsidered in 2007. The railway infrastructure built from Tanga to Arusha during the colonial era has a missing link to Uganda through Lake Victoria via Musoma Port. Increased political and economic will to complete this missing link resulted in the commissioning of a feasibility study and preliminary design for construction of the Arusha–Musoma railway line. Construction of this line will supplement the upgrading of the Tanga–Arusha railway line. The terms of reference issued by the Reli Assets Holding Company (RAHCO) for the feasibility study requires that container terminals be built at Tanga and Musoma. Therefore, the extension of the railway to Musoma is considered to transport international transit containers mainly to/from Uganda. The counterpart port of Musoma Port is Port Bell in Uganda.

At present, Port Bell is connected with the railway line in Uganda. The port has a rail link span to accommodate wagon ferries such as the MV Umoja. However, the facilities of the rail link at Port Bell need to be rehabilitated. Meanwhile, Musoma Port is located on a small peninsula to the north of Musoma City. The railway line is limited within the port premises and the rail track from the port needs to be extended through the city to the main railway line. In addition, the port premises are of a narrow rectangular shape, which is unfavourable for container handling. Under these circumstances, it is better that a new container terminal port be built on a different site from the existing port.

Figure 4.17 shows the location of Musoma Port, railway access to which is blocked by the downtown area of the city.

Figure 4.17: Location of Musoma Port

Candidate Site for a New Musoma Port

It is premature at this stage to propose an appropriate site to build a new container port at Musoma since the feasibility study of the railway extension from Arusha to Musoma has not yet

commenced. However, only to estimate "order of magnitude" construction costs, a candidate site has been temporarily selected.

From an engineering viewpoint, the requisite conditions for a container terminal port are as follows:

- sufficiently available space to provide a container stacking yard;
- an area with calm water to handle containers from shore to ship;
- flat land to provide access and a shunting area for railway operation;
- a short railway line to reduce transport cost; and
- a short navigation route to Port Bell.

As a result of quick evaluation of the above requisite conditions, one candidate project site may be located at the southeastern end of Suguti Bay as shown in Figure 4.18.

Figure 4.18: Candidate Site for a New Musoma Port at the Southeastern End of Suguti Bay

To move forward with candidate site, a site reconnaissance survey and close coordination between RAHCO and TPA is required.

(b) Cargo and Ships

Domestic cargo used to be transported by ship between Mwanza and Musoma. At present, however, there is no regular service on this route. Service was suspended due to the development of the road network, as Mwanza and Musoma are connected with each other by an upgraded paved road. Therefore, the new Musoma Port is considered to mainly handle international transit container cargo to and from its counterpart port, Port Bell in Uganda. In this regard, the new port should be developed as a container port. Since lake transport can no longer rely on a wagon ferry, container ships of a 60-TEU capacity should be considered.

(c) Facility Layout Plan

A tentative layout plan of the container terminal to be built at the new Musoma Port is shown in Figure 4.19. The layout plan assumes one mobile container ship-to-shore (STS) crane to be employed at the quay. This assumption is due to the narrow rectangular shape of the container terminal, which makes it easy to accommodate a container block train of 30 wagons. In the initial stage two reach stackers and five tractors with seven chassis will be employed.

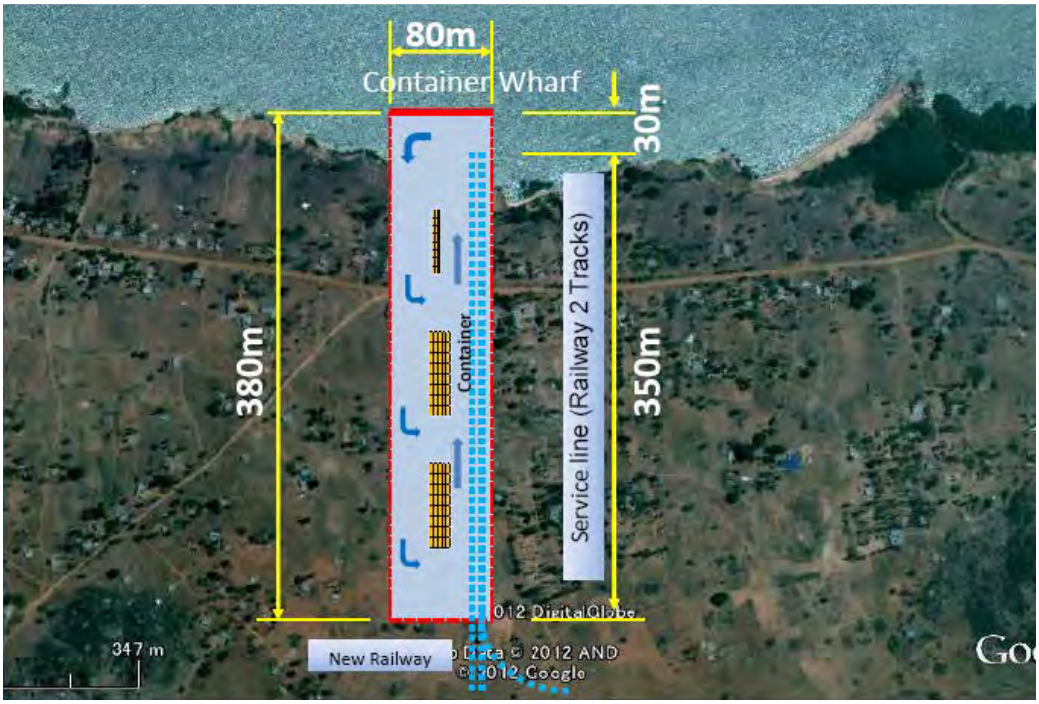


Figure 4.19: Temporary Facility Layout Plan of the New Musoma Port

(d) Organization and Capacity Building

Organizational and capacity building measures similar to those for Kigoma Port may be necessary.

Temporary Construction Cost

Table 4.27 presents a preliminary estimate of the construction cost. A reliable estimate will be possible only after necessary site investigations (e.g., topographic and bathymetric surveys) have been conducted at the candidate site and subsoil information along the quay alignment has been obtained. Figure 4.20 presents the construction procedure for the container wharf.

(g) Environmental Consideration

An entirely new site was chosen. The impacts of the project on the natural environment including on fowl and mammals as well as on land, aquatic, and benthic organisms that may be affected by the reclamation should be assessed in accordance with the environmental laws and regulations of Tanzania or, in case such are not available, in accordance with acceptable standards to be applied for the lake environment.

The site seems to be a private property but no inhabitants are currently living on the site. Should a resettlement action plan be required, the social environmental impacts should also be assessed.

Table 4.27: Preliminary Estimate of the Construction Cost of the Container Terminal of the New Musoma Port

Item	Description	Unit	Quantity	Rate (USD)	Amount (USD)	Remarks
	Development of new Container port	sum	1.0		25,269,790.0	(Musoma)
1	Dredging of port basin					
	1) Dredging and dispose	m^3	5,000.0	28.0	140,000.0	
2	Container Wharf					
	1) Earth Works (Excavation and Filling)	m^3	10,000.0	70.0	700,000.0	
	2) Quay wall (Steel Sheet pile & Tie Rod type)	m	80.0	28,000.0	2,240,000.0	
	3) Coping Concrete (RC)	m	80.0	7,560.0	604,800.0	
	4) Rubber Fenders (V-Type)	no	20.0	33,600.0	672,000.0	
	5) Bollard & Bit	sum	1.0	56,000.0	56,000.0	
	6) Co. Pavement (30 m * 80 m)	m^2	2,400.0	420.0	1,008,000.0	
	7) As. Pavement (80 m *350 m)	m^2	28,000.0	168.0	4,704,000.0	
	8) Railway (Service line 350 m * 2))	m	700.0	910.0	637,000.0	
	9) Elevating of Service line	m^2	3,500.0	168.0	588,000.0	
	10) Drainage of Wharf	m	500.0	728.0	364,000.0	
	11) Lighting	unit	2.0	42,000.0	84,000.0	
	12) Power Supply	m	1,000.0	140.0	140,000.0	
	13) Access Road (10 * 100 m)	m2	1,000.0	128.1	128,100.0	
3	Equipment					
	1) Mobile Container STS Crane (35 ton at 19 m radius)	unit	1.0	2,800,000.0	2,800,000.0	
	2) Reach Stacker (35 ton, 3 tiers)	unit	2.0	1,330,000.0	2,660,000.0	
	3) Multi-purpose Forklift (3-5 ton)	unit	2.0	84,000.0	168,000.0	
	4) Tractor Head	unit	5.0	196,000.0	980,000.0	
	5) Terminal Chassis	unit	7.0	109,200.0	764,400.0	
	Sub Total	sum			19,438,300.0	
4	General Expense	%	30		5,831,490.0	(Sub*0.3)

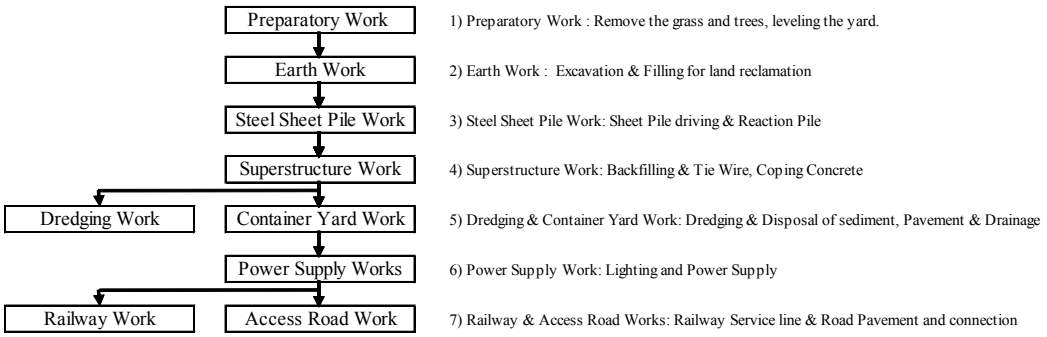


Figure 4.20: Construction Procedure for the Container Wharf

(4) Development of Kigoma Port[27]

(a) Objectives

Kigoma Port will be developed as a container hub port on Lake Tanganyika. Over the short term the objectives of its rehabilitation will be to:

- Realize a smooth modal shift of containers between railway and ships to meet the demand for containers to be generated by operation of a container block train between Dar es Salaam and Kigoma Port starting in 2015;
- Provide infrastructure facilities including handling equipment to handle mainly international containers; and
- Carry out capacity building for the current concessionaire for port operation.

(b) Container Cargo Demand

Based on the TPA forecast, the JICA Study Team estimated transit containers to and from Burundi, both annually and daily, as shown in Table 4.28. TPA assumes that transit containers to and from DRC will be transported by TAZARA until 2030. This assumption is considered reasonable because the transport infrastructure in the hinterland of Kalemie Port is very poor and it is unlikely to be improved until 2030 to meet the container transport. According to the demand forecast, the volume of outbound transit cargo at Kigoma Port to Bujumbura Port except for fuel/petroleum and transportation (used cars) is estimated to be 329,000 tonnes under conservative growth and 369,000 tonnes under the target growth scneario. The total import volume of containerized cargo in 2030 in the table (323,000 tonnes) indicates no significant difference in the demand forecasts of TPA and the JICA Study Team.

Table 4.28: Containers to Be Transported between Kigoma Port and Burundi Ports

		2015	2020	2025	2030
Imports	1,000 tonnes	71	146	222	323
	TEUs	5,745	11,807	18,015	26,211
	Boxes	4,214	8,661	13,214	19,226
	20 footer	2,667	5,482	8,364	12,170
	40 footer	1,547	3,179	4,850	7,056
Exports	1,000 tonnes	9	19	27	38
	TEUs	620	1,253	1,792	2,567
	Boxes	586	1,185	1,694	2,427
	20 footer	553	1,119	1,599	2,291
	40 footer	33	66	95	136
Empties	TEUs	5,125	10,554	16,223	23,644
	Boxes	3,628	7,476	11,520	16,799
	20 footer	2,114	4,363	6,765	9,879
	40 footer	1,514	3,113	4,755	6,920
Throughput/Year	1,000 tonnes	80	164	249	361
	TEUs	11,490	23,614	36,030	52,422
	Boxes	8,428	17,322	26,428	38,452
	20 footer	5,334	10,964	16,728	24,340
	40 footer	3,094	6,358	9,700	14,112
Throughput/Day	TEUs	31	65	99	144
	Boxes	23	47	72	105
	20 footer	15	30	46	67
	40 footer	8	17	27	39

[27] In August 2013, TPA called for the tender for "Rehabilitation of Rail Mounted Gantry Crane for Kigoma Port." TPA is planning to rehabilitate the cargo terminal of the port.

(c) Facility Layout Plan

The container block train will have 20 wagons at the beginning and will gradually increase in capacity to 30 wagons in 2022. Therefore, the terminal should be laid out to accommodate a container block train with 30 wagons, i.e., 60 TEUs per train. Since the existing cargo stacking yard is too short to accommodate one train at its full length, two rail tracks will be provided so that 15 wagons can be parked on each track.

An existing rail-mounted container STS gantry crane at Kigoma Port will be utilized. The gantry crane is capable of loading and unloading a 40-foot container weighing 35 tonnes. However, it is not currently operational due to a lack of spare parts. Since it has been in service about 20 years, the gantry crane can be repaired and made workable without difficulty once spare parts are provided.

To ensure smooth and simple container handling, loading/unloading between shore and ship and that between the stacking yard and railway wagons should be separately operated. Thus, one reach stacker should be deployed at the quay to deliver containers to or receive them from the gantry crane. The reach stacker will load and unload containers onto and from the chassis circulated by two tractors between the stacking yard and the quay.

Similarly, along the railway tracks one reach stacker will be deployed to load and unload containers onto and from railway wagons. Containers will be circulated between railway tracks and the stacking yard by two chassis moved by two trailer trucks.

A total of three reach stackers will be sufficient: one for the quay side operation, one for railway track operation, and one for stacking. Four tractor heads and chassis are required.

Figure 4.21 presents the temporary layout of the container terminal to be built at Kigoma Port.

Figure 4.21: Temporary Layout of Container Terminal at Kigoma Port

(d) Rehabilitation of Quay Wall

Since the gantry crane rails are only 108 m long at present, the crane rails need to be extended to accommodate two container ships. The overall length of a container ship to carry 60 TEU of containers is estimated to be 60 m. Since an allowance is needed at both the bow and stern, one container berth should be 80 m long. For two container ships, the berth length should be 160 m.

Since the bearing capacity of the quay foundation is reportedly unknown, it is probable that the extension of the crane rails requires rehabilitation of the quay wall. Therefore, to be financially "safe", rehabilitation of the quay wall has been taken into account.

Technically speaking, the lake bed at the quay wall is considered to be of diluvial deposits[28] that have run into the lake from the hinterland hills. They consist of a mixture of sand and cobblestones. Therefore, as a temporary solution, rehabilitation should be temporarily considered using a steel pipe sheet pile wall. The steel pipe sheet piles will be driven in front of the existing quay and anchored by tie wires or rods to the anchor wall made of concrete or steel sheet piles. Figure 4.22 shows a conceptual temporary cross section of the rehabilitated quay wall. It must be designed according to the results of investigations to be carried out at the prefeasibility stage.

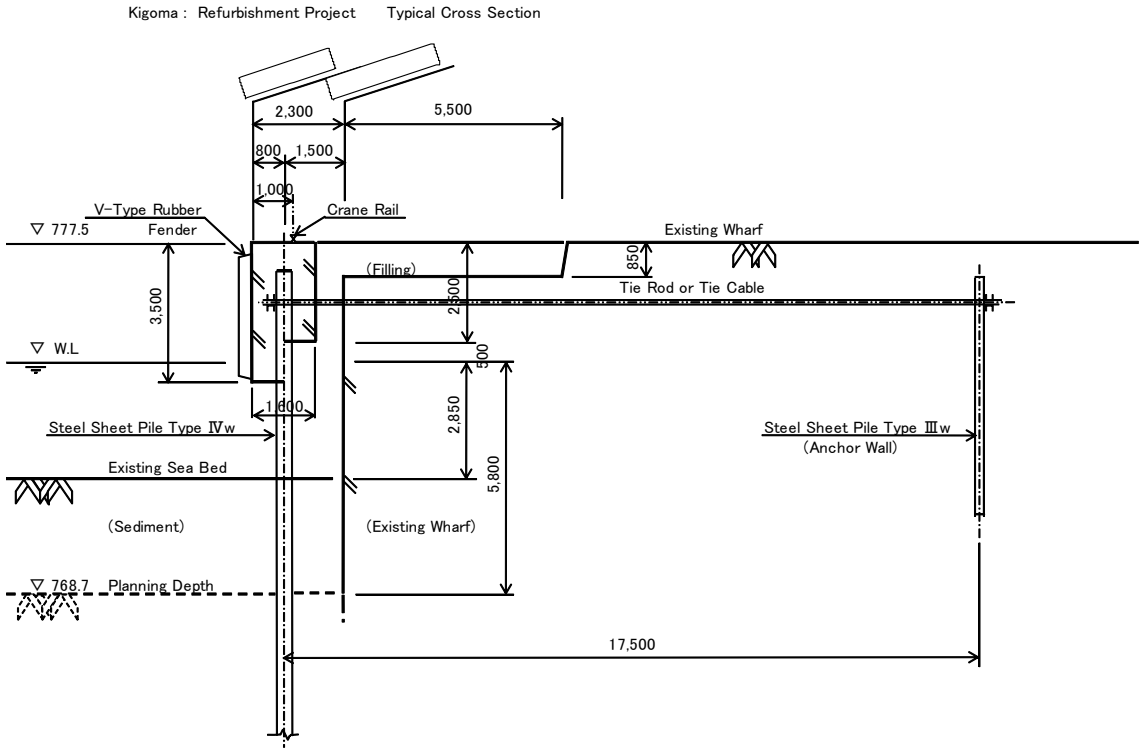


Figure 4.22: A Conceptual Temporary Cross Section of the Rehabilitated Quay Wall

(e) Tentative Construction Cost and Construction Schedule

Table 4.29 presents a preliminary estimate of the cost of constructing the container wharf. The construction procedure and construction schedule for the container wharf are shown in Figure 4.23 and Figure 4.24, respectively.

[28] Diluvial deposits are superficial deposits formed by flood-like operations of water; they are contrasted with alluvial deposits formed by slow and steady aqueous agencies.

Table 4.29: Preliminary Estimate of Construction Cost of Container Wharf

Item	Description	Unit	Quantity	Rate (USD)	Amount (USD)	Remarks
	Refurbishment Work	sum	1.0		24,574,810.0	(Kigoma)
1	Dredging of port basin					
	1) Dredging and dispose	m^3	38,400.0	28.0	1,075,200.0	
2	Container Wharf					
	1) Temp. Work (Temporary loading facilities)	sum	1.0	500,000.0	500,000.0	
	2) Quay wall (Steel Sheet pile & Tie Rod type)	m	160.0	28,000.0	4,480,000.0	
	3) Coping Concrete (RC)	m	160.0	7,560.0	1,209,600.0	
	4) Rubber Fenders (V-Type)	no	40.0	33,600.0	1,344,000.0	
	5) Bollard & Bit	sum	1.0	112,000.0	112,000.0	
	6) Reinstallation of Crane rail (2 line)	line	2.0	56,000.0	112,000.0	
	7) Co. Pavement (10 m * 160 m)	m^2	1,600.0	420.0	672,000.0	
	8) As. Pavement (60 m * 160 m)	m^2	9,600.0	168.0	1,612,800.0	
	9) Railway (Service line 320 m * 2))	m	640.0	910.0	582,400.0	
	10) Elevating of Service line)	m^2	3,200.0	168.0	537,600.0	
	11) Drainage of Wharf	m	450.0	728.0	327,600.0	
	12) Lighting	unit	4.0	42,000.0	168,000.0	
	13) Power Supply	m	1,000.0	140.0	140,000.0	
	14) Access Road (10 * 100 m)	m^2	1,000.0	128.1	128,100.0	
3	Equipment					
	1) Reach Stacker (35 ton, 3 tiers)	unit	3.0	1,330,000.0	3,990,000.0	
	2) Multi-purpose Forklift (3–5 ton)	unit	2.0	84,000.0	168,000.0	
	3) Tractor Head	unit	5.0	196,000.0	980,000.0	
	4) Terminal Chassis	unit	7.0	109,200.0	764,400.0	
	Sub Total	sum			18,903,700.0	
4	General Expense	%	30		5,671,110.0	(Sub*0.3)

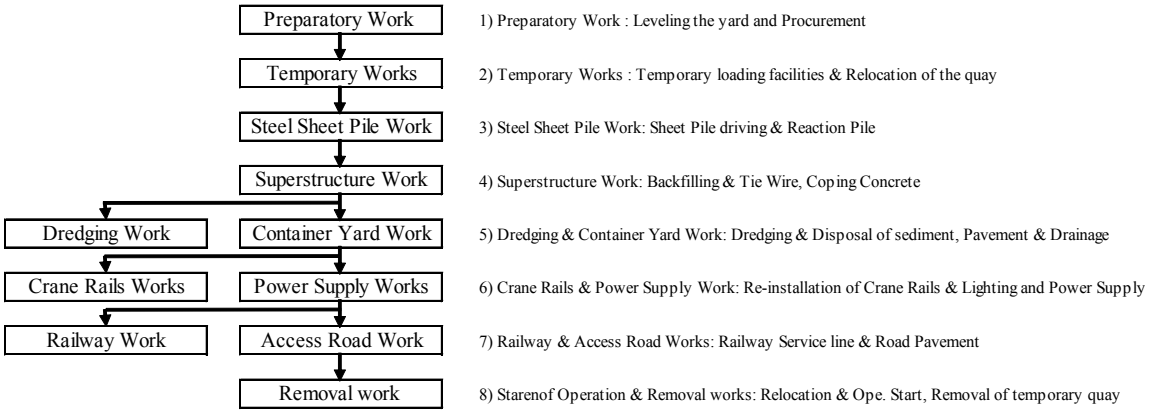


Figure 4.23: Construction Procedure for the Container Wharf

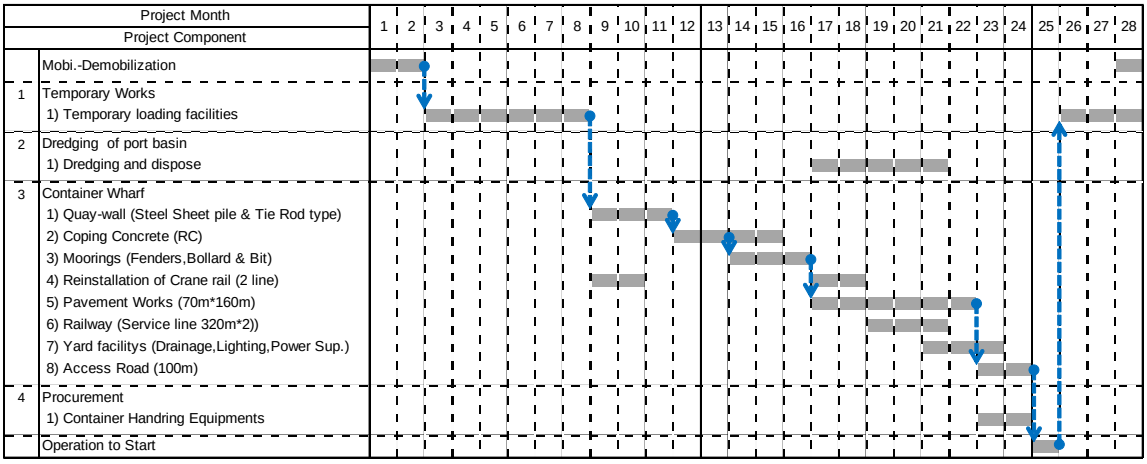


Figure 4.24: Construction Schedule for the Container Wharf

(f) Environmental Considerations

TPA has carried out dredging to deepen the lake bed in front of the quay wall and the construction will not involve any dredging/reclamation works. In addition, the construction works are limited within the port premises. Therefore, an environmental assessment may not be required.

(g) Organization of the Container Terminal

As the initial stage of the operation of the container terminal, almost all the containers will be in transit to and from Bujumbura Port. Therefore, the operation will be rather simple. The port operator should organize and train its team to handle containers. Figure 4.25 presents an example of the organization for a small-scale container terminal such as the one to be built at Kigoma Port.

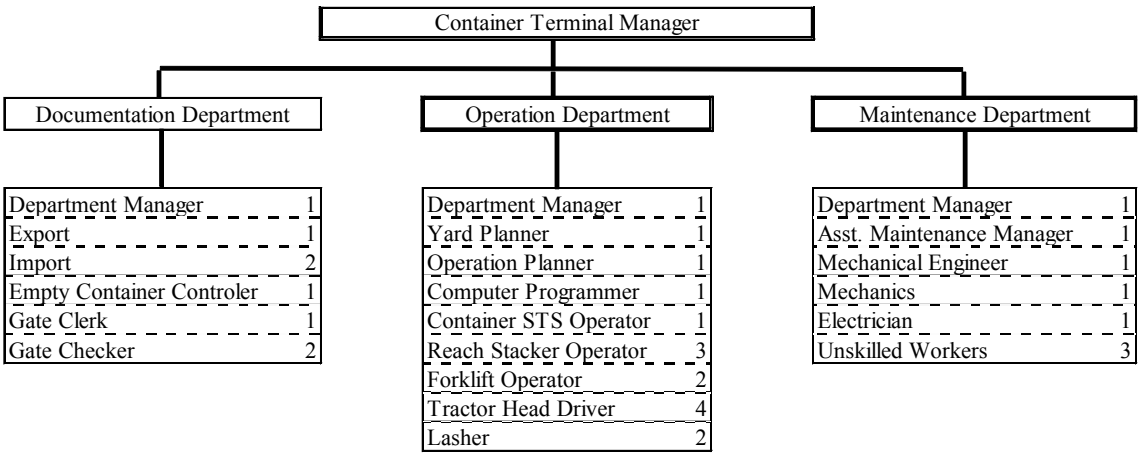


Figure 4.25: Organization of a Small-Scale Container Terminal

(h) Recommendations

In addition to infrastructure including the construction of container terminals, in increasing the traffic of transit containers via Kigoma Port it will be important to simplify as much as possible customs clearance and cargo inspection at both Kigoma and Dar es Salaam Ports. To this end, computerization to monitor cargo movement across Tanzanian territory is recommended.

Specific recommendations follow.

Recommendation 1: Establishment of Management Company for Container Block Train Operation

In addition to TRL, the operator of container block trains, a management entity for operation of the container block trains should be established. The entity is likely to be a joint venture between TRL and the private sector and engaged in sales and customer services. Its head office should be located at Dar es Salaam and one of its branch offices should be located at Kigoma. The management entity should perform the following functions:

1) For customers
   - To act for customs clearance of cargo for customers
   - To determine transport fees, issue invoices, and receive payments
   - To provide customers with services including cargo tracking

2) For customs offices
   - To perform customs clearance for one container block train each
     - At Dar es Salaam, to request customs clearance for transshipment cargo (T1; Customs' Approval Form for Transshipment)
     - At Kigoma, to request customs clearance for export cargo
       (For transshipment cargo, it is usually required to confirm documents and the seal number attached to the cargo.)

The concept of the management entity and organization are shown in Figure 4.26 and respectively.

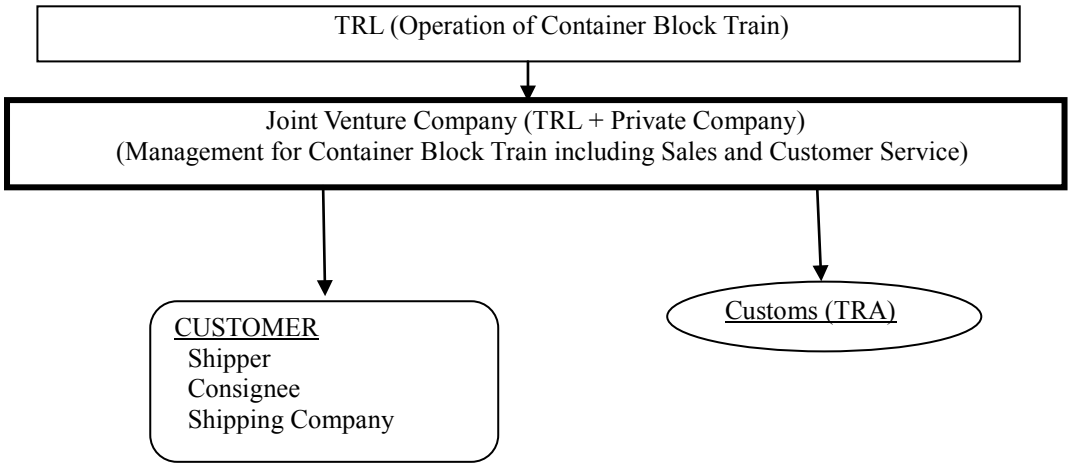


Figure 4.26: Management Entity for Container Block Train Operation

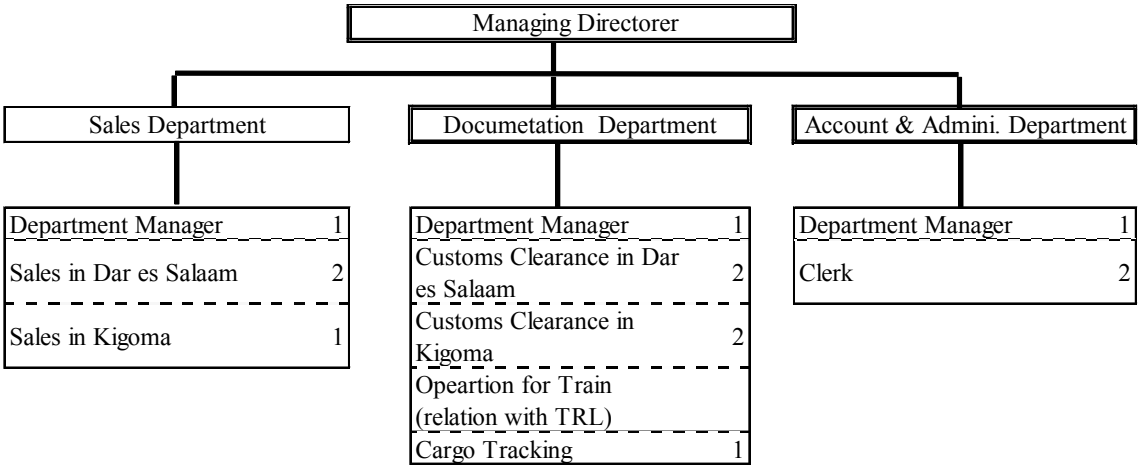


Figure 4.27: Organization of Management Entity

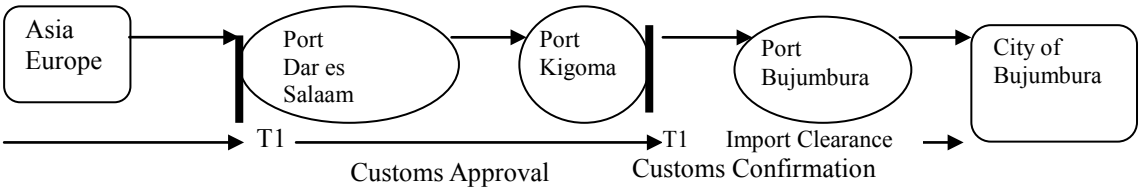
The branch office at Kigoma will clear customs for one container block train as a whole to expedite transport the modal shift between ships and trains.

Recommendation 2: Customs Clearance

Since one of the important factors in determining the operating schedule of container block trains is the simplifying and shortening of customs clearance, it is indispensable that the management entity and the Customs and Excise Department (TRA, Tanzania Revenue Authority) address this issue. The following points should be agreed upon before operation of the container block trains:

1) One agent should be engaged in customs clearance for one container block train. (Customs clearance for cargo transported by truck should be carried out together with the agent for each truck.)
2) To simplify and expedite the customs clearance procedures, a risk management system should be implemented and an authorized economic operator (AEO) system be developed. As a rule, cargo customs clearance at Kigoma Port should be undertaken by reference to the shipping documents.
3) A target cargo dwell time at Kigoma Port should be agreed upon, e.g., two days. When compared with truck transport, railway transport is advantageous for the customs office to control because there is (i) a fixed transport route and (ii) only one operator (i.e., TRL). To exploit this advantage, both the customs office and management entity should shorten customs clearance procedures and consequently shorten cargo transport time. To this end, a certain dwell time of cargo should be targeted and discussed periodically in meetings among the concerned parties (i.e., TRA, TRL, TPA, and the management entity) to address bottlenecks in accomplishing the target.

Figure 4.28 presents the customs procedure for transshipment containers transported by container block trains.



Note: T1 is the customs approval form for transshipment

Figure 4.28: Customs Procedure for Block Train Transshipment Containers

Recommendation 3: Terminal Operation

1) Establishment of an EDI Network

Kigoma Port is a connection point between railway and maritime transport. It is important to expeditiously shift containers from train to ship and vice versa. Too many containers dwelling at Kigoma Port will delay the operation of container block trains. To prevent this from happening, information networks should be established as follows:

- an electronic data interchange (EDI) network covering Kigoma, Dar es Salaam, and Bujumbura Ports to provide information about container cargo, status of train and ship operation, and the like; and
- a network covering the railway stations between Dar es Salaam and Kigoma Ports to monitor the whereabouts of container cargo and provide consignees with internet access to the network for them to obtain information about their cargo without delay.

Even though French is an official language in Burundi, the language used in the network should be English to meet international trade standards.

2) Inventory Control

Inventory should be computerized to provide for the correct and timely control of container cargo.

3) Other Measures

The following facilities will be required: (i) a customs office, (ii) an inspection area for customs clearance, and (iii) a security fence. If existing facilities can be refurbished, this should be done.

Recommendation 4: Nomination of Customs Brokers for Customs Clearance at Kigoma

If a management entity for the container block train operation cannot be established, an alternative would be to designate a reliable customs broker to carry out the clearance of container block trains at Kigoma Port. The designated custom broker would clear all the cargo transported by the container block trains to assure expeditious customs clearance.

(5) Development of Kasanga Port

(a) Objectives

The upgrading of the road from Tunduma to Kasanga Port is underway and is expected to be completed in a few years. Once the road upgrading is completed, the road from Dar es Salaam to Kasanga Port will be paved for the entire length. All the transit cargo to areas along Lake Tanganyika can be transported along this route since it is an alternative to the Dar es

Salaam–Kigoma route. To reduce transport costs, the existing dry port at Mbeya may be used as a modal shift node between road transport and the TAZARA railway, which has performed relatively better than TRL between Tabola and Kigoma.

Thus, the objectives of the development of Kasanga Port are as follows:

- To enhance the movement of transit cargo to/from the western shore of Lake Tanganyika; and
- To exploit Mbeya dry port and the TAZARA railway to reduce transport costs.

(b) Cargo and Ships

Kasanga Port has been shipping cement produced at Mbeya and maize/maize flour produced in Rukuwa Province, which is the hinterland of the port. This cargo has been transported by ship to Kigoma and Bujumbura Ports. However, as TANROADS continues upgrading the road from Sumbawanga to Kasulu along the eastern shore of Lake Tanganyika, agricultural produce and a certain portion of cement may shift from ship to truck. Therefore, Kasanga Port will gradually become important as a gateway to the eastern shore of the lake in the DRC, particularly to its southeastern region, where a road network has yet to be developed. In such case, the counterpart port in the DRC will be Moba. Transit cargo will be transported between Kasanga Port and Moba Port without passing through Zambia. Over the long term, it will move from Moba Port to the south to Lubumbashi, the second largest city in the DRC. The cargo to be handled at Kasanga Port will be international transit container cargo. Consequently, container ships will ply between Kasanga Port and its counterpart port in the DRC.

While a container block train of 30 wagons will be operated on the TRL railway, TAZARA will introduce the same transport system from Dar es Salaam to Mbeya. Container ships of 60-TEU capacity will be put into service. RoRo ships that TPA envisaged in its development plan will be used for short-distance hauls to Mpulungu Port in Zambia and several cluster ports of Tanzania that will remain inaccessible by road. In this regard, a berth having a slope should be provided to accommodate RoRo ships.

(c) Facility Layout Plan

At present, Kasanga Port has a 20 m quay wall only. In the initial stage of its development as a gateway port to the southwestern shore of Lake Tanganyika, an 80 m long quay wall will be required to accommodate a container ship with 60-TEU capacity. Location of the initial construction of the quay wall should be flexibly laid out so that it can eventually be extended to 160 m to accommodate two container ships simultaneously. In its development plan TPA envisages a container stacking yard in the hilly backyard, about 15 m higher than the quay. The port road between the stacking yard and quay should be longitudinally as well as horizontally aligned for frequent movement of tractors/chassis. In addition, an open area to temporarily stack empty containers is required outside of the port premises, as it is foreseen that there will not be many stuffed containers coming from the DRC. A candidate for stacking empty containers is the flat plain in Kasanga Village.

Since the volume of containers to be handled is of the order of 100-150 TEUs a day, mobile container STS cranes should be employed. These STS cranes should be accompanied by reach stackers and tractors/chassis to move containers between the quay and stacking yard. A RoRo berth can be located near the access road to the port from Kasanga Village. Figure 4.29 shows the tentative facility layout of Kasanga Port.

Figure 4.29: Tentative Facility Layout of Kasanga Port

(d) Tentative Cost

The first phase of the container terminal development should consist of extension of the quay wall from 20 m to 80 m. The port road should be completed to operate tractors/chassis to/from the stacking yard, which also requires completion. At this phase, two mobile container STS cranes should be procured together with two reach stackers and four tractors/chassis. One of the STS cranes can be used for loading/unloading break bulk cargo by replacing its container spreader with a conventional hook. The second phase should be implemented when increased container cargo volumes warrant expansion. Eventually a full 160 m quay should be completed and the stacking yard fully developed.

Accordingly, the tentative cost of Phases I and II of the development of a container terminal at Kasanga Port was estimated as shown in Tables 4.30 and 4.31, respectively. Also, the container wharf construction plan/procedure for Phases I and II is shown in Figures 4.30 and 4.31, respectively.

Table 4.30: Tentative Construction Cost of Container Wharf (Phase I)

	Description	Unit	Quantity	Rate (USS)	Amount (USD)	Remarks
	Development of Container Wharf (Phase I)	sum	1.0		24,918,712.0	(Kasanga Phase 1)
1	Temp. work					2,247,000.0
	1) Temp. Work (leveling)	m^2	2,000.0	21.0	42,000.0	20 * 100 m
	2) Quay wall (Steel Sheet pile & Tie Rod type)	m	30.0	28,000.0	840,000.0	
	3) Coping Concrete (RC)	m	30.0	7,560.0	226,800.0	
	4) Rubber Fenders (V-Type)	nos	5.0	33,600.0	168,000.0	
	5) Bollard & Bit	sum	1.0	21,000.0	21,000.0	
	6) Earth Works (Filling)	m^3	3,600.0	21.0	75,600.0	(from yard)
	7) Co. Pavement (30 m * 40 m)	m^2	1,200.0	420.0	504,000.0	
	8) As. Pavement (20 m * 110 m)	m^2	2,200.0	168.0	369,600.0	
2	Dredging of port basin					140,000.0
	1) Dredging and dispose	m^3	5,000.0	28.0	140,000.0	
3	Container Wharf					4,754,400.0
	1) Temp. Work (leveling)	m^2	1,600.0	21.0	33,600.0	20 * 80 m
	2) Quay wall (Steel Sheet pile & Tie Rod type)	m	80.0	28,000.0	2,240,000.0	
	3) Coping Concrete (RC)	m	80.0	7,560.0	604,800.0	
	4) Rubber Fenders (V-Type)	nos	20.0	33,600.0	672,000.0	
	5) Bollard & Bit	sum	1.0	56,000.0	56,000.0	
	6) Earth Works (Filling)	m^3	9,600.0	21.0	201,600.0	(from yard)
	7) Co. Pavement (10 m * 80 m)	m^2	800.0	420.0	336,000.0	
	8) As. Pavement (40 m * 80 m)	m^2	3,200.0	168.0	537,600.0	
	9) Drainage of Wharf	m	100.0	728.0	72,800.0	
4	Stacking Yard					2,724,120.0
	1) Earth Works (Excavation and Filling)	m^3	24,090.0	28.0	674,520.0	(to wharf)
	2) Drainage of Stacking Yard	m	200.0	728.0	145,600.0	
	3) As. Pavement (100 m * 100 m)	m^2	10,000.0	168.0	1,680,000.0	100 * 100 m
	4) Lighting	unit	2.0	42,000.0	84,000.0	
	5) Power Supply	m	1,000.0	140.0	140,000.0	
5	Port Road					1,930,320.0
	1) Earth Works (Excavation)	m^3	36,000.0	28.0	1,008,000.0	
	2) Access Road (10 * 3,600 m)	m^2	7,200.0	128.1	922,320.0	
6	Equipment					7,372,400.0
	1) Mobile Container STS Crane (35 ton at 19 m radius)	unit	1.0	2,800,000.0	2,800,000.0	
	2) Reach Stacker (35 ton, 3 tiers)	unit	2.0	1,330,000.0	2,660,000.0	
	3) Multi-purpose Forklift (3–5 ton)	unit	2.0	84,000.0	168,000.0	
	4) Tractor Head	unit	5.0	196,000.0	980,000.0	
	5) Terminal Chassis	unit	7.0	109,200.0	764,400.0	
	Sub Total	sum			19,168,240.0	
7	General Expense	%	30		5,750,472.0	(Sub*0.3)

Construction Plan

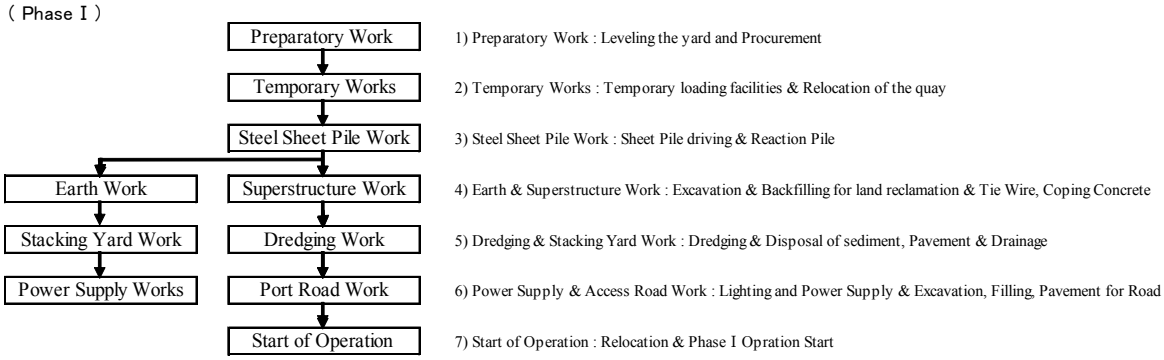


Figure 4.30: Container Wharf Construction Procedure (Phase I)

Table 4.31: Tentative Construction Cost of Container Wharf (Phase II)

Item	Description	Unit	Quantity	Rate (USD)	Amount (USD)	Remarks
	Development of Container Wharf (Phase II)	sum	1.0		9,309,300.0	(Kasanga Phase 2)
1	Temp. work					18,900.0
	1) Temp. Work (Removal of the existing pier)	m^2	300.0	63.0	18,900.0	20 * 15 m
2	Dredging of port basin					140,000.0
	1) Dredging and dispose	m^3	5,000.0	28.0	140,000.0	
3	Container Wharf					4,594,100.0
	1) Temp. Work (Leveling)	m^2	1,600.0	21.0	33,600.0	20 * 80 m
	2) Quay wall (Steel Sheet pile & Tie Rod type)	m	75.0	28,000.0	2,100,000.0	
	3) Coping Concrete (RC)	m	75.0	7,560.0	567,000.0	
	4) Rubber Fenders (V-Type)	no	19.0	33,600.0	638,400.0	
	5) Bollard & Bit	sum	1.0	52,500.0	52,500.0	
	6) Earth Works (Filling)	m^3	13,200.0	21.0	277,200.0	(from yard)
	7) Co. Pavement (10 m * 80 m)	m^2	750.0	420.0	315,000.0	
	8) As. Pavement (40 m * 80 m)	m^2	3,200.0	168.0	537,600.0	
	9) Drainage of Wharf	m	100.0	728.0	72,800.0	
4	Stacking Yard					2,408,000.0
	1) Earth Works (Levelling)	m^2	4,800.0	21.0	100,800.0	80 * 60 m
	2) Earth Works (Filling)	m^3	9,200.0	28.0	257,600.0	(from yard)
	2) Drainage of Stacking Yard	m	200.0	728.0	145,600.0	
	3) As. Pavement (100 m * 100 m)	m^2	10,000.0	168.0	1,680,000.0	100 * 100 m
	4) Lighting	unit	2.0	42,000.0	84,000.0	
	5) Power Supply	m	1,000.0	140.0	140,000.0	
	Sub Total	sum			7,161,000.0	
5	General Expense	%	30		2,148,300.0	(Sub*0.3)
	Development of Container Wharf (Phase I)	sum	1.0		24,918,712.0	(Kasanga Phase 1)
	Development of Container Wharf (Phase II)	sum	1.0		9,309,300.0	(Kasanga Phase 2)
	Total				34,228,012.0	

Construction Plan

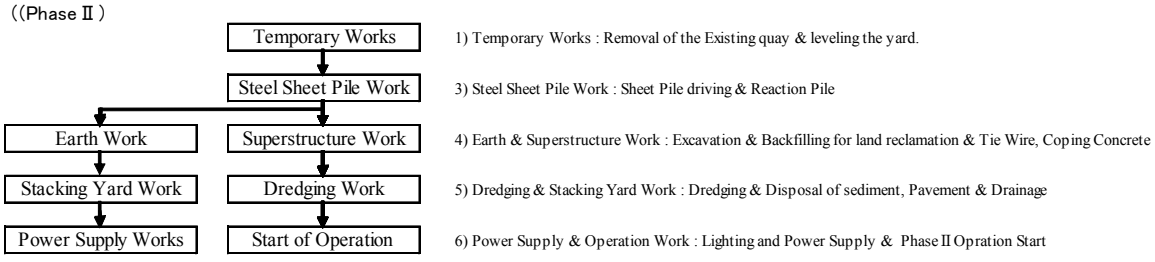


Figure 4.31: Container Wharf Construction Procedure (Phase II)

(e) Option to be Considered

Organizational and capacity building for the container terminal operation at Kasanga Port should be pursued as at Kigoma Port. In addition, the logistics planners of TPA should bear in mind that if the operation of a container block train between Dar es Salaam Port and Kigoma is delayed, Kasanga Port may be the best port (once the first 80 m quay wall is completed) to serve international transit containers to/from Burundi and even Rwanda. Because the performance of TAZARA is better than that of TRL, Mbeya dry port can serve international transit containers, and the road from Mbeya will have been upgraded and paved all the way to Kasanga Port.

(f) Environmental Considerations

As some reclamation is required, the environmental impacts of the project on aquatic and benthic organisms that may be affected should be assessed in accordance with the environmental laws and regulations of Tanzania or, in case such are not available, in accordance with acceptable standards to be applied for the lake environment.

No people are living at the selected site. However, the construction works may require access to the site by heavy duty vehicles, which would have to pass through the nearby village. In this regard, an assessment of social impacts may be necessary.

Chapter 5 Road Sector Development Strategy

5.1 Process of Sector Planning and Project Identification

The basic points of departure for conducting sector planning and identifying projects in the road sector were the analyses of current and future transport demand in Chapter 1, and the assessments of Chapter 2 for moving from the demand forecasts to corridor/sector strategies. Building on these basic points of departure, the following considerations were taken into account:

(i) Table 2.1 (Summary of Transport Demand Growth and Resource Allocation) forecast road freight demand from 2010 to 2030 to increase by 552% (from 4.06 million tonnes to 22.41 million tonnes) along the Dar es Salaam (DSM) Corridor, by 587% (from 6.98 million tonnes to 41.00 million tonnes) along the Central Corridor, and by 864% from 16.90 million tonnes to 137.39 million tonnes along other corridors.[1]

(ii) Accordingly, the traffic forecasts used in this chapter (e.g., annual growth rates of 8% and a fourfold increase in traffic by 2030) may be considered broadly comparable to the macro forecasts prepared in this study or even "conservative" (low).

(iii) Considering that the overall traffic demand forecast has not been assigned to each road in the network, assessment of specific roads and road sections was undertaken in subsection 5.3.3 based on daily traffic count data (see, e.g., Figure 5.2) and estimates of traffic volumes near major cities (Table 5.3) and applicable growth rates.[2]

(iv) The road projects proposed in this master plan were based not only on forecast traffic demand and implied economic return but also other elements of the road development strategy as presented in subsection 5.6.1 (e.g., relieving existing congestion or problems within a short time, road network strengthening via corridor development, relief of urban congestion, capacity expansion, and improvement of service levels).

The remainder of this chapter presents an overview of the development strategy (5.2), an assessment of the road network (5.3), analysis of corridor development (5.4), road development strategy (5.5), and selected projects (5.6).

5.2 Development Strategy: Overview

It is expected that transport demand in Tanzania will increase to more than four times the current transport volume within 20 years. It is also anticipated that transport services provided by railways, even after their planned rehabilitation, will be limited to certain regions since their networks have been primarily designed to serve traffic along international corridors and not to serve many scattered population centres. It is not economically feasible to construct railway links to connect population centres located off such corridors, at least within the planning period of this Master Plan. Therefore, the task of connecting the regions off of the international corridors with the growing national economy must be borne by the road transport.

Road development strategy should be in line with the overall development strategy to assure comprehensive transport and trade system development. Specific strategies, as set out in Chapter 2, include (i) strengthening international corridors, (ii) developing infrastructure for the optimal modal share, (iii) meeting domestic transport demand, (iv) alleviating bottlenecks in the Dar es Salaam metropolitan area, (v) implementing clear regulatory/financing frameworks.

[1] The impact of freight traffic growth on overall traffic volume depends on total traffic volume on the road network. The traffic volume survey conducted by the JICA Study Team found that trucks account for 30% of overall traffic on average. This proportion is higher when total traffic volume is small. Appendix 2 presents details.

[2] Detailed investigations to more precisely forecast traffic volumes on specific sections will eventually be required.

Strategy (iii) above – meeting domestic transport demand – is important for two reasons. First, Tanzania's population is widely spread out across the country, unlike many countries where the capital city accounts for a disproportionate share of the national total in population. The population of Dar es Salaam region is only 7.4% of the national total and is likely to remain at around that proportion. The Mwanza region, which is located more than 1,000 km from Dar es Salaam, has a larger population than does Dar es Salaam region. Out of 21 regions in Tanzania, 13 have a population more than one half of that of Dar es Salaam region. Such a distribution of populations results in greater transport demand than in a country where a relatively large proportion of the total population resides in a primate city. Second, regions that have largely been self-contained with subsistence agriculture typically require more exchanges with other parts of the country as their economy grows. Conversely, if Tanzania's transport system does not provide adequate means of exchange between its regions, the economic growth of the regions will be suppressed. This study has forecast that domestic transport demand would grow faster than the international transport demand as shown in Chapter 1.

In order to formulate the road sector development strategy, first of all to identify the present road network, road and traffic conditions including future traffic demand as well as the above strategies for freight transport were taken into account. The strategy was also determined by relative importance of corridors, east-west and north-south. The forecast freight transport demand was reflected in the road sector development strategy but at the same time the national policy to reduce poverty was considered an important factor especially regarding regional road development.

5.3 Road Network

5.3.1 Road Network in Tanzania

The Tanzanian road network plays an important role in the economic development of the country, especially considering that other surface transport modes (e.g., railway) have deteriorated and provide poor service (although it is suited to the long-distance transport of goods and passengers). At present, road transport is the major mode of transport in the country, carrying over 90% of passengers and over 75% of freight traffic. In particular, (trunk) roads serve not only major transport demand from the seaport to inland destinations but also provide door-to-door services more effectively than any other modes of transport in rural areas where people need freedom to move.

The classification of roads in Tanzania is based on hierarchical functions, as follows:

- Trunk Roads: primary national and international through routes that link several regions and provide access to important border posts and ports;
- Regional Roads: secondary routes connecting district centres in a region or connecting other important centres to a trunk road;
- District Roads: tertiary routes linking (i) district headquarters with ward centres, (ii) important centres within the district, and (iii) important centres to a higher class road;
- Feeder Roads: village access roads linking important centres within a district to the rest of the network; and
- Urban Roads within urban centres, including arterial roads, collector roads, local collector roads, and access roads.

Trunk roads and regional roads are under the responsibility of the Tanzania National Roads Agency (TANROADS). The local government authorities (LGAs) under the Prime Minister's Office Regional Administration and Local Government (PMO-RALG) are responsible for the

district, urban, and feeder roads (the local roads network), to open up existing and potential rural productive areas for agriculture, small-scale mining, and rural tourism.

The total classified road network in the Tanzania Mainland was estimated to be 91,532[3] km based on TANROADS and PMO-RALG reports in 2011, as shown in Table 5.1.

Table 5.1: Road Length by Different Organizations

Organization	Length (km)	Length (km)	Total Length (km)
TANROADS			33,495
Trunk Roads	12,197		
Regional Roads	21298		
PMO-RALG			58,037
Urban Roads		5,995	
District Roads		29,338	
Feeder Roads		22,704	
Grand Total			91,532

The national trunk and regional road network consists of:

- Trunk roads 12,197 km, of which 5,537 km are paved and 6,660 km are unpaved; and
- Regional roads: 21,298, of which 847 km are paved and 20,451 km are unpaved

So far there are no expressways or toll highways in Tanzania. With economic growth and associated growth in traffic, there will be a strong demand for expressways that will significantly improve the speed, efficiency, comfort, and safety of road traffic.

5.3.2 Road Conditions

The trunk and regional road conditions have been steadily improved due to the various road maintenance/rehabilitation and development activities. An overall road condition assessment of trunk roads at the end of December 2010 indicated that 53% were good, 35% were fair, and 12% were poor, compared to 47% good, 34% fair, and 19% poor in 2008 when project implementation commenced. A total of 77% of the paved trunk road were good, but only 27% of the unpaved trunk road were rated good.

The pavement conditions of regional roads still remain unsatisfactory. Only 31% of the roads were rated good, 51% fair, and 17% poor, in comparison to 39% good, 38% fair, and 23% in poor condition in 2008 as shown in Table 5.2. Even with paved road surfaces, most regional roads are in fair or poor condition.

Table 5.2: Proportion of Pavement Rating

Type	Pavement	Good	Fair	Poor
Trunk	Paved	77 % (70%)	15 % (23%)	8 % (7%)
	Unpaved	27 % (32%)	56 % (42%)	17% (26%)
	Sub total	53 % (47%)	35 % (34%)	12% (19%)
Regional	Paved	45 % (85%)	28 % (13%)	27% (2%)
	Unpaved	31 % (38%)	52 % (39%)	17% (23%)
	Sub total	31 % (39%)	51 % (38%)	17% (23%)

Note: Numbers in parentheses represent the conditions in 2008.
Source; TANROADS RMMS (2010)

[3] Estimates of TANROADS (33,495 km) and PMO-RALG Report (58,037 km) road lengths in 2011.

The proportion of paved trunk roads was 45% (5,537 km paved out of 12,197 km) and that of regional roads was 4% (847 km out of 21,298 km) according to the TANROADS data as of June 2011. The proportion of district roads that were paved was 1.3% (756 km out of 58,000 km). The conditions of the district roads are worse, with 22% good, 34% fair, and 44% poor.[4]

5.3.3 TANROADS

As an implementation body for roads, TANROADS prepares construction and maintenance plans along with specifications for road works, as well performing road works. In addition to the planning, design, and implementation of new and rehabilitation works, TANROADS is responsible for traffic control and management, e.g., by controlling the overloading of trucks, regulating traffic during road works and disasters, and regulating traffic to protect the road structures and surface.

The Agency is headed by a Chief Executive, under which there are five directorates: Planning, Procurement and Contracts, Projects, Maintenance, and Business Support. The Agency has established offices in 21 administrative offices headed by Regional Managers.[5]

5.3.4 PMO-RALG

The main function of PMO-RALG is to enable Local Government Authorities (LGAs) to provide quality services. Local transportation is one local government activity. In order to comply with and respond to the national development framework strategies, PMO-RALG is to adopt and apply the strategies to improve services to implement the revised strategic plan.

Since PMO-RALG has a wide scope of responsibilities for local government activities, local district, urban, and feeder roads are managed by the 161 Local Government Authorities (LGAs). City, Municipality, Town, and District Councils act as road authorities. The LGAs carry out inventory and condition surveys, planning, prioritization, project design, tendering, and supervision of maintenance and development works.[6]

Although LGAs contribution to freight transport is limited, there are some sections of LGA roads that are directly connected to trunk roads and facilitate the smooth flow of long-distance traffic.

5.4 Corridor Development in Tanzania

5.4.1 Major Corridors

Tanzania's position is very important for international trade from the Indian Ocean to inland countries including Uganda, Burundi, Rwanda, the DRC, and even Zambia and Malawi. The East African Community (EAC) road corridors in Tanzania should be accorded first priority in the strategic development of the freight transport infrastructure plan. There are four major east-west corridors that will contribute to transport from coastal areas to inland Tanzania and inland countries:

1. Dar es Salaam (TANZAM or TAZARA) Corridor (DAR ES SALAAM-Morogoro–Iringa–Mbeya–Tunduma);
2. Central Corridor (Dar es Salaam–Morogoro–Dodoma–Singida–Nzega–Nyakanazi –Rusumo);

[4] 5th Joint Infrastructure Sector Review Meeting, Roads under Local Government Authorities, October 2011.
[5] www.tanroads.org.
[6] www.pmoralg.go.tz.

3. Tanga(Arusha) Corridor (Arusha–Moshi–Himo–Lushoto–Tanga); and
4. Mtwara Corridor (Mtwara–Mingoyo–Masasi–Tunduru–Songea–Mbamba Bay).

Figure 5.1 presents a map of major corridors and links in Tanzania. A brief description of each corridor and related issues regarding road and railway transport follows.

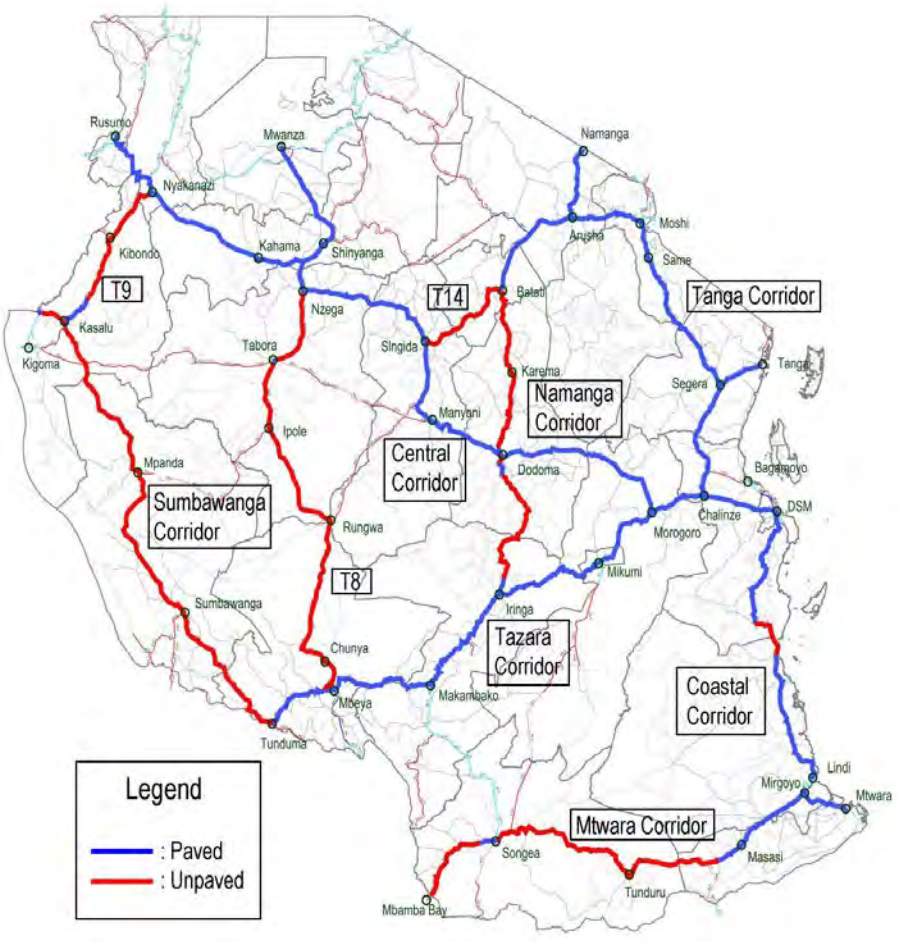


Figure 5.1: Major Corridors and Links in Tanzania

(1) Dar es Salaam Development Corridor

The Dar es Salaam Corridor, which is sometimes referred to as the TANZAM or TAZARA Corridor, connects Dar es Salaam Port with the Southern and Eastern Highland through the Dar es Salaam–Tunduma Highway.[7] Photo 5.2 show parts of the corridor.

The Corridor offers the shortest distance between Dar es Salaam Port and Zambia, Malawi, and the southern parts of Tanzania. However, there are other competitive choices especially from the Indian Ocean to Malawi, Zambia, and the DRC. For example, Nacala Port in Mozambique may compete with Dar es Salaam Port for traffic to and from Malawi, Zambia, and the DRC. Unless the TAZARA railway and highway provide efficient, fast, and reliable transport services, this corridor will lose its advantageous position. Major constraints facing the Dar es Salaam Corridor include:

[7] See, e.g., 10 Year Transport Sector Investment Programme (TSIP) Phase I 2007/08–2011/12.

- General deterioration in the performance of the TAZARA railway, including its signaling and telecommunication system, locomotives, wagons, and other operating equipment;
- Delays in port cargo clearance resulting from the poor overland transport system, largely attributable to the poor performance of TAZARA; and
- inadequate facilities for transshipment at interface points.

The potentials of the Dar es Salaam Corridor are numerous. The land along the corridor is a leading producer of maize, which is the leading food crop along the corridor. Other agricultural products include tea, coffee, and forestry products. Industrial activities include cement, beverages, and vegetables, and fruit canning.

Photo 5.1: Tanania National Road Route 1 Near Mbeya

Photo 5.2: Newly Rehabilitated Section of T1

(2) Central Development Corridor

The Central Corridor originates from Dar es Salaam Port and follows the central line route extending to eastern DRC, Burundi via Kigoma on Lake Tanganyika, to Rwanda via Isaka Dry Port, and to Uganda via Mwanza on Lake Victoria. The corridor offers the shortest distances between the Port of Dar es Salaam and the landlocked countries as follows:

- Dar – Kigoma – Bujumbura; Road/Rail and Lake: 1,436 km;
- Dar – Kigoma – Kalemie; Road/Rail and Lake: 1,374 km;
- Dar – Isaka – Kigali; Rail and Road 1,463 km; and
- Dar – Mwanza – Portbell; Rail and Lake 1,581 km.[8]

(3) Tanga Development Corridor

The Tanga Development Corridor has great potential to serve the Lake Victoria regions as well as Uganda, Burundi, and Rwanda using Tanga Port. Projects required to remove critical bottlenecks along this corridor include the development of a new deep water port at Tanga and improvement of the T2 highway. The corridor offers significant agricultural potential, tourist attractions, and mineral deposits, all of which will contribute to the economic viability of transport investments. There is a good paved road stretching from Tanga to Arusha, Makuyuni, and Ngorongoro.

(4) Mtwara Development Corridor

The Mtwara Development Corridor has been identified to serve the Southern African Development Community (SADC) countries of (northern) Malawi, Mozambique, and

[8] 10 Year Transport Sector Investment Programme (TSIP) Phase I 2007/08–2011/12.

northeastern Zambia considering the location of the corridor. Although the relative priority of the corridor is low among the main east-west corridors, there are a number of projects the viability of which will depend on infrastructure development, including coal exploration, Iron ore exploration, A Mtwara gas and industry platform, and tourism.

Along with port development, road development is a critical component for achieving the potential of the corridor. Specific constraints to be addressed for infrastructure development include:

- the limited capacity of Mtwara Port;
- the absence of a paved road network linking the port to the hinterland; and
- Mbamba Bay Port, which needs to be developed to allow for transit traffic from Mkata Bay in Malawi to Mtwara and to overseas locations.

The most important (road development) project for the Mtwara Development Corridor is the completion of the asphaltic pavement of currently unpaved sections between Mtwara and Mbamba Bay.

5.4.2 Road Transport Corridors

In addition to four major development corridors mainly serving east-west traffic, there are five transport corridors that are also important connections for national development and domestic transport. The road transport corridors extend for about 10,300 km, 40% of which is bituminized. The corridors are listed below:

(i) **Southern Coastal Corridor (T7[9])**: Dar es Salaam – Kibiti – Lindi – Mingoyo (508 km). Improvement of the road infrastructure of this corridor will promote economic activities in the southern part of Tanzania and improve this important regional link to Mozambique.

(ii) **Lake Circuit Corridor (T4)**: Sirari (Kenyan border) – Musoma – Mwanza – Bukoba – Mutukula (border with Uganda)(1,019 km). This lake circuit corridor serves manufacturing and processing industries as well as agriculture, mining, tourism, fisheries, and trade. It is an important link to the EAC partner states of Kenya and Uganda.

(iii) **Namanga Corridor Great North Corridor (T2, T5)**: Iringa – Dodoma – Arusha – Namanga (1,067 km). The Namanga Corridor serves agricultural areas, mining, and tourism. This is part of the historic Great North Road linking Cairo and Cape Town, and has been heralded as an important Trans-African Highway link.

(iv) **Western Corridor (Sumbawanga Corridor, T9):** Tunduma – Sumbawanga – Mpanda – Kigoma – Nyakanazi (1,286 km). Economic activities along this corridor include agriculture, tourism, mining, timberworks, fishing, and goldsmithing. Photo 5.3 and 5.4 show parts of the Western Corridor.

[9] T7: Tanzania National Road Route No. 7.

Photo 5.3: Tunduma-Ikana under Construction

Photo 5.4: Laela- Sumbawanga under Construction

(v) Central Western Corridor (T8): Mbeya – Rungwe – Ipole – Tabora up to Nzega (1,201 km). Possible development activities include forestry, tourism, and mining. Photo 5.5 and 5.6 show parts of the Central Western Corridor.

Photo 5.5: Gravel Road, T8

Photo 5.6: Typical Earth Road, T8

5.4.3 Traffic Volume on the Trunk Roads

Traffic count data along the trunk roads from 2007 through 2010 has been collected as presented in Figure 5.2. It is apparent that the present daily traffic on the ordinary sections of the trunk roads is far less than the capacity of two-lane roads (i.e., about 10,000-14,000 vehicles per day) except in the Dar es Salaam area, and that this will continue to be the case in 2030 when traffic is about four times the current levels. That said, there will be congested sections near towns, e.g.,, due to local traffic, the mixing of motorized traffic with pedestrians and other non-motorized forms of transport, encroachment on the road by vendors.[10] Although detailed traffic count data are not shown on the map due to space limitations, the daily traffic volumes close to major cities from traffic counts conducted by TANROADS are shown in Table 5.3.

[10] Trunk roads have both access and mobility functions; long-distance traffic mainly depends on the mobility function of the road, which access-controlled highway can provide. Naturally, overall traffic speed on ordinary roads is far slower than on expressways.

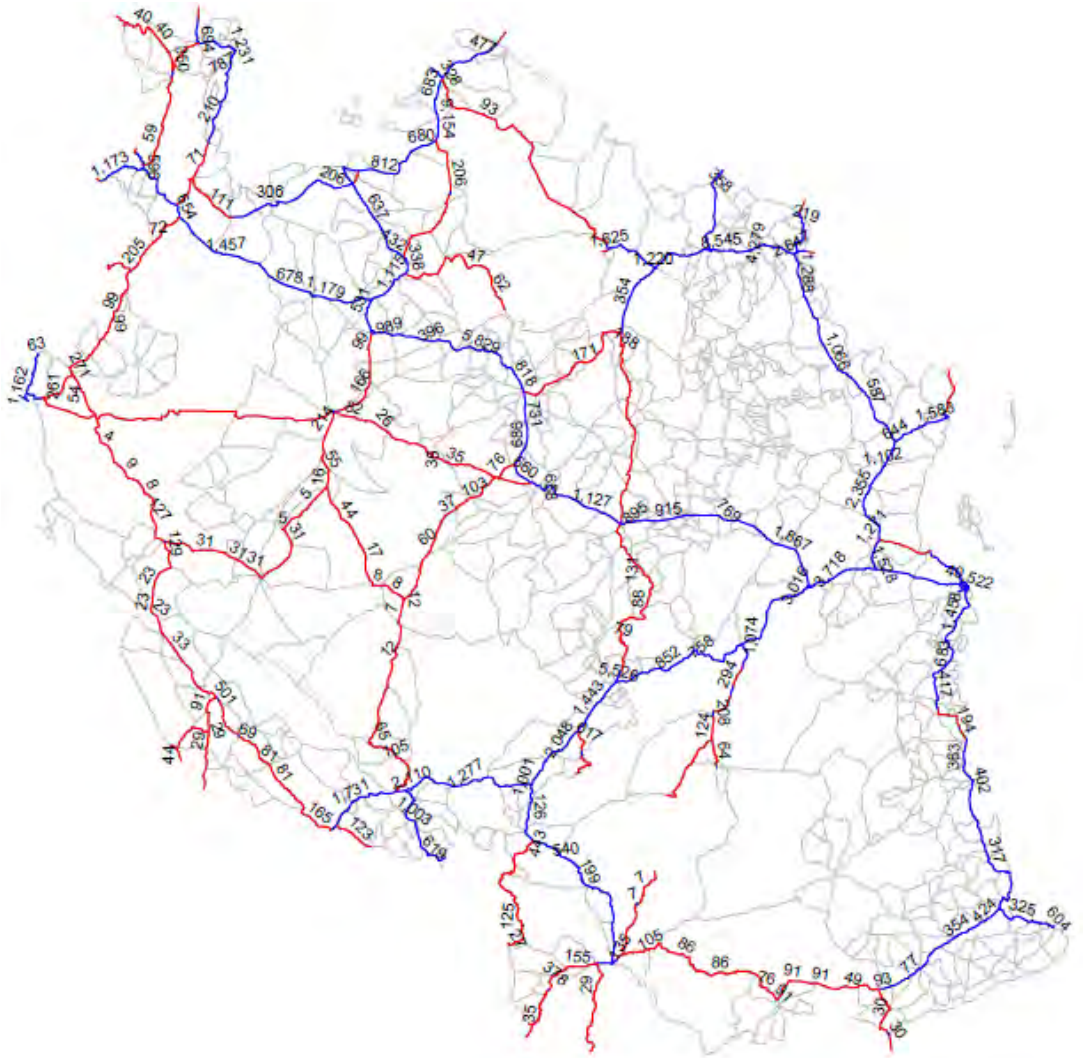


Figure 5.2: Daily Traffic Count Data on Trunk Roads from 2007 to 2010

Table 5.3: Estimates of Traffic Volumes Near Major Cities

Corridor	City	Daily Traffic	Year of Count	Adjusted Traffic in 2010 *	Rough Estimated Traffic in 2030
Central (DSM)	Morogoro	4,500–7,200	2010	4,500–7,200	18,000–28,800
TANZAM	Mbeya	6,000	2007	7,140	28,560
Arusha (Tanga)	Moshi	5,500	2007	6,550	26,200
Arusha (Tanga)	Arusha	13,000–16,000	2008	14,560–17,980	58,240–71,920
Central (DSM)	Dodoma	8,200	2010	8,200	32,800

Note: * Growth rate of traffic of 6% (3.025 times) and 8% (4.66 times) per annum is compared and multiple factor of four for 20 years used for adjustment and future estimation
Source: TANROADS traffic count data

Traffic volume in the target year of 2030 is expected to be about four times that in 2010. In order to avoid congestion in the cities listed in the table, widening of the existing road and/or construction of a bypass road will be necessary (see Figure 5.3 presenting the example of a bypass in Mbeya). An access-controlled, four-lane bypass road will be necessary except in Arusha, which will need six lanes. A detailed investigation to determine future traffic volume and highway location will eventually be required.

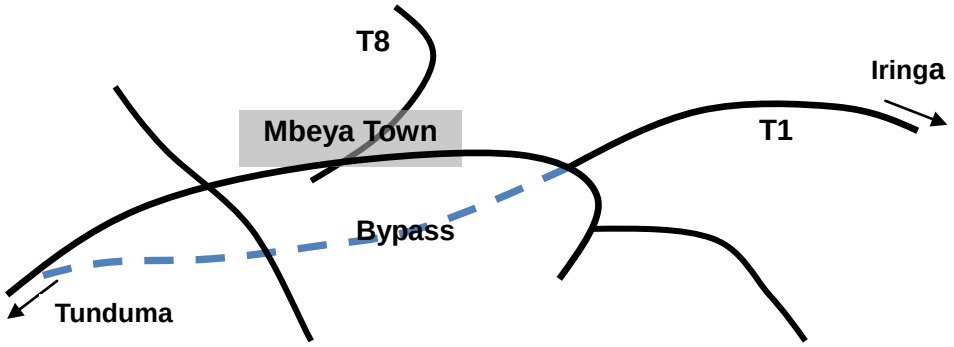


Figure 5.3: Example of a Bypass in Mbeya

5.5 Road Development Strategy

The Government of Tanzania (GOT) has strived to make the country a medium-developed country through sustainable economic growth and poverty reduction. One way to fulfil the national policy of poverty reduction is to provide sufficient transport in all regions including in rural areas. The most advantageous element of road transport is its door-to-door nature, since it uses not only the trunk road network but also regional and district road networks. Currently, local government road infrastructure conditions are very poor. Of a total classified network of 58,037 km, almost 15,000 km is currently impassable by normal motor vehicles. A further 20,000–30,000 km is impassable by normal motor vehicles during the rainy season.

A policy objective is to develop safe, reliable, effective, efficient, and fully integrated road transport infrastructure and operations that will best meet the needs of travel and transport at lower costs. Also envisaged is an environmentally sound transport system providing for cleaner logistics, e.g., utilizing liquefied natural gas (LNG) or compressed natural gas (CNG). An efficient and reliable transport network supports every field of economic activity especially in the transport of goods from ports inland (including to landlocked countries). The Government has given a high priority to the road transport sector as can be seen from funding levels. Consider, for example, that the Roads Fund for maintenance has increased from Tsh 287 billion in 2011 from Tsh 80 billion five years ago.[11]

Considering the annual growth rate between 4% and 8% (Government target), the overall traffic volume may be expected to increase fourfold by 2030. Large investments in infrastructure are one of the four crucial components of the Tanzania Five Year Development Plan (FYDP 2011/2012–2015/2016). However, a number of implementation bottlenecks are from a review of Vision 2025, e.g., an imbalance between/among transport modes and isolated project implementation without a distinction between short- and long-term projects.

Issues in the road sector include the incomplete road network, the low proportion of trunk and regional roads that are paved, traffic congestion in urban areas due to unplanned development, a lack of budget and skills for road construction and maintenance, insufficient capacity of the construction industry in Tanzania, and reduced road network reliability under certain weather conditions.

The freight transport strategy in Chapter 2 is the basis for the road development strategy. Each item of the freight transport strategy corresponds to the road development strategies in the following sub-sections.

[11] Draft Policy Analysis Paper, 5th Joint Infrastructure Sector Review 2011, Directorate of Policy and Planning.

(i) Strengthening international corridors can be achieved through the strategies: Road network strengthening (5.5.1) where raising pavement ratio of trunk roads and regional roads was emphasized, and Development of access-controlled expressway (5.5.4) for high speed, efficient and long-haul transport;

(ii) Developing infrastructure for the optimal modal share can be achieved through the strategy of Coordinated Development with Other Modes (5.5.3);

(iii) Meeting domestic transport demand can be achieved through the strategies of the Road network strengthening (5.5.1) by upgrading not only trunk roads but also regional roads, Capacity Expansion and Improvement of Service Levels (5.5.2) and Development of an Access-Controlled Expressway Network (5.5.4) also for domestic movements; and

(iv) Alleviating bottlenecks in the Dar es Salaam metropolitan area can be achieved through strategies of Capacity Expansion and Improvement of Service Levels (5.5.2) and Development of an Access-Controlled Expressway Network (5.5.4) for additional capacity especially along the major corridors.

The following sub-sections explain the detail of each road development strategy.

5.5.1 Road Network Strengthening

The proportion of trunk roads that are paved is 45% and that of regional roads is 4%. The overall road condition assessment of trunk roads at the end of December 2010 indicated that 53% were in good condition, while 35% were fair 12% were poor. A total of 77% of paved roads were rated good, while 27% of unpaved trunk roads were rated good. Increasing the proportion of the road network that is paved will contribute to reliable, effective, efficient, and fully integrated road transport infrastructure and operations. The measures of the road network strengthening to assure comprehensive transport and trade system development include:

- Strengthening of the existing road network (trunk and regional roads) through upgrading and rehabilitation to bituminous standard of the deteriorated pavement by 2030;
- Completion of the network of major road transport corridors described in section 4.4.2; and
- Construction of new sections of trunk roads to shorten distances and benefit local areas.

Various investment and implementation plans including the EAC Regional Transport Strategy and Roads Development Program have been put forward. Table 5.4 and Figure 5.4 present the trunk road sections covered by various plans. The sections in red in the figure (851 km in total) are not specified in the various plans but are to be paved by 2030.

Table 5.4: Trunk Road Sections Covered by Various Plans

ID	Corridor	Name	Length (Km)	Within Region
101	Western Corridor	Sumbawanga-Matai-Kasanga port	112	RUKWA
102	Western Corridor	Matai-Kasesya	65	RUKWA
103	Western Corridor	Tunduma-Sumbawanga	231	MBEYA, RUKWA
104	Western Corridor	Sumbawanga-Kibaoni	151.6	RUKWA
105	Western Corridor	Kibaoni-Mpanda	95	RUKWA
106	Western Corridor	Mpanda-Kanyani (Kidahwe)	252	KIGOMA, RUKWA
107	Western Corridor	Kidawhe-Nyakanazi	290	KAGERA, KIGOMA
201	Tanzam	Msimba-Ikokoto-Mafinga	219	IRINGA, MOROGORO
301	Central	Isaka-Lusahunga	242	KAGERA, SHINYANGA
401	Lake Circuit	Biharamulo-Bwanga-Uyovu	112	KAGERA
402	Lake Circuit	Kagoma-Biharamulo-Lusahunga	154	KAGERA
403	Lake Circuit	Kisesya Bypass	17	MWANZA
404	Lake Circuit	Nyanguge-Mz/Mara Border	80	MWANZA
405	Lake Circuit	Mz/Mara Border-Musoma	85.5	MARA, MWANZA
406	Lake Circuit	Musoma-Makutano	17.5	MARA
407	Lake Circuit	Makutano-Sirari	83	MARA
501	North Eastern	Chalinze-Segera-Tanga (Kitumbi-Tanga)	120	COAST, TANGA
502	North Eastern	Tanga-Horohoro	65	TANGA
503	North Eastern	Korogwe-Mkumbara-Same	172	KILIMANJARO, TANGA
504	North Eastern	Same-Himo	89	KILIMANJARO
505	North Eastern	Arusha-Moshi-Himo-Holili	140	ARUSHA, KILIMANJARO
506	North Eastern	Sanya Juu-Bomang'ombe	25	KILIMANJARO
601	The Great North	Arusha-Namanga	105	ARUSHA
602	The Great North	Arusha-Minjingu	104	ARUSHA, MANYARA
603	The Great North	Minjingu-Babati-Singida	222	MANYARA, SINGIDA
604	The Great North	Babati-Dodoma-Iringa	523	DODOMA, IRINGA, MANYARA
701	Mtwara Corridor	Mtwara -Masasi	200	LINDI, MTWARA
702	Mtwara Corridor	Tunduru-Namtumbo	194	RUVUMA
703	Mtwara Corridor	Namtumbo-Songea	70	RUVUMA
704	Mtwara Corridor	Peramiho-Mbinga	78	RUVUMA
705	Mtwara Corridor	Mbinga-Mbamba Bay	66	RUVUMA
706	Mtwara Corridor	Mangaka-Mtambaswala	65	MTWARA
801	Central Western	Mbeya-Chunya-Makongolosi	115	MBEYA
802	Central Western	Nzega-Tabora	116	TABORA
803	Central Western	Tabora -Ipole -Rungwa	262	SINGIDA, TABORA
804	Central Western	Ipole-Koga-Mpanda	359	RUKWA, TABORA
805	Central Western	Manyoni-Itigi-Tabora	264	SINGIDA, TABORA
806	Central Western	Tabora -Urambo	90	TABORA
807	Central Western	Uvinza -Kidahwe	77	KIGOMA
808	Central Western	Daraja la Malagarasi na barabara zake (maelezo yai	48	KIGOMA
901	Southern Coastal	Ndundu-Somanga	60	COAST, LINDI
1001	Road Projects out of Transport Corridors	Korogwe – Handeni	65	TANGA
1002	Road Projects out of Transport Corridors	Mziha – Turiani – Magole	84.6	MOROGORO, TANGA
1003	Road Projects out of Transport Corridors	Dumila – Kilosa	63	MOROGORO
1004	Road Projects out of Transport Corridors	Bariadi – Lamadi	71.8	MWANZA, SHINYANGA
1005	Road Projects out of Transport Corridors	Bagamoyo - Makofia – Msata	64	COAST
1006	Road Projects out of Transport Corridors	Handeni – Mkata	54	TANGA
1007	Road Projects out of Transport Corridors	Kisarawe – Maneromango	54	DAR ES SALAAM
1008	Road Projects out of Transport Corridors	Njombe – Makete	109	IRINGA
1009	Road Projects out of Transport Corridors	Kwasadala-Masama	12.2	KILIMANJARO
1010	Road Projects out of Transport Corridors	Kibosho Shine -Kwa Raphael -International School	43	KILIMANJARO
1011	Road Projects out of Transport Corridors	Rau Madukani -Mawela -Uru Njari	12.5	KILIMANJARO
1012	Road Projects out of Transport Corridors	Kirua Nduoni -Marangu Mtoni	31.5	KILIMANJARO
1013	Road Projects out of Transport Corridors	Kahama Mjini	5	SHINYANGA
1014	Road Projects out of Transport Corridors	Bunda – Kisorya – Nansio	118	MARA, MWANZA
1015	Road Projects out of Transport Corridors	Rujewa – Madibira -Mafinga	151	IRINGA, MBEYA
1016	Road Projects out of Transport Corridors	Katumba -Tukuyu	80	MBEYA
1017	Road Projects out of Transport Corridors	Nata – Fort Ikoma	141	MARA
1018	Road Projects out of Transport Corridors	Makurunge – Saadani – Pangani -Tanga	178	COAST, TANGA
1019	Road Projects out of Transport Corridors	Mto wa Mbu-Loliondo-Mugumu-Nata	452	ARUSHA, MARA
1020	Road Projects out of Transport Corridors	Kyaka -Bugene	59	KAGERA
1021	Road Projects out of Transport Corridors	Kawawa Jct – Mwenge - Tegeta Phase	17	COAST, DAR ES SALAAM
1022	Road Projects out of Transport Corridors	Makambako -Songea	295	IRINGA, RUVUMA
1101	Feasibility Studies and Detail Desisgn (FS & DD)	Tabora – Mambali – Bukene – Itobo – Kahama	149	SHINYANGA, TABORA
1102	Feasibility Studies and Detail Desisgn (FS & DD)	Lupilo – Malinyi – Kilosa kwa Mpepo – Londo – Kita	296	MOROGORO, RUVUMA
1103	Feasibility Studies and Detail Desisgn (FS & DD)	Ifakara – Mahenge	67	MOROGORO
1104	Feasibility Studies and Detail Desisgn (FS & DD)	Kibondo – Mabamba	35	KIGOMA
1105	Feasibility Studies and Detail Desisgn (FS & DD)	Kolandoto – Lalago – Mwanhuzi – Matala – Oldeani	328	ARUSHA, SHINYANGA, SINGIDA
1106	Feasibility Studies and Detail Desisgn (FS & DD)	Omugakorongo – Kigarama – Murongo	105	KAGERA
1107	Feasibility Studies and Detail Desisgn (FS & DD)	Mpemba – Isongole (Tanzania/Malawi)	49	MBEYA

Source: JICA Study Team

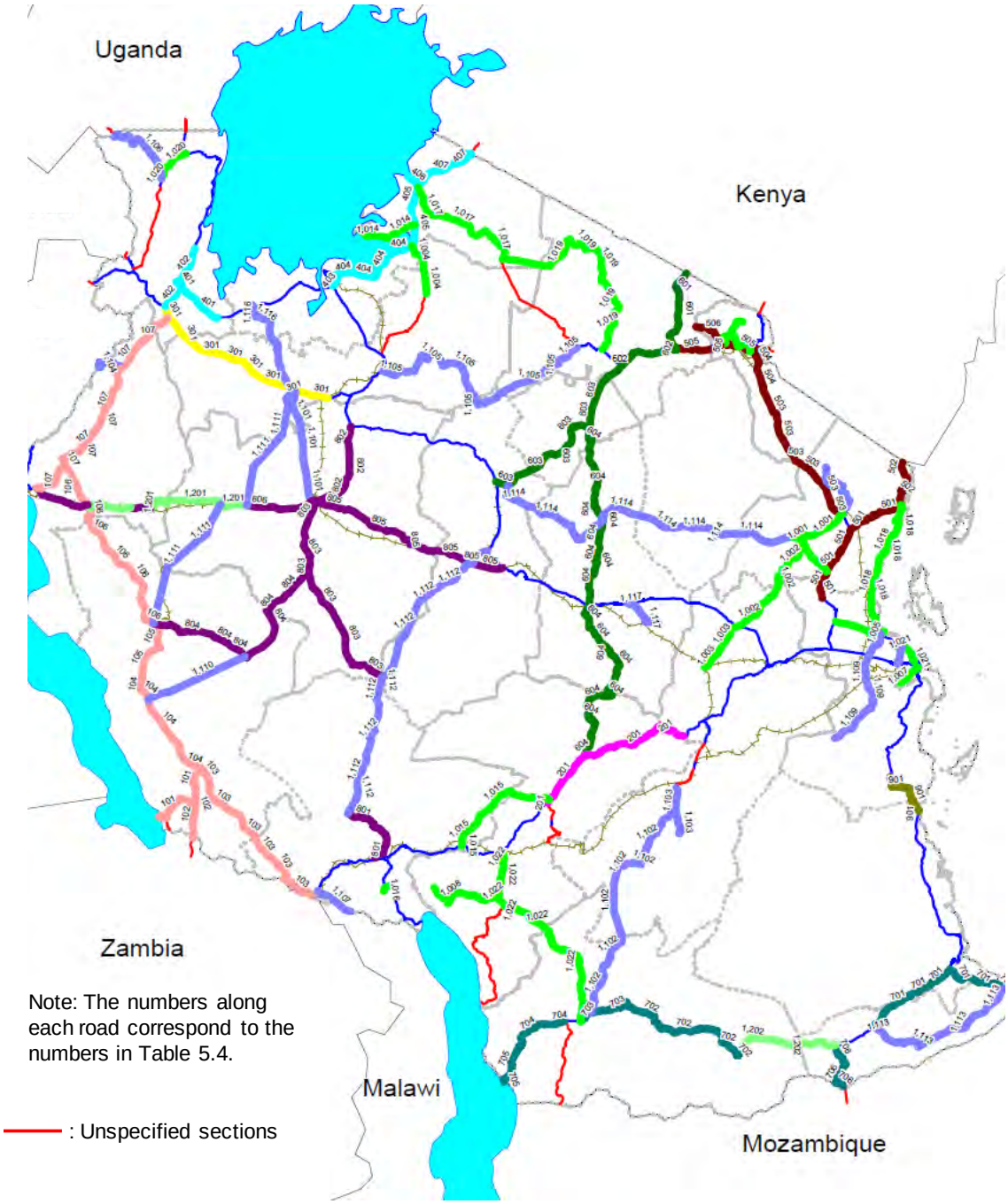


Figure 5.4: Trunk Roads Network Covered in Various Plans

5.5.2 Capacity Expansion and Improvement of Service Levels

Forecast growth in traffic demand necessitates an increase in the capacity of certain trunk road sections, e.g., by widening (see Photo 5.8).

Photo 5.7: Congestion of Morogoro Rd, T1

Photo 5.8: Bagamoyo Road Widening

The following policies should be taken into account regarding capacity expansion and improvement of service levels:

- Widening of existing trunk roads to absorb increased traffic in the future;
- Congestion relief in the urban road network such as in DAR ES SALAAM;
- Congestion relief near major cities; and
- Provision of road service facilities (highway stations) along trunk roads for the convenience and comfort of drivers and the safety of traffic.

5.5.3 Coordinated Development with Other Modes

Although it is widely understood that road transport is the dominant mode for the transport of goods and passengers in Tanzania, there should be harmonized development among the various transport modes. Each mode has its own comparative advantage(s), e.g., regarding distance, type of cargo, handling requirements. The following are basic policies for this purpose:

- Coordinated development of roads with ports and railways;
- Provision of access roads for new development areas; and
- Improvement of vulnerable road sections.

5.5.4 Access-Controlled Expressway Network

There are many kinds of road hierarchies starting from community roads focusing on the accessibility of people to frontage roads. The district roads in Tanzania are mainly for accessibility. The main function of trunk roads is to serve international and domestic freight transport providing mobility as opposed to accessibility. The regional roads supplement the trunk roads in terms of both accessibility and mobility. Although the road network hierarchy in Tanzania is clearly defined, the services of trunk roads and other road categories are not well separated.

In most industrialized countries there is a relatively clear classification of roads based on function. Figure 5.5 presents a schematic of mobility and accessibility by road category.

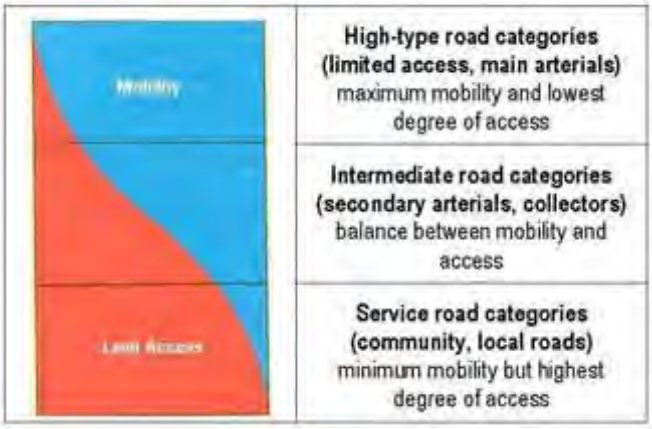


Figure 5.5: Mobility and Access by Road Category

The highest ranking in this categorization is access-controlled highways, which only allow for access through designated interchanges. Land access is limited by physical structures such as embankments, bridges, tunnels, and fences along the highway. The intermediate road category is similar to trunk roads in Tanzania at present, which provide both traffic and access functions.

Even within urban areaa a road hierarchy should be established based on the function of each road within the urban road network. Urban expressways are at the top in this categorization, with arterial roads serving a traffic function, and distributors and streets providing for land access.

A nationwide expressway network is designed so that efficient, high-speed, safe, and comfortable transport can be secured because of better design, good maintenance, and controlled access (see Photos 5.9 and 5.10). A nationwide expressway network (above trunk roads in the hierarchy) is not yet categorized in Tanzania but will be necessary with future growth in the economy and the transportation of goods and passengers. Expressways provide efficiency, comfort, and cargo and safer transport of goods and passengers. Access-controlled expressways are proposed in this Master Plan as long-term projects, including:

- Nationwide Expressway Network (the basic plan of which is to be formulated by 2030);
- Implementation of priority sections from candidate sections; and
- An Urban Expressway Network in DAR ES SALAAM based on the Dar es Salaam City Master Plan of 2008.

Photo 5.9: Four-lane Expressway

Photo 5.10: Interchange

The design speed of urban expressways will be either 80 km/h or 100 km/h; a typical cross section of a four-lane expressway is shown in Figure 5.6.

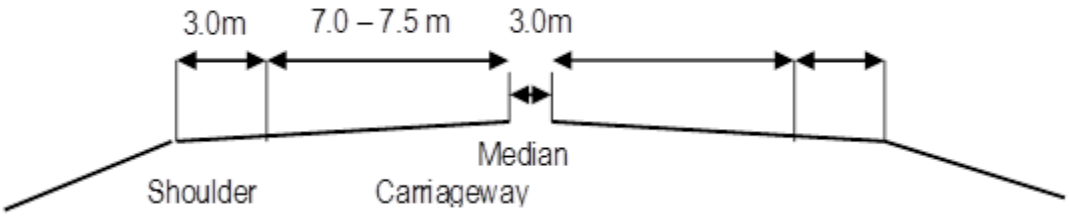


Figure 5.6: Typical Cross Section (Four Lanes)

5.6 Selected Projects

5.6.1 Selection Criteria

Based on the road development strategy, this subsection presents proposed road projects including specific sections. These include ongoing projects as well as projects proposed in the various development plans,[12] all of which were considered as short-term projects up to 2017. Also, there are projects that will be implemented beyond 2017, i.e., medium- and long-term projects.

The selection criteria for the short-term projects include the following:

(i) Relieving existing congestion or problems within a short time (i.e., widening of already congested road sections such as Morogoro Road and Bagamoyo Road);

(ii) Road network strengthening through corridor development: These are road sections within major corridors that are directly connected to ongoing or already upgraded sections. Based on the transport demand forecast, priority should be given to road sections that will quickly benefit road users within the short term. Thus, the length of the road sections will be relatively short to assure implementation in the short term.

(iii) Dar es Salaam area's congestion relief: The short-term projects within this category will include the first section of the access–controlled outer ring road of DAR ES SALAAM and intersection improvements.

The selection criteria for the mid-term projects include the following:

(i) Improvement of existing and future traffic conditions when the traffic demands increase by extension of the short-term project sections such as the widening of Morogoro Road;

(ii) Road network strengthening though corridor development: The road sections selected will be important connections between/among major corridors and basically the extension of the short-term project sections, for which surveys and detailed design have been completed by the Government because of increased demand in the future but for which funds have not yet been allocated.

[12] Prioritized Projects in the EAC Regional Transport Strategy and Roads Development Program, JYTZ 11010 Five Year Plan, Transport Sector Investment Programme (TSIP) Committed Road Projects, and Trunk Roads and Regional Roads, Roads Development Projects-Three Year Rolling Plan FY 2011/2012 to 2012/2013.

(iii) Dar es Salaam area's Congestion Relief: The extension of the outer ring road of Dar es Salaam, which is considered as a second stage section of the road, is a mid-term project.

The selection criteria for the long-term projects include the following:

(i) Road network strengthening through corridor development. The projects under this category include road sections going through areas for potential future agriculture production where current transport demand is relatively small, but significant measure of demand is expected after upgrading.
(ii) Dar es Salaam area's Congestion Relief: Road capacity expansion and improvement of service levels: The projects in this category include the continuation of the ring road around Dar es Salaam and urban expressways. Other projects aiming to relieve congestion near the major cities include bypass construction based on forecast traffic. Roadside service facilities for selected locations requiring service improvement are also included.

(iii) Access-controlled expressway network: The basic plan for a nationwide expressway network will be prepared within the master plan period. Construction of the higher priority sections of the planned expressway network will be commenced. The Bagamoyo expressway, which is the access road for the new Bagamoyo Port, will be constructed and connected to the outer ring road of Dar es Salaam.

5.6.2 Short-Term Development Projects

The implementation period for the short-term development projects will be 2013–2017. The short-term projects are aimed at relieving existing problems within a short time. There are four types of short-term measures: (i) widening roads to increase capacity and improve traffic conditions, (ii) corridor development or upgrading to facilitate transport movement, (iii) urban congestion relief, and (iv) roadside service improvements. In addition, there are ongoing projects managed by TANROADS (refer to Part 1 of the second volume of the Report). Some projects that will begin may not necessarily be completed within the short-term period ending in 2017. The short-term projects are listed below and mapped in Figure 5.7.

(1) Widening

Widening of Kimara–Chalinze (94 km, Morogoro Road to 4-lanes from its existing 2-lane alignment)[13]

The Morogoro Road carries heavy traffic volume from Dar es Salaam port to inland areas and countries. The four-lane section of the road is very short and only located in the Dar es Salaam urban area. It is always crowded by not only heavy trucks but also buses and automobiles toward the direction of the west, south west and even north-west through several corridors. The capacity improvement is urgent work to do even for mitigating the present condition. This project will serve short and medium term traffic demand.

Widening of Bagamoyo Road (40 km)

The New Bagamoyo Road from Sam Nujoma to Wazo Hill is under widening works. This section is the extension to Bagamoyo town where a new port is under planning. The industrial development near Bagamoyo town by private sectors has already started in consideration of the new port development. This section will serve the generated traffic by the new development toward Dar es Salaam areas.

[13] From the end of the 4-lane section in Dar es Salaam to Chalinze in the short-term plan.

(2) Corridor

Upgrading of Kibaoni (Kizi)–Mpanda (95 km-Western (Sumbawanga) Corridor T9)[14]

The section from Tunduma via Sumbawanga till Kibaoni has been under construction financed by MCC and GOT. This section is an extension to Mpanda. The section is selected as a short term project to enhance network strengthening because the feasibility study, detailed engineering design and tender documents preparation for Kibaoni–Mpanda–Kanyani road were completed in 2010.

The Western (Sumbawanga) Corridor is considered to be one of the important traffic corridors especially for domestic transport of mining and agricultural products along the corridor. The present road of gravel and earth condition prevents smooth and efficient transport of these goods. Once it is paved traffic volume will increase thus stimulating local economies and reducing poverty in the region. This section is the extension of the present on-going section.

Upgrading of Kidahwe–Kanyani–Kasulu (62 km, near Kigoma Port, T19 and T9)[15]

The section is strongly related to the Kigoma Port development. The extension of the road section reaches Nyakanazi for the development of the Western Corridor. This section is selected as a short term project for network strengthening because the feasibility study, detailed engineering design and tender documents preparation for Mpanda–Uvinza–Kanyani were completed in 2010. Besides, the Western (Sumbawanga) Corridor is considered to be one of the important traffic corridors especially for domestic transport of mining and agricultural products along the corridor. This section is a part of the Western Corridor and contributes to Kogoma Port related transport, too.

Upgrading of Mbinga–Mbamba Bay (66 km, Mtwara Corridor T6)[16]

Mbinga–Mbamba bay road section (66 km) is part of the Mtwara Development corridor which starts from Mtwara Port to Mbamba Bay port. This section is selected as a short term project for the network strengthening of the corridor that has a potential for transport of natural resources, and agriculture products, which will be transported by road. It is selected as a short term projects because the feasibility study was completed in 2007 as part of the Songea–Mbamba Bay road (144 km) and detailed design and preparation of tender documents are also completed, too.

(3) Access Road Improvement

Upgrading of Bagamoyo–Mlandizi (37 km unpaved regional road)

The New Bagamoyo Port is under planning. The industrial development near Bagamoyo by private sectors has already started in consideration of the new port construction. This section will serve the supplemental connection from Bagamoyo to the Morogoro Road, which is further connected to inland and even Dar es Salaam traffic. The section, once completed contributes to the distribution of traffic from the new Bagamoyo Development Zone. Some parts of transport from Bagamoyo to Morogoro direction would use this road because of shorter distance.

An Outer Ring Road

The outer ring road is the bypass of Dar es Salaam city and connects the New Bagamoyo Road, Morogoro Road and finally Nyerere Road to alleviate traffic being concentrated on the Nelson Mandela Road. The inner ring of the Nelson Mandela Road and another ring road being planned

[14] The Tanzania Five Year Development Plan 2011/12–2015/16.
[15] Extension of Kigoma–Kidahwe (completed in June 2010, T19).
[16] The Tanzania Five Year Development Plan 2011/12–2015/16.

inside of the outer ring road will distribute traffic within Dar es Salaam area and inbound-outbound traffic. This road of about 30 km in total is selected as a short- to long-term project to be implemented step by step. The section, once completed contributes to the distribution of traffic from the major radial trunk roads. Some parts of transport from Bagamoyo to Dar es Salaam or vise versa can use this route instead of using inner ring routes that are usually congested.

Ubungo Intersection

The intersection of Morogoro Road and Nelson Mandela Road is always crowded due to heavy traffic from Dar es Salaam port to inland of Tanzania and inland countries on the Nelson Mandela Road as well as ordinary bus and automobile traffic on both roads. The basic structure of the grade separation would be similar to those appeared in the Tazara Intersection Flyover concept. However, the significant truck traffic from Morogoro Road to Nelson Mandela Road (right-turning movements) should be carefully accommodated in order not to interrupt BRT traffic.

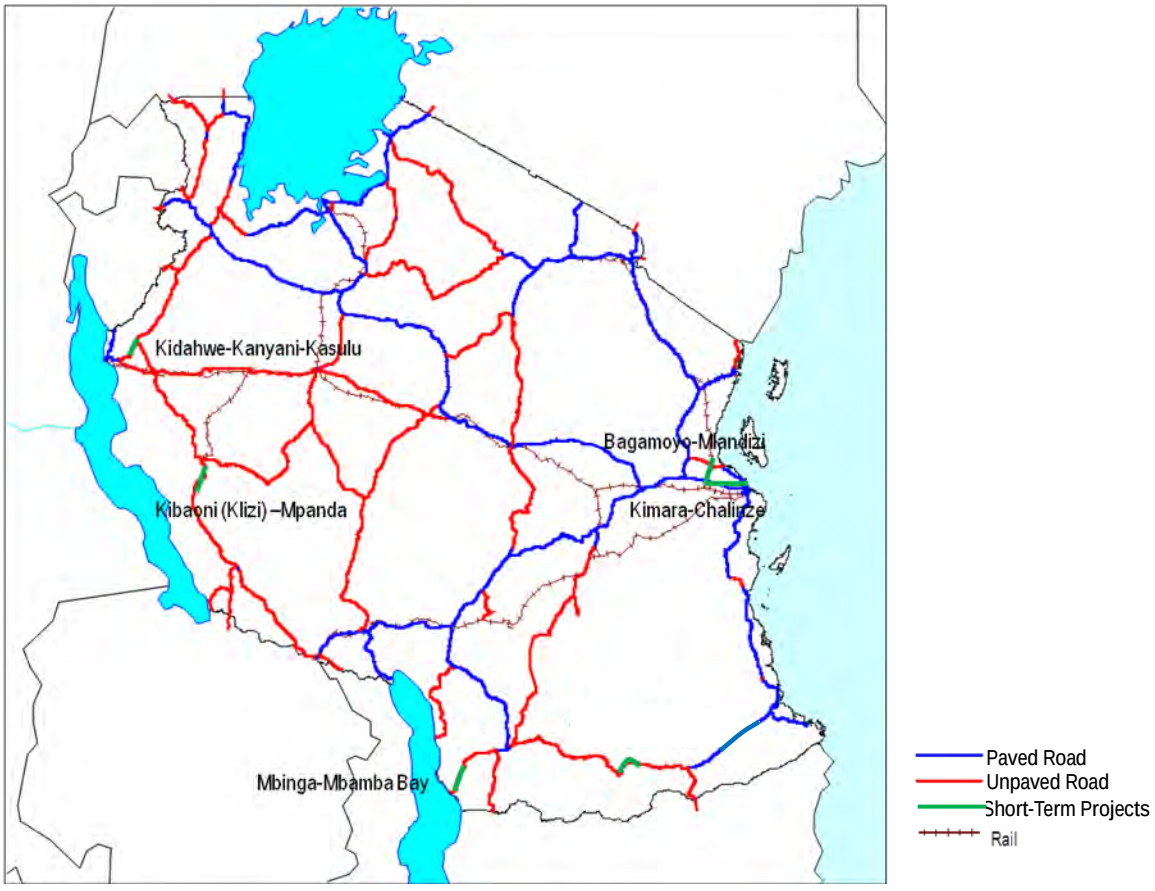


Figure 5.7: Short-Term Development Projects

5.6.3 Medium-Term Development Projects

There were several sections of development and traffic corridors without funding as of 2012. The figure includes both medium- and long-term projects based on the master plan strategy. The expected medium-term projects were categorized based on the relative importance of the corridors. The medium-term projects are listed below and mapped in Figure 5.8.

(1) Widening

Widening of Chalinze–Morogoro (100 km)

This section is selected as a medium term project to handle near future traffic demand and as the extension of the short term development section of Kimara– Chalinze, which handles significant amount of traffic because this section is a duplicated section of both Central and TANZAM corridors. Capacity increase of the major corridor will contribute greater efficiency of the freight transport as well as passengers. Better service level of traffic along the trunk roads benefits trucks and automobiles who need speedy and efficient transport.

(2) Corridor Projects

Upgrading of Kibaoni–Mpanda–Kanyani (269 km)

The road forms part of the Western (Sumbawanga) Corridor and it is a continuation of Sumbawanga–Mpanda road which links with the Kigoma–Nyakanazi road at Kanyani. This road is selcted as a medium term project because the neighboring sections are under construction and Detailed Engineering Design and Tender Documents preparation for Kibaoni–Mpanda–Kanyani road were completed in 2010. Part of the section Kibaoni–Mpanda of 95 km is considered as a short term development project in this master plan. The rest of the section of 269 km will be implemented as a medium term project.

Upgrading of Kigoma (Kidahwe)–Nyakanazi (248 km)

This road is important for transportation of goods and services to and from Kigoma port and selected as a medium term project because the construction to bitumen standard for Kigoma–Kidahwe road section (36 km) was completed in 2010 under GOT financing. Besides, Feasibility study, Detailed Engineering Design and Tender Documents preparation for Mpanda–Uvinza–Kanyani were completed in 2010. The part of the section, Kidawe–Kanyani–Kasulu of 62 km is taken as a short term development project. The rest of the section of 248 km will be constructed as a medium term project.

Upgrading of Kigoma (Kidahwe)–Nyakanazi (248 km)

This road is important for transportation of goods and services to and from Kigoma port and selected as a medium term project because the construction to bitumen standard for Kigoma–Kidahwe road section (36 km) was completed in 2010 under GOT financing. Besides, Feasibility study, Detailed Engineering Design and Tender Documents preparation for Mpanda–Uvinza–Kanyani were completed in 2010. The part of the section, Kidawe–Kanyani–Kasulu of 62 km is taken as a short term development project. The rest of the section of 248 km will be constructed as a medium term project.

Upgrading of Kidahwe (Kigoma)–Ilunde–Malagarasi–Kaliua (188 km)

This road is part of the Tabora–Urambo–Kaliua–Malagarasi–Kigoma road. The road links Kigoma port with Tabora Municipal. It is a gravel road and its accessibility is limited due to there have been no bridge at Malagarasi river. Except for the Ilunde–Mlagarasi–Kaliua sections, the rest are under construction. This section is selected as a medium term project because detailed design and preparation of tender documents for the whole route are complete. Upgrading to bitumen standard for the Kigoma–Kidahwe section 35.7 km is complete under GOT financing. Upgrading to bitumen standard for the Kidahwe–Uvinza section 76km is also ongoing under GOT/Abu-dhabi financing. Construction of Malagarasi Bridge and 48km of approach roads are ongoing under Korean Government financing. Upgrading to bitumen standard for the Urambo–Tabora road section (94km) is ongoing under GOT financing.

This road comprises a part of the Western Corridor for international and domestic transport of the area. Better service level along the trunk roads benefits trucks and automobiles which need speedy and efficient transport. This section of the road is going parallel with the TRL line to be rehabilitated for bulky and long haul cargoes. Road transport still needs for short-medium distance and various kinds of commodities.

Upgrading of the Manyoni–Itigi–Tabora Road (71 km) to Bitumen

This road links Tabora with the Central Corridor at Mkiwa in Manyoni District. The road is of gravel standard which is inaccessible during the rainy seasons. The main function of road is transportation of cotton from Tabora to Dar es Salaam and Tanga ports for export. This road is selected as a medium term project because detailed design update, Environmental and Social Impact Assessment and preparation of tender documents of Tabora–Nyahua–Chaya (166.5) and Nyahua–Itigi–Manyoni 89.65 km were completed in 2011. Construction works are ongoing on Tabora–Nyahua section (85 km) and Manyoni–Itigi–Chaya section (89.3 km) under GOT financing. The to-be-upgraded section is the Nyahua–Chaya section of 71.15 km.

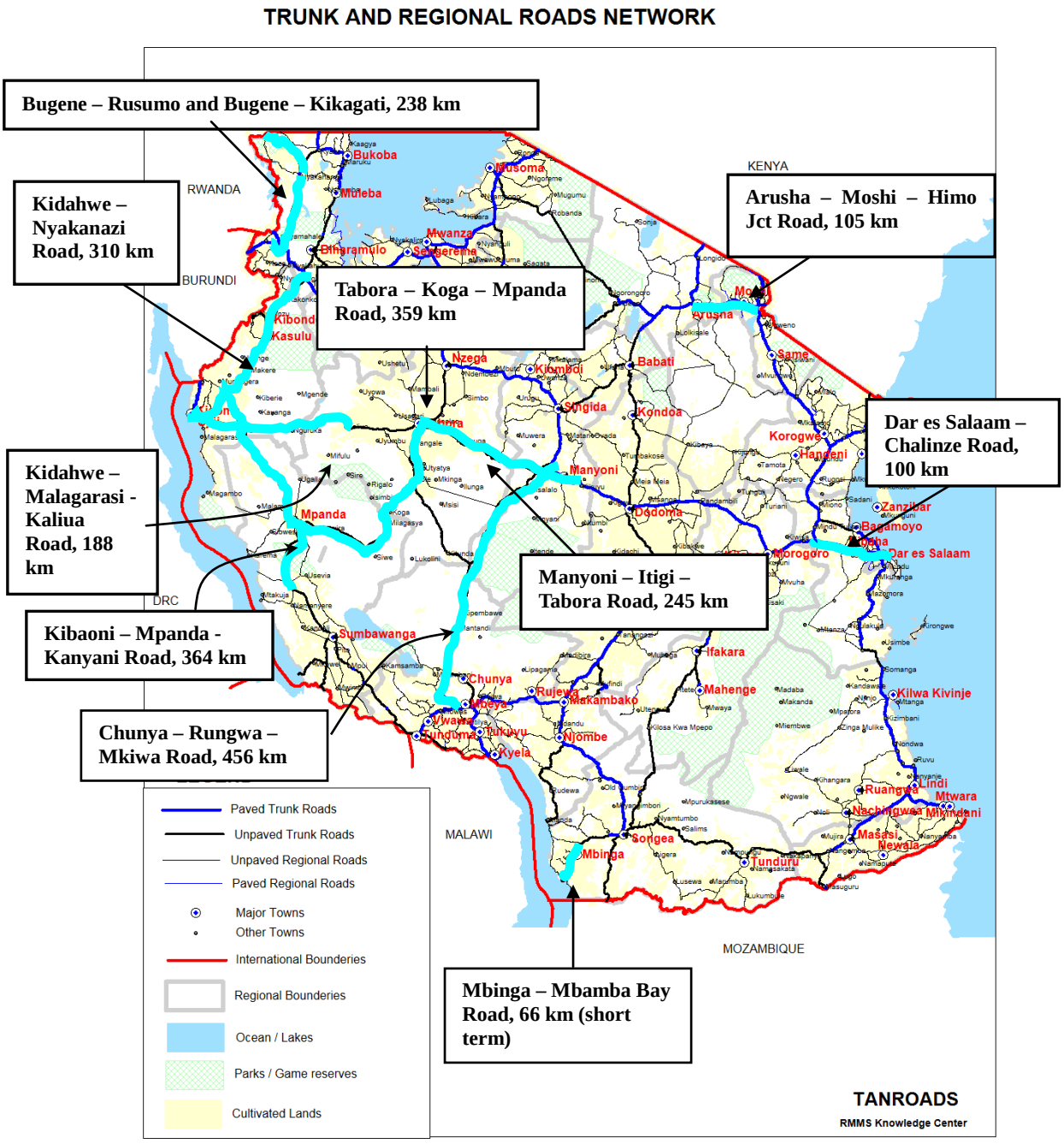


Figure 5.8: Planned Roads without Funding along Major Corridors as of 2012

5.6.4 Long-Term Development Projects

The long-term development projects are listed below:

(1) Corridor Projects

Upgrading of the Kasulo–Rusumo and Bugene–Murongo Bugene–Kikagati Roads (236 km) to Bitumen

This road section is important regionally as they link neighbouring countries of Uganda, Rwanda, Burundi, DRC with Karagwe District which has economic potential in terms of

agriculture, livestock, minerals and tourism. Upgrading to bitumen standard is on going on Kyaka-Bugene road 59 km under GOT financing.

This section is selected as a lon term project because there is no financing commitment for feasibility, detailed engineering design and preparation of tender documents and construction of Bugene–Murongo and Murongo–Kasulo with a total of 238 km

Upgrading of the Tabora–Koga–Mpanda Road (359 km) to Bitumen

The road links with the Western Corridor route at Mpanda where it joins the Tunduma–Sumbawanga–Nyakanazi road. Economic activities along this road include agriculture, tourism, mining, timberworks, fishing and gold smiting. Construction of this road to bitumen standard will form an important connection between the Southern Highlands of Tanzania with Lake Zone and Eastern part of Tanzania through the Nzega–Tabora road which is currently under construction to bitumen standard. This section is expected to enhance road network strengthening and economic development of the region. Feasibility study was completed in April 2010 while detailed design and preparation of tender documents for upgrading to bitumen standard were completed in 2011 under GOT financing.

Upgrading of the Chunya–Makongolosi–Rungwa–Itigi–Mkiwa Road (413 km) to Bitumen

The main economic activities along the project area include agriculture, livestock, mining and tourism. The main agricultural crops are maize, sorghum, millet, rice, pulses, cassava, Banana and potatoes. Construction of Mbeya–Chunya road section (72 km) to bitumen standard is on going under GOT financing. Feasibility study, detailed design and preparation of tender documents for Makongolosi–Rungwa–Mkiwa (413 km) were completed in 2011 under GOT financing. There is no financing commitment for civil works for the 413 km section from Makongolosi–Rungwa

(2) Urban Roads

Ring Roads around Major Cities

The future traffic volume near major cities exceeds the capacity of an ordinary 2-lane trunk road according to the future traffic forecast in the year 2030. In order to avoid congestion in the city building a bypass is recommended. Access controlled by-pass construction around Dodoma, Arusha, Morogoro Mbeya and Mwanza will be planed and mainly contribute to through traffic around the major cities to avoid congestion in the city areas.

An Urban Express Way

According to the “Dar es Salaam Transport Policy and System Development Master Plan” an urban expressway network was proposed. The purpose of the expressway is to increase overall capacity and smooth flow of the traffic within the city area. There is a possibility to introduce PPP schemes for the plan and construction.

(3) National Expressway Network

Basic national expressway planning will start in 2013/2014. The plan will be authorized in the next Tanzania Five Year Development Plan. The basic planning, route location, and FS/DD work will start in 2018/2019. The construction of priority sections will start in 2022. The first section of the expressway will open by 2030. It is recommended to introduce a toll highway system and utilize a PPP scheme or private funding systems in order to reduce the burden of implementation on government finances.

(4) Expressway Sections to be Started by 2030

Dar es Salaam–Chalinze (100 km)

This section is a priority section of an expressway to assure smooth and efficient transport from Dar es Salaam to Morogoro when the traffic volume increases. Consultancy Services for detailed review and analysis to establish toll roads in Tanzania through PPP arrangement was completed in September 2011 by the Government. According to the economic analysis results an IRR range between 19% and 23% for 6 Lane Expressway on Dar es Salaam (Ubungo–Mlandizi, 55 km) and 4 Lane Expressway for Mlandizi–Chalinze 45 km respectively.

The expressway reduces traffic congestion and ensures faster transport by reduced time, better riding quality, safer roadway and reliability. It also increases smooth and fast traffic thus improving transport efficiency and speed.

Chalinze–Morogoro (90 km)

This section is the extension of Dar es Salaam–Chalinze section of the expressway. The traffic volume from Dar es Salaam to Morogoro would be among the highest in Tanzania, which would justify construction of the expressway as a higher priority section.

Morogoro–Dodoma (255 km)

This section is located on the Central Corridor and connects to the capital city of Dodoma.

Arusha–Moshi–Himo Junction Dual Carriageway (105 km)

This road links two tourist and economically important towns of Arusha and Moshi, links the two towns to tourist attractions such as the Serengeti, Ngorongoro, Arusha and Kilimanjaro National Parks. The existing road is a two lane road. The study which was carried out in 2011 to establish toll roads in Tanzania recommended that this road is economically and financially viable for construction to a dual carriageway under PPP arrangement. The traffic volume based on year 2010 on this road ranges between 5,000–7,500 AADT.

Bagamoyo Expressway (40 km)

The New Bagamoyo Port is being planned. There are various development schemes near the area. One of the infrastructure development projects in the long term plan will be an expressway in addition to the existing road capacity increase as a short term development.

(5) Uncovered Trunk Roads

After careful examination of the trunk roads, it was found that there are significant lengths of the roads that are neither covered by ongoing sections nor specified as master plan projects, as can be seen in Table 5.5.

Table 5.5: Roads Not Covered by Ongoing Sections or in the Master Plan

Region	Trunk Roads 2010		Trunk Roads 2030		Paved Regional and New Roads
	Paved	Unpaved	Paved	Unpaved	
Arusha	328	213	460	81	211
Coast	396	106	502	–	224
Dar es Salaam	120		120	–	48
Dodoma	201	354	554	–	232
Iringa	479	385	586	278	150
Kagera	446	460	786	120	–
Kigoma	95	563	658	–	–
Kilimanjaro	295		295	–	129
Lindi	334	14	347	–	–
Manyara	71	140	211	–	142
Mara	171	242	339	73	110
Mbeya	367	443	811	–	104
Morogoro	443	403	790	55	145
Mtwara	171	113	283	–	198
Mwanza	376	34	410	–	86
Rukwa	14	873	875	12	198
Ruvuma	191	734	794	131	–
Shinyanga	330	326	555	101	143
Singida	286	388	675	–	34
Tabora	152	815	966	–	317
Tanga	272	55	327	–	472
Grand Total	5,537	6,660	11,345	851	2,945
		12,197		12,197	

Source: JICA Study Team

A total of 851 km of trunk roads should be paved as a long-term project at a cost of about USD 680 million in order to strengthen road network.

(6) Traffic Safety Devices

Although there are traffic control signs and information boards along the major highways, the number of signs and boards and the information provided to drivers is insufficient to ensure traffic safety. Since it is difficult to provide necessary signs and information boards within a short time period, they should be provided over a period of ten years (short and medium term) along about 12,000 km of trunk roads. The new signboards and information boards should be based on an accepted design standard.

5.6.5 Service Level Improvements along Trunk Roads

The improvement of roadside services through highway stations is recommended as set out below.

(1) Pilot Implementation of the Facilities at Two Locations along the TANZAM Corridor

The geography of Tanzania, including its size, scattered settlement pattern, diversity, and dispersion, give roads a special role in the integration of the national economy. The transport of goods and passengers depends on well-organized trunk, regional, and district road networks. However, the pavement conditions of even trunk roads are not satisfactory at present. Furthermore, the distance between major towns where various services to drivers, passengers, and vehicles are expected is relatively long because of the country's size. Services that are critical for traffic safety and the comfort of road users are poorly provided. A highway station is

a facility equipped with parking, a workshop, shops, a fuel station, toilets, and a restaurant located especially in remote areas along trunk roads. The shops in such facilities will sell locally grown agricultural products or manufactured goods, which will promote the local economy.

The selection of the locations and preliminary planning for the pilot implementation will start in 2013. Test construction will commence in 2016 after completion of the FS and DD in 2014/2015. The facilities will be completed in 2017. The expected cost for one location on both sides of the road is estimated at USD 8 million. Figure 5.9 presents the concept of the roadside facility, to be developed on 1 ha, with tentative locations west of Mikumi and east of Makambako.

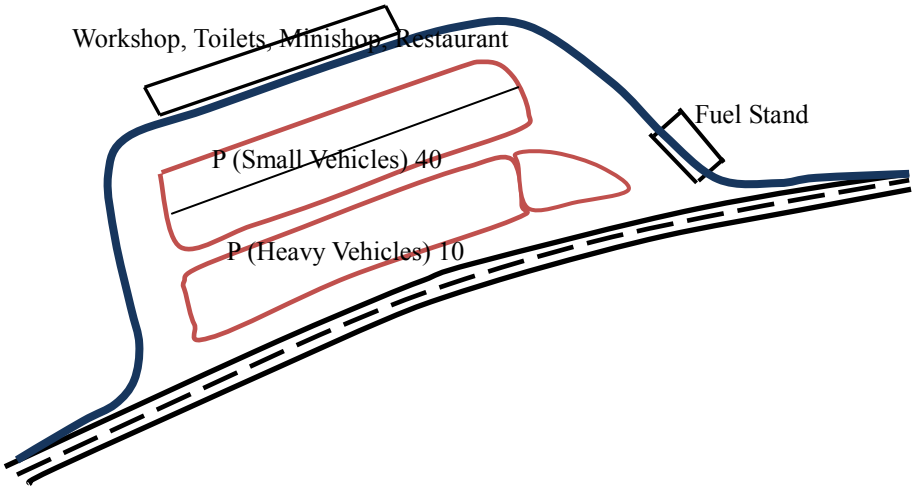


Figure 5.9: Concept of Roadside Facility

(2) Nationwide Improvement of Roadside Services (Highway Stations)

Service facilities will be required for a total of about 9,000 km of trunk roads along major corridors for freight and passenger transport. Currently, these services are provided in cities and towns since there are no intermediate service facilities. About 30–40 facilities will be required for the major corridors assuming an average distance of 200 km between facilities. A rough estimate of total costs is USD 300–400 million (i.e., USD 8 million per location).

Detailed project descriptions of short-, medium-, and long-term projects are shown in Table 5.7 to 5.30 and other necessary projects are shown in Table 5.7 to 5.30.

5.6.6 Mitigation Measures for the Impact on Environment and Social Consideration

The SEA survey was conducted, and the impact on environment and social considerations has been evaluated in this study. The project descriptions shown in Table 5.7 through 5.31 are the determined SEA survey results.

Table 5.6 shows the potential impact on each component.

Table 5.6: Potential Impact of the Lake Port Project on Each Component

COMPONENTS / POTENTIAL IMPACTS	Total Score	Biodiversity,Flora and Fauna	Population, Health & Safety	Soil	Water	Air	Climatic Factors	Material Assets	Cultural Heritage	Landscape
Destruction of cultural heritage sites.	-2								-2	
Temporary water and soil pollution	-4			-2	-2					
Destruction of wetlands	-2	-1								-1
Increased emission of GHG.	-5					-3	-2			
Destruction of natural vegetation.	-6	-3								-3
Soil erosion.	-6			-3						-3
Landscape alternations.	-3									-3
Increased freight / cargo transportation	3		3							
Faster movement of freight / cargo	3		3							
Reduced traffic congestion	6		3			3				
Improved access to social services	3		3							
Increased access to domestic and external markets	3		3							
Reduced transportation costs	3		3							
Rise in health and safety risks	-2		-2							
Increased transmission of communicable diseases	-3		-3							
Creation of employment and income generation	3		3							
Resettlement of people	-2		-2							
Loss of material assets	-2							-2		

Note: the level of evaluation is categorised as follows. -3; High -Ve impact, -2: Medium -Ve impact, -1: Low -Ve impact, 0: Neutral or Negligible impact, 1: Low +Ve impact, 2: Medium +Ve impact, 3: High +Ve impact

It is significant that there are high negative impacts in terms of destruction of natural vegetation, soil erosion and emission of GHG as a result of increase in the number of large scale shipment. Meanwhile, there is high positive impact of reduction of traffic congestion followed by other positive impacts such as improved quality of transportation activities and increased access to domestic and external markets.

Considering the above listed evaluations and further details regarding the impact of the project on specific areas described in chapter 10, the following mitigation measures need to be taken into account to implement road development.

1. Follow safeguard policies of World Bank and JICA on Involuntary resettlement
2. Enforce emission standards.
3. Introduce roadside emission testing for vehicles and specify maximum age limit on imported vehicles.
4. Promote the use of clean fuel such as Liquefied Petroleum Gas (LPG), Compressed Natural Gas (CNG), Sulphur free petrol and diesel.
5. Enforce relevant legislation to prevent development activities within protected areas (GRs and NPs).

6. Compliance with Environmental Protection Objectives.
7. Avoid development activities within ecologically valuable natural vegetation and environmentally sensitive areas.
8. Minimize soil erosion through good construction practices and restoration of disturbed areas
9. Avoid landscapes with special or unique characteristics.

Table 5.7: Widening of Kimara–Chalinze (94 km) of Morogoro Road 4-Lane from Existing 2-Lane)

Project Name	**Widening of Kimara–Chalinze (94 km) of Morogoro Road 4-lane from existing 2-lane)**

(1)	***Location (Project Area)***	Dar es Salaam, Coastal
(2)	***Executing Agency***	Tanzania National Roads Agency (TANROADS)
(3)	***Background***	Morogoro Road carries heavy traffic volumes from Dar es Salaam Port to inland areas of Tanzania and neighboring landlocked countries. The four-lane section of the road is very short and only located in the DSM urban area. It is always congested with not only heavy trucks but also buses and automobiles toward the west, southwest, and the northwest through several corridors. The capacity improvement is urgent. This project will serve short- and medium-term traffic demand.
(4)	***Type of Project***	Widening of the existing 2-lane road to a 4-lane road.
(5)	***Objectives***	Capacity increase to mitigate traffic congestion
(6)	***Proposed Work Components***	94 km of FS/DD Earthworks and pavement construction Structure design and construction
(7)	***Project Justification***	Traffic volume in 2010 on the 2-lane road section exceeded capacity resulting in constant traffic congestion especially in and near the DSM metropolitan area. Although a long-term solution will be necessary to accommodate future traffic growth along the route, this project will serve present DSM congestion relief as well as medium-term requirements.
(8)	***Project Timing***	Short-term
(9)	***Implementation Work Duration***	4.5 years
(10)	***Total Project Cost***	USD 190 million
(11)	***Implementation Scheme***	No specific funds are available for the project. Development partner funds may be required.
(12)	***Investment Plan***	N.A.
(13)	***Donor Funds***	No commitment
(14)	***Land Acquisition***	Most of the area is within the present right of way.
(15)	***Environmental Impact***	Low (minimum relocation, no significant adverse effects)
(16)	***Social Impact***	Low
(17)	***EIA Status***	Not yet done.
(18)	***Expected Benefit***	Reduced traffic congestion, higher speeds, reduced accidents.
(19)	***Documents Available***	N.A.
(20)	***Connection with Other Modes***	N.A.

Project Location Map

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 5.8: Widening of the Bagamoyo Road (Wazo Hill–Bagamoyo, about 40 km, Extension of the Present Widening Works)

Project Name	**Widening of the Bagamoyo Road (Wazo Hill – Bagamoyo, about 40 km, Extension of the present widening works)**

(1)	***Location (Project Area)***	Dar es Salaam and Coastal Regions	**Project Location Map** 
(2)	***Executing Agency***	Tanzania National Roads Agency (TANROADS)	
(3)	***Background***	The New Bagamoyo Road from Sam Nujoma to Wazo Hill is being widened. This section is the extension to Bagamoyo town where a new port is planned. The industrial development near Bagamoyo by the private sector has already started industrial development in anticipation of construction of the port. This road section will serve the generated traffic by the new development toward DSM.	
(4)	***Type of Project***	Widening of the existing 2-lane road to a 4-lane road.	
(5)	***Objectives***	Capacity increase and traffic generation to serve future development.	
(6)	***Proposed Work Components***	FS/DD (40 km) Earthworks and pavement construction Structure design and construction	
(7)	***Project Justification***	The traffic volume of the section near DSM exceeds capacity under interrupted flow conditions. A four-lane road will secure smooth traffic flow according to the future traffic demand. In addition, the widening will contribute to the development of the Bagamoyo area. Although a long-term solution for future traffic growth will be necessary, this project will serve current and medium-term requirements.	
(8)	***Project Timing***	Short-term	
(9)	***Implementation Work Duration***	4 years	
(10)	***Total Project Cost***	USD 80 million	
(11)	***Implementation Scheme***	No specific funds are available for the project. Development partner funds may be required.	
(12)	***Investment Plan***	N.A.	
(13)	***Donor Funds***	No commitment	
(14)	***Land Acquisition***	Most of the area is within the present right of way.	
(15)	***Environmental Impact***	Low (minimum relocation, no significant adverse effects)	
(16)	***Social Impact***	Low	
(17)	***EIA Status***	Not yet done.	
(18)	***Expected Benefit***	Reduced traffic congestion, higher speeds, reduced accidents, accelerated development.	
(19)	***Documents Available***	N.A.	
(20)	***Connection with Other Modes***	Port	

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 5.9: Upgrading to Bituminous Standard of Kibaoni (Kizi)–Mpanda (95 km-Western [Sumbawanga) Corridor T9)

Project Name	**Upgrading to Bituminous Standard of Kibaoni (Kizi)–Mpanda (95 km - Western [Sumbawanga) Corridor T9)**

(1)	***Location (Project Area)***	Rukwa Region
(2)	***Executing Agency***	Tanzania National Roads Agency (TANROADS)
(3)	***Background***	The section from Tunduma via Sumbawanga to Kibaoni has been under construction with financing from the Millennium Challenge Corporation and the GOT. This section is an extension to Mpanda. The earthworks and pavement construction would start in 2014 since the feasibility study, detailed engineering design, and tender documents for the Kibaoni–Mpanda–Kanyani road were completed in 2010.
(4)	***Type of Project***	Upgrading to bituminous standard.
(5)	***Objectives***	Capacity increase, smooth traffic flow, and efficient transport.
(6)	***Proposed Work Components***	Tender assistance, 95 km of road construction Earthworks and pavement construction Structure design and construction
(7)	***Project Justification***	The Western (Sumbawanga) Corridor is important especially for domestic transport of mining and agricultural products. The present road consists of gravel and earth, which prevents the smooth and efficient transport of these goods. Although the forecasted traffic demand remains relatively small. After paving, traffic volumes will increase thereby stimulating the local economies and reducing poverty in the region. This section is the extension of an ongoing section.
(8)	***Project Timing***	Short-term
(9)	***Implementation Work Duration***	4 years
(10)	***Total Project Cost***	USD 76 million
(11)	***Implementation Scheme***	No specific funds are available for the project. Development partner funds may be required.
(12)	***Investment Plan***	N.A.
(13)	***Donor Funds***	No commitment
(14)	***Land Acquisition***	Most of the area is within the present right of way.
(15)	***Environmental Impact***	Low (minimum relocation, no significant adverse effects)
(16)	***Social Impact***	Low
(17)	***EIA Status***	Not yet done.
(18)	***Expected Benefit***	Reduced traffic congestion, higher speeds, reduced accidents, accelerated development of nearby area.
(19)	***Documents Available***	FS/DD
(20)	***Connection with Other Modes***	N.A.

Project Location Map

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 5.10: Upgrading to Bituminous Standard of Kidahwe–Kanyani–Kasulu (62 km, Near Kigoma Port, T19 & T9)

Project Name	**Upgrading to Bituminous Standard of Kidahwe–Kanyani–Kasulu (62 km, Near Kigoma Port, T19 & T9)**	
(1)	***Location (Project Area)***	Kigoma Region
(2)	***Executing Agency***	Tanzania National Roads Agency (TANROADS)
(3)	***Background***	The section is strongly related to the development of Kigoma Port. The extension of the road section reaches Nyakanazi for the development of the Western Corridor. The feasibility study, detailed engineering design, and tender documents preparation for Mpanda–Uvinza–Kanyani were completed in 2010.
		Project Location Map 
(4)	***Type of Project***	Upgrading to bituminous standard
(5)	***Objectives***	Facilitate transport of goods and passengers.
(6)	***Proposed Work Components***	Tender assistance (62 km) Earthworks and pavement construction Structure design and construction
(7)	***Project Justification***	The Western (Sumbawanga) Corridor is important especially for domestic transport of mining and agricultural products. The present road consists of gravel and earth, which prevents the smooth and efficient transport of these goods. Although the forecasted traffic demand remains relatively small. After paving, traffic volumes will increase thereby stimulating the local economies and reducing poverty in the region. This section is the part of the Western Corridor reaching to Nyakanazi.
(8)	***Project Timing***	Short-term
(9)	***Implementation Work Duration***	3.5 years
(10)	***Total Project Cost***	USD 50 million
(11)	***Implementation Scheme***	No specific funds are available for the project. Development partner funds may be required.
(12)	***Investment Plan***	N.A.
(13)	***Donor Funds***	No commitment
(14)	***Land Acquisition***	Most of the area is within the present right of way.
(15)	***Environmental Impact***	Low (minimum relocation, no significant adverse effects)
(16)	***Social Impact***	Low
(17)	***EIA Status***	Not yet done.
(18)	***Expected Benefit***	Reduced traffic congestion, higher speeds, reduced accidents, accelerated development.
(19)	***Documents Available***	N.A.
(20)	***Connection with Other Modes***	Port

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 5.11: Upgrading to Bituminous Standard of Mbinga–Mbamba Bay (66 km, Mtwara Corridor T6)

Project Name	**Upgrading to Bituminous Standard of Mbinga–Mbamba Bay (66 km, Mtwara Corridor T6)**	
(1)	***Location (Project Area)***	Ruvuma Region
(2)	***Executing Agency***	Tanzania National Roads Agency (TANROADS)
(3)	***Background***	The Mbinga–Mbamba Bay road section (66 km) is part of the Mtwara Development Corridor, which connects Mtwara Port and Mbamba Bay Port. The road is of gravel standard and in fair condition. A feasibility study was completed in 2007 as part of a Songea–Mbamba Bay road (144 km) study and the detailed design and tender documents have also been completed. The construction of the Peramiho–Mbinga road section (78 km) is ongoing with financing from the Millennium Challenge Corporation and the GOT.
(4)	***Type of Project***	Upgrading to bituminous standard
(5)	***Objectives***	Capacity increase, smooth traffic flow, and efficient transport.
(6)	***Proposed Work Components***	Tender assistance (66 km) Earthworks and pavement construction Structure design and construction
(7)	***Project Justification***	The proportion of paved road along the Mtwara Corridor is the lowest among the country's development corridors. Although the forecasted traffic demand does not necessitate capacity increase but justify upgrading of the road. In addition to natural resources and agriculture products, which will be transported by road, natural gas is also an important product along the corridor. Mtwara Port competes with Nacala Port in Mozambique.
(8)	***Project Timing***	Short-term
(9)	***Implementation Work Duration***	3 years
(10)	***Total Project Cost***	USD 53 million
(11)	***Implementation Scheme***	No specific funds are available for the project. Development partner funds may be required.
(12)	***Investment Plan***	N.A.
(13)	***Donor Funds***	No commitment
(14)	***Land Acquisition***	Most of the area is within the present right of way.
(15)	***Environmental Impact***	Low (minimum relocation, no significant adverse effects)
(16)	***Social Impact***	Low
(17)	***EIA Status***	Not yet done.
(18)	***Expected Benefit***	Higher speeds, reduced accidents, efficient transport.
(19)	***Documents Available***	N.A.
(20)	***Connection with Other Modes***	Port

Project Location Map

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 5.12: Upgrading to Bituminous Standard of Bagamoyo–Mlandizi (37 km, Unpaved Regional Road)

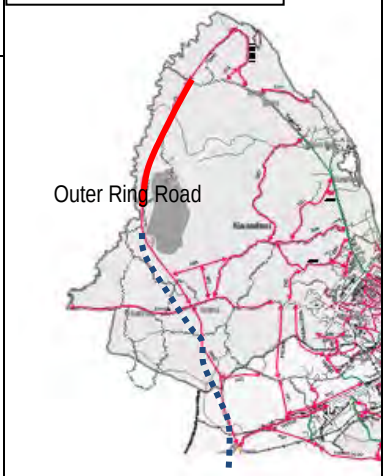
Project Name		**Upgrading to Bituminous Standard of Bagamoyo–Mlandizi (37 km, Unpaved Regional Road)**
(1)	***Location (Project Area)***	Coastal Region
(2)	***Executing Agency***	Tanzania National Roads Agency (TANROADS)
(3)	***Background***	The New Bagamoyo Port is being planned. Industrial development near Bagamoyo by private sectors has already started in anticipation of construction of the new port. This section will serve the supplemental connection from Bagamoyo to Morogoro Road, which is further connected inland; it will also serve Dar es Salaam traffic.
(4)	***Type of Project***	Upgrading to bituminous standard
(5)	***Objectives***	Facilitate transport of goods and passengers from the New Bagamoyo Port.
(6)	***Proposed Work Components***	FS/DD and tender assistance (37 km) Earthworks and pavement construction Structure design and construction
(7)	***Project Justification***	The section, once completed, will contribute to the distribution of traffic from the new Bagamoyo Development Zone. Some transport from Bagamoyo to Morogoro will use this road because of the shorter distance thus reduce burden to Dar es Salaam area congestion.
(8)	***Project Timing***	Short-term
(9)	***Implementation Work Duration***	4 years
(10)	***Total Project Cost***	USD 30 million
(11)	***Implementation Scheme***	No specific funds are available for the project. Development partner funds may be required.
(12)	***Investment Plan***	N.A.
(13)	***Donor Funds***	No commitment
(14)	***Land Acquisition***	Most of the area is within the present right of way.
(15)	***Environmental Impact***	Low (minimum relocation, no significant adverse effects)
(16)	***Social Impact***	Low
(17)	***EIA Status***	Not yet done.
(18)	***Expected Benefit***	Reduced traffic congestion, higher speeds, reduced accidents, accelerated development.
(19)	***Documents Available***	N.A.
(20)	***Connection with Other Modes***	Port

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 5.13: Construction of Outer Ring Road (10 km)

Project Name	**Construction of Outer Ring Road (10 km)**	
(1)	***Location (Project Area)***	Dar es Salaam
(2)	***Executing Agency***	Tanzania National Roads Agency (TANROADS)
(3)	***Background***	The Outer Ring Road will be a bypass of Dar es Salaam connecting the New Bagamoyo Road, Morogoro Road, and Nyerere Road to alleviate traffic concentrated on Nelson Mandela Road. The inner ring of Nelson Mandela Road and another ring road planned inside of the outer ring road will distribute traffic within the Dar es Salaam area and serve inbound-outbound traffic. The route location and Pre-FS, FS, and DD were completed by TANROADS.
(4)	***Type of Project***	Construction of a new highway
(5)	***Objectives***	Facilitate transport of goods and passengers from the New Bagamoyo Port to Dar es Salaam.
(6)	***Proposed Work Components***	Tender assistance (10 km) Earthworks and pavement construction Structure design and construction
(7)	***Project Justification***	The section, once completed, will contribute to the distribution of traffic from the major radial trunk roads. Some traffic between Bagamoyo and Dar es Salaam can use this route instead of using the inner ring routes, which are usually congested, thus contributing to the relief of traffic congestion in Dar es Salaam.
(8)	***Project Timing***	Short-term
(9)	***Implementation Work Duration***	4 years
(10)	***Total Project Cost***	USD 40 million
(11)	***Implementation Scheme***	No specific funds are available for the project. Development partner funds may be required.
(12)	***Investment Plan***	N.A.
(13)	***Donor Funds***	No commitment
(14)	***Land Acquisition***	Land acquisition will be necessary for the new section.
(15)	***Environmental Impact***	Medium (significant land acquisition and minimum relocation, less significant adverse effects)
(16)	***Social Impact***	Medium
(17)	***EIA Status***	Not yet done.
(18)	***Expected Benefit***	Reduced traffic congestion, higher speeds, reduced accidents, accelerated development.
(19)	***Documents Available***	N.A.
(20)	***Connection with Other Modes***	N.A.

Project Location Map



Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 5.14: Construction of Ubungo Intersection (Morogoro and Nelson Mandela Roads)

Project Name	**Construction of Ubungo Intersection (Morogoro and Nelson Mandela Roads)**

(1)	***Location (Project Area)***	Dar es Salaam
(2)	***Executing Agency***	Tanzania National Roads Agency (TANROADS)
(3)	***Background***	The intersection of Morogoro Road and Nelson Mandela Road is always congested due to heavy traffic from Dar es Salaam Port to inland destinations in Tanzania and neighboring landlocked countries as well as ordinary bus and automobile traffic on both roads. Traffic exceeds the intersection capacity resulting in congestion. The design of the grade-separated structure should be coordinated with the bus rapid transit (BRT) plan; with the connection between the BRT and long-distance buses at Ubungo Bus Terminal, the flyover would be along Nelson Mandela Road. Thus, the BRT would stay on the surface of Morogoro Road. The basic structure of the grade separation would be similar to those in the Tazara Intersection Flyover concept. However, the significant truck traffic from Morogoro Road to Nelson Mandela Road (right-turning movements) should be accommodated in order not to interrupt BRT traffic.
(4)	***Type of Project***	Bridge structure and pavement
(5)	***Objectives***	Alleviate traffic congestion in Ubungo intersection
(6)	***Proposed Work Components***	FS/DD and tender assistance Structure design and construction
(7)	***Project Justification***	This is one of the most congested intersections in Dar es Salaam. A significant number of trucks, buses, and automobiles will benefit from a grade-separated structure at the intersection. This project will contribute reducing traffic congestion in Dar es Salaam.
(8)	***Project Timing***	Short-mid term
(9)	***Implementation Work Duration***	4 years
(10)	***Total Project Cost***	USD 100 million
(11)	***Implementation Scheme***	No specific funds are available for the project. Development partner funds may be required.
(12)	***Investment Plan***	N.A.
(13)	***Donor Funds***	No commitment
(14)	***Land Acquisition***	Most of the area is within the present right of way.
(15)	***Environmental Impact***	Low (minimum relocation, no significant adverse effects)
(16)	***Social Impact***	Low
(17)	***EIA Status***	Not yet done.
(18)	***Expected Benefit***	Reduced traffic congestion, higher speeds, reduced accidents, accelerated development.
(19)	***Documents Available***	N.A.
(20)	***Connection with Other Modes***	N.A.

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 5.15: Construction of Roadside Services (Highway Stations)

Project Name	**Construction of Roadside Services (Highway Stations)**

(1)	***Location (Project Area)***	Morogoro and Iringa Regions	**Project Location Map** 
(2)	***Executing Agency***	Tanzania National Roads Agency (TANROADS)	
(3)	***Background***	There are many vehicle breakdowns along major trunk roads due to a lack of proper vehicle maintenance. Repair stations/ workshops along the route would help maintain and repair vehicles. New service facilities would be required for the total of about 9,000 km of trunk roads along major corridors for freight and passenger transport. Currently, these services are provided in cities/towns; there are no service facilities between cities/towns. The required number of facilities would be about 30-40 for the major corridors assuming an average distance of 200 km between facilities.	
(4)	***Type of Project***	Pilot construction of the service facilities in Morogoro and Iringa Regions	
(5)	***Objectives***	Provide better services and reduce accidents	
(6)	***Proposed Work Components***	FS/DD and tender assistance Earthworks and pavement construction	
(7)	***Project Justification***	Better services along the trunk roads will benefit drivers of trucks and automobiles that need maintenance, food, and rest during travel. This project is expected to indirectly contribute to traffic congestion relief along the roadway according to the traffic demand.	
(8)	***Project Timing***	Short-mid term	
(9)	***Implementation Work Duration***	4 years	
(10)	***Total Project Cost***	USD 16 million	
(11)	***Implementation Scheme***	No specific funds are available for the project. Development partner funds may be required.	
(12)	***Investment Plan***	N.A.	
(13)	***Donor Funds***	No commitment	
(14)	***Land Acquisition***	Land acquisition will be required.	
(15)	***Environmental Impact***	Low-Medium (minimum relocation depending on the location, no significant adverse effects)	
(16)	***Social Impact***	Low	
(17)	***EIA Status***	Not yet done.	
(18)	***Expected Benefit***	Reduced traffic accidents, improved comfort and safety.	
(19)	***Documents Available***	N.A.	
(20)	***Connection with Other Modes***	N.A.	

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 5.16: Widening of Chalinze–Morogoro (100 km) Section of the Morogoro Road

Project Name	**Widening of Chalinze–Morogoro (100 km) Section of Morogoro Road**

(1)	***Location (Project Area)***	Coastal and Morogoro Regions	**Project Location Map** 
(2)	***Executing Agency***	Tanzania National Roads Agency (TANROADS)	
(3)	***Background***	This section is an extension of Kimara–Chalinze (to be improved in the short term), which handles a significant amount of traffic because this section is a duplicated section of both the Central and TANZAM corridors. The FS/DD would start between 2015 and 2016. Earthworks and pavement construction would start in 2017 after completion of the FS/DD. It is expected that the project will be completed in 2020.	
(4)	***Type of Project***	Widening of the existing road.	
(5)	***Objectives***	Increase capacity of the present roadway to reduce traffic jam and accidents.	
(6)	***Proposed Work Components***	FS/DD and tender assistance Earthworks and pavement construction	
(7)	***Project Justification***	Increasing the capacity of this major corridor will increase the efficiency of the freight transport as well as passenger transport according to the future traffic demand. An improved level of service along the trunk roads will benefit trucks and automobile traffic.	
(8)	***Project Timing***	Mid term	
(9)	***Implementation Work Duration***	4 years	
(10)	***Total Project Cost***	USD 200 million	
(11)	***Implementation Scheme***	No specific funds are available for the project. Development partner funds may be required.	
(12)	***Investment Plan***	N.A.	
(13)	***Donor Funds***	No commitment	
(14)	***Land Acquisition***	Land acquisition will be required.	
(15)	***Environmental Impact***	Low-Medium (some relocation, no significant adverse effects)	
(16)	***Social Impact***	Low	
(17)	***EIA Status***	Not yet done.	
(18)	***Expected Benefit***	Increase level of service, thus improving transport efficiency and speed.	
(19)	***Documents Available***	N.A.	
(20)	***Connection with Other Modes***	N.A.	

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 5.17: Upgrading of Kibaoni–Mpanda–Kanyani (269 km of 364 km Section)

Project Name	**Upgrading of Kibaoni–Mpanda–Kanyani (269 km of a 364 km section)**

(1)	***Location (Project Area)***	Kigoma and Rukwa Region	
(2)	***Executing Agency***	Tanzania National Roads Agency (TANROADS)	
(3)	***Background***	The road forms part of the Western (Sumbawanga) Corridor and is a continuation of the Sumbawanga–Mpanda Road, which links with Kigoma–Nyakanazi Road at Kanyani. It is unpaved trunk road in fair condition. Tunduma–Sumbawanga Road (231 km) is being upgraded to a bitumen standard under with financing from the Millennium Challenge Corporation, while the Sumbawanga–Kibaoni section (151.5 km) is being upgraded to a bitumen standard with GOT financing. There is no financing commitment for the Kibaoni– Mpanda–Kanyani sections (364 km). A feasibility study, detailed engineering design, and tender documents for Kibaoni–Mpanda–Kanyani Road were completed in 2010. Part of the 95 km Kibaoni–Mpanda section is considered as a short-term development project in this master plan. The remaining 269 km of this section will be implemented as a mid-term project.	
(4)	***Type of Project***	Upgrading the existing road to a bituminous standard.	
(5)	***Objectives***	Increase comfort of riding, safety, and transport efficiency of the road.	
(6)	***Proposed Work Components***	Tender assistance Earthworks and pavement construction	
(7)	***Project Justification***	This road is a part of the Western Corridor serving international and domestic transport. Although the future traffic demand remains relatively low. An improved level of service level trunk roads will benefit truck and automobile traffic.	
(8)	***Project Timing***	Mid term	
(9)	***Implementation Work Duration***	4 years	
(10)	***Total Project Cost***	USD 215 million	
(11)	***Implementation Scheme***	No specific funds are available for the project. Development partner funds may be required.	
(12)	***Investment Plan***	N.A.	
(13)	***Donor Funds***	No commitment	
(14)	***Land Acquisition***	Most of the road will use the existing right of way.	
(15)	***Environmental Impact***	Low-Medium (some relocation, no significant adverse effects)	
(16)	***Social Impact***	Low	
(17)	***EIA Status***	Not yet done.	
(18)	***Expected Benefit***	Increased level of service for traffic, thus improving speed and transport efficiency.	
(19)	***Documents Available***	N.A.	
(20)	***Connection with Other Modes***	N.A.	

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator..

Table 5.18: Upgrading of Kigoma (Kidahwe)–Nyakanazi (248 km of 310 km)

Project Name	**Upgrading of Kigoma (Kidahwe)–Nyakanazi (248 km of 310 km)**

(1)	***Location (Project Area)***	Kigoma Region
(2)	***Executing Agency***	Tanzania National Roads Agency (TANROADS)
(3)	***Background***	The road is part of the Western Corridor, traverses Tunduma (on the Tanzania/Zambia border), Nyakanazi (linking the neighbouring countries of Rwanda, Burundi, the DRC, Uganda, and Kenya), and the Mbeya, Rukwa, Kigoma, and Kagera Regions. This road is an important link to and from Kigoma Port. The road is made of gravel and needs to be upgraded to a bitumen standard. The Kigoma–Kidahwe road section (36 km) was upgraded to bitumen in 2010 with GOT financing. The feasibility study, detailed engineering design, and tender documents for Mpanda–Uvinza–Kanyani were prepared in 2010. The 62 km Kidawe–Kanyani–Kasulu section will be a short-term development project. The remaining 248 km will be constructed as a mid-term project.
(4)	***Type of Project***	Upgrading the existing road into a bituminous standard.
(5)	***Objectives***	Increase ride quality along the road and transport efficiency.
(6)	***Proposed Work Components***	Tender assistance Earthworks and pavement construction
(7)	***Project Justification***	This road is a part of the Western Corridor serving international and domestic transport. Although the future traffic demand remains relatively low. An improved level of service level trunk roads will benefit truck and automobile traffic.
(8)	***Project Timing***	Mid term
(9)	***Implementation Work Duration***	4 years
(10)	***Total Project Cost***	USD 200 million
(11)	***Implementation Scheme***	No specific funds are available for the project. Development partner funds may be required.
(12)	***Investment Plan***	N.A.
(13)	***Donor Funds***	No commitment
(14)	***Land Acquisition***	Most of the road will use the existing right of way.
(15)	***Environmental Impact***	Low-Medium (some relocation, no significant adverse effects)
(16)	***Social Impact***	Low
(17)	***EIA Status***	Not yet done.
(18)	***Expected Benefit***	Increased level of service, which will improve transport efficiency and speed.
(19)	***Documents Available***	N.A.
(20)	***Connection with Other Modes***	N.A.

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 5.19: Upgrading of Kidahwe (Kigoma)–Ilunde–Malagarasi–Kaliua (188 km)

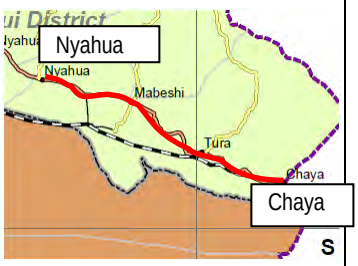
Project Name	**Upgrading of Kidahwe (Kigoma)–Ilunde–Malagarasi–Kaliua (188 km)**

(1)	***Location (Project Area)***	Kigoma Region	**Project Location Map** 
(2)	***Executing Agency***	Tanzania National Roads Agency (TANROADS)	
(3)	***Background***	This road is part of the Tabora–Urambo–Kaliua–Malagarasi–Kigoma Road. The road links Kigoma Port with Tabora Municipality. It is a gravel road with limited accessibility because there is no bridge over the Malagarasi River. Sections other than Ilunde–Mlagarasi–Kaliua are under construction as indicated below. Detailed design and tender documents for the whole route are complete. The 35.7 km Kigoma–Kidahwe section has been upgraded to bitumen complete with GOT financing. Upgrading of the 76 km Kidahwe–Uvinza section to a bitumen standard is also ongoing with GOT and Abu Dhabi financing. Construction of the Malagarasi Bridge and 48 km of approach roads is ongoing under Government of the Republic of Korea financing. Upgrading of the 94 km Urambo–Tabora road section is ongoing with GOT financing. Funds are required for the following sections: Uvinza–Ilunde (48 km); Ilunde–Malagarasi– Kaliua (108 km); and Kaliua–Urambo–Tabora (32 km). The cost for the 188 km is USD 150 million	
(4)	***Type of Project***	Upgrading the existing road into a bituminous standard.	
(5)	***Objectives***	Increase ride quality and transport efficiency.	
(6)	***Proposed Work Components***	Tender assistance Earthworks and pavement construction	
(7)	***Project Justification***	This road is a part of the Western Corridor serving international and domestic transport. Although the current traffic demand remains low due to lack of road connections. An improved level of service level trunk roads will benefit truck and automobile traffic. This section of the road will be improved in parallel with rehabilitation of the TRL line to better serve bulky, long-haul traffic. Road transport is still required for the future traffic demand for short-medium distances and to serve various kinds of commodities.	
(8)	***Project Timing***	Mid term	
(9)	***Implementation Work Duration***	4 years	
(10)	***Total Project Cost***	USD 150 million	
(11)	***Implementation Scheme***	No specific funds are available for the project. Development partner funds may be required.	
(12)	***Investment Plan***	N.A.	
(13)	***Donor Funds***	No commitment	
(14)	***Land Acquisition***	Most of the road will use the existing right of way.	
(15)	***Environmental Impact***	Low-Medium (some relocation, no significant adverse effects)	
(16)	***Social Impact***	Low	
(17)	***EIA Status***	Not yet done.	
(18)	***Expected Benefit***	Increased level of service, which will improve transport efficiency and speed.	
(19)	***Documents Available***	N.A.	
(20)	***Connection with Other Modes***	N.A.	

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

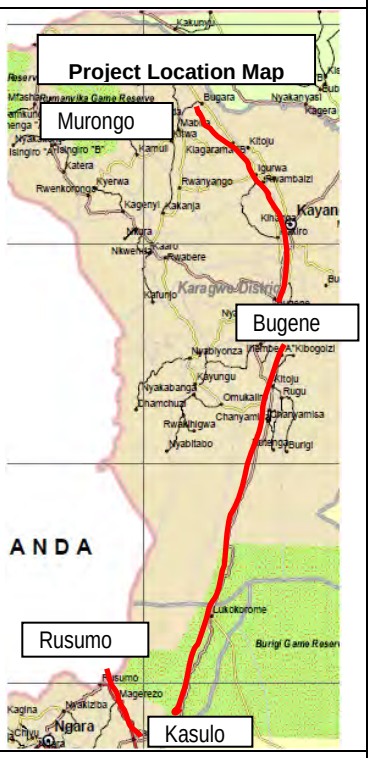
Table 5.20: Upgrading of Manyoni–Itigi–Tabora Road (71.15 km of a 245 km Road Section)

Project Name	**Upgrading of Manyoni–Itigi–Tabora Road (71.15 km of a 245 km road section)**

(1)	***Location (Project Area)***	Tabora and Singida Region	**Project Location Map** 
(2)	***Executing Agency***	Tanzania National Roads Agency (TANROADS)	
(3)	***Background***	This road links Tabora with the Central Corridor at Mkiwa in Manyoni District. The road is made of gravel and is inaccessible during the rainy seasons. The main function of the road is to serve the transport of cotton from Tabora to Dar es Salaam and Tanga Ports for export. An updated detailed design, an environmental and social impact assessment, and tender documents have been prepared for Tabora–Nyahua–Chaya (166.5 km) and Nyahua–Itigi–Manyoni (89.65 km) were completed in 2011. Construction works are ongoing on Tabora–Nyahua section (85 km) and Manyoni–Itigi–Chaya (89.3km) with GOT financing. The to-be-upgraded Nyahua–Chaya section is 71.15 km.	
(4)	***Type of Project***	Upgrading the existing road to a bitumen standard.	
(5)	***Objectives***	Increase ride quality and transport efficiency.	
(6)	***Proposed Work Components***	Tender assistance Earthworks and pavement construction	
(7)	***Project Justification***	This road is linked with the Central Corridor at Nzega and Manyoni Towns, which in turn is linked with the neighbouring countries of Rwanda, Burundi, and Uganda. This section goes parallel to TRL line, which mainly handles bulky and long-haul transport. andasually congested. An improved level of service level trunk roads will benefit truck carrying smaller quantity and short-medium distant cargoes and automobile traffic. Once the network is completed future traffic demand will increase.	
(8)	***Project Timing***	Mid term	
(9)	***Implementation Work Duration***	4 years	
(10)	***Total Project Cost***	USD 57million	
(11)	***Implementation Scheme***	No specific funds are available for the project. Development partner funds may be required.	
(12)	***Investment Plan***	N.A.	
(13)	***Donor Funds***	No commitment	
(14)	***Land Acquisition***	Most of the road will use the existing right of way.	
(15)	***Environmental Impact***	Low-Medium (some relocation, no significant adverse effects)	
(16)	***Social Impact***	Low	
(17)	***EIA Status***	Not yet done.	
(18)	***Expected Benefit***	Increased level of service, which will improve transport efficiency and speed.	
(19)	***Documents Available***	N.A.	
(20)	***Connection with Other Modes***	N.A.	

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 5.21: Upgrading of Kasulo–Rusumo and Bugene–Murongo Bugene–Kikagati Roads (238 km)

Project Name	**Upgrading of Kasulo–Rusumo and Bugene–Murongo Bugene–Kikagati Roads (238 km)**	
(1)	***Location (Project Area)***	Kagera Region
(2)	***Executing Agency***	Tanzania National Roads Agency (TANROADS)
(3)	***Background***	This road links with the Mutukula (on the Tanzania/Uganda border)–Bukoba and Bukoba–Muhutwe–Kagoma–Lusahunga Road at Kyaka, where it branches off towards Karagwe District. The Kyaka–Bugene section (59 km) is being upgraded to bitumen with under GOT financing. There are no financing commitments for the Bugene–Murongo section (114 km)(on the Tanzania/Uganda border) and Bugene–Kasulo–Rusumo (124 km)(on the Tanzania/ Rwanda border). These road sections are important regionally as they link the neighbouring countries of Uganda, Rwanda, Burundi, and the DRC with Karagwe District, which has economic potential in terms of agriculture, livestock, minerals, and tourism. The Kyaka–Bugene section (59 km) is being upgraded to bitumen with GOT financing. There is no financing commitment for feasibility, detailed engineering design, preparation of tender documents, and construction of Bugene–Murongo and Murongo–Kasulo, totaling 238 km.
		
(4)	***Type of Project***	Upgrading of existing road to bitumen standard.
(5)	***Objectives***	Increase ride quality and transport efficiency.
(6)	***Proposed Work Components***	FS/DD, Tender assistance Earthworks and pavement construction
(7)	***Project Justification***	Although the current traffic demand remains low, this road will contribute to the development of agriculture, livestock, minerals, and tourism when the traffic demand increases.
(8)	***Project Timing***	Long term
(9)	***Implementation Work Duration***	4 years
(10)	***Total Project Cost***	USD 190 million
(11)	***Implementation Scheme***	No specific funds are available for the project. Development partner funds may be required.
(12)	***Investment Plan***	N.A.
(13)	***Donor Funds***	No commitment
(14)	***Land Acquisition***	Most of the road will use the existing right of way.
(15)	***Environmental Impact***	Low-Medium (some relocation, no significant adverse effects)
(16)	***Social Impact***	Low
(17)	***EIA Status***	Not yet done
(18)	***Expected Benefit***	Increased level of service, which will improve transport efficiency and speed, and attract tourists to the region.
(19)	***Documents Available***	N.A.
(20)	***Connection with Other Modes***	N.A.

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 5.22: Upgrading of Tabora–Koga–Mpanda Road (359 km)

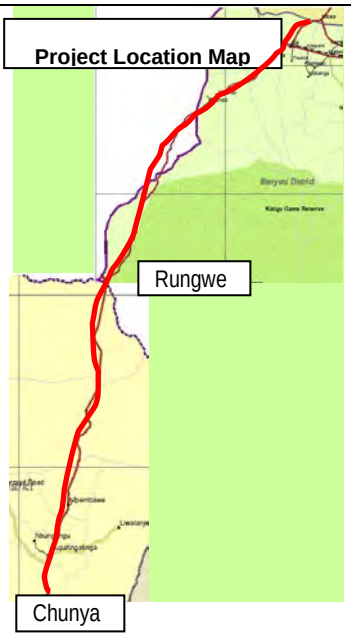
Project Name	**Upgrading of Tabora–Koga–Mpanda Road (359 km)**

(1)	***Location (Project Area)***	Tabora and Rukwa Regions	**Project Location Map** 
(2)	***Executing Agency***	Tanzania National Roads Agency (TANROADS)	
(3)	***Background***	The road is located in the Tabora and Rukwa regions. It links with the Western Corridor route at Mpanda where it connects with the Tunduma–Sumbawanga–Nyakanazi Road. The road is made of unengineered earth/gravel and is in fair/poor condition. Economic activities along the road include agriculture, tourism, mining, timberworks, fishing, and goldsmithing. Upgrading of this road to bitumen will provide an important connection between the Southern Highlands of Tanzania and the Lake Zone and eastern part of Tanzania through the Nzega–Tabora Road, which is currently being upgraded to bitumen. The road will also connect with the neighbouring countries of Zambia and the DRC through Kasanga Port and the Kasesya and Tunduma border posts. A feasibility study was completed in April 2010, while detailed design and preparation of tender documents for upgrading to bitumen were completed in 2011, both with GOT financing. The regional roads are linked with trunk roads that are linked with the neighbouring countries.	
(4)	***Type of Project***	Upgrading the existing road to a bituminen standard.	
(5)	***Objectives***	Increase ride quality and transport efficiency.	
(6)	***Proposed Work Components***	Tender assistance Earthworks and pavement construction	
(7)	***Project Justification***	Upgrading of this road to bitumen will provide an important connection between the Southern Highlands of Tanzania with the Lake Zone and eastern part of Tanzania through the Nzega–Tabora road. This road will contribute to the development of agriculture, livestock, minerals, and tourism for the future transport demand increase.	
(8)	***Project Timing***	Long term	
(9)	***Implementation Work Duration***	4 years	
(10)	***Total Project Cost***	USD 287 million	
(11)	***Implementation Scheme***	No specific funds are available for the project. Development partner funds may be required.	
(12)	***Investment Plan***	N.A.	
(13)	***Donor Funds***	No commitment	
(14)	***Land Acquisition***	Most of the road will use the existing right of way.	
(15)	***Environmental Impact***	Low-Medium (some relocation, no significant adverse effects)	
(16)	***Social Impact***	Low	
(17)	***EIA Status***	Not yet done	
(18)	***Expected Benefit***	Smoother, faster traffic, which will improve transport efficiency and speed, and promote industry in the region.	
(19)	***Documents Available***	N.A.	
(20)	***Connection with Other Modes***	N.A.	

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 5.23: Upgrading of Chunya–Makongolosi–Rungwa–Itigi–Mkiwa Road (413 km of a 456 km Road Section)

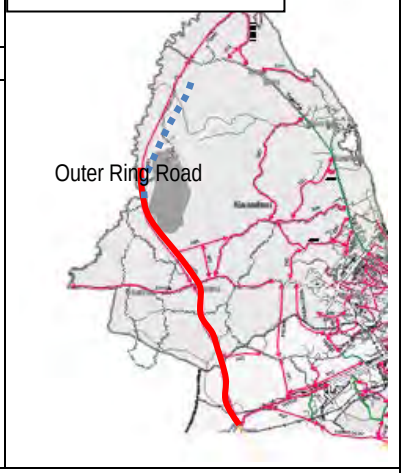
Project Name		**Upgrading of Chunya–Makongolosi–Rungwa–Itigi–Mkiwa Road (413 km of a 456 km road section)**
(1)	***Location (Project Area)***	Mbeya, Singida, and Tabora Regions
(2)	***Executing Agency***	Tanzania National Roads Agency (TANROADS)
(3)	***Background***	This road extends about 456 km and links with the TANZAM Highway at Mbeya and the Central Corridor at Mkiwa. The project road is located in Mbeya and Singida with a small portion in the Tabora region. It serves a total population of about 4.9 million based on population census data (2002). The main economic activities along the project road include agriculture, livestock, mining, and tourism. The main agricultural crops are maize, sorghum, millet, rice, pulses, cassava, bananas, and potatoes. Upgrading of the Mbeya–Chunya road section (72 km) to bitumen is ongoing with GOT financing. The feasibility study, detailed design, and tender documents for Makongolosi–Rungwa–Mkiwa (413 km) were completed in 2011 with GOT financing. There is no financing commitment for civil works for the 413 km Makongolosi Rungwa section. The road links Tanzania with Zambia and the Central Corridor, which connects Tanzania and the neighbouring countries of Rwanda, Burundi and Uganda.
(4)	***Type of Project***	Upgrading the existing road into a bitumen standard.
(5)	***Objectives***	Increase ride quality and transport efficiency.
(6)	***Proposed Work Components***	Tender assistance Earthworks and pavement construction
(7)	***Project Justification***	Upgrading this road to bitumen will provide an important connection between the Southern Highlands of Tanzania with the Lake Zone and eastern part of Tanzania through the Nzega–Tabora road. This road will contribute to the development of agriculture, livestock, minerals, and tourism for the future transport demand increase.
(8)	***Project Timing***	Long term
(9)	***Implementation Work Duration***	4 years
(10)	***Total Project Cost***	USD 365 million
(11)	***Implementation Scheme***	No specific funds are available for the project. Development partner funds may be required.
(12)	***Investment Plan***	N.A.
(13)	***Donor Funds***	No commitment
(14)	***Land Acquisition***	Most of the road will use the existing right of way.
(15)	***Environmental Impact***	Low-Medium (some relocation, no significant adverse effects)
(16)	***Social Impact***	Low
(17)	***EIA Status***	Not yet done
(18)	***Expected Benefit***	Smoother, faster traffic, which will improve transport efficiency and speed and promote industry in the region.
(19)	***Documents Available***	N.A.
(20)	***Connection with Other Modes***	N.A.



Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 5.24: Construction of Outer Ring Road (20 km)

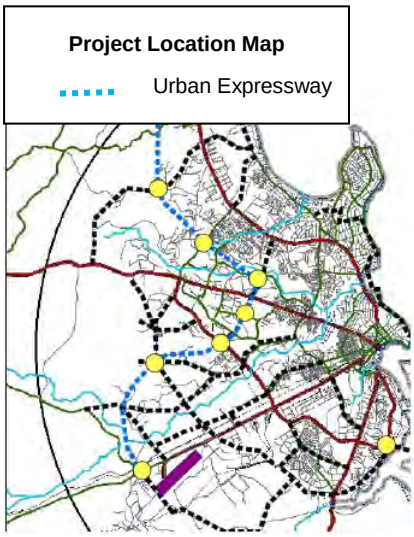
Project Name	**Construction of Outer Ring Road (20 km)**

(1)	***Location (Project Area)***	Dar es Salaam	**Project Location Map** 
(2)	***Executing Agency***	Tanzania National Roads Agency (TANROADS)	
(3)	***Background***	The Outer Ring Road will be a bypass of Dar es Salaam connecting the New Bagamoyo Road, Morogoro Road, and Nyerere Road to alleviate traffic concentrated on Nelson Mandela Road. The inner ring of Nelson Mandela Road and another ring road planned inside of the outer ring road will distribute traffic within the Dar es Salaam area and serve inbound-outbound traffic. The route location, pre-FS, and FS/DD were completed by TANROADS. The construction of the second stretch of the road (20 km) will start in 2020 or 2021 and the earthworks and pavement construction will start in 2021.	
(4)	***Type of Project***	Construction of a new highway	
(5)	***Objectives***	Facilitate transport of goods/people between New Bagamoyo Port and Dar es Salaam	
(6)	***Proposed Work Components***	Tender assistance (20 km) Earthworks and pavement construction Structure design and construction	
(7)	***Project Justification***	The section will contribute to the distribution of traffic from the new Bagamoyo Development Zone. Some traffic parts of transport from Bagamoyo to Morogoro will use this road because of the shorter distance thus contributing to the relief of traffic congestion in Dar es Salaam.	
(8)	***Project Timing***	Long-term	
(9)	***Implementation Work Duration***	4 years	
(10)	***Total Project Cost***	USD 80 million	
(11)	***Implementation Scheme***	No specific funds are available for the project. Development partner funds may be required.	
(12)	***Investment Plan***	N.A.	
(13)	***Donor Funds***	No commitment	
(14)	***Land Acquisition***	Land acquisition will be necessary for the new section.	
(15)	***Environmental Impact***	Medium (significant relocation, some adverse effects)	
(16)	***Social Impact***	Medium	
(17)	***EIA Status***	Not yet done.	
(18)	***Expected Benefit***	Reduced traffic congestion, higher speeds, reduced accidents, accelerated development.	
(19)	***Documents Available***	N.A.	
(20)	***Connection with Other Modes***	N.A.	

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 5.25: Construction of Urban Expressways (59 km)

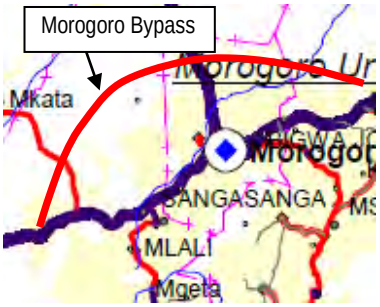
Project Name	**Construction of Urban Expressways (59 km)**

(1)	***Location (Project Area)***	Dar es Salaam	 Source: Dar es Salaam Transport Master Plan(2008)
(2)	***Executing Agency***	Tanzania National Roads Agency (TANROADS)	
(3)	***Background***	An urban expressway network was proposed in the Dar es Salaam Transport Policy and System Development Master Plan. The purpose of the expressways is to increase the overall capacity and smooth flow of traffic within urban areas. There is a possibility of introducing PPP schemes. The pre-feasibility study of the urban expressways would be based on the Dar es Salaam Urban Master Plan and commence in 2020/2021, with the FS/DD to follow in 2021/2022. Construction would start in 2023/2025. Part of the expressway network would be completed in 2030. The estimated construction cost for the 59 km of expressways is USD 360 million.	
(4)	***Type of Project***	Construction of a limited access expressway network inside Dar es Salaam.	
(5)	***Objectives***	Increase overall capacity and efficiency of transport inside Dar es Salaam.	
(6)	***Proposed Work Components***	FS/DD, tender assistance Structures and pavement construction	
(7)	***Project Justification***	The expressways would be used by automobiles and trucks mainly for city delivery purposes. This expressway network would provide fast and efficient transport. Heavy trucks would use the circular and radial trunk roads on the outskirts of Dar es Salaam to avoid congestion in the city centre.	
(8)	***Project Timing***	Long term	
(9)	***Implementation Work Duration***	10 years	
(10)	***Total Project Cost***	USD 360 million	
(11)	***Implementation Scheme***	No specific funds are available for the project. Development partner funds may be required.	
(12)	***Investment Plan***	N.A.	
(13)	***Donor Funds***	No commitment	
(14)	***Land Acquisition***	Land acquisition will be required.	
(15)	***Environmental Impact***	Low-Medium (some relocation with a certain level of adverse effects)	
(16)	***Social Impact***	Low	
(17)	***EIA Status***	Not yet done	
(18)	***Expected Benefit***	Reduced traffic congestion, faster transport with reduced travel times, better ride quality, safer roadways, and improved reliability.	
(19)	***Documents Available***	N.A.	
(20)	***Connection with Other Modes***	N.A.	

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 5.26: Construction of Ring Road around Major Cities (50 km)

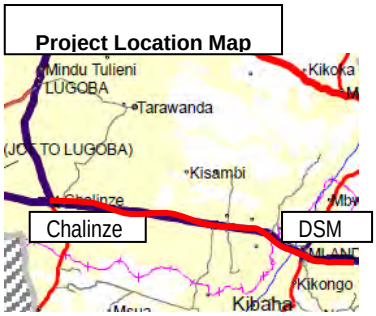
Project Name	**Construction of Ring Road around Major Cities (50 km)**

(1)	***Location (Project Area)***	Dodoma, Arusha, Morogoro, Mbeya, and Mwanza	**Project Location Map** 
(2)	***Executing Agency***	Tanzania National Roads Agency (TANROADS)	
(3)	***Background***	Forecast traffic volume near major cities exceeds the capacity of an ordinary 2-lane trunk road. In order to avoid urban congestion, building bypass roads is recommended. Access- controlled bypass construction around Dodoma, Arusha, Morogoro, Mbeya, and Mwanza will be planned. The total length of these bypasses would be 50 km (10 km each on average). These sections would be planned and a FS/DD prepared in 2018. Construction would start in 2020 with completion in 2024. The expected construction cost is USD 200 million.	
(4)	***Type of Project***	Construction of new limited access expressway near major cities.	
(5)	***Objectives***	Increase overall capacity and efficiency of the transport near major cities.	
(6)	***Proposed Work Components***	FS/DD, tender assistance Earthwork, structures, and pavement construction	
(7)	***Project Justification***	Forecasted traffic demands justify construction of either widening of the existing urban roads, which is usually very difficult, or new road construction. The proposed bypasses could be used as a part of a national expressway network in the future.	
(8)	***Project Timing***	Long term	
(9)	***Implementation Work Duration***	10 years	
(10)	***Total Project Cost***	USD 200 million	
(11)	***Implementation Scheme***	No specific funds are available for the project. Development partner funds may be required.	
(12)	***Investment Plan***	N.A.	
(13)	***Donor Funds***	No commitment	
(14)	***Land Acquisition***	Land acquisition will be required.	
(15)	***Environmental Impact***	Low-Medium (some relocation, no significant adverse effects)	
(16)	***Social Impact***	Low	
(17)	***EIA Status***	Not yet done	
(18)	***Expected Benefit***	Reduced traffic congestion, reduced travel times, better ride quality, safer roadways, and improved reliability.	
(19)	***Documents Available***	N.A.	
(20)	***Connection with Other Modes***	N.A.	

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 5.27: Construction of Expressway (Dar es Salaam–Chalinze, 100 km)

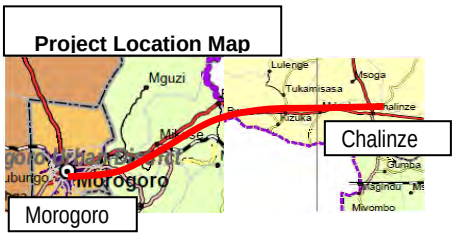
Project Name	**Construction of Expressway (Dar es Salaam–Chalinze, 100 km)**

(1)	***Location (Project Area)***	Dar es Salaam and Coastal Region	
(2)	***Executing Agency***	Tanzania National Roads Agency (TANROADS)	
(3)	***Background***	Consultancy services for detailed review and analysis to establish toll roads in Tanzania through PPP arrangements were completed in September 2011. The economic analysis indicated an internal rate of return (IRR) ranging between 19% and 23% for a six-lane Expressway in Dar es Salaam (Ubungo–Mlandizi, 55 km) and a four-lane expressway linking Mlandizi–Chalinze (45 km), respectively. The financial analysis indicated an FIRR ranging between 12.3% and 13.0% for a six-lane expressway in Dar es Salaam (Ubungo–Mlandizi, 55 km) and a four-lane expressway linking Mlandizi–Chalinze (45 km), respectively.	
(4)	***Type of Project***	Construction of a new limited access expressway.	
(5)	***Objectives***	Increase overall capacity and efficiency of transport .	
(6)	***Proposed Work Components***	FS/DD review, tender assistance Earthwork, structures, and pavement construction	
(7)	***Project Justification***	Forecasted traffic demands justify construction of the expressway. This expressway will not only provide increased service levels but also will reduce traffic accidents.	
(8)	***Project Timing***	Long term	
(9)	***Implementation Work Duration***	10 years	
(10)	***Total Project Cost***	USD 441 million	
(11)	***Implementation Scheme***	No specific funds are available for the project. Development partner funds may be required.	
(12)	***Investment Plan***	A PPP scheme would be adopted.	
(13)	***Donor Funds***	No commitment	
(14)	***Land Acquisition***	Land acquisition will be required.	
(15)	***Environmental Impact***	Low-Medium (some relocation, no significant adverse effects)	
(16)	***Social Impact***	Low	
(17)	***EIA Status***	Not yet done	
(18)	***Expected Benefit***	Reduced traffic congestion, reduced travel times, better ride quality, safer road traffic, and increased reliability.	
(19)	***Documents Available***	N.A.	
(20)	***Connection with Other Modes***	N.A.	

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 5.28: Construction of Expressway (Chalinze–Morogoro, 90 km)

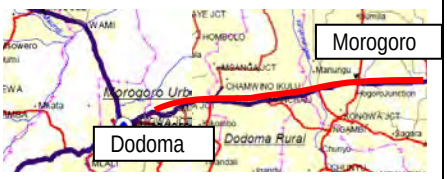
Project Name	**Construction of Expressway (Chalinze–Morogoro, 90 km)**

(1)	***Location (Project Area)***	Coastal and Morogoro Region	
(2)	***Executing Agency***	Tanzania National Roads Agency (TANROADS)	
(3)	***Background***	This section is the extension of Dar es Salaam–Chalinze section of the expressway. The traffic volume from Dar es Salaam to Morogoro will be among the highest in Tanzania, which would justify construction of the expressway as a higher priority section. Planning and FS/DD would start between 2018 and 2019. Construction would start in 2022. Expected completion of the highway would be in 2027. The estimated project cost is USD 380 million.	
(4)	***Type of Project***	New construction of access-controlled expressway.	
(5)	***Objectives***	Increase overall capacity and efficiency of transport along Morogoro Road.	
(6)	***Proposed Work Components***	FS/DD , Tender assistance Earthworks, structures, and pavement construction	
(7)	***Project Justification***	The forecasted traffic demand justifies construction of the expressway. This road will not only improve service levels but also reduce traffic accidents.	
(8)	***Project Timing***	Long term	
(9)	***Implementation Work Duration***	10 years	
(10)	***Total Project Cost***	USD 380 million	
(11)	***Implementation Scheme***	No specific funds are available for the project. Development partner funds may be required.	
(12)	***Investment Plan***	N.A.	
(13)	***Donor Funds***	No commitment	
(14)	***Land Acquisition***	Land acquisition will be required.	
(15)	***Environmental Impact***	Low-Medium (some relocation, no significant adverse effects)	
(16)	***Social Impact***	Low	
(17)	***EIA Status***	Not yet done	
(18)	***Expected Benefit***	Reduced traffic congestion and faster transport, better ride quality, safer roadway and reliability.	
(19)	***Documents Available***	N.A.	
(20)	***Connection with Other Modes***	N.A.	

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 5.29: Construction of Expressway (Morogoro–Dodoma (255 km)

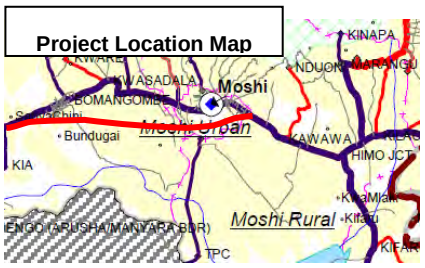
Project Name	**Construction of Expressway (Morogoro–Dodoma (255 km)**

(1)	***Location (Project Area)***	Morogoro and Dodoma Region	**Project Location Map** 
(2)	***Executing Agency***	Tanzania National Roads Agency (TANROADS)	
(3)	***Background***	This section is located on the Central Corridor and connects with the capital city of Dodoma. Planning and FS/DD will commence in 2023/2024. Construction will start in 2027. Expected completion will be in 2032. The expected cost of the project will be USD 1,020 million (USD 1.020 billion).	
(4)	***Type of Project***	Construction of new limited access expressway.	
(5)	***Objectives***	Increase overall capacity and efficiency of the transport along Morogoro Road.	
(6)	***Proposed Work Components***	FS/DD, tender assistance Earthworks, structures, and pavement construction	
(7)	***Project Justification***	The forecasted traffic demand justifies construction of the expressway. This road will not only improve service levels but also reduce traffic accidents.	
(8)	***Project Timing***	Long term	
(9)	***Implementation Work Duration***	10 years	
(10)	***Total Project Cost***	USD 1,020 million (USD 1.020 billion)	
(11)	***Implementation Scheme***	No specific funds are available for the project. Development partner funds may be required.	
(12)	***Investment Plan***	N.A.	
(13)	***Donor Funds***	No commitment	
(14)	***Land Acquisition***	Land acquisition will be required.	
(15)	***Environmental Impact***	Low-Medium (some relocation, no significant adverse effects)	
(16)	***Social Impact***	Low	
(17)	***EIA Status***	Not yet done	
(18)	***Expected Benefit***	Reduced traffic congestion and faster transport, better ride quality, safer roadway and reliability.	
(19)	***Documents Available***	N.A.	
(20)	***Connection with Other Modes***	N.A.	

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 5.30: Construction of Arusha–Moshi–Himo Junction Dual Carriageway (105 km)

Project Name	**Construction of Arusha–Moshi–Himo Junction Dual Carriageway (105 km)**

(1)	***Location (Project Area)***	Arusha Region	
(2)	***Executing Agency***	Tanzania National Roads Agency (TANROADS)	
(3)	***Background***	This road links the economically important towns of Arusha and Moshi, and links the two towns to tourist attractions such as the Serengeti, Ngorongoro, Arusha, and Kilimanjaro National Parks. The existing road has only two lanes. The 2011 study of toll roads in Tanzania found that this road was economically and financially viable for construction to a dual carriageway under a PPP arrangement. Annual average daily traffic in 2010 ranged between 5,000 and 7,500. The economic analysis indicates an EIRR ranging between 18% and 25% for a Four-Lane Highway between Arusha and Himo Junction (105 km).	
(4)	***Type of Project***	Upgrading the existing road to a four-lane bitumen road.	
(5)	***Objectives***	Increase overall capacity and efficiency of transport in the Moshi-Arusha area.	
(6)	***Proposed Work Components***	FS/DD review, tender assistance Earthworks, structures, and pavement construction	
(7)	***Project Justification***	Forecasted traffic demand justifies widening of the road. This road will not only improve service levels but also reduce traffic accidents.	
(8)	***Project Timing***	Long term	
(9)	***Implementation Work Duration***	5 years	
(10)	***Total Project Cost***	USD 144 million	
(11)	***Implementation Scheme***	No specific funds are available for the project. Development partner funds may be required.	
(12)	***Investment Plan***	N.A.	
(13)	***Donor Funds***	No commitment	
(14)	***Land Acquisition***	Land acquisition will be required.	
(15)	***Environmental Impact***	Low-Medium (some relocation, no significant adverse effects)	
(16)	***Social Impact***	Low	
(17)	***EIA Status***	Not yet done	
(18)	***Expected Benefit***	Reduced traffic congestion and faster transport, better ride quality, safer roadway and reliability.	
(19)	***Documents Available***	N.A.	
(20)	***Connection with Other Modes***	N.A.	

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 5.31: Construction of Bagamoyo Expressway (40 km)

Project Name	**Construction of Bagamoyo Expressway (40 km)**	
(1)	***Location (Project Area)***	Coast Region and Dar es Salaam
(2)	***Executing Agency***	Tanzania National Roads Agency (TANROADS)
(3)	***Background***	A New Bagamoyo Port is being planned. There are various development schemes near the area. One infrastructure development project in the long-term plan will be an expressway to be developed in addition to short-term road capacity increases. Limited access expressways will be constructed parallel to the existing Bagamoyo Road. In this project 40 km of the section would be planned and a FS/DD conducted in 2020. Construction would start in 2024 with completion in 2028. The expected project cost is USD160 million.
(4)	***Type of Project***	Construction of a new limited access expressway along the existing trunk road.
(5)	***Objectives***	Increase overall capacity and efficiency of transport between the New Bagamoyo Port and Dar es Salaam as well as other nearby areas.
(6)	***Proposed Work Components***	FS/DD, tender assistance Earthworks, structures, and pavement construction
(7)	***Project Justification***	The New Bagamoyo Port will generate significant traffic to Dar es Salaam and to inland areas of the country. It will also mitigate the burden of traffic between the existing Dar es Salaam port and inland areas of Tanzania and neighbouring landlocked countries via Nelson Mandela and Morogoro Roads, both of which are congested at present. An expressway connected to the planned Dar es Salaam outer ring road will provide services for fast and efficient transport and thus encourage development of the area.
(8)	***Project Timing***	Long term
(9)	***Implementation Work Duration***	4 years
(10)	***Total Project Cost***	USD 160 million
(11)	***Implementation Scheme***	No specific funds are available for the project. Development partner funds may be required.
(12)	***Investment Plan***	N.A.
(13)	***Donor Funds***	No commitment
(14)	***Land Acquisition***	Land acquisition will be required.
(15)	***Environmental Impact***	Low-Medium (some relocation, no significant adverse effects)
(16)	***Social Impact***	Low
(17)	***EIA Status***	Not yet done
(18)	***Expected Benefit***	Reduced traffic congestion and faster transport, better ride quality, safer roadway and reliability.
(19)	***Documents Available***	N.A.
(20)	***Connection with Other Modes***	N.A.

Project Location Map

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Chapter 6 Railway Sector Development Strategy

6.1 Process of Sector Planning and Project Identification

The basic points of departure for conducting sector planning and identifying projects in the railway sector were the analyses of current and future transport demand in Chapter 1, and the assessments of Chapter 3 for moving from the demand forecasts to corridor/sector strategies. Building on these basic points of departure, the following considerations were taken into account:

(i) Table 2.1 (Summary of Transport Demand Growth and Resource Allocation) forecast railway freight demand from 2010 to 2030 to increase by 695% from 0.47 million tonnes to 3.29 million tonnes along the Dar es Salaam (DSM) Corridor and by 1455% from 0.35 million tonnes to 5.14 million tonnes along the Central Corridor. These forecasts reflect shippers' behaviour.

(ii) The traffic forecasts used in this chapter were considered reasonable compared to these overall growth rates. For example, the rail volume forecast of Tanzania Railways Limited (TRL) was 3.10 million tonnes[1] in 2030, including both domestic and transit freight (i.e., less than the 4.79 million tonnes forecast along the Central Corridor) as indicated in Figure 6.2. These forecasts, as stated in subsection 6.2, assume that rail transport volume will grow by 8% per year after 2016 (there is a capacity constraint before that), corresponding to a conservative assumption for long-term GDP growth of about 5%.

(iii) As noted in subsection 6.2.1, it was assumed that the market share for rail would decrease somewhat after 2016 if the market grows faster than 8% per year, reflecting the shift in the total cargo transport market towards more high value commodities.

The remainder of this chapter presents an overview of the rail strategy (6.2), rail transport forecasts for TRL (6.3), development strategies for TRL (6.4), development strategies for TAZARA (6.4), and benchmarking of TRL and TAZARA (6.5).

6.2 Overview of the Sector

Consecutive years of underfunding of railway operations and maintenance activities over the past decade have resulted in aused accelerated freight traffic loss by TRL and the Tanzania Zambia Railway Authority (TAZARA). In 2011, TRL's freight traffic tonnage (267,008 tonnes) was less than 17% of its peak level (1.56 million tonnes) in 2003. TAZARA's freight volume of 534,000 tonnes in 2010/2011 was lower than the average of 600,000 tonnes achieved over the past decade and was only 45% of the peak volume of 1.2 million tonnes achieved in 1986.

Currently, the situation of TRL is precarious. With barely 12 of its mainline locomotive fleet of 44 units available for freight service every day and a system-wide *schedule*[2] *speed* reduced to only 14 km per hour as a result of frequent locomotive failures, TRL is only able to provide a bare minimum level of services. This level is well below commercial requirements. Its declining capacity is exacerbated by the decrepit condition of its track and bridges – some sections of the

[1] Transit volume between three countries such as Brundi, Rwanda and Uganda are considered in Figure 6.2. p6-8 while Demand Forecast by Study Team include DRC as well. Besides, the domestic transport volume excludes in Shinyanga and because of that the transffer methord's assumed as by block train to Mwanza, the freight volume in Isaka is included as transit volume to Rwanda. Therefore, considering those back ground, Case 1 and Case 2 from the result by demand forecast by Study Team can be changed into 2.591 million tonnes and 3.739 million tonnes. And the volume, 3.1 million tonnes is kept within this range.

[2] Schedule speed is the ratio of distance covered between two stops and total running time including the time of all stops. The schedule speed of a given train, when running on a given service (i.e., with a given distance between stations) is affected by: (i) acceleration and braking retardation; maximum or crest speed; and (iii) duration of stops.

Central Line which are laid in light rail (56 lbs/yard) are fast becoming inoperable. *A failure to rectify this situation instantly can only result in complete cessation of services.*

The immediate problem of track condition is comparatively less serious for TAZARA than for TRL. This is because much of the rail infrastructure for TRL (particularly the Central Line including links to Kigoma and Mwanza Ports) was constructed 100 years ago, in accordance to the railway standards prevalent at that time, while TAZARA was constructed 35 years ago, in accordance to relatively higher and more current standards. Therefore, the TAZARA track is newer and heavier than that of TRL with concrete sleepers, 80 lb rail, and 18 tonne maximum axle loading.

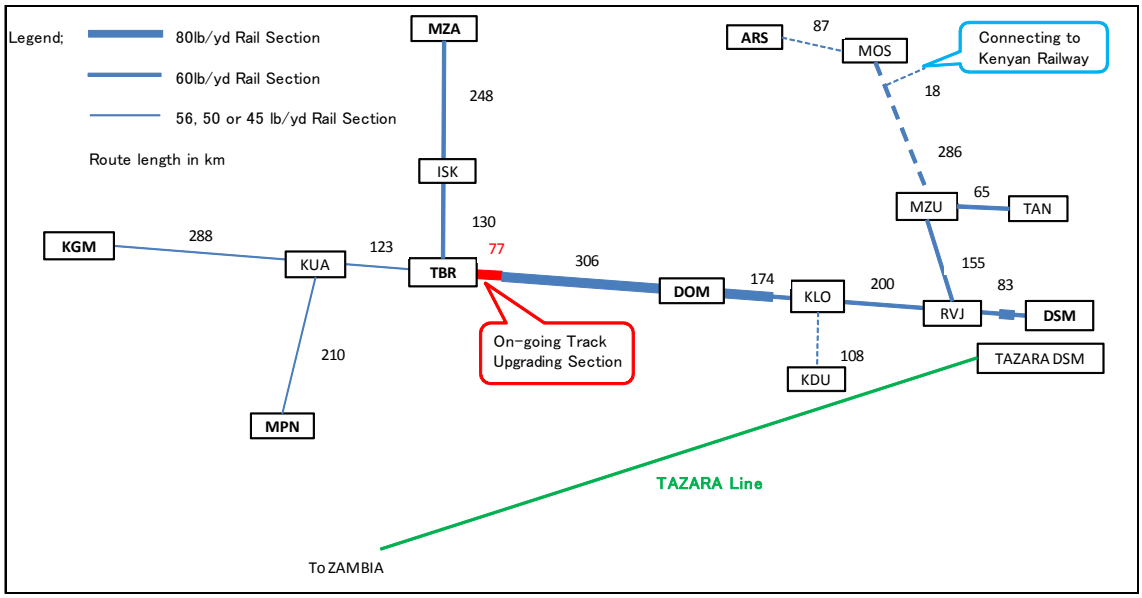
Nonetheless, like TRL, TAZARA currently faces serious shortages of locomotives with an average of 12 of an operating fleet of 23 mainline units available for freight and passenger services each day. However, TAZARA's immediate situation is not as dire as that of TRL since the former is receiving ongoing financial support from China. In late 2011, the Governments of Tanzania and Zambia secured an interest-free concessional loan of USD 39 million from China. This loan is intended to cover the cost of supply of 6 new locomotives and 90 new container wagons, but the loan agreement does not address the medium-term issue of the deteriorating condition of the TAZARA track and bridges.

The reduced carrying capacity of TAZARA primarily because of locomotive shortages, the commercial interests of the railway operator in Zambia (which also operates the Zimbabwe railway system under a concession), and changes within the copper industry in Zambia, have all led to a loss of most of the inter-regional copper traffic (about 97%) which has now shifted to road transport.[3] It has also resulted in a shift of much of the rail traffic, formerly directed to Dar es Salaam, to other corridors (Zimbabwe–Mozambique for loading on deep sea vessels or movement to South Africa for further processing and export to overseas markets). Some 80% of Zambian copper concentrates and refined copper exports now go to South Africa.[4] While copper mining is on the increase in Zambia, a national policy of increasing the amount of value added in the mining industry means that only a limited tonnage of copper concentrate is exported. More precisely, increased refining capacity within Zambia means that exports are likely to grow less rapidly than copper mining output since exports contain a concentration of copper (principally in the form of anodes and cathodes).

Strategies have been identified for the *recovery and stabilization* of the railway systems in the short term (2013–2017) and for their *capacity expansion and productivity growth* in the medium term (2018–2022) and the long term (2023–2030).

Figure 6.1 and Table 6.1 indicate the existing condition of TRL lines:

[3] Larry Phipps, Railway Consultant for USAID, *SADC Railways Revitalization Policy Dialogue*, August 2011.
[4] CPCS, *Zambia Railway Concession Review Study*, prepared for the World Bank in June 2010



Notes: (1) TRL lines are using meter gauge. Rails are welded at 80 and 60 lb/yard rail sections of the Central Line, Mwanza Line and Tanga Line. Other lines are using fishplate joints. Whole lines are using steel sleepers. (2) The TAZARA line is using welded 80 lb/yard rail on PC sleepers.

Figure 6.1: Schematic Map of TRL Network and TAZARA Line

Table 6.1: Existing TRL Network

Line Name	Route Length (km)	No. of Station	Existing Condition
Central Line	1,254	66	Operating (no schedule)
Mwanza Line	379	19	Operating (no schedule)
Mpanda Line	210	7	Operating (no schedule)
Singida Line	114	4	Suspending
Mikumi Line	108	3	Suspending due to damaged track
Link Line	188	8	Operating (no schedule)
Arusha Line	438	28	Partly operating, major part suspending due to damaged track
Connection Line to Kenyan Railway	18	0	Suspending
Total	2,709	135	

After RITES (India) came to Tanzania as the concessionaire for the operation and management of the railway in October 2007, the Government of Tanzania suspended its subsidy to TRL. Joint operation by RITES-TRL failed and RITES left its position in August 2011. While the cause of the failure has not been analyzed yet, it was reported that the number of working locomotives decreased and the track was not well-maintained after RITES came in as the operator. In fact, RITES had tried to reduce maintenance costs by reducing maintenance staff, and leased its own locomotives, which were not functioning well.

Even after RITES left, the management structure, i.e., Reli Assets Holding Company (RAHCO) as the owner of the infrastructure and TRL as the operator still remained. Subsidy from the Government to TRL is still very limited. That is one of the factors that caused the decline of TRL's operation.

Based on the site survey and hearing from shippers and freight forwarders, it was confirmed that the shift from rail to road transport was generated by a decreased number of trains resulting from the shortage of locomotives. It was also confirmed that because of the big difference in transport costs between rail and road, freight forwarders are willing to return to rail transport if punctual and secured train operation can be assured. Therefore, it was assumed that the demand for rail transport is always larger than supply in the railway sector.

As described in Section 6.1, rail transport volume is expected to grow at a rate of 8% per annum after 2016, corresponding to a conservative assumption for long-term GDP growth of about 5%. If rail transport volume grows more than 8%, transport capacity can be increased by expediting the introduction of locomotives and wagons within the line capacity as detailed in Table 6.12.

6.2.1 Priority Short-Term Strategies for Rehabilitation of Existing Network

In the light of the foregoing observations, it can be concluded that the railway strategy, in the short term *must* be focused on the *repair and rehabilitation of the rail systems in order to restore services to their previous level and to re-capture traffic lost to road transport.* A focus on upgrading or improving motive power for both railways and track standards for TRL should be, and must be, left until later years in the forecast timeline. The immediate objective must be to save the existing railway systems from total collapse by restoring their infrastructure and operating assets to a level of serviceability that will allow them to resume suspended services and recapture lost freight business.

In the case of TRL, this will mean a period of three years, 2013–2015, when the mainline locomotive fleet and track and bridges on the Central Line will be rehabilitated to reduce breakdowns and derailments as well as to permit faster operating speeds and shortened turnarounds. During this period, the productivity of railway assets will increase progressively, gradually allowing a return to traffic levels last seen in the pre-RITES era.

In the case of TAZARA, the short-term injection of funds from China will allow restoration of locomotive and wagon availability to acceptable levels along with increase in their haulage capacities.

The short-term strategies for TRL are discussed in subsection 6.4.1.

6.2.2 Medium-Term Strategies for Capacity Expansion and Cost Reduction on the Existing Network

Once the railway systems have restored their former service levels and have resumed traffic growth, they can begin to optimize their use of track capacity and reduce their unit operating costs by increasing train lengths and locomotive haulage capacities, during the Medium Term (2018–2022). Most of the analysis in this section relates to TRL but it is also of relevance to TAZARA, which operates under joint Tanzanian and Zambian management and is subject to joint decision-making on strategy.

Medium-term strategies for TRL are discussed in detail in subsection 6.4.2

6.2.3 Long Term Strategies for Network Expansion and Upgrading

In reality, expansion of the TRL network is unlikely to occur before 2030 and the future expansion of the TAZARA network (e.g., to the southeast to connect with new mining areas and Mtwara Port) is relatively of a more long-term prospect.

In the case of TRL, the justification for construction of new railway links from Isaka to Rwanda and Burundi is affected by:

- The prospect of sufficient freight tonnages to generate enough net revenue to offset the large scale of the associated investment;
- The engineering problems and costs associated with construction of new railway lines through mountainous terrain (possibly involving construction of numerous tunnels and bridges in order to maintain a ruling gradient of 1%); and
- Consideration of a policy to construct all new lines in standard (1,435 mm) gauge.

These issues are discussed in detail in subsections 6.2.4 and 6.4.3 below.

6.2.4 Strategy for the Construction of Standard Gauge Track in Tanzania

(1) Implementation Strategy

As stated in the Volume 2 of the Action Plan, construction of standard gauge track is regarded by some as the key for revitalization of the railway.

However, it must be recognized that the construction would be costly and requires considerable time. Thersfore, the issue would be to determine how to complete this standard gauge track construction in Tanzania to accommodate increasing demand for the following decades without any break, during a period when TRL will increase its transport capacity. Design, the securing of financing, and construction of a new standard gauge network would take 5–10 years to fully begin operation; so the immediate issue, between now and 2022, is to determine how to make the most effective use of existing rail assets.

There are a number of possible methods to achieve standard gauge construction:

(i) Converting existing metre gauge track to standard gauge track;
(ii) Replacing existing metre gauge track with dual gauge track; and
(iii) Constructing new standard gauge track separately.

The idea of converting the existing metre gauge track to standard gauge track is not practical for Tanzania because:

- The existing train operation would have to be suspended.
- There are 1,471 bridges and culverts on the Central Line of which about 60% were constructed during the German colonial era, with a design axle load of 10 tonnes, 14% were constructed during the British colonial era with 12 tonnes, and 16% with 15 tonnes axle loads. Only 133 bridges and structures (9%) were constructed with a 25-tonne International Union of Raiwlays (UIC, from the French acronym) design axle load. When a new standard gauge track is to be constructed on the same track bed, demolition of the existing structures and the construction of new structures will be costly.
- The existing track bed is constructed for metre gauge track. When converting to standard gauge, widening of the track bed will be required.
- Existing workshops and running sheds cannot be used for standard gauge rolling stock.

Dual gauge construction is useful where different gauge trains are running on short sections of the same track at the same time. However, it is not planned to operate metre gauge trains in Tanzania after the completion of the standard gauge track. Therefore, it is not recommended to construct dual gauge track, which is inordinately expensive.

A practical approach to standard gauge track construction is to construct the new line parallel to the existing metre gauge track. The advantages of this method are:

- Rail movement of current and projected non-construction traffic can be continued during construction.
- Construction materials, equipment, and personnel can also be transported on the existing track.
- After the completion of new standard gauge track, the old metre gauge track materials can be salvaged easily. The salvaged rail can be utilized on branch lines where the freight volume is less than on the Central Line.

(2) Construction Cost of Standard Gauge Track

The construction cost of track varies depending on the design axle load while the design axle load varies depending on the locomotives to be used, planned train speed, and annual passing tonnage on the track.

Table 6.2 indicates an example of design axle load with other factors adopted in by the JR (Japan Railway companies). The table indicates design parameters for the 1,067mm gauge track (Cape Gauge). Therefore, if the existing TRL track is rehabilitated to the same or better standards than the 3rd class track, as shown in the table, TRL can operate the existing track until the annual passing tonnage exceeds 10 million tonnes.

Table 6.2: JR Track Design Parameters

Grade of Track	1st class	2nd class	3rd class	4th class
Design axle load (ton)	18	17	15	14
Design passing tonnage T (Mil. Ton/year)	T ≧ 20	20 > T ≧ 10	10 > T ≧ 5	5 > T ≧ 2
Design maximum speed V (km/h)	130 ≧ V > 110	110 ≧ V > 90	90 ≧ V >70	70 ≧ V
Rail Weight W (kg/m)	W ≧ 50	W ≧ 50	W ≧ 43	W ≧ 43
Min. number of sleepers (per 25m)	39	37	37	34
Ballast Depth D (mm)	D ≧ 300	D ≧ 250	D ≧ 200	D ≧ 200

The description in the Transport Master Plan of the East African Community (EAC) stating how "low velocity and limit to permissible axle load is due to narrow gauge" may be considered misleading. As a matter of fact, there are *two heavy haul lines in South Africa, both with a track gauge of 1,067 mm* (known as "Cape Gauge"), which is also used by TAZARA. The Sishen–Saldanha line, with an 861 km long single track, is carrying iron ore on a track having an axle load of 30 tonnes. This line has a design transport capacity of 60 million tonnes of ore per year. The Richards Bay Line, with a 588 km double track, is carrying coal on a track having an axle load of 26 tonnes. This line has capacity to transport 74 million tonnes of coal and 14 million tons of general cargo per year.

Except for the Shinkansen ("bullet train") lines, which run at 270–300 km/hour, the Cape Gauge is dominant in Japan. The Japan Freight Railway Company (JRF) operates its freight trains at 110–120 km/hour on this gauge. In the case of passenger trains, JR is operating at 160 km/hour where the track is elevated. Therefore, the assertion that "low velocity [is] due to narrow gauge" is incorrect.

There is no indication of the maximum future demand for the planned standard gauge track. In order to estimate the construction cost, it is assumed that an annual passing tonnage of 30 million tonnes and a maximum train speed of 100 km/hour will apply. The estimated construction cost of a new standard gauge Central Line would be as shown in Table 6.3.

The estimated cost is equivalent to a unit cost of USD 2.976 million per km, *or at least three times the cost of a fully rehabilitated metre gauge line.*

This estimated cost/km cannot be applied for other lines, such as Isaka–Rwanda/Burundi and Arusha–Moshi, because the topographic conditions are quite different and unit costs are likely to be higher.

The timing of the construction of the standard gauge track should be planned based on the demand forecast and when it will exceed the capacity of the metre gauge track.

Table 6.3: Cost Estimate of New Central Line (Standard Gauge)

Work Item	Estimated Quantity	Estimated Cost (Mil. US$)
Civil work	1,254 km	650
Track work	1,254 km	750
Structural work	1,600 locations	650
Signal & telecommunications	1 unit	20
Workshops	2 (loco + wagon)	150
Running Sheds	5	100
Diesel locomotives	40	120
Wagons	1600	640
Station buildings	66	30
Contingencies	20%	622
Total		3732

6.2.5 Mitigation Measures for the impact on environment and social considerations

The SEA survey was conducted, and the impact on environment and social considerations has been evaluated during this study.

Table 6.4 shows the potential impact on each component.

Table 6.4: Potential Impact of the Railway Project on Each Component

COMPONENTS / POTENTIAL IMPACTS	Total Score	Biodiversity, Flora and Fauna	Population, Health & Safety	Soil	Water	Air	Climatic Factors	Material Assets	Cultural Heritage	Landscape
Resettlement of people and loss of assets during rehabilitation works	-2		-1					-1		
Destruction of natural vegetation due to rehabilitation works	-1	-1								
Destruction of natural vegetation due to new railway	-3	-3								
Resettlement of people during rehabilitation works	-1		-1							
Increased access to domestic and external markets	3		3							
Faster movement of freight / cargo	3		3							
Landscape alteration due to rehabilitation works	-1									-1
Landscape alteration due to new railway	-3									-3
Destruction of cultural heritage due to rehabilitation works	-1								-1	
Water pollution due to bridge / culvert works	-2				-2					
Soil disturbance due to rehabilitation works	-2			-2						
Soil disturbance due to new railway	-3			-3						
Creation of employment and income generation opportunities	3		3							
Emission of greenhouse gases	-2					-1	-1			

Note: the level of evaluation is categorised as shown in follows. -3; High -Ve impact, -2: Medium -Ve impact, -1: Low -Ve impact, 0: Neutral or Negligible impact, 1: Low +Ve impact, 2: Medium +Ve impact, 3: High +Ve impact

It is noteworthy that there are some negative impacts in terms of destruction of natural vegetation, formation of soil disturbance due to new railway, and landscape alteration due to rehabilitation works. Meanwhile, there are high positive impacts of freight transport, access to domestic and external markets, faster movement of freight / cargo and creation of employment and income generation.

Considering the above listed evaluations and further details on the impact of the project on specific areas described in chapter 10, the following mitigation measures need to be taken into account to implement railway development.

1. Avoid development activities within ecologically valuable natural vegetation and environmentally sensitive areas.
2. Minimize soil erosion through good construction practices and restoration of disturbed areas.
3. Avoid landscapes with special or unique characteristics.

6.3 Rail Transport Forecasts for TRL

6.3.1 Forecasting Method

It was necessary to estimate the likely future freight tonnages and tonne-km to be hauled by rail on the TRL network over the forecast timeframe from 2013–2030. These forecasts were needed as a basis for calculation of the requirement of locomotives and wagons during the forecast period.

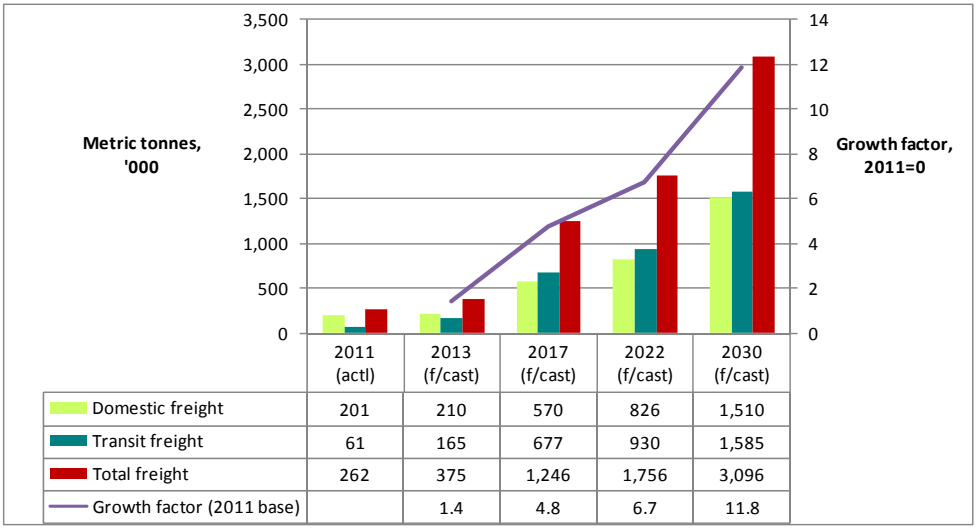
As described in Chapter 1, the results of interview surveys of cargo owners, shippers, and forwarders reveals that there is a large amount of latent and unrealized demand for rail transport because of poor or nonexistent rail service. A modal split model, subsequently developed, indicates substantial railway share can be expected once such obstacles are removed. However, it was decided to adopt a conservative approach in forecasting railway demand, considering the inherent difficulty in railway operation, which is necessarily inflexible relative to road transport due to organizational and technical issues.

The preliminary forecast was unconstrained by capacity for all years after 2016, but during the first four years when the railway will be undertaking repair and rehabilitation of its track infrastructure and mainline locomotives, it was assumed that railway transport volumes will be limited especially by the capacity of the locomotive fleet. Even with this constraint, rail transport volume is still expected to return to its 2006 (pre-RITES) level of about 775,000 tonnes by 2015. After 2016, rail transport volume is expected to grow at the rate of 8% per annum (corresponding to a conservative assumption for long-term GDP growth of about 5%, as explained in Chapter 1), unconstrained by track capacity, which is estimated to exceed 7 million tonnes per year). That is, the market share for rail would decrease somewhat after 2016 if the market grows faster than 8% per year, reflecting the shift in the total cargo transport market towards more high value commodities. This leaves sufficient capacity to carry construction materials when (or if) the new standard gauge line is constructed, as discussed in subsection 6.1.4 above. If it is desired to increase rail market share, additional locomotives and wagons could be acquired and more of the spare track capacity utilized, but there is a risk that service levels will decrease if traffic levels become too high in relation to track capacity.

In the case of transit container flows to/from Burundi, Rwanda, and Uganda, forecasts prepared by the Tanzania Ports Authority (TPA) were used as a basis for estimating *future rail-hauled container traffic* between Dar es Salaam and Kigoma, and Dar es Salaam and Isaka/Mwanza South. It was assumed that all container traffic to/from Burundi would be directed through Kigoma Port, while transit containers to/from Rwanda and Uganda would be transported respectively via the Isaka Inland Container Deport (ICD)(for transfer to trucks) and Mwanza Port (for transfer to lake vessels).

6.3.2 Forecast Results

The forecasts of freight tonnage are given in Figure 6.2, while forecasts of the change in average haul distances and the derived future tonne-km are given in Table 6.5.



	2011 (actl)	2013 (f/cast)	2017 (f/cast)	2022 (f/cast)	2030 (f/cast)
Domestic freight	201	210	570	826	1,510
Transit freight	61	165	677	930	1,585
Total freight	262	375	1,246	1,756	3,096
Growth factor (2011 base)		1.4	4.8	6.7	11.8

Note: JICA Study Team estimate based on TRL Traffic Statistics 2001–2011 and TRL Business Plan 2011–2019, December 2010

Figure 6.2: Preliminary Forecast of Rail Freight Tonnage on TRL Network

Table 6.5: Preliminary Forecast of Rail Freight Tonne-km and Length of Haul (TRL)

Freight type/TKM/Av.haul (km)	2011 Actual	2013	2017	2022	2030
		Forecast			
Domestic freight					
Tonne-km (million)	184	191	568	816	1,495
Average length of haul (Km)	913	908	930	930	932
Transit freight					
Tonne-km (million)	75	87	745	1,035	1,789
Average length of haul (Km)	1232	1148	1090	1102	1116
Total freight					
Tonne-km (million)	259	278	1,313	1,851	3,284
Average length of haul (Km)	988	972	1015	1019	1024
Growth factor (2011 = 0)		1.1	5.1	7.1	12.7

Note: JICA Study Team estimate based on TRL Traffic Statistics 2001-2011 and TRL Business Plan 2011-2019, December 2010

As can be observed, the forecasts anticipate that *the total rail freight tonnage in 2030 will be nearly 12 times its actual level in 2011*, while the corresponding figures for domestic freight and transit freight tonnage in 2030 will be *8 times and about 26 times their 2011 levels*, respectively. Slightly higher growth factors will apply to rail freight tonne-km because the average length of haul is expected to increase slightly over the forecast period from 988 km in 2011 to 1,024 km in 2030.

Revival of TRL's badly deteriorated track and locomotive assets will be essential for the early recovery of railway freight traffic. The staff of the TRL Commercial Department have advised that an early improvement of the locomotive supply situation will, in itself, lead to almost immediate recovery of traffic recently lost to road. Subsequent traffic growth will then depend upon efficiency and productivity gains realized from: (i) increased rail schedule speeds, (ii)

increased block train operations and reduced terminal time, and (iii) longer trains. However, the expected quantum shift of traffic from road to rail will also depend on rail's price competitiveness, which in turn will depend on the extent to which the foregoing gains can be translated into lower tariffs in comparison to the road.

Block train operation will be ready when enough locomotives are rehabilitated to operate and the container handling facility in Kigoma Port is ready (anticipated to be in 2015).

6.3.3 Cost Comparison – Rail and Road

Based on the TPA data, the current rail share of transit container traffic between Dar es Salaam Port and Burundi, Rwanda, and Uganda, was estimated at less than 10%. Rehabilitation of the locomotive fleet and track renewal on the Central and Mwanza Lines, complemented by rehabilitation of rail terminal facilities in Kigoma, Isaka, and Mwanza South, will provide capacity for the future operation of block trains of up to 30 wagons on a shuttle basis to and from Dar es Salaam Port. This, in turn, will reduce rail unit costs and provide a strong competitive advantage for rail over road transport in these corridors. Accordingly, it was assumed that rail would secure a 45% share of total container traffic to and from Kigoma Port in the first year of upgraded services (2015), increasing to 75% by 2030. In the case of container transport to and from Rwanda and Uganda, the rail share was assumed to increase from 30% in 2013 to 60% in 2030, the lower share for rail, in this case, reflecting better road infrastructure and stronger competition from road transport in the Mwanza and Rwanda corridors.

To secure a dominant share of traffic by rail in these corridors, an analysis was made of the relative operating costs per tonne-km of rail and road services over a given haul length of 1,020 km (the average assumed to apply on the TRL network over the forecast period). For this purpose, railway costs were estimated on the basis of forecast expenditure data in the TRL Business Plan, related to forecast tonne-km growth.[5] The resulting analysis of rail costs is given in Table 6.6 and Figure 6.3

Table 6.6: Estimate of Future Railway Operating Cost

Factor	2013	2019	2024 (1)	2030
Forecast tonne-km (mill.)	378	1,451	2,066	3,172
Costs in US$ per tonne-km				
O&M cost per tonne-km	0.0917	0.0449	0.0398	0.0256
Depreciation per tonne-km (2)	0.0007	0.0060	0.0070	0.0064
Rail cost per tonne-km	0.0924	0.0509	0.0468	0.0319

Notes: (1) Train formations of 30 wagons assumed to be introduced progressively from 2022 (currently 20 wagons). Formation of all trains assumed to be 30 wagons by 2030.
(2) Includes depreciation of all capital expenditure identified in the Master Plan, except for expenditure on network expansion (new line construction).

[5] Tanzania Railways Ltd., *Business Plan 2011–2019*, December 2010. See Appendix 6 Profit/Loss Projection for Period 2011–2019 (Million USD).

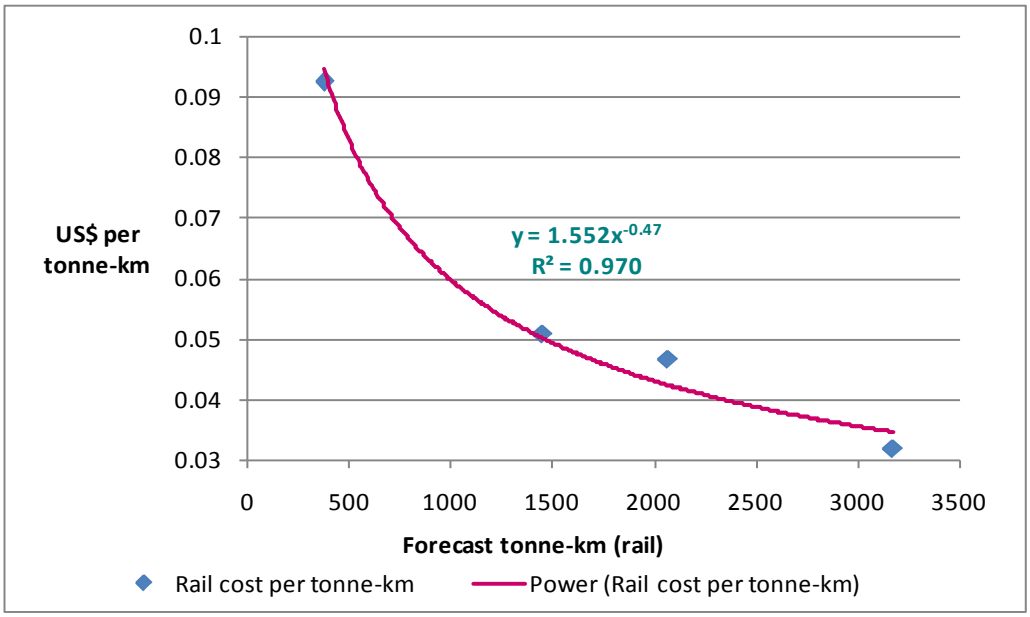


Figure 6.3: Declining Rail Unit Cost Relative to Increasing Tonne-km Rail Task

A unit cost for road transport was calculated on the basis of data supplied in a survey of operators of container trailer trucks running between Dar es Salaam and Kigali. Owing to the relatively small proportion of fixed costs associated with road transport operations, this unit cost was not expected to decline significantly with increasing transport volume. The opposite is true for rail, for which up to 80% of recurrent costs may be regarded as fixed.

The comparison of the rail and road unit operating costs indicates a substantial cost advantage for rail over the forecast period (as may be observed in Table 6.7 below) demonstrating scope for a large shift of traffic from road to rail in the longer term.

Table 6.7: Comparison of Rail and Road Unit Costs

Item	2013	2019	2024	2030
Rail transport cost, USD per tonne-km	0.0924	0.0509	0.0468	0.0319
Road transport cost, USD per tonne-km	0.1683	0.1653	0.1628	0.1593

Note: Rail transport cost is inclusive of depreciation of investments in renewal of track and structures, locomotive and wagon rehabilitation, and new locomotive and wagon acquisition. Road transport cost is inclusive only of vehicle depreciation (no allowance for road infrastructure investment).

6.4 Development Strategies for TRL

6.4.1 Short-Term Strategies

(1) Improvement of Existing Locomotive Availability and Supply

Proposed Locomotive Rehabilitation Programme

Currently, the number of mainline locomotives fully available[6] for traffic each day averages only 12 units, out of a fleet numbering 44 units (i.e., an availability rate of only 27%). This poor

[6] "Fully available" means that locomotives may be assigned to traffic 75% of the time, with the balance (25%) being downtime for maintenance. In addition, there are currently on the register 6 Class 88 locomotives that are estimated to be available for only 44% of the time, owing to their poor condition resulting from deferred maintenance. If it is assumed that these would be equivalent to three fully available locomotives, the current number available on a daily basis would be 15.

availability itself severely restricts TRL's freight haulage capacity, but does not reflect the excessive rate of in-service mechanical and electrical failures of otherwise available locomotives (which is currently seen). These failures frequently cause trains to become stranded in the middle of block sections, with the result that they delay other traffic, thereby reducing the prevailing schedule speed[7] to a level that further reduces TRL's freight haulage capacity.

The immediate objective for rehabilitation of the existing TRL locomotive fleet will be to return to operation, in good working condition, 17 of the 44 mainline locomotives on the register. Of these locomotives, some 11 are defective (i.e., not working), while the remaining six are working, but in very poor condition, owing to deferred overhauls.

The rehabilitation programme that is being proposed for 2012–2015 as part of this Master Plan is given in Table 6.8.

Table 6.8: Proposed Locomotive Rehabilitation Programme (TRL)

Year	Description	Class 88	Class 89	Total
2013	Repair of defective units – no.	2	2	4
2014	Repair of defective units – no.		1	1
2014	Overhaul of undermaintained units – no.	6		6
2015	Re-manufacturing of defective units – no.	3		3
2016	Re-manufacturing of defective units – no.	3		3
	Total	***14***	***3***	***17***
	Total to be financed by an international funding agency	**12**		**12**

Source: JICA Study Team estimates, based on information from the Acting Chief Mechanical Engineer, TRL

While this schedule relates to the rehabilitation of 17 mainline locomotives, the Government of Tanzania is committed to obtaining funds for the repair of five of these locomotives. Advice received from TRL in early 2012 indicated that funds had been obtained for work on four of these (two Class 88 and two Class 89) locomotives and that the necessary spare parts had been ordered. However, since this work had not yet commenced, it is likely that it was/will be carried over into the next financial year (2012/2013).

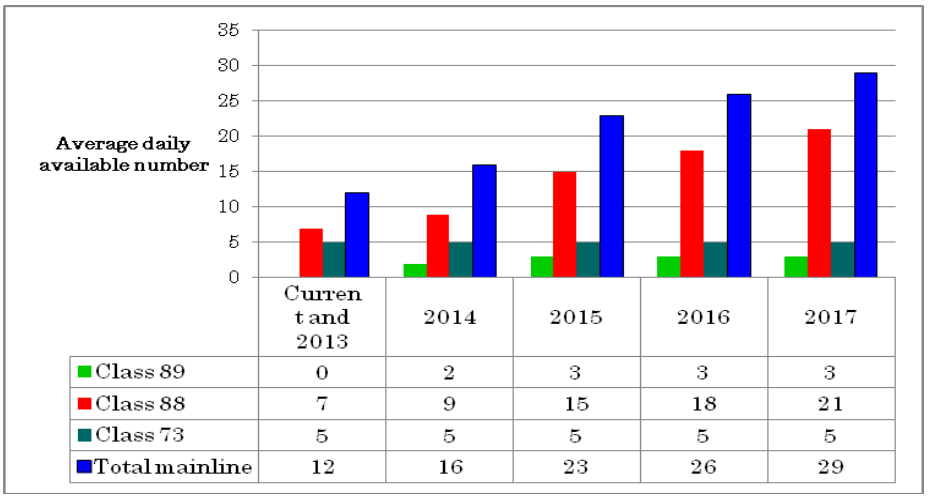
The balance of the rehabilitation work (for 12 locomotives) is planned to be financed with assistance from an international development partner. Since it is likely that the loan approval and tendering processes will take at least a year to complete, it is expected that the first tranche of this work involving the overhaul of the six Class 88 locomotives operating at restricted availability will not commence until 2014. However, it would be completed in that year, with the overhauled locomotives re-entering service in 2015. It is expected that the second and third tranches of this work (each involving the re-manufacturing[7] of three Class 88 locomotives) will be undertaken in the succeeding two years (2015 and 2016).

By 2017, it is expected that 29 out of the mainline fleet of 44 locomotives (66%) will be fully available for traffic, as compared with only 12 (28%) currently, as is shown in Figure 6.3 below.

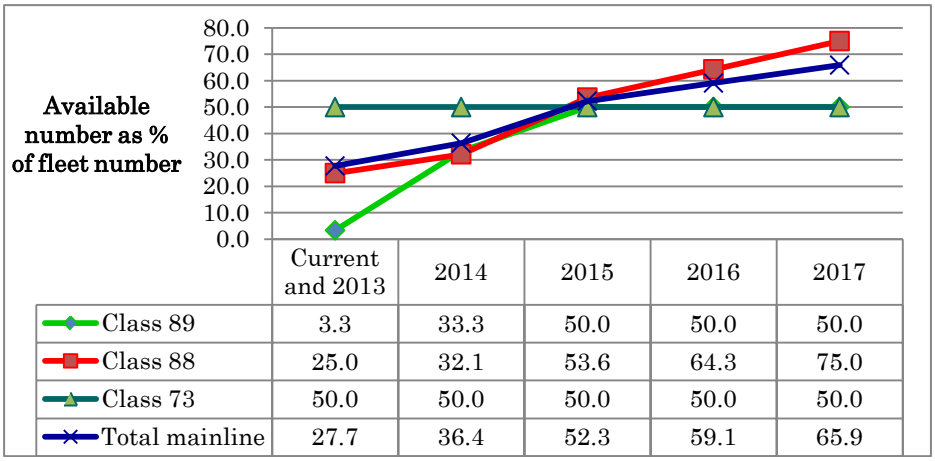
[7] "Schedule speed" is the ratio of distance covered between two stops and total running time including the time of all stops. The schedule speed of a given train, when running on a given service (i.e., with a given distance between stations) is affected by: (i) acceleration and braking retardation; maximum or crest speed; and (iii) duration of stops.

[7] "Re-manufacturing" involves stripping the locomotive to the mainframe and bare bogie frames, followed by installation of "state of the art" equipment and control systems above the main frame, as well as fitting new traction motors and bogie fittings on the bogie frames. The result is a locomotive that is close to a new one, since only the main and bogie frames are original components. Thus the re-manufacturing process, which costs about USD 1.8 million per unit as compared with USD 2.5–3.0 million for a new locomotive, will add nearly 30 years to the life of the existing locomotive.

The effect of the rehabilitation programme on the daily availability of mainline locomotives for traffic is shown in Figure 6.4.



	Current and 2013	2014	2015	2016	2017
Class 89	0	2	3	3	3
Class 88	7	9	15	18	21
Class 73	5	5	5	5	5
Total mainline	12	16	23	26	29



	Current and 2013	2014	2015	2016	2017
Class 89	3.3	33.3	50.0	50.0	50.0
Class 88	25.0	32.1	53.6	64.3	75.0
Class 73	50.0	50.0	50.0	50.0	50.0
Total mainline	27.7	36.4	52.3	59.1	65.9

Source: JICA Study Team estimates based on data from Acting Chief Mechanical Engineer, TRL

Figure 6.4: Effect of Rehabilitation on Mainline Locomotive Availability

Effect on Productivity of the Locomotive Fleet

The availability numbers in Figure 6.4 measure gross availability. In other words, they include the numbers of locomotives required to run:

- Freight services;
- Passenger services;
- Assist services (i.e., banking or assistance to climb short but steeply graded sections); and
- Works trains (conveying ballast, sleepers or rail to works sites).

Currently, about 6 locomotives, or half the daily available number, are required to run non-freight services. By 2016, this number is expected to increase to 8. Thus, as a result of the rehabilitation programme, the number available for freight service would increase from the present 6 to 21 by 2017.

The productivity of a mainline locomotive allocated to freight service may be calculated in terms of its annual net tonnage capacity, based on assumptions about average length of haul, schedule speed, and terminal time. For the TRL system, the proposed re-railing and rehabilitation of bridges and culverts on the Central Line will permit a significant improvement in operating speeds. Hence, the importance of coordinating, to the maximum extent possible, the work on track improvement with the locomotive rehabilitation cannot be overemphasized. While additions of serviceable locomotives to the fleet will have the greatest impact in terms of increasing schedule speeds and hence of expanding the freight haulage capacity of TRL, track relaying (supported by repair of bridges and culverts) will allow the lifting of speed restrictions on the re-laid sections, which will further increase schedule speeds.

Schedule Speed

The schedule speed achievable on the Central Line in each of the years from 2013 to 2018 will reflect the progressive locomotive rehabilitation coupled with progressive re-railing of the line. The current very low schedule speed (14 km per hour) is mainly caused by frequent locomotive failures on the line, resulting in a need to clear the tracks and to detain wagons at various stations. This problem will be eliminated with the rehabilitation of locomotives, and coupled with the increase in maximum speeds possible from re-railing (supported by the rehabilitation of bridges and culverts), schedule speeds are expected to increase as shown in Table 6.9.

Table 6.9: Effect on Schedule Speed on Central Line of Locomotive Rehabilitation and Re-Railing

Item	*Current and Year 1 (2013)*		*2014*		*2015*		*2016*		*2017*		*2018*	
Rail weight	Km	Max. Speed	Km	Max. Speed	Km	Max. Speed	Km	Max. Speed	Km	Max. Speed	Km	Max. Speed
< 60 lbs	525	25	448	25	411	25	274	25	137	25	0	25
60lbs	283	30	283	56	283	56	283	56	283	56	283	56
80lbs	446	56	523	56	560	56	697	56	834	56	971	56
Total	1254	37.2	1254	44.9	1254	45.8	1254	49.2	1254	52.6	1254	56.0

Item	2013	2014	2015	2016	2017	2018
Serviceable locomotives available per day	12	16.0	23.0	26.0	29.0	29.0
Schedule speed (km/hour), after loco rehabilitation	14	18.7	26.8	30.3	33.8	33.8
Schedule speed (km/hour), adjusted for increased maximum speeds after re-railing	14	22.6	27.4	32.6	36.2	36.0

Source: JICA Study Team estimates based on data provided by Acting Chief Civil Engineer, TRL

It should be noted that in 2030 the schedule speed will still be 36 km/hour. Schedule speed includes allowance for stopping time and for the variation from maximum speed due to line curvature and gradient (this has been fully explained in Section 6.1). Between now and 2017, the schedule speed will be improved by three actions: rehabilitation of the locomotive fleet, re-railing of the track in 80 lb/yard rail, and rehabilitation of track structures. Some improvement of the schedule speed is possible with the introduction of new locomotives (from 2022), but these locomotives will be hauling loads which are 50% greater than the current figure. Therefore, it is suggested that the schedule speed applied after the locomotive and track rehabilitation will also be applied up until 2030.

Locomotive productivity in each of the initial five forecast years was calculated on the basis of the schedule speeds shown in Table 6.10, combined with an assumption of an average haul distance for the TRL system of 1,001–1,020 km and a turnaround time at either end of 12 hours. The resulting average tonnage capacities per locomotive per year are shown in Table 6.10.

Table 6.10: Average Haulage Capability per Locomotive Per Year (Net Freight Tonnes)

Year/Schedule speed	Class 88/89 (75% utilization)	Class 73 (75% utilization)	Class 88 (44% utilization)
Current (schedule speed, 14km/hr)	30,808	27,826	18,074
2013 (schedule speed, 14 km/hr)	30,808	27,826	18,074
2014 (schedule speed,22.6 km/hr)	46,638	27,826	27,361
2015 (schedule speed, 27.4 km/hr)	53,876	27,826	Not applicable
2016 (schedule speed, 32.6 km/hr)	61,195	27,826	Not applicable
2017 (schedule speed,36.0 km/hr)	65,171	27,826	Not applicable

Source: JICA Study Team estimate based on data provided by the Acting Chief Mechanical Engineer, TRL

The strong correlation between locomotive haulage capacity (expressed in net freight tonnes per locomotive per year) and schedule speed may be observed in Figure 6.5.

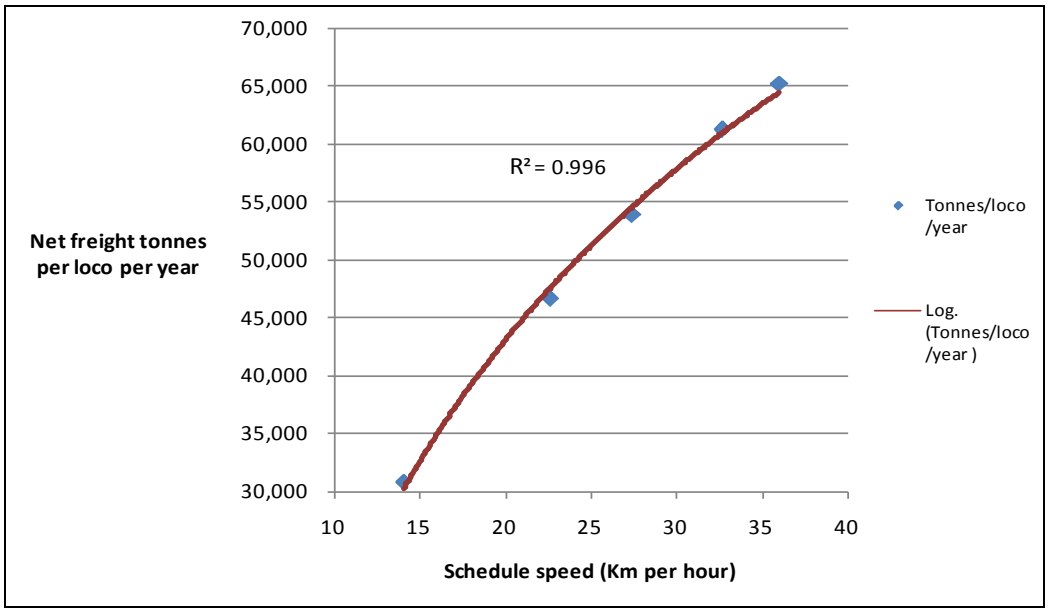


Figure 6.5: Correlation between Locomotive Haulage Capacity and Schedule Speed (Class 88 Locomotive)

The haulage capacity of the Class 73 locomotives, deployed on services along the Mpanda Line, which is laid with rail of a weight of less than 56 lbs per yard, is assumed to be fixed at 27,060 net tonnes per locomotive per year, as the maximum speed on this line is initially limited to about 25 km per hour.

Total Freight Net Tonnage Capacity and Actual Volume on TRL System

When applied to the number of locomotives estimated to be available for freight traffic, the annual tonnage capacity per locomotive may be used to calculate the total freight net tonnage capacity on the TRL system in each of the initial five forecast years 2013-2017 as shown in Table 6.11. In 2011, the percentage relationship between the actual net tonnage transported and the calculated tonnage capacity was about 92%. In the case of the initial five forecast years, it was assumed that the annual freight haulage volume would be approximately equivalent to the calculated capacity in those years. This is based on the advice of the TRL Commercial Manager that addressing the severe shortage of locomotives would immediately result in the restoration of the freight traffic volume lost by rail in recent years.[8]

[8] Meeting with JICA Railway Study Team on 27 September 2011.

Table 6.11: Estimates of TRL Annual Freight Haulage Volume (Net Tonnes)

Item	2011 Base year Actual	2013 Forecast	2014 Forecast	2015 Forecast	2016 Forecast	2017 Forecast
TRL freight haulage volume (tonnes)	262,019	285,800	592,921	863,784	1,046,293	1,293,906

Note: JICA Study Team estimates, based on freight capacity calculations

TRL Freight Volume Forecast Relative to Calculated Line Capacity

Line capacity calculations were made for the Central and Mwanza Lines in order to demonstrate the freight capacity that would be available after elimination of the capacity constraints currently imposed by the shortage of locomotives and poor track condition (especially on the Central Line).

Line capacity calculations were based on the progression of schedule speed and the introduction of 30 wagon trains as from 2022 (refer to Table 6.13 below). It will be noted that, even without any further increase in schedule speed after 2016, the annual line capacity of the Central Line, unconstrained by locomotive capacity, will grow from the present 2.1 million tonnes to 7.6 million tonnes in 2023–2030. This would provide more than adequate capacity until 2030 if the rail volume forecast for the entire network in that year is only of the order of 3.1 million tonnes. A similar calculation made for the Mwanza Line shows that it has a line capacity even greater than that of the Central Line – of the order of 10 million tonnes per annum in 2023–2030.

The above line capacity calculations involved the application of Scott's formula, which calculates the capacity of a single line section of railway in terms of the maximum number of trains that can be operated per day in both directions, given the schedule speed through the longest block section on the line.

The average train payload (net tonnes of freight) is applied to the train number (assuming all trains will be transporting freight) to arrive at the maximum freight volume that can be handled in a year. This volume may be increased by adding more wagons to individual trains. If, for example, trains were to comprise 40 wagons instead of 30, the maximum annual freight volume would increase to 10.0 million tonnes (from 7.6 million tonnes) on the Central Line, and to 13.3 million tonnes (from 10.0 million tonnes) on the Mwanza Line.

However, increasing train lengths on these lines would require two changes to operating and investment plans. First, a second locomotive would have to be added to train consists in order to keep axle loads within the axle load limit of 18 tonnes applying in future across the system (since more powerful locomotives are likely to exceed this limit). Second, crossing loop lengths would have to be increased from 500 metres, as proposed for 30 wagon trains hauled by a single locomotive, to about 670 metres, as would be necessary for 40 wagons hauled by *two* locomotives.

Table 6.12: Calculation of Single Line Capacity, Dar es Salaam–Kigoma and Isaka

Scott's formula (calculation of single line capacity):
N = 24/(T+t)

where N = Number of trains/day (both directions)
T = longest Travel and stopping time in hours between passing sidings on a given line
t = signalling delay time in hours (assumed to be 2 minutes at both ends = 0.067 hours)

Central Line	Current and 2013	2014	2015	2016	2023–2030
Longest block distance	37	37	37	37	37
Average running speed	14	22.1	24.3	31	31
T	2.6	1.7	1.5	1.2	1.2
t	0.067	0.067	0.067	0.067	0.067
N	8	13	15	19	19
Operating days/year	365	365	365	365	365
Train payload	800	800	800	800	1200
Backhaul ratio	1.1	1.1	1.1	1.1	1.1
Annual freight haulage capacity (t) (Unconstrained by locomotive availability)	2,123,636	3,450,909	3,981,818	5,043,636	7,565,455
Mwanza Line	Current and 2013	2014	2015	2016	2023–2030
Longest block distance	30	30	30	30	30
Average running speed	14	22.1	24.3	34	34
T	2.1	1.4	1.2	0.9	0.9
t	0.067	0.067	0.067	0.067	0.067
N	10	16	18	25	25
Operating days/year	365	365	365	365	365
Train payload	800	800	800	800	1200
Backhaul ratio	1.1	1.1	1.1	1.1	1.1
Annual freight haulage capacity (t) (Unconstrained by locomotive availability)	2,654,545	4,247,273	4,778,182	6,636,364	9,954,545

Source: JICA Study Team estimates based on projected schedule speeds and operation of 30 wagon trains by 2023

Forecast Freight Train Frequency on the TRL Network

Currently, only about six freight trains operate every week in each direction: 2 trains per week, each between Dar es Salaam and Kigoma, between Dar es Salaam and Isaka/Mwanza, and between Mpanda and Mwanza. Based on the preliminary rail volume forecast, it was calculated that the number of trains operated *per week* will grow from 10 in 2013 to 66 by 2030 (refer to Table 6.13). These calculations assume that 30 wagon trains will be introduced to the TRL network as from 2022.

Table 6.13: Freight Train Frequencies TRL Network 2011–2030

Item	2011 Base year Actual	2013 Forecast	2017 Forecast	2022 Forecast	2030 Forecast
Train number per year	312	486	1,854	2,340	3,534
Train number per week	6	10	36	45	68

Source: JICA Study Team estimates

(2) Improvement of Existing Wagon Availability and Supply

TRL has a total fleet of 1,357 wagons, but 719 of these wagons have been immobilized as a result of defects, most of which are due to the wagons being too old. Nearly one third of the total fleet is more than 30 years old, while more than half are between 25 and 30 years old. Only 330 of the 719 defective wagons have been assessed as being suitable for economic repair.

TRL's overall wagon requirement will also be influenced by the increased schedule speeds and shortened turnarounds made possible by the locomotive and track rehabilitation programmes.

Turnarounds can also be improved by the increased operation of block trains, which require an absolute minimum of (or no) en-route shunting. It is expected that these factors will operate to ensure that the current available fleet of 638 wagons will be sufficient to satisfy transport needs during the short term (2013–2017), assuming that the available fleet comprises a suitable mix of wagon types. However, *an injection of funds will be necessary for their increased maintenance during this period.*

In the medium term (2018–2022), it will be necessary to rehabilitate the 330 wagons that have been assessed as suitable for improvement. The addition of these wagons to the active fleet will ensure that new wagon purchases can be delayed until the long term (2023–2030).

(3) Central Line Track Renewal and Realignment, to Increase Service Speeds

There are three kinds of rail used on the Central Line: welded 80 lb/yard, welded 60 lb/yard, and fish-plated (non-welded) 56.12 lb/yard rails. The total length of the Central Line is 1,254 km and section lengths of each weight of rail are 416 km of 80 lb/yard rail, 283 km of 60 lb/yard rail, and 555 km of 56.12 lb/yard rail. The very low service speed of the Central Line is mainly caused by the very poor condition of the light (56.12 lb/yard) rail section.

In order to increase the service speed, the most effective measure is replacing 56.12 lb/yard fish-plated rail with welded 80 lb/yard rail. The existing track structure of the Central Line is as shown in Table 6.14.

Table 6.14: Track Structure of the Central Line

<table>
<tr><th rowspan="2">Station</th><th rowspan="2">km</th><th colspan="3">Weight of Rail (lb/yard)</th></tr>
<tr><th>56.12lb/yard</th><th>60lb/yard</th><th>80lb/yard</th></tr>
<tr><td>Dar es Salaam</td><td>0</td><td rowspan="5"></td><td>20</td><td></td></tr>
<tr><td>Pugu</td><td>20</td><td></td><td>22</td></tr>
<tr><td>Mpigi</td><td>42</td><td rowspan="2">263</td><td rowspan="2"></td></tr>
<tr><td>beween Munisagara and Mzaganza</td><td>305</td></tr>
<tr><td>Tigi</td><td>626</td><td rowspan="4"></td><td rowspan="2">321</td></tr>
<tr><td>Malonga</td><td>730</td><td>104</td><td></td></tr>
<tr><td>between Goweko and Galula</td><td>803</td><td></td><td>73</td></tr>
<tr><td>Kigoma</td><td>1254</td><td>451</td><td></td></tr>
<tr><td>Total</td><td>1254</td><td>555</td><td>283</td><td>416</td></tr>
</table>

Fishplate jointed track requires more frequent maintenance work than welded rail track because of its weak joint structure. Because of insufficient maintenance work on the section between Tigi and Kigoma, trains run at very slow speeds to avoid derailment (see Photo 6.1). When this section is upgraded by welded 80 lb/yard rail, alignment of some steep curve sections will be improved to allow higher speed operation.

Photo 6.1: Trace of Derailment
(Abandoned Rails and Bent Sleepers)

(4) Central Line Bridge and Structure Rehabilitation (Phase 1)

Table 6.15 indicates the design loads of individual bridges on the Central Line. As shown in the table, the dominant design load is 10 tonnes and 15 tonnes. Those structures having a-10 tonne design load were constructed during the German colonial era, while those having 15 tonnes were constructed during British rule.

The number of structures having a design load between 9 and 14 tonnes is 1,100 (74.5%), between 15 and 19 tonnes is 238 (16.2%), and those having 25 tonnes is 133 (9.0%).

In order to accommodate future railway transport demand, those structures will be reinforced or reconstructed to conform to the 18-tonne axle load, in order to be adopted across the network. As explained in subsection 6.2.4, it is not recommended to convert the existing track to new standard gauge track. Therefore, reconstruction to a 25-tonne axle load will not be required.

Some of structures were severely damaged by flooding, as shown in Photo 6.2.

Photo 6.2: Bridge at Km 517, Damaged by Floodwaters

Since the number of structures is 1,471, it would be very difficult to rehabilitate all of them in a short time. A detailed survey was therefore conducted within the Tabora-Kigoma section of the Central Line in order to identify priorities for those structures requiring urgent rehabilitation. The results of this survey are given in Volume 4, which presents the pre-feasibility study of the short-term railway projects identified in this Master Plan.

The former Tanzania Railways Corporation (TRC) had prepared a complete inventory of bridge and structures in 2005, showing the location, year of construction, structure type, length, design load, loading standard, catchment area, opening size, and rating of structure from A to D.

Based on this inventory and on the planned 16-tonne axle load train operation, the survey was planned to classify all structures into the following categories:

a) Grade A: Sound condition. No reinforcement is required.
b) Grade B: Minor reinforcement is required.
c) Grade C: Major reinforcement is required.
d) Grade D: Re-construction is required.

Reinforcement and reconstruction works will initially be carried out for the structures classified as Grade C or D in accordance with abovementioned classification.

Table 6.15: Number of Structures and Design Axle Load – Central Line

km	Design Axle Load (ton)												Total
	9	10	11	12	13.5	14	15	15.5	16	18	19	25	
0.00 – 21.01	0	12	0	14	0	0	18	0	0	0	0	0	44
21.06 – 32.55	0	17	0	4	0	0	13	0	0	0	1	4	39
32.96 – 47.24	0	11	0	9	0	0	15	0	0	0	0	0	35
47.62 – 73.22	0	5	0	14	0	0	24	0	0	0	0	0	43
73.52 – 84.28	0	3	0	9	0	0	30	0	0	0	0	0	42
84.29 – 119.94	0	1	0	4	0	0	48	0	1	0	0	0	54
120.26 – 156.46	0	14	0	3	0	0	23	0	0	0	0	1	41
156.82 – 183.11	0	20	2	5	0	1	6	0	0	1	0	5	40
183.51 – 250.44	0	18	0	10	0	2	7	0	0	0	0	4	41
252.04 – 279.51	0	24	0	4	1	0	6	0	0	0	0	1	36
280.26 – 295.04	0	12	0	11	0	0	11	0	0	0	0	14	48
295.30 – 314.52	0	23	0	6	1	0	0	0	0	0	0	8	38
314.95 – 329.83	0	11	0	22	0	0	1	0	0	0	0	0	34
330.07 – 338.48	0	1	0	27	0	0	0	0	0	0	0	9	37
338.77 – 352.95	0	16	0	15	0	0	0	0	0	0	0	5	36
353.49 – 364.38	0	17	0	7	0	0	1	0	0	0	0	13	38
364.60 – 399.36	0	26	0	4	0	0	0	0	0	0	0	5	35
399.79 – 422.41	0	28	0	3	0	0	3	0	0	0	0	0	34
423.13 – 439.20	0	28	0	0	0	0	4	0	0	0	0	0	32
440.08 – 454.36	0	26	0	1	2	0	2	0	0	0	0	3	34
454.36 – 479.77	0	32	0	0	0	0	1	0	0	0	0	0	33
479.92 – 503.68	2	24	0	6	1	0	1	1	0	0	0	2	37
504.59 – 536.70	0	22	0	7	0	0	0	0	0	0	0	6	35
537.13 – 566.30	0	25	0	1	0	0	2	0	0	0	0	4	32
567.15 – 577.09	0	30	0	2	0	0	0	0	0	0	0	0	32
577.53 – 639.47	0	23	0	4	0	0	9	0	0	0	0	4	40
640.35 – 689.22	0	27	0	0	0	0	5	0	0	0	0	2	34
690.56 – 745.70	0	26	0	2	1	0	0	0	0	0	0	6	35
746.21 – 777.88	0	30	0	1	0	0	1	0	0	0	0	0	32
779.13 – 814.98	0	26	0	6	0	0	0	0	0	0	0	4	36
815.53 – 851.34	0	29	0	0	0	0	0	0	0	0	0	2	31
852.37 – 876.62	0	31	0	0	0	0	0	0	0	0	0	0	31
877.12 – 922.76	0	27	0	1	0	0	1	0	0	0	0	6	35
924.50 – 966.92	0	29	0	1	0	0	0	0	0	0	0	1	31
968.22 – 1019.98	0	31	0	0	0	0	0	0	0	0	0	0	31
1022.08 – 1085.63	0	23	2	1	0	0	1	0	0	0	0	12	39
1085.66 – 1128.81	0	27	3	3	0	0	0	0	0	0	0	2	35
1129.58 – 1152.89	0	30	0	0	0	0	1	0	0	0	0	1	32
1153.38 – 1214.88	0	30	0	0	0	0	0	0	0	0	0	2	32
1215,06 – 1237.73	0	27	0	0	0	0	0	0	0	0	0	6	33
1238.27 – 1250.74	0	9	0	4	0	0	0	0	0	0	0	1	14
Total	2	871	7	211	6	3	234	1	1	1	1	133	1471
(%)	0.14%	59.21%	0.48%	14.34%	0.41%	0.20%	15.91%	0.07%	0.07%	0.07%	0.07%	9.04%	100.00%

(5) Reform and Improvement of Track Maintenance Practices and Standards (including Rehabilitation of Track Maintenance Equipment)

When RITES came to Tanzania as the concessionaire for railway operation, they reorganized track maintenance gangs from stationed groups to the mobile gang system in order to decrease the number of workers.

Before RITES, TRC allocated a track maintenance gang for every 8 km, and each group, with 8 staff members, maintained an 8 km section. TRC provided houses for their family members and supplied consumables.

RITES abandoned this system and adopted the Mobile Maintenance Gang (MMG) system. Each group consisted of 15 members with a motor trolley, and maintained a section of about 100 km.

The MMG system did not work well because of the increased workload on staff and insufficient equipment. Among the 23 heavy duty motor trolleys, 6 units were defective, and among the 14 inspection trolleys, 5 units were defective.

After RITES left, TRL resumed stationed maintenance activities in areas where MMG was clearly not functioning. However, it was difficult to reassemble staff discharged by RITES. Consequentially, the track condition has continued to deteriorate.

Furthermore, none of the track maintenance machines, i.e., 4 units of ballast tamping machines and 4 units of ballast regulators, are presently usable.

(6) Skills Improvement and Training

As mentioned, many experienced track maintenance staff members were discharged by RITES, and it is difficult to reassemble those staff. Therefore, it is urgently required to reorganize track maintenance groups in order to keep track in good condition for higher speed train operation. Recruitment and training of new track maintenance staff is also required.

Since many of the houses provided for stationed maintenance gangs were abandoned, it is difficult to return to the same system that operated before RITES. It is therefore required to set up a new track maintenance system utilizing ballast tamping machines and ballast regulators that will be rehabilitated.

Training of operating staff for this equipment will be planned and executed.

6.4.2 Medium-Term Strategies

(1) Increase in Siding and Train Lengths on Existing Network

TRL's future financial stability is likely to depend on realization of opportunities for strong productivity growth resulting in a reduction of unit operating costs. Key to this outcome is the scope for improving the productivity of mainline locomotives and train crews, as well as for making optimum use of track capacity, by *increasing train lengths*.

Determination of Optimum Train Length for TRL Network

The first step is to determine the optimum train length for the future, given the constraints of axle load, ruling gradients, and locomotive trailing loads.

The *designed maximum axle load* of the network is the first such constraint that must be considered. Under this Master Plan, it is proposed to complete the re-railing of the entire

network in 80 lbs per yard rail. This will allow axle loads of *up to 18 tonnes*, as compared with the current general axle load limit of 16 tonnes and local limits of 13–14 tonnes on light track (such as that along the Mpanda Line). It has to be noted that there are many bridges throughout the network for which the design axle load is as low as 10 tonnes. However, considering the currently applied margin of safety factors as well as cost consideration, heavier axle loads can be accomodated with such structures, if speed is reasonably controlled.

Current limitations on train lengths are determined by the trailing load capacity of the most powerful locomotives in the fleet. These are the Class 88 and 89 locomotives (of 1,880 and 2,000 HP, respectively), which are the main freight-hauling types in operation on the TRL network. In flat terrain, these types can haul up to 1,200 gross trailing tonnes each, without assistance from banking locomotives. This trailing tonnage is equivalent to 800 tonnes net, or to 20 wagons each with a payload of 40 tonnes. Thus current train lengths are limited to: 20 wagons × 15 m = 300 m + 20 m (locomotive) = 320 m. With the addition of a 5% braking allowance, the total length of passing loops needed to accommodate such train lengths is about 340 metres. Most stations on the Central Line are understood to have at least one passing track with a length of at least 430 metres.

Future motive power requirements must be determined by reference to the trailing load specifications of future trains. Two options for future train lengths were studied: a formation of 40 wagons (nearly double existing train lengths) and a formation of 30 wagons (equal to a length of 470 metres, nearly 50% greater than current train lengths). The first of these, a 40-wagon formation, will have a maximum gross trailing load of 2,400 tonnes, while the second, a 30-wagon formation, will have a maximum gross trailing load of 1,800 tonnes. The following approach, as shown in Table 6.16, was used to determine the locomotive power requirement for the future.

It was assumed that a power to weight ratio of 1:1.3[9] would be realistic for a modern well-maintained locomotive, compared with the ratio (1:1.6) for Class 88 locomotives, which are now more nearly 40 years old and in poor condition. Their trailing loads have been restricted in order to reduce the stress on their power-plant and traction systems.

For the purpose of this analysis, two alternative locomotive power ratings were assumed: 2,500 HP, equivalent to the power of a modern Japanese diesel-electric locomotive designed for the Cape Gauge network of Hokkaido, with an axle load of 16 tonnes, and 3,000 HP, equivalent to the power of other Japanese diesel-electric locomotives in service on the metre gauge network of Thailand, but which have an axle load of 18 tonnes, or more.

[9] A recent Burlington Northern study indicates power to weight ratios of 1:1.3–1:1.4 for modern locomotives hauling intermodal trains in the United States.

Table 6.16: Determination of Optimum Train Length and Locomotive HP Requirement

Class 88 (1880 HP) has trailing load capacity of 1200 tonnes on near level grade:

Factor	HP	Max.trailing tonnes	Power/weight ratio	
HP/tonnage ratio of Class 88:	1,880	1,200	1.6	
For new 2547 HP locomotive:	2,547	1,959	1.3	
For new 3000 HP locomotive:	3,000	2,308	1.3	
If 30 wagon trains assumed, t =		1,800	√	well within haul cap.of 2547 HP loco
If 40 wagon trains assumed, t =		2,400	X	not within haul cap.of either 2547 or 3000 HP loco

Source: JICA Study Team estimates

The analysis shows that neither locomotive type is capable of hauling 40 wagon trains on near level grades, while 30 wagon trains are well within the capacity of a single 2,500 HP locomotive.

On this basis, it was concluded that the ***optimum train configuration for the future would be 30 standard wagons hauled by a single 2,500 HP locomotive***. However, as observed in Section 5.3, if in the future it is desired to increase freight haulage capacity by operating 40 wagon trains, these trains can be hauled by two 2,500 or 3,000 HP locomotives in order to keep within the axle load limit of 18 tonnes that will apply across the system. Inevitably, this will require increased investment in motive power as well as in extension of crossing loops, which would be offset by a resulting reduction in operating costs.

Selection of a Suitable Locomotive for the Future Network

The locomotive assumed as the basis for this analysis is a 1,900 KW (2,547 HP) diesel electric locomotive designed for use in freight haulage on the light Cape Gauge (1,067 mm) network of Hokkaido, Japan. It has a gross weight of 96 tonnes and a B-B-B wheel configuration (see Photo 6.3 and 6.4), giving it a maximum axle loading of only 16 tonnes and the capability of negotiating tight curves.

Photo 6.3: Profile View of Toshiba DF 200 AC Locomotive Showing B-B-B (6 Axle) Wheel Configuration

Photo 6.4: Toshiba DF 200 AC at Head of Freight Train

The specifications for this type of locomotive, designed and manufactured by the Toshiba Company of Japan, are given in Table 6.17 below. *The locomotive is relatively unique in the sense that it combines a light axle load with midrange power.* While higher HP locomotives are available for narrow gauge application, they generally have higher axle loadings (mostly more than 18 tonnes).

Even if it were possible to select locomotives of higher power rating, but within the desired axle load range, it would not be possible to fully utilize their extra power since trains would still require double heading (addition of an extra locomotive) on two steeply graded sections of the Central line. These are: the 39 km section between Morogoro and Mikata (with a gradient of 19‰) and the 64 km section through the Rift Valley between Makutupora and Aghondi (with a gradient of 20‰).

Table 6.17: Specifications of Toshiba DF 200 AC Diesel-Electric Locomotive

Axle arrangement			B-B-B	
Size (length×width×height)			19,600mm × 2,800mm × 4,078mm	
Mass in working order / Axle load			96.0 t / 16.0 t	
Maximum running speed			110 km/h	
Output at wheel rim			1,900 kW	**= 2,547 HP**
Maximum tractive effort			294 kN (30 t)	**= 66,094**
Engine (output/revolution)			1,324 kW / 1,800 rpm	
No. of engines			2	

Source: *Improvement of Diesel Electric Locomotive Traction System*, Nakagawa, T, Morita, E and Numazaki, M, Japan Freight Railway Company, Kawasaki Heavy Industries Ltd, and Toshiba Corporation, Tokyo 2006

Phased Introduction of Longer Trains

In this Master Plan it is envisaged that 30 wagon trains would be introduced starting in 2022 once sufficient numbers of new locomotives have been acquired and crossing loop and siding trackage at stations has been lengthened to the required 500 metres.[10]

[10] This length is calculated as: 30 wagons × 15 m + 20 m (locomotive) = 470 m + 5% (23 m) braking allowance = 493, or approximately 500 m. It should be noted that there is no allowance for a brake van in these calculations. In the future it is expected that all trains will operate without a brake van, and that train guards will be accommodated in the locomotive cab.

The proposed phasing of the introduction of these longer trains is as presented in Table 6.18.

Table 6.18: Phased Introduction of Longer Trains

Train type/formation	2013–2021	2022	2023	2024	2025	2026	2027–2030
All freight trains (except container trains)							
20 wagon formation	100%	70%	70%	50%	50%	50%	50%
30 wagon formation	0%	30%	30%	50%	50%	50%	50%
Container trains							
20 wagon formation	100%	70%	70%	50%	30%	20%	0%
30 wagon formation	0%	30%	30%	50%	70%	80%	100%

Note: Number of trains is shown in Table 6.13.

From about 2023, it is expected that there will be sufficient containers available for rail haulage to allow for the operation of a daily container block train to Kigoma Port and for the operation of a daily container train from Dar es Salaam to Isaka and Mwanza South (initially with loading split between these two destinations). Thus, it is expected that the introduction of longer trains will occur earlier for container services than other freight services, where there will continue to be a requirement for en route train load adjustment (i.e., cutting off and adding of wagons at intermediate stations).

(2) Transportation Nodes: Railway ICD

Kigoma

Kigoma will be one of the major transport nodes for transfer of cargo between the railway and inland waterway transport in the future. From the end of the Medium Term Development Plan (2022), trains consisting of 30 wagons are scheduled to be operated between Dar es Salaam and Kigoma. Since the train length will be 470 m, the track layout within Kigoma Port will be rehabilitated to accommodate longer trains.

Because of the limited space within Kigoma Port, 470 m long trains will be broken into two parts, each of 15 wagons, which will be placed in short tracks inside the port, using the train locomotive. In order to allow the locomotive to turn around for the breaking operation, the triangular track (shown in the Figure 6.6) and the associated turnouts will be rehabilitated.

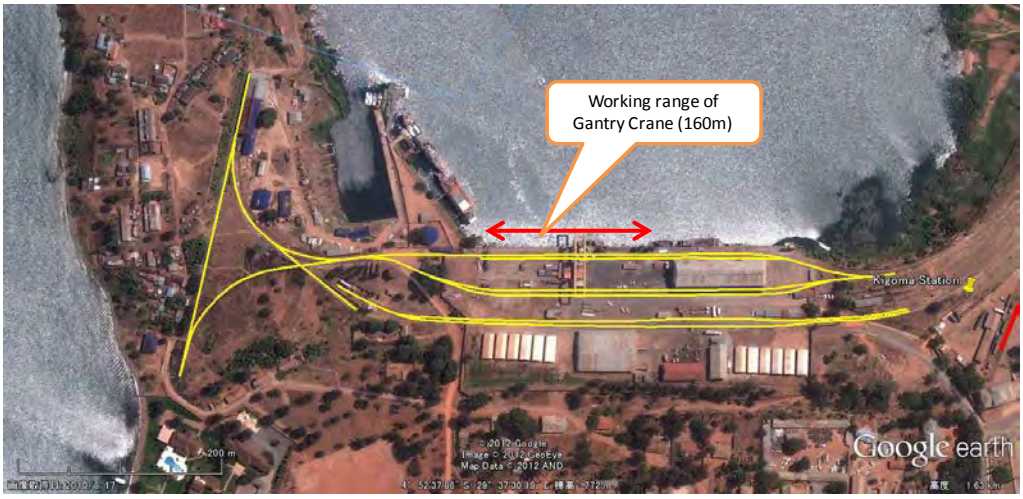


Figure 6.6: Track Layout within Kigoma Port

Isaka

At the same time as Kigoma, longer train operations will be commenced to/from Isaka, from the end of the Medium Term Development Plan. Because the existing track layout within Isaka ICD (Figure 6.7) is designed for 10–11 wagon trains, the track within the ICD must be extended to accommodate trains of 30 wagons.

If land acquisition is not difficult, it is recommended to extend the area towards the north in order to avoid the breaking and combining operation of trains. It is also recommended to form loops in the extended siding tracks for easier train operation.

Figure 6.7: Existing Track Layout at Isaka ICD

Mwanza South

There are many siding tracks within Mwanza South Port (Figure 6.8). However, the track lengths are not sufficient for a 30-wagon block train, and track layouts are not adequate for container handling. It is therefore recommended to modify the track layout inside the port for easier container handling, loading, and unloading between train and ship.

Figure 6.8: Existing Track Layout within Mwanza Port

(3) Completion of Track Renewal and Realignment (Sections Other than the Central Line)

After completion of track upgrading on the Central Line and a part of Mwanza Line, the remaining sections will be upgraded to allow heavier locomotive operation.

It is recommended to salvage 60 lb/yard rail from the Central Line and replace the lighter rail, such as, 45 lb/yard, 50 lb/yard, 55 lb/yard, and 56.12 lb/yard, used on branch lines. Table 6.19 presents the distribution of route-km by weight of rail.

Table 6.19: Distribution of Route-km by Weight of Rail

Line	Weight of Rail in lbs per Yard						Totak km
	45	50	55	56.12	60	80	
Central				555	283	416	1254
Mwanza					378		378
Mikumi		84		24			108
Mpanda	112.9	71		59			242.9
Link Line			43	9	101	35	188
Tanga-Moshi	86				352		438
Moshi-Arusha							0
Singida		22		93			115
Total	198.9	177	43	740	1114	451	2723.9
% of Total route-km	7.3%	6.5%	1.6%	27.2%	40.9%	16.6%	100.0%

(4) Completion of Bridge and Structure Rehabilitation (Sections Other than Central Line)

This will involve a continuation of the rehabilitation of bridges and structures following Phase 1 construction.

(5) Improvement of Signalling and Telecommunications System (Installation of GPS)

There is almost no signalling left on the TRL network. Previously, there was an old system of semaphore signals at all stations, but the components of this system, including pulleys, masts, and wires were stolen. Today, there is no signalling system to assist station masters (SMs) in controlling trains. A system of written train orders, backed up by telephone communication between SMs at different stations, is the only form of safe working in use currently. On the TRL network, points are controlled by SMs.

From Dar es Salaam to Dodoma, there is no communication with trains, but between Dodoma and Tabora, SMs can communicate with trains via high frequency radio (see Photos 6.5 and 6.6).

The Signals and Telecommunications Engineer would want to install a GPS-controlled block system of the type currently operating in Zimbabwe. This system is cheap, effective, and not subject to pilferage.

Photo 6.5: Solar Cell for High Frequency Radio and Abandoned Pulley

Photo 6.6: Old Tablet Machine

(6) Procurement of New Locomotives (16–18 Tonne Axle Load), to Sustain Traffic Growth

Based on the preliminary rail transport forecast (see Section 6.2) and on the assumption of faster turnarounds as described in the foregoing sections, a requirement for 9 new locomotives was estimated in the Medium Term. Three of these locomotives would be required to support traffic growth, while 6 would be required to replace life-expired units, which would by then be beyond economic overhaul. It is suggested that the locomotives to be purchased should be of a type similar to the Toshiba DF 200 AC, the specifications of which were given above. A preliminary estimate of the unit purchase cost of these locomotives is USD 3 million, inclusive of all government taxes and charges. Thus, the overall investment in new locomotive purchases during the Medium Term would be USD 24 million.

(7) Procurement of New Design Freight Rolling Stock

Given that the network is likely to be designed with an axle load of no more than 18 tonnes before 2030, there would be little scope to purchase wagons with a higher axle loading than the present maximum axle loading of 15 tonnes. However, it would *be desirable if wagons with a more efficient gross to net ratio were acquired for future operation*, in order to achieve fuel efficiency and to reduce unit operating costs. In this context, it was noted that there are several types of container wagon in operation on the TRL network, some of them supplied by the private logistics operator East African Rail Hauliers. In particular, two types of container wagons were noted during the field trip of the railway study team to Kigoma, with significantly different payload and tare weights, as shown in Table 6.20.

Table 6.20: Different Payload and Tare Weights of Container-Wagon in Operation on the TRL Network

	Max. payload (tonnes)	Tare (tonnes)	Gross/net ratio
Container wagon (1)	42.0	14.8	1: 1.352
Container wagon (2)	45.2	13.2	1: 1.292

Other types of wagons (e.g., boxcars) have higher gross/net (G/N) ratios, of the order 1: 1.4–1.5. However, in both of the above-mentioned cases, G/N ratios are substantially lower than the overall average assumed for the network in the TRL Business Plan (1: 1.500).

In the Medium Term, it is expected that 330 existing wagons will be rehabilitated for continuing operation, at a unit cost of USD 27,200, giving a total investment cost of nearly USD 9 million.

(8) New Line Construction to Bagamoyo New Port

There is a plan to construct a new port at Bagamoyo, about 70 km north of Dar es Salaam. Although there is a road to Bagamoyo, a railway connection is essential to handle cargo to/from the new port.

When considering the railway connection, two alternative routes can be considered:

- Connection to the Link Line; and
- Direct connection to Dar es Salaam.

The existing Link Line is located 27 km west of the new Bagamoyo Port (Figure 6.9). If the track alignment goes in parallel with the existing road to Msata, the land is generally flat and there is no obstacle except for the Ruvu River and its flood plain. The width of the river is about 50 m while the width of its flood plain is about 5 km.

If a direct connection is required, the line will go to the west of Bagamoyo Road (Figure 6.10). The route length will be 52.6 km, traversing rolling terrain. The average ground elevation in the hilly area is 150 m and the highest point is 189 m. In order to minimize land acquisition/appropriation, the branching point will be 13.8 km from Dar es Salaam station.

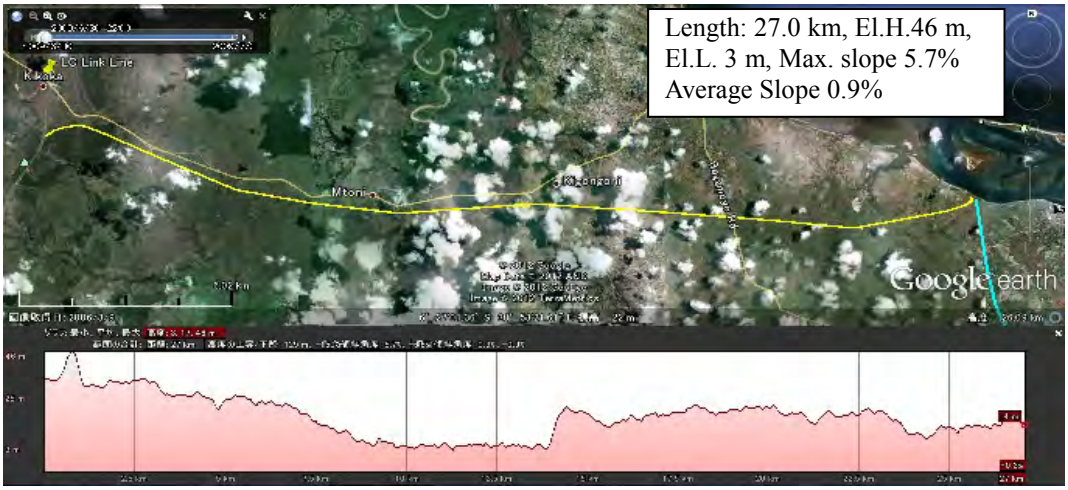


Figure 6.9: Bagamoyo Port Rail Link Connecting to the Link Line

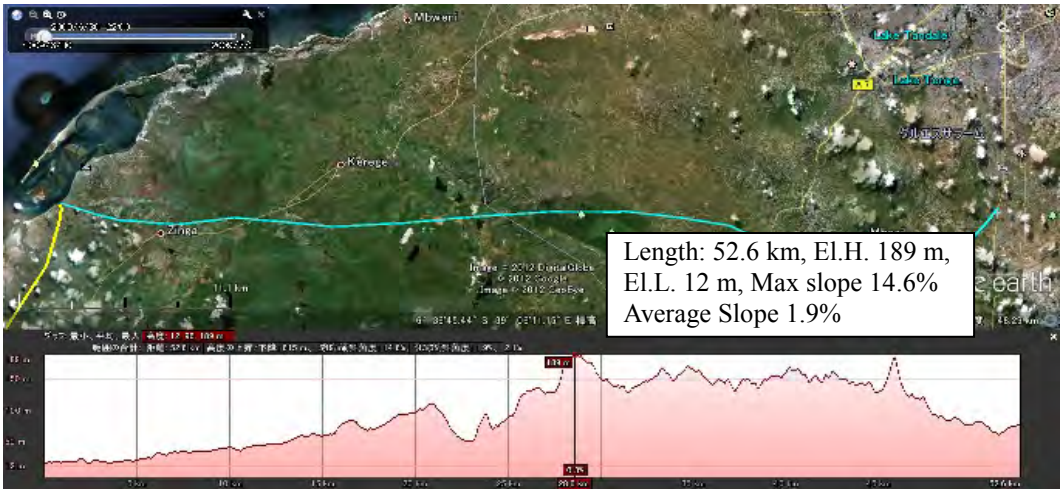


Figure 6.10: Bagamoyo Port Rail Link (Direct Connection to Dar es Salaam)

6.4.3 Long-Term Strategies

(1) Procurement of New Locomotives (16–18 Tonne Axle Load)

Based on the preliminary rail transport forecast (Section 6.2) and on assumptions concerning faster locomotive turnarounds, purchases of new locomotives to support traffic growth were estimated. It is suggested that these locomotives should be of a similar type to the Toshiba DF 200 AC described in subsection 6.4.2 (i) above. In the long term, it is estimated that 21 new locomotives will need to be acquired for a total investment cost of USD 63 million.

(2) Procurement of New Design Freight Rolling Stock

In the long term, a need to acquire 431 new wagons of various types was estimated. Acquisition of these wagons at a unit cost estimated at USD 75,000, giving a total investment cost of USD 32.33 million, would result in an active fleet by 2030 of 1,399 wagons. This fleet would be required to sustain traffic growth beyond 2030. The same remarks apply to the acquisition of more efficient wagons, as were made in the case of wagon acquisition during the medium term.

(3) New Line Construction to Rwanda and Burundi

Required Timing and Capacity

Although it has been decided to construct standard gauge track in Tanzania, the timing is unclear because the rehabilitated metre gauge track will have sufficient capacity for a few decades. If the railway connection to Rwanda and Burundi is an urgent issue, there will be an option to construct metre gauge lines to those countries.

Upgraded Track and Standard Gauge Track

In order to avoid confusion, definitions are given for the terms “upgraded track” and “standard gauge track” as follows:

- Upgraded track: Metre gauge track using 80 (or heavier) lb/yard rail with properly allocated steel or pre-stressed concrete sleepers to allow an 18 tonne axle load. Bridges and culverts will be constructed to the same loading condition. Existing railway facilities, equipment, depots and workshops can be used.
- Standard gauge track: 1,435 mm gauge track using 100 (or heavier) lb/yard rail with steel or pre-stressed concrete sleepers to allow a 25 ton axle load. Due to the difference of the gauge, all the existing railway facilities, equipment, depots and workshops cannot be used.

Alternatives to Be Considered

- Base case 1: Construction of connections to Rwanda and Burundi in upgraded metre gauge, plus conversion of the existing metre gauge line from Dar es Salaam to Isaka to upgraded standards. This would avoid need for cargo transfer at Isaka.
- Base case 2: As per Base case 1, except that the track bed and sleepers (for the entire route) would be designed for later conversion to standard gauge. This would avoid need for cargo transfer Isaka, but at higher cost than for Base 1 case.
- Standard gauge 1: Construction of connection to Rwanda and Burundi in standard gauge, with break-of-gauge at Isaka. Continuing need for cargo transfer at Isaka, but instead of rail to road, there would be transfer between rail gauges, with a probable need to invest in new transfer equipment.
- Standard gauge 2: Construction of standard gauge all the way from Dar es Salaam to Rwanda and Burundi. This would likely have to be built on separate formation – at

considerably greater cost but would avoid need for cargo transfer at Isaka, but at substantially higher cost than for Base case 1.

Conclusions to Be Drawn

- There is no big difference in the construction costs for track structures between upgraded metre gauge and standard gauge from Isaka to Rwanda and Burundi. Due to the wider embankment/cut, heavier rail and longer sleepers, the construction cost of standard gauge track will be 10% to 15% higher than that for new metre gauge. However, there are many differences in other facilities. In case of an upgraded track, trains from Dar es Salaam through Tabora can go to Rwanda and Burundi directly. On the other hand, when the new section is constructed in standard gauge, all the freight must be transferred to standard gauge trains at Isaka. In this case, a specialized rail-rail transfer facility must be constructed. In addition, because the existing workshop cannot be utilized for standard gauge trains, new workshop facilities for standard gauge locomotives and wagons must be built along the new line. Track maintenance equipment and facilities for standard gauge will also be required.
- Construction of standard gauge track from Dar es Salaam to Rwanda and Burundi will require a huge amount of investment because the existing railway facilities cannot be upgraded for standard gauge trains. There are 1,471 bridges and culverts on the Central Line between Dar es Salaam and Kigoma. More than 92% of those bridges and culverts were constructed to design axle loads of 10, 12, or 15 tonnes. It will take a long time to remove those old structures and construct new structures for standard gauge trains. If train operation cannot be suspended, there is no other way to construct a new track for the standard gauge trains.
- It will be very difficult to use existing workshops for maintenance of standard gauge locomotives and wagons because almost all of the equipment and machinery is designed for metre gauge and tracks installed inside the workshops are embedded in concrete slab. When the standard gauge line is constructed, new workshops and depots must be constructed at the same time.

Topographic Conditions to Rwanda and Burundi

Figures 6.11 to 6.13 indicate the horizontal and vertical alignment between Isaka and Kigali, and of the branch line between Keza and Musongati. Mountainous topography poses a major challenge for construction of the proposed new railway links *since it is likely that there would be a requirement to construct numerous bridges and tunnels along the alignments to keep the ruling gradient within 1% and to avoid sharp curves.*

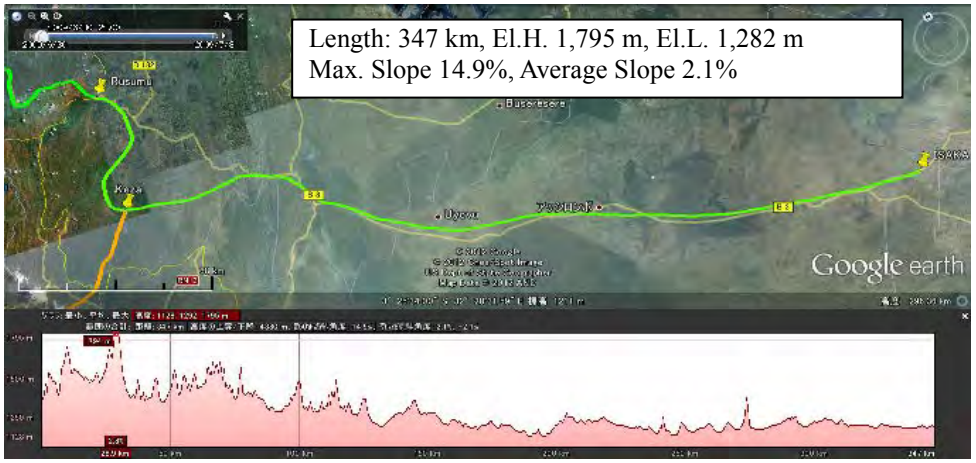


Figure 6.11: Plan and Profile of Isaka–Rusumu Section

Figure 6.12: Plan and Profile of Kigali–Rusumu Section

Figure 6.13: Plan and Profile of Keza–Musongati Section

The horizontal alignments shown in the previous figures were taken from the document Phase II Dar es Salaam–Isaka–Kigali/Keza–Musongati Railway Project Study (African Development Fund: September 2009).

6.5 Development Strategies for TAZARA

TAZARA's short-term business plan involves a doubling of freight tonnage and ton-km and a tripling of passengers and passenger-km between 2011 and 2014.[11] While rolling stock acquisition plans are essentially fully funded from own resources and the 14th Protocol with China, planned line improvement shows a funding gap of more than USD 67 million, as well as a gap of nearly USD 48 million for signalling and telecommunications. Given the nominal line capacity of at least 5 million tonnes, the short-term traffic targets are not unrealistic.

6.5.1 Short-Term Investment Strategy

The following suggestions were offered by the Deputy Managing Director of TAZARA during an interview with the JICA Study Team:

(i) Provision of fibre-optic system for data and voice communications to avoid interference from high voltage cables; and

(ii) Short-term management training for non-railway background managers in following fields:

- Planning and Corporate Affairs
- Traffic
- Human Resources
- Finance
- Marketing
- Auditing

According to the Deputy Managing Director, training of senior staff, which is not included in the Chinese support, is strongly required to improve TAZARA's operations.

6.5.2 Medium-Term Strategy (No Proposals)

6.5.3 Long Term Strategy (No Concrete Proposal)

The most likely long-term development (possibly beyond 2030) would be to extend the TAZARA network to connect with agricultural zones between Mbeya and Lake Tanganyika. This would require a decision of the two owners to shift TAZARA from its historical and current emphasis on transit traffic to an expanded role in the movement of traffic within Tanzania.

6.6 Benchmarking of TRL and TAZARA

Figure 6.14, taken from the review of the Zambian rail concession referred to earlier[12] shows traffic levels on five ongoing African rail concessions (CAMRAIL in Cameroon, MADARAIL in Madagascar, SITARAIL connecting Abidjan with Ouagadougou, TRANSRAIL connecting Dakar with Bamako, and RSZ in Zambia). All have operated in recent years within the range of 400,000 to about 1 million tonnes per year. This is broadly in line with current TAZARA traffic, and double recent handling by TRL.

Figure 6.15, from the same source, shows average revenue per tonne-km and most operate in a narrow band of USD 0.04 to 0.06 per tonne-km. This is below the current cost of TRL as estimated above (see subsection 6.3.3), but well above the projected cost at future annual

[11] As described in the *Rail Sub-sector Review Paper*, prepared in September 2011 for the 5th Joint Infrastructure Sector Review in October 2011.
[12] CPCS, *Zambia Railway concession Review Study*, prepared for the World Bank in June 2010

throughput of 3 million tonnes or more. TRL's average revenue of USD 85 per tonne, or USD 0.053 per tonne-km, is, thus, in line with the concessional railways of sub-Saharan Africa. TAZARA's average revenue is about USD 70 per tonne. Based on an average haul of 1,500 km (most traffic moves between Dar es Salaam and the interchange point with RSZ at Kpiri Mposhi in Zambia), the average TAZARA freight tariff is about USD 0.047 per tonne-km, also in line with those of other railways of sub-Saharan Africa.

Figure 6.16 shows the average line haul for the same five railways. These range from 400–1,000 km, compared with about 980 km currently for TRL and 1,500 km for TAZARA. Again, TRL has an average haul (forecast to increase to at least 1,025 km in future) in line with other African railways, while the haul on TAZARA is somewhat higher (but likely to fall in future, as domestic traffic on the existing network grows).

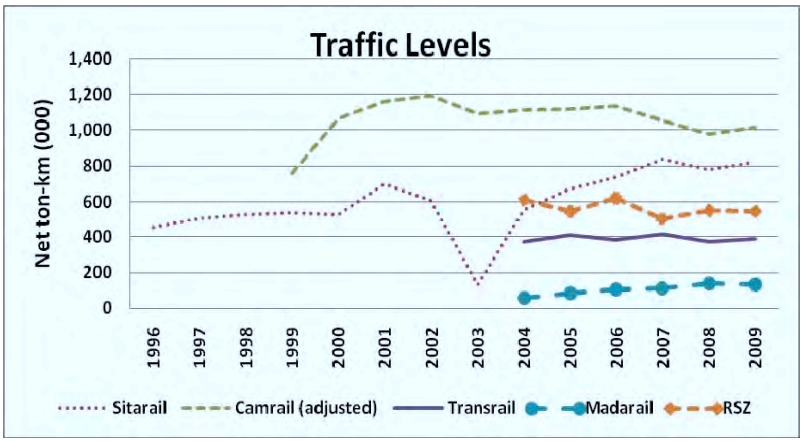


Figure 6.14: Comparative Traffic Volumes, Five Railways of Sub-Saharan Africa

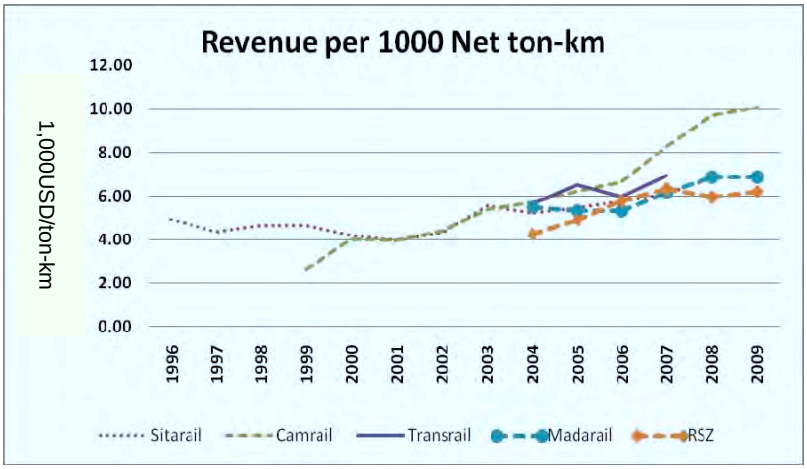


Figure 6.15: Comparative Average Revenue per Tonne-km, Five Railways of Sub-Saharan Africa

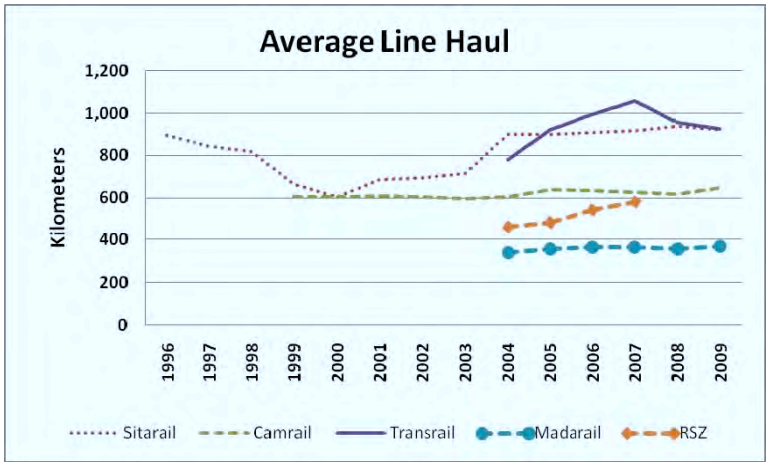


Figure 6.16: Comparative Length of Haul (km), Five Railways of Sub-Saharan Africa

Chapter 7 Development Strategy for Other Modes and Facilities

7.1 Airports/Air Transport

The development of the master plan for airport/air transport sector must consider all traffic activity including not only air cargo but also passenger movement. This study carefully reviewed the plan for both cargo and passenger development from the previous chapter based on basic airport facilities such as where aircraft takes off and lands, where cargo is loaded and unloaded, and where passengers safely embark and disembark of airplanes safely. However, this master planning study concentrated on air cargo handling facility and equipment as well as human capacity development.

7.1.1 Development Strategy: Overview

Improvement of airports/air transport facilities in Tanzania is urgently required due to the poor current condition of facilities and equipment, and the lack of cargo handling activity at major airports.

As mentioned in the Strategy for Freight Transport Development in the previous chapter, the air transport sector recognizes the importance these strategies, including particularly (i) strengthening international corridors, (ii) developing infrastructure for an optimal modal split, and (iii) alleviation of bottlenecks in the Dar es Salaam area. Since major airports are located at the nodes of international corridors, including in the Dar es Salaam area, their role in modal sharing is also important.

The JICA study team forecast air cargo transport as described in Chapter 1. The demand forecast in the case of high growth rate (8%) is shown in Table 7.1.[1] The assumed completion of the development project for Mwanza Airport, the preparation stage of which has already been commenced by the Arab Bank for Economic Development in Africa (BADEA) and the OPEC [Organization of the Petroleum Exporting Countries] Fund for International Development (OFID) with the Government of Tanzania (GOT), is 2017.

Table 7.1: Demand Forecast for Air Cargo Transport

Airport	Trade Type	2010 (actual)	2015	2020	2025	2030
JNIA	Import	13,114,390	17,632,263	23,708,158	31,877,744	42,862,484
	Export	1,984,446	2,775,788	3,882,694	5,431,004	7,596,737
	Total	***15,098,836***	***20,408,050***	***27,590,852***	***37,308,748***	***50,459,221***
KIA	Import	1,412,578	1,899,338	2,553,830	3,433,853	4,617,123
	Export	2,728,149	3,806,435	5,324,335	7,447,531	10,417,399
	Total	***4,140,727***	***5,705,773***	***7,878,165***	***10,881,384***	***15,034,522***
Mwanza Airport	Import	2,121,840	3,794,217	10,542,109	14,174,811	19,059,304
	Export	355,086	496,684	1,435,632	2,008,122	2,808,904
	Total	***2,476,926***	***4,290,901***	***11,977,741***	***16,182,933***	***21,868,209***

Abbreviations: JNIA = Julius Nyerere International Airport, KIA = Kilimanjaro International Airport
Source: JICA Study Team based on Tanzania Airports Authority (TAA) data

[1] It is noted that this master planning study is focused on freight transport. That said, it is recognized that passenger transport is of greater importance in the aviation sector.

(1) Ministry of Transport

The Tanzania Five Year Development Plan (FYDP 2011/12–2015/16) mentioned Tanzania's expanding air cargo from 22,461 tonnes to 35,500 tonnes and passenger freight handling capacity from 2.95 million to 3.43 million people as a "key output target for 2015". The increasing volume of cargo tonnage is consistent with the government's target GDP established in 2011/12. The summarised goal, strategic intervention, and key output of the Ministry of Transport (MOT) to be reached by 2015 are shown in Table 7.2.

Table 7.2: Goal, Strategic Intervention and Key Output/Target for 2015

Goal	Strategic Intervention	Key Output/ Target for 2015
Promote a high quality, competitive and integrated national, regional, and international air transport network in order to enjoy the benefit of economies of scale.	Expand Tanzania's air cargo and passenger freight handling capacities in view of strategically making the country the regional and international trade gateway.	- Expanding Tanzania's air cargo from 22,461 tonnes to 35,500 tonnes. - Increasing annual passenger freight handling capacities from 2.95 million to 3.43 million. - Reviving the national flag carrier.

Source: MOT

(2) TAA Plan

The Tanzania Airports Authority (TAA) prepared a plan to be implemented in the period from 2011/12 to 2029/30 to tackle the government target as shown in Table 7.3.

Some of the projects have already been implemented and/or at the preparation stage, supported with funds from development partners and government budget, as described in the progress report for this study. Priority projects are basic airport facilities such as runway, taxiway and apron. Traditionally, cargo facility development is not the first priority.

Table 7.3: Matrix of Planned TAA Projects (2011/12 to 2029/30)

PROJECT/ ACTIVTY	SPECIFIC PLANNED PROJECTS		
	Short-Term 2011-2013	Mid-Term 2014-2018	Long-Term 2019-2030
Construction of new terminal building (Terminal III) at JNIA	**For Both Passenger and Cargo Terminals** • Request/Application of funding from donor/ Government/Loan/Grant and Budget approvals • Procurement of consultants and contractor • Feasibility study and Detailed engineering design of taxiway, aprons, access road, connector road, car parking, passenger terminal building and cargo terminal building	**Passenger Terminals Development:** • Construction of taxiways, apron, access road, connector roads, car parking and terminal building **Cargo Terminals Development:** • Construction of a new Cargo terminal building storage, quarantine area etc. • Cargo Building approx 5,400sqm • Construct/extend apron to allow B-747 with space for equipment storage Taxiway, car parking, access road etc	• RWY extension • Rapid exist taxiways • Parallel runway **Cargo Terminals development:** • Further expansion of the Building and Pavement depending on the traffic increase
Rehabilitation and upgrading of KIA	• Feasibility study and design for Apron, taxiways, renovation of terminal building and environmental works • Consultancy and works procurement • Construction of Apron, taxiways and renovation of terminal building Environmental works	• Construction of Apron, taxiways and renovation of terminal building • Environmental works **Cargo Terminals Development:** • Rehabilitation and improvement of existing facilities, which are still performing well	**Cargo Terminals Development:** • Further expansion of the Building and pavement depending on the traffic increase
Rehabilitation and upgrading of Mwanza Airport	• Extension of Runway • Construction of new Terminal Building, **Cargo Terminal**, Apron, car parking Areas, Passenger Apron Road network, water supply and drainage		**Cargo Terminals Development:** • Further expansion of the Building and pavement depending on the traffic increase

Rehabilitation and upgrading of Mtwara Airport	• Soliciting for funds for Feasibility study and Detailed Engineering Design • Procurement of consultancy for feasibility study and detailed Engineering	• Execution of feasibility study and Detailed Engineering Design • Soliciting funding for works (GOV+DPs) • Implementation of works for upgrading of the airport to CODE 4C(runway, apron, taxiways, terminal building) **Cargo Terminals Development:** • Study needed to establish requirement for development of cargo facilities as per the current demand	**Cargo Terminals Development:** • Further expansion of the Building and pavements depending on the traffic increase
Rehabilitation and Upgrading of Arusha	• Rehabilitation of runway (completion of 420m section) to asphalt • Construction of new apron and linking taxiways, access road, car parking, peripheral roads, etc	• Construction of new Terminal building complete with all associated infrastructure and facilities • Construction of new VIP Terminal complete with all association infrastructure and facilities • Construction of Power Station complete with all associated infrastructure and facilities • Installation of NavAids and MET facilities **Cargo Terminals Development** • Study needed to establish requirement for development of cargo facilities as per the current demand	• Construction of parallel full taxiway **Cargo Terminals Development** • Further expansion of the Buildings and pavements depending on the traffic increase

Rehabilitation and upgrading of Kigoma Airport	• Rehabilitation and upgrading of runway to bitumen standard • Rehabilitation and upgrading of apron to bitumen standard • Construction of a new terminal building and car parking	• Construction of a new terminal building and car parking continues • Supply and installation of AGL system • Extension of runway to 3500m for B-737 • Supply and instillation of NavAids facilities • Construction of VIP building • Construction of a new control tower and MET observatory building Fuel farm **Cargo Terminal Development:** • Study needed to establish requirement for development of cargo facilities as per the current demand	**Cargo Terminals Development:** • Further expansion of the Building and pavement depending on the traffic increase
Rehabilitation and upgrading of Mpanda Airport	• Completion of the peripheral roads and perimeter fence • Construction of water storage tanks for fire fighting and rescue • Acquired land for airport development and shifting of the railway line partially • Compensation • Railways line diversion	• Design of Terminal building, Fire station and the control tower • Construction of Terminal building • Construction of fire station • Construction of control tower **Cargo Terminal Development:** • Study needed to establish requirement for development of cargo facilities as per the current demand	**Cargo Terminals Development:** • Further expansion of the Building and pavement depending on the traffic increase
Complete construction of Songwe Airport	• Completion of the construction of pavements works on runways, taxiway, apron, access road, connector roads and car parking • Completion of control tower, fire station and old and new termination buildings • Construction of inner fence • Construction of peripheral roads • Construction of RESA • Installation of equipment for Meteorological and Navigation control	**Cargo Terminals Development:** • Study needed to establish requirements for development of cargo facilities as per the current demand	**Cargo Terminals Development:** • Further expansion of the Buildings and Pavement depending on the traffic increase

Source: TAA

However, Mwanza Airport is a short-term project while Julius Nyerere International Airport (JNIA) and Kilimanjaro International Airport (KIA) are mid-term projects specifically formulated as cargo facilities under the TAA plan.

From the viewpoint of air cargo activities, priority airports, i.e., JNIA, KIA, and Mwanza, should be selected in accordance with international cargo operations. The second priority airports are those in the northern and eastern parts of the country such as Arusha, Kigoma, Songwe, and Mtwara, while the third priorities should be strategic airports for future development as part of a long-term plan.

7.1.2 Relevant Issues

(1) Air Cargo Situation

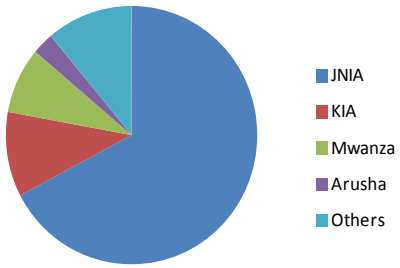
The development strategy for the master plan is to expand the capacity and enhance the service level of cargo facility/equipment.

JNIA is positioned to serve the development of Tanzania's economy and earn foreign currency income. JNIA handles about 70% of the total air cargo of Tanzania (about 20,000 tonnes in 2010 as shown in Table 7.4 and Figure 7.1).

Table 7.4: Cargo at Major Airports in 2010

	JNIA		KIA		Mwanza		Arusha		Other	
International	17,841	75%	3,098	13%	8	0%	0	0%	2,800	12%
Domestic	983	31%	0	0%	638	20%	812	26%	743	23%
Other	852	32%	0	0%	1,768	67%	1	0%	4	0%
Total	19,676	67%	3,098	10%	2,414	8%	813	3%	3,547	12%

Abbreviations: JNIA = Julius Nyerere International Airport, KIA = Kilimanjaro International Airport
Source: TAA



Source: TAA

Figure 7.1: Air Cargo Tonnage in 2010

(2) JNIA

The existing cargo terminal is located between passenger terminals 1 and 2. Photo 7.1 provides an overview from the control tower. The cargo terminal has an exclusive taxiway and apron. The apron is so small that a wide body aircraft cannot park in front of the apron. Therefore, wide body cargo aircraft usually park on the passenger terminal 2 apron.

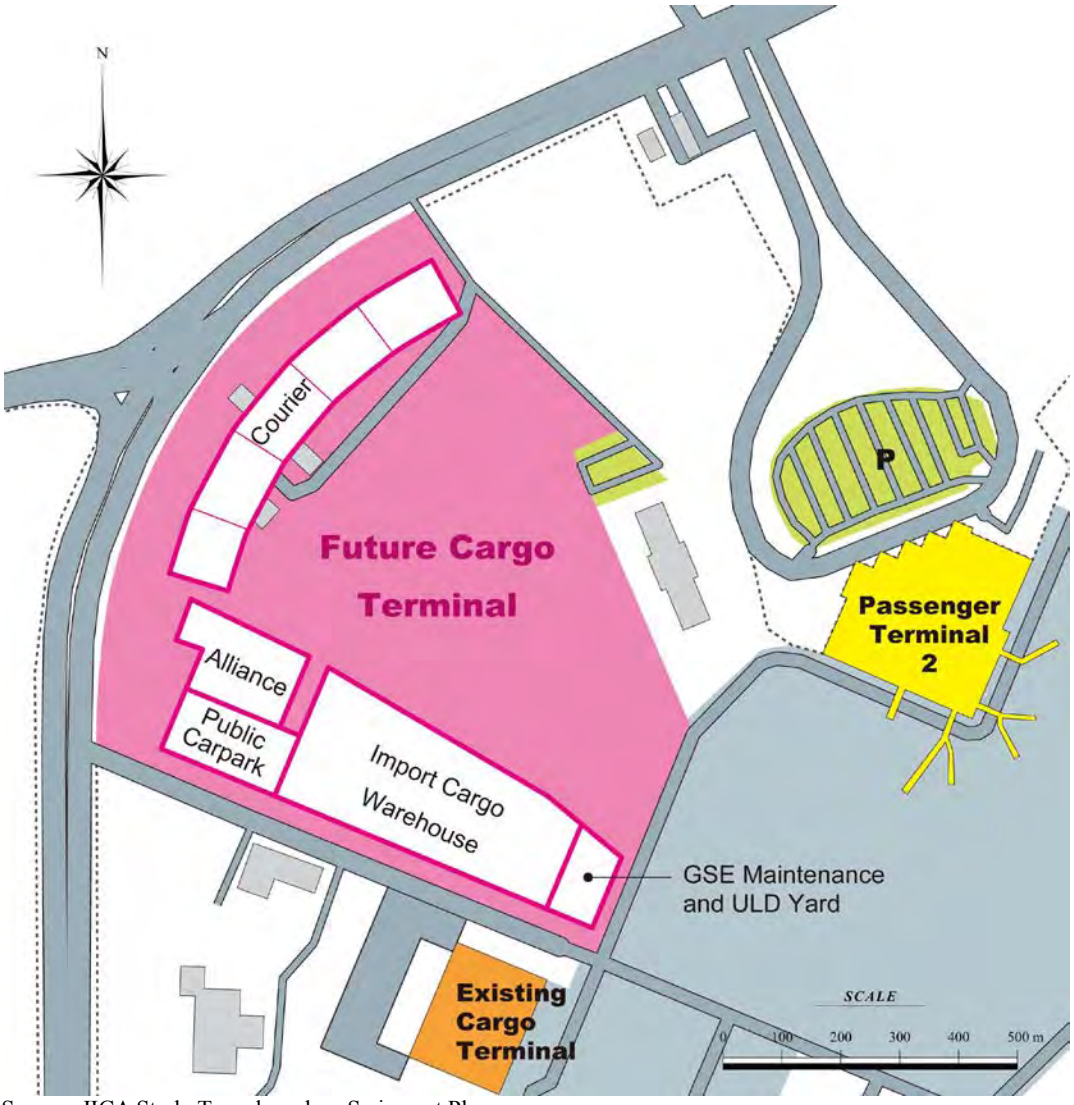
Source: JICA Study Team

Photo 7.1: Cargo Terminal (Left) and Passenger Terminal (Right)

The existing cargo terminal building area is about 70,000 m^2. This area is not extremely small when assessed with the empirical index in the Airport Development Reference Manual of the International Air Transport Association (IATA). However, based on interviews and investigations by the JICA Study Team at the JNIA cargo area, large volumes of cargo items especially imported goods are scattered in untidy spaces and the operation space of the forklifts was limited due to the long preparation time of clearing. Based on an evaluation of cargo activity in 2010, freighters with more than 50-tonne capacity such as the Boeing 777 and Airbus 340 arrive 17 times per day. Therefore, when a freighter comes, the limited space available is a problem.

Over the past few years, Swissport International Ltd. renovated the cargo terminal building, breaking the inside partition wall and installing a rack for cargo storage. Also, Swissport has proposed to TAA a plan for the construction of a new cargo terminal building in addition to the existing cargo terminal developed under a build-operate-transfer (BOT) scheme as shown in Figure 7.2. This plan includes about a total area of about 15,000 m^2, with warehouse space, handling space, offices, and other related facilities.

Also, Swissport is constructing the expansion of the cold room because the existing cold room is too small at only 188 m^2 (see Photo 7.2).



Source: JICA Study Team based on Swissport Plan

Figure 7.2: Future Plan of Cargo Terminal

Source: JICA Study Team

Photo 7.2: Construction of New Cold Room (Ground Floor Slab Concrete Works)

Based on the review of the current situation, the JNIA cargo building does not urgently require expansion but it will be necessary to secure additional space in the near future. The initial calculation of required cargo building is shown in Table 7.5.

Table 7.5: Initial Calculation of Required Cargo Building

Airport Name	Current Situation		Short-term (up to 2017/18)		Mid-term (up to 2022/23)		Long-term (up to 2030)	
JNIA	Volume	19,676 ton	Volume	24,000 ton	Volume	32,500 ton	Volume	50,500 ton
	Existing Area	7,000 m^2	Required Area	8,000 m^2	Required Area	10,900 m^2	Required Area	16,900 m^2

Source: JICA Study Team

Also, it is necessary that related cargo handling facilities such as an aircraft loading apron and vehicle parking are developed at the same time.

Finally, effective cargo handling requires not only a cargo terminal facility but also basic airport facilities such as the runway, taxiway, and apron. A calculation of runway capacity assuming the same growth rates indicates saturation by 2020 to 2025. Therefore, it is recommended to add another runway by that time for the proper operation of aircraft movements for both cargo and passengers.

(3) KIA

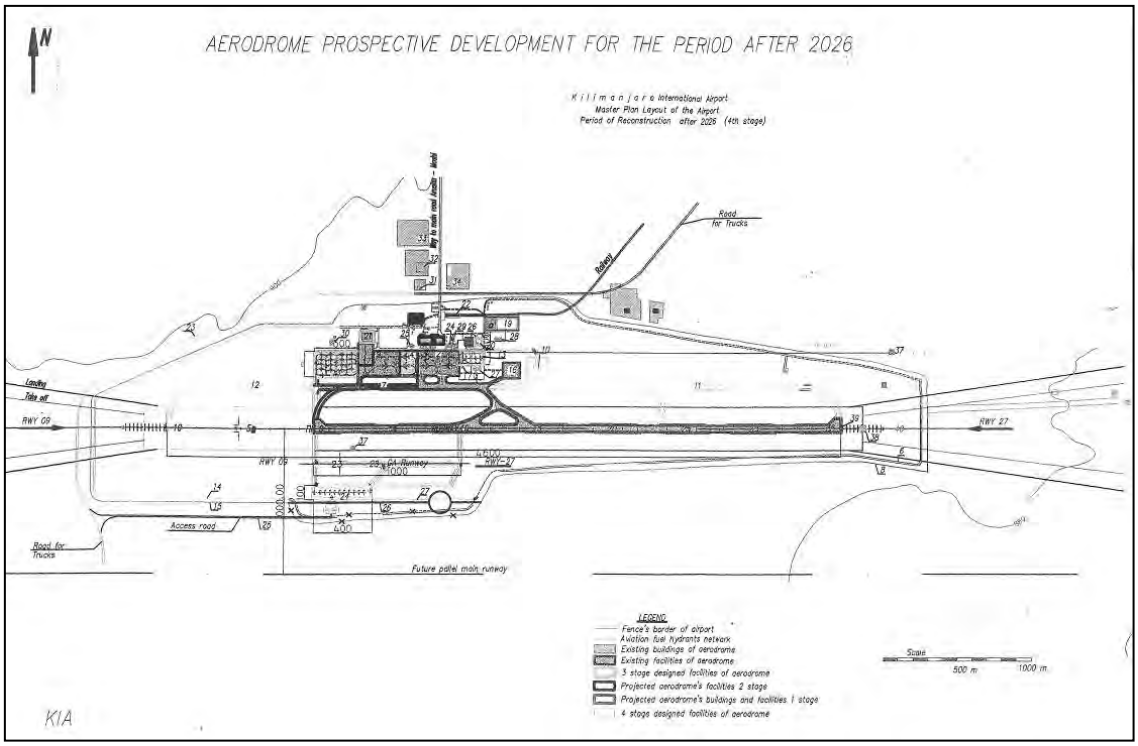
The existing cargo terminal building in KIA is about 2,900 m^2 and the annual cargo handling volume was about 4,150 tonnes in 2010. There is no exclusive loading apron for cargo since there is a cargo building nearby. The access road can accommodate only vehicles.

Kilimanjaro Airports Development Corporation (KADCO) conducted a master planning study in 2001, which was prepared by Aeroproject (T) Ltd (see the layout plan inFigure 7.3). This study formulated four development stages. Cargo facility development by stage was planned as shown in Table 7.6.

Table 7.6: Cargo Development by Stages

Stage		Project
Urgent	2007 to 2011	Rehabilitation and equipping of existing building
Short-term	2011 to 2016	Construction of vehicle parking (1,800 m^2)
Mid-term	2016 to 2026	Construction of cargo apron (10,000 m^2)
Long-term	after 2026	Development of new cargo terminal

Source: JICA Study Team based on KADCO Master Plan



Source: KADCO Master Plan

Figure 7.3: KIA Master Plan Layout

Based on the initial calculation of cargo building requirement, the existing facility was found to have sufficient space taking into account annual cargo handling volume. The required area to meet the demand forecast is shown in Table 7.7. This basic scenario is the same as in the KADCO study. Therefore, the cargo building will be developed and expanded during the mid-term stage together along with the loading apron.

Table 7.7: Area Required for the Cargo Terminal

Airport Name	Current Situation		Short Term (up to 2017/18)		Mid Term (up to 2022/23)		Long Term (up to 2030)	
KIA	Volume	5,000 tonnes	Volume	6,800 tonnes	Volume	9,400 tonnes	Volume	15,100 tonnes
	Area	2,900 m^2	Required Area	2,270 m^2	Required Area	3,200 m^2	Required Area	5,100 m^2

Source: JICA Study Team

(4) Mwanza

Currently, Mwanza Airport lacks a specific cargo terminal facility. In 1977, a development project including the runway, taxiway, apron, passenger terminal, cargo terminal, control tower, navigation aids, and other related facilities enabled Boeing 737 operation. However, the project was not completed due to the outbreak of the Uganda War in 1978. Recently, the runway, fire station, and pavement foundation for the passenger apron were completed, although other planned facilities have not yet been constructed.

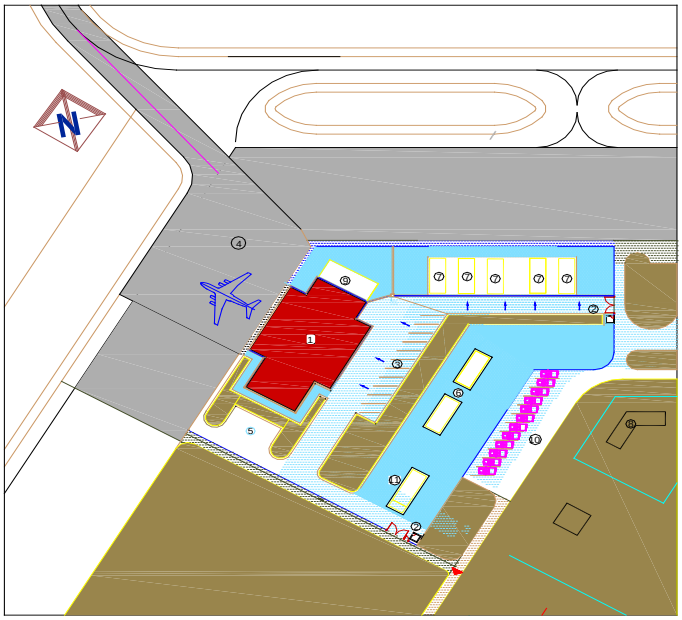
The Mwanza Region is Tanzania's second most important economic contributor after Dar es Salaam. Mwanza seeks export earnings from freshwater fish (e.g., Nile Perch from Lake Victoria), and from the gold and diamond mining industry in the surrounding area, which can have a significant impact on cargo activity.

TAA has already formulated a Mwanza airport development project including a cargo terminal, to be funded by the GOT and BADEA/OFID. The total project amount cost is about USD 60 million, 20% of which is from foreign funds. The remaining budget is still being prepared by the GOT. Although the loan agreement for this project was signed in 2007, it was postponed.

A feasibility study named (*Upgrading of Mwanza Airport, Financial and Economic Analysis Report*) was conducted in 2005 by National Development Corporation and a detailed study was conducted in 2010 by Unitec. The main scope of works of this study was as follows:

1 New pavement (runway for 4E, taxiway and apron for 4D);
2 New passenger terminal building and ancillary buildings including new control tower;
3 Navigation aids (COM, NAV, SUR, MET) system;
4 Expansion apron for relief congestion; and
5 New cargo terminal including dedicated apron.

The cargo facilities include a new cargo apron of about 22,500 m^2 and a cargo terminal building of about 6,000 m^2. The layout plan of the cargo area is shown in Figure 7.4.



Source: TAA

Figure 7.4: Layout of Cargo Terminal

The calculation of the required area is shown in Table 7.8.

Table 7.8: Cargo Terminal Required Area

Airport Name	Current Situation		Short Term		Mid Term		Long Term	
Mwanza	Volume	17,000 tonnes	Volume	10,400 tonnes	Volume	14,100 tonnes	Volume	21,900 tonnes
	Area	-	Required Area	3,500 m^2	Required Area	4,700 m^2	Required Area	7,300 m^2

Source: JICA Study Team

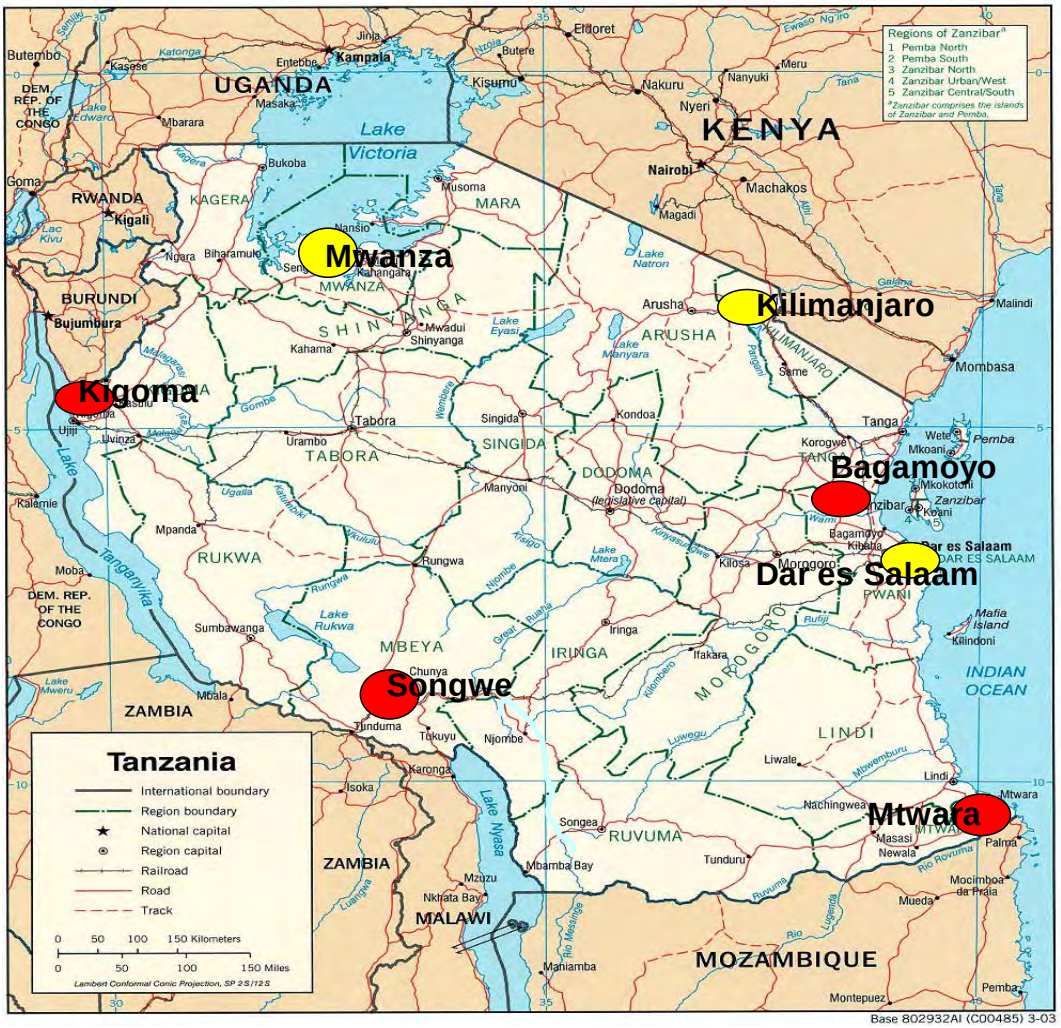
The cargo capacity in the opening year will need to accommodate the demand forecast after ten years of operation. Therefore, the capacity of cargo terminal requires about 5,000 m^2.

The results of a rough calculation showed that the runway capacity was sufficient until 2030. However, it is necessary to develop other project components, including a runway, taxiway, control tower, and navigation aids to harmonize the operation of Mwanza Airport.

(5) Other Airports

TAA manages 58 airports most of which are in poor condition. However, the first-priority development airports (JNIA, KIA, and Mwanza) and second-priority airports (Kigoma, Songwe, Mtwara, and Bagamoyo) were selected based on discussions with TAA and in consideration of the Tanzania Five Year Development Plan as well as earmarked locations in export processing zones.

However, assessment of second-priority airports requires establishing requirements for development of cargo facilities based on current (and likely future) demand. These priority airports are shown in Figure 7.5 on the following page.



First-priority airports Second-priority airports
Source: JICA Study Team

Figure 7.5: Location Map for Priority Airports

7.1.3 Mitigation Measures for the Impact on Environment and Social Considerations

The SEA survey was conducted, and the impact on environment and social considerations has been evaluated in this study. Table 7.9 shows the potential impact on each component.

Table 7.9: Potential Impact of the Airport Project on Each Component

COMPONENTS / POTENTIAL IMPACTS	Total Score	Biodiversity, Flora and Fauna	Population, Health & Safety	Soil	Water	Air	Climatic Factors	Material Assets	Cultural Heritage	Landscape
Resettlement of people and loss of assets due to land acquisition.	-2		-1					-1		
Destruction of natural vegetation / habitat	-1	-1								
Destruction of cultural heritage sites.	-1								-1	
Rise in health and safety risks.	-1		-1							
Water pollution.	-1				-1					
Soil disturbance and pollution.	-1			-1						
Landscape alterations.	-1									-1
Increased freight cargo handling capacity.	2		2							
Faster movement of freight / cargo	3		3							
Reduced transportation costs	3		3							
Increased access to domestic and external markets.	3		3							
Increased emission of greenhouse gases.	-5					-3	-2			
Creation of employment and income generation opportunities.	0									

Note: the level of evaluation is categorised as shown in follows. -3; High -Ve impact, -2: Medium -Ve impact, -1: Low -Ve impct, 0: Neutral or Negligible impact, 1: Low +Ve impact, 2: Medium +Ve impact, 3: High +Ve impact

It is noteworthy that the negative impact of increased emission of greenhouse gases is higher than any other potential impacts. Meanwhile, the positive impacts of faster movement of freight /cargo, reduced transportation costs and increased access to domestic and external markets are high.

Considering the above listed evaluations and further details on the impact of the project on specific areas described in chapter 10, enforcement of emission standards shall be taken into account as a mitigation measure to implement air port development.

7.1.4 Selected Projects

The following priority air cargo facility projects are recommended:

1. JNIA Cargo Terminal Development;
2. KIA Cargo Terminal Development; and
3. Mwanza Airport New Cargo Terminal Development.

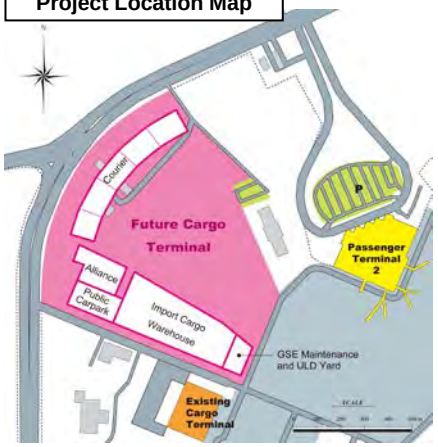
Detailed project descriptions are shown in Table 7.10 to 7.12.

Table 7.10: JNIA Cargo Terminal Development Project Sheet

Project Name	**Julius Nyerere International Airport (JNIA) Cargo Terminal Development**

(1)	***Location (Project Area)***	Dar es Salaam
(2)	***Executing Agency***	Tanzania Airports Authority (TAA)
(3)	***Background***	JNIA serves as the gateway for international air traffic and as the hub for domestic flights in Tanzania. It is located about 10 km from the city center of Dar es Salaam. JNIA has two runways, two passenger terminal buildings, and other related airport facilities. Currently, TAA has plans to develop both the cargo terminal and passenger terminal due to the poor condition of airport facilities and the increase in air traffic activities (both cargo handling and passenger movement).
(4)	***Type of Project***	Construction of a new cargo terminal.
(5)	***Objective***	Develop a new cargo terminal to cope with the growing aviation sector.
(6)	***Proposed Work Cmponents***	Cargo terminal area: about 8,000 m^2
(7)	***Project Justification***	1. Cargo traffic at JNIA has been increasing. 2. Overcapacity of the existing cargo terminal when large aircraft freights (hauling more than 100 tonnes) arrive. 3. Thus, it is necessary to build a new cargo terminal at JNIA to meet the increasing demand.
(8)	***Project Timing***	Short-term
(9)	***Implementation Work Duration***	Two years
(10)	***Total Project Cost***	About USD 15 million
(11)	***Implementation Scheme***	Swissport proposed a Build-Operate-Transfer scheme.
(12)	***Investment Plan***	N.A.
(13)	***Donor Funds***	N.A.
(14)	***LandAacquisition***	Inside airport boundary
(15)	***Environmental Impact***	Low
(16)	***Social Impact***	Low
(17)	***EIA Status***	Not yet done; generally, environmental impacts will be confined to within the airport perimeter; an EIA is not required.
(18)	***Expected Benefist***	The existing cargo facilities will reach capacity by 2023. Currently cargo freighters arrive once or twice a week as charter flights. Building an air cargo terminal is most essential.
(19)	***Documents Available***	Master Plan
(20)	***Connection with Other Modes***	Connection with truck transport: cargo transfer and vehicle movement verification procedures are required to minimize delay.

Project Location Map



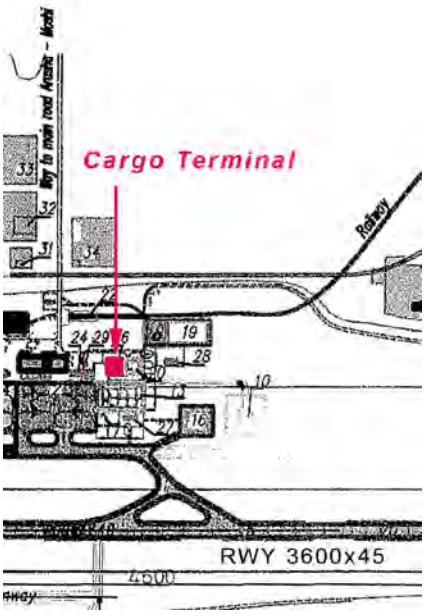
Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 7.11: KIA Cargo Terminal Development Project Sheet

Project Name	**Kilimanjaro International Airport (KIA) Cargo Terminal Development**

(1)	***Location (Project Area)***	Kilimanjaro between Arusha and Moshi
(2)	***Executing Agency***	Tanzania Airports Authority (TAA)/ Kilimanjaro Airport Development Company Ltd. (KADCO)
(3)	***Background***	KIA is situated at the foot of Mount Kilimanjaro, the highest mountain in Africa. KIA serves as the main gateway airport for wildlife tourism in Tanzania. KIA has a 3,607 m runway, a passenger terminal building, and other related airport facilities. TAA has an airport facility development plan (including a cargo terminal) in response to the insufficient condition of facilities and increasing air traffic activity (both cargo handling and passenger movement). KIA is located in the northern part of Tanzania, where famous flowers and vegetables are grown for strategic export to Europe.
(4)	***Type of Project***	Construction of a new cargo terminal.
(5)	***Objective***	Develop new cargo terminal to address aviation sector growth.
(6)	***Proposed Work Components***	Cargo terminal area: about 3,000 m^2
(7)	***Project Justification***	1. Increase in cargo traffic at KIA. 2. Strategic place for export of perishable items to Europe. 3. Thus, it is necessary to build a new cargo terminal for KIA to meet the increasing demand.
(8)	***Project Timing***	Mid-term
(9)	***Implementation Work Duration***	Two years
(10)	***Total Project Cost***	About USD 10 million
(11)	***Implementation Scheme***	N.A.
(12)	***Investment Plan***	N.A.
(13)	***Donor Funds***	No committed funds
(14)	***Land Acquisition***	Inside the airport boundary
(15)	***Environmental Impact***	Low
(16)	***Social Impact***	Low
(17)	***EIA Status***	Not yet done; generally, environmental impacts will be confined to within the airport perimeter; an EIA is not required.
(18)	***Expected Benefist***	The existing cargo facility will be saturated by 2030. Since the airport's location is strategic for the exportation of perishable items to Europe, an air cargo terminal is essential.
(19)	***Documents Available***	Master Plan
(20)	***Connection with Other Modes***	Connection with truck transport: cargo transfer and vehicle movement verification procedures are required to minimize delay.

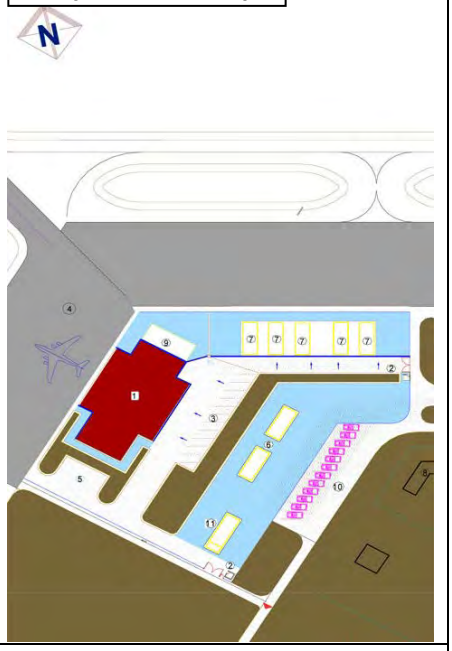
Project Location Map



Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

Table 7.12: Mwanza Airport Cargo Terminal Development Project Sheet

Project Name	**Mwanza Airport Cargo Terminal Development**

(1)	***Location (Project Area)***	Mwanza	**Project Location Map** 
(2)	***Executing Agency***	Tanzania Airports Authority (TAA)	
(3)	***Background***	Mwanza Airport is located beside Lake Victoria in Mwanza City, which is the second largest city in Tanzania. The airport is about 10 km from the city center. In 1977, a development to enable Boeing 737 operation was commenced. However, the project was not completed due to the outbreak of the Uganda War in 1978; thus, there was no runway, fire station, or pavement foundation for the passenger apron at that time. These were recently completed, but all other facilities have not yet been constructed. Mwanza Airport currently has no specific cargo terminal facility. The Mwanza Region plays an important role in terms of exports as it provides fresh fish from Lake Victoria and recently gold from mines in the surrounding area.	
(4)	***Type of Project***	Construction of a new cargo terminal.	
(5)	***Objective***	Develop a new cargo terminal to address aviation sector growth.	
(6)	***Proposed Work Components***	1. Cargo terminal area: about 6,000 m^2	
(7)	***Project Justification***	1. Cargo traffic of Mwanza Airport will increase. 2. Strategic place for export of freshwater fish and mining products. 3. Thus, it is necessary to build a new cargo terminal for Mwanza Airport to meet the increasing demand	
(8)	***Project Timing***	Short-term	
(9)	***Implementation Work Duration***	2 years	
(10)	***Total Project Cost***	About USD 7 million	
(11)	***Implementation Scheme***	N.A.	
(12)	***Investment Plan***	N.A.	
(13)	***Donor Funds***	No committed funds yet.	
(14)	***Land Acquisition***	Inside the airport	
(15)	***Environmental Impact***	Low	
(16)	***Social Impact***	Low	
(17)	***EIA Status***	Not yet done; generally, environmental impacts will be confined to within the airport perimeter; an EIA is not required.	
(18)	***Expected Benefits***	There is currently no specific cargo facility. Considering that Mwanza is strategically located for the export of freshwater fish and mining products, an air cargo terminal is essential.	
(19)	***Documents Available***	Feasibility Study and Detailed Design	
(20)	***Connection with Other Modes***	Connection with truck transport: cargo transfer and vehicle movement verification procedures are required to minimize delay.	

Note: The data above is based on field surveys and interviews undertaken by the JICA Study Team. "N.A." and "Not certified" in (14) and (17) will be revised after the Strategic Environmental Assessment is completed. Consequently, (15) and (16) have been estimated by the JICA Study Team as a general indicator.

7.2 Pipelines and Oil Terminals

An energy master plan for Tanzania in draft form was to be released in June 2012. Accordingly, it was of little value to work out a master plan for pipelines and oil terminals before that at this time. Studies and future plans for the crude oil pipeline and related facilities should reflect the energy master plan.

It is nevertheless recommended that the points presented below should be taken into consideration in formulating development strategy for this sector.

7.2.1 Development Strategy

Based on the transport demand forecasts in this study, strategies such as (i) developing infrastructure for an optimal modal share and (ii) alleviation of bottlenecks in the Dar es Salaam area were considered in investigating development plans.

The GOT anticipates an annual GDP growth rate of 5%–8%, which is significantly higher than the forecast world average of 3%–5%. The demand forecast in this section was estimated based on an annual he GDP growth rate of 8%, i.e., the higher forecast.

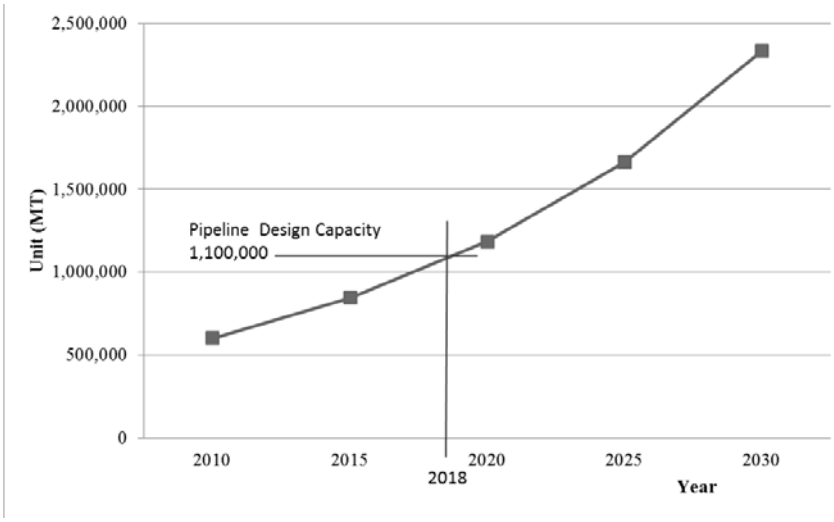
7.2.2 Relevant Issues

(1) Crude Oil Pipeline and Related Facility

The volume of crude oil transported through the Tanzania Zambia Mafuta (TAZAMA) Pipeline from Dar es Salaam to Zambia increased by 27% from 2009 to 2010. As noted, the GOT anticipates an annual GDP growth rate of 5%–8%. Zambia's economy is expected to grow at an annual rate of 7%, at which the demand for oil through TAZAMA pipeline will exceed its annual capacity of 1.1 million tonnes by 2018.

The volume transported to Zambia is to be decided through discussions between the Governments of Tanzania and Zambia. The pipeline is not considered a bottleneck at this stage because there have not been any concrete decisions to increase this volume.

The trend described above is illustrated in Figure 7.6.

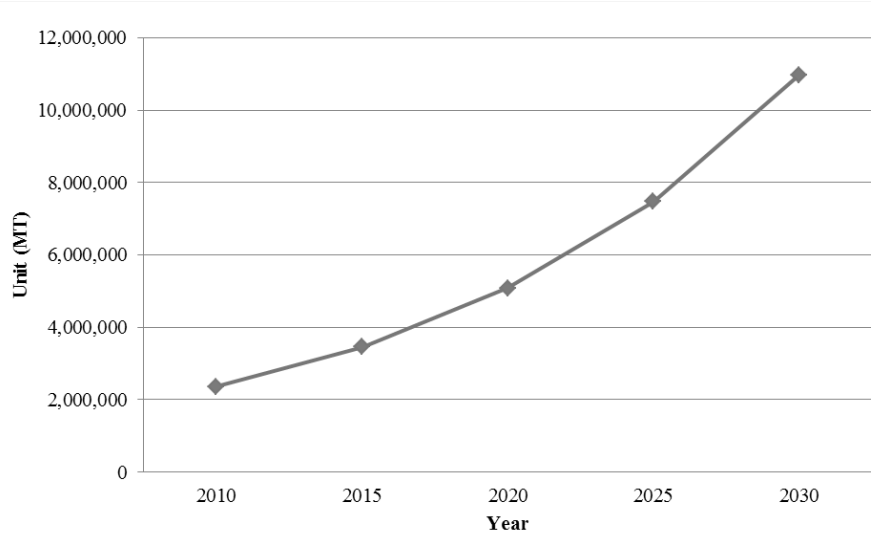


Source: JICA Study Team

Figure 7.6: Demand Forecast for the TAZAMA Pipeline

The consumption of petroleum products has grown rapidly due to population growth and the increase in economic activities over the last ten years. It is estimated that the import petroleum volume in 2030 will be 11 million metric tonnes.

The trend forecast of imported petroleum product volume is shown in Figure 7.7.



Source: JICA Study Team

Figure 7.7: Forecast of Imported Petroleum Product Volume

In 2010, more than 95% of petroleum products imported to Tanzania were unloaded at the Kurasini Oil Jetty (KOJ) in Dar es Salaam Port. The remaining 5% were imported through Tanga, Mtwara, and ports on Lake Victoria, and by road tankers, through the Sirari border crossing with Kenya.

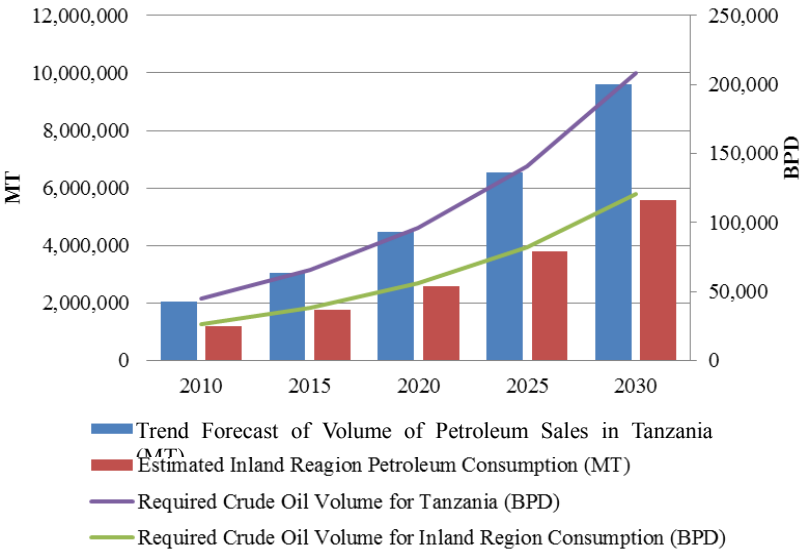
Based on the data for imported petroleum products in 2010 and estimated imports of petroleum product volume in 2030, the total imported volume of petroleum products was estimated to be 10.450 million metric tonnes at Dar es Salaam Port and 550,000 metric tonnes at other ports. Figure 7.8 presents a visual presentation of this data.

Source: JICA Study Team

Figure 7.8: Estimated Import Petroleum Product Volume in 2030

Sales of petroleum in Tanzania will reach 9.6 million metric tonnes assuming a GDP growth rate of 8% a year (i.e., the higher case).

Figure 7.9 presents a forecast of sales of petroleum products and the needed crude oil volumes.



Source: JICA Study Team

Figure 7.9: Trend Forecast of Volume of Petroleum Sales

The oil marketing company is to plan to increase storage tanks and transport operating efficiency depending on market demand. Therefore, these factors are not considered bottlenecks at this stage.

Noor Oil and Industrial Technology Ltd a consortium of Russian and German firms ha planned construction of an oil refinery to process 200,000 barrels per day in Dar es Salaam and a pipeline with a distance of 1,500 km to transport refinery products from Dar es Salaam to Mwanza and Kigoma. If implemented, the combination of the oil refinery and a long-distance pipeline would be effective in reducing the cost of transporting oil products in the Tanzanian hinterland, switching from truck/rail to pipeline. However, there are some concerns for transporting refined products, rather than crude oil, through a long-distance pipeline:

- general development planning principles dictate that crude oil should be transported by a long-distance pipeline to the area in which it is consumed, and refined in that area;
- specifically, transporting flammable refined products by long-distance pipelines for more than 50 km should be avoided to reduce risk hazards; and
- since there are several types of refined products, transferring them on a single pipeline can be inefficient because two or more products may be mixed.

Therefore, it is recommended that the oil refinery be constructed at a site inland and crude oil be transported by the pipeline. The new oil refinery can supply the inland regions of Tanzania and its neighbours with petroleum products in addition to some for the export market.

Its advantages are linked to the net proceeds from the storage and transport of petroleum products to Mwanza, Mara, Kigoma, and neighboring countries such as Uganda, Rwanda, and Burundi. Besides having access to cheaper oil, East African countries will also save on the cost of road maintenance from the excessive use of road transport to deliver products to destinations.

To achieve this aim, steady and gradual implementation of the energy master plan is critical. As noted, an energy master plan for Tanzania in draft form was to be released in June 2012. Studies and a future plan for the crude oil pipeline and related facilities must be carried out in line with the energy master plan.

(2) Natural Gas Pipeline

The Songo Songo Gas Field and a gas field near Mnazi Bay are currently in operation in Tanzania. The gas produced is processed for power generation and other industrial customers in Dar es Salaam.

Based on the latest results of field investigations, it can be assumed that gas fields in Tanzania are of a large scale. However, natural gas production is at an early stage in the country, infrastructure is inadequate, and production scale is still small compared to proven natural gas reserves. Unlike petroleum oil, natural gas is not restricted by the OPEC production ceiling. A country can increase production by its own accord; therefore, further expansion of natural gas production is expected.

The natural gas market in Tanzania is still incomplete and further development and improvements in the sector are necessary. The distributional process for gas collection, including transmission, has not yet been established. Accordingly, it is necessary for policy to encourage private sector participation in setting up the gas market.

In principle, two strategies can be considered for natural gas development in Tanzania. The first is a strategy emphasizing the export of natural gas. The second strategy is to emphasize

domestic gas distribution. For Tanzania, which aims at a 8% GDP growth rate, the domestic supply of natural gas for electrical power generation and raw material for domestic industries, along with export, is important. The GOT considers that natural gas development will have a synergistic effect on economic growth in the country.

It was assumed that the following issues would be described in the energy master plan:

(1) development of the domestic natural gas market, including supply of gas for domestic industries, resulting in a synergistic effect on GDP growth;
(2) increase in cost effectiveness resulting in a larger market share in the export of natural gas; and
(3) definition of the amount of natural gas reserves.

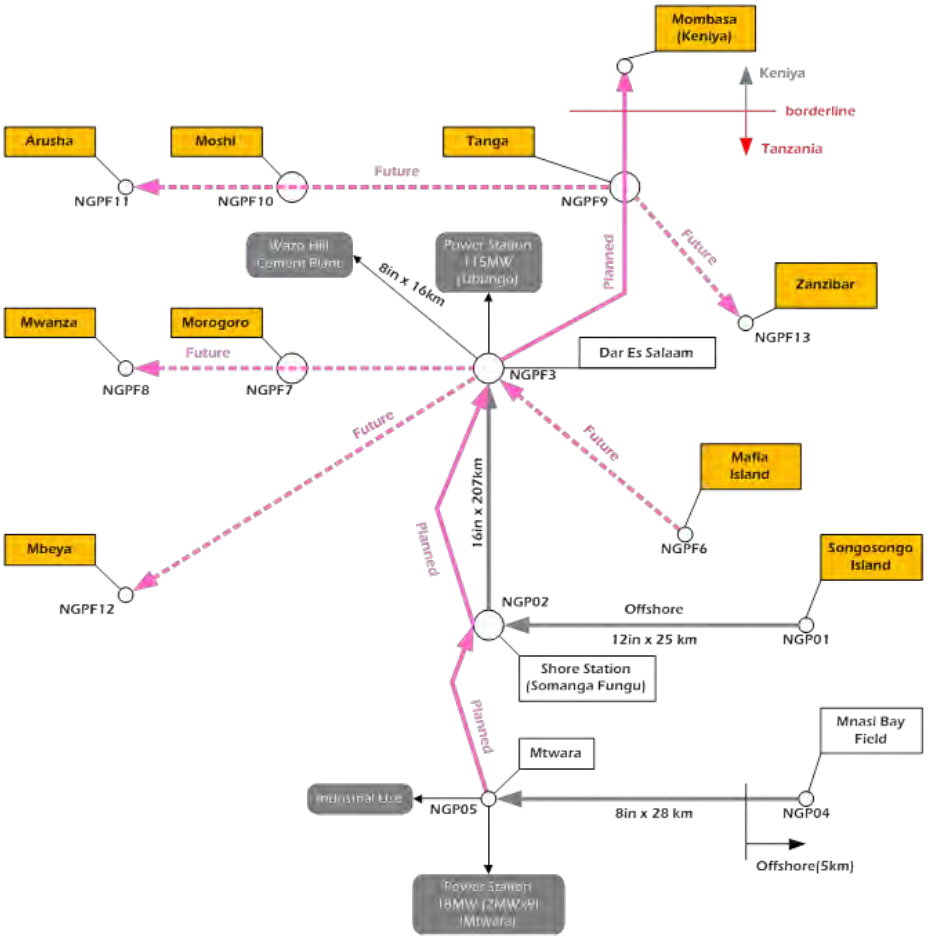
The strategy defines the gas fields and reserves to determine the priority for pipeline projects. It is necessary for the GOT to first disclose policies and the legal framework regarding these three strategies, and then strive to strengthen partnerships with investors.

Gas pipelines will connect Mnazi Bay with Songo Songo, Kiliwani and Nyuni, Mkuranga, and deep sea gas reserves on the coastal area. The following should be considered in planning for a gas pipeline network (also seeFigure 7.10):

- Gas power generation at inland locations and stabilization of electric power;
- Use in industrial areas and cities; and
- Gas exports.

The gas produced in Tanzania will be used for the following purpose:

- Industrial parks for Gas-Intensive Industries.
  - Electricity Generation
  - Ammonia /Urea Complex
  - Methanol
  - Iron and Steel
  - LNG
- Small domestic industries including manufacturing, cement, ceramic, glass production, and food processing.
- Household, institutions, and natural gas vehicles.



Source: JICA Study Team

Figure 7.10: Natural Gas Pipeline Development Plan

To achieve this vision, steady and gradual implementation of the energy master plan will be critical All studies and future plans for gas pipelines must be carried out based on the energy master plan.

(3) Oil Terminals

The oil marketing companies will plan to increase the number of storage tanks and transport operating efficiency depending on market demand. Therefore, these factors are not considered bottlenecks at this stage.

Each of the oil marketing companies will prepare an extended plan for an oil terminal. The policies and plans of the companies must be in line with the energy master plan. Therefore, it will be desirable to conduct investigations after the energy master plan has been officially issued.

Reinforcement plans developed by the oil marketing companies should be taken into consideration. Any required long-distance pipeline for petroleum products must safety requirements.

The oil marketing companies will prepare their future marketing strategies based on the energy master plan after it is issued.

7.3 Cross-Border Facilities

7.3.1 Current Development Plan of Border Facilities and OSBPs

Tanzania has a long border and many border stations. Eight (main) border stations are being or are to be developed as one-stop border posts (OSBPs; see Table 7.12 at the end of this subsection). An OSBP is a joint effort with neighbouring countries to bring border control activities in one place.

Usually a bilateral agreement on the establishment and implementation of an OSBP is concluded between two countries. The East African Community (EAC) is moving towards establishing an EAC Act on OSBPs. When the EAC Council approves this Act, it will take precedence over (i.e., supersede) the partner states' laws with respect to matters of border procedures and related issues. OSBPs on the border with other EAC countries will be implemented under this Act. The current agreement between Burundi for OSBP operation at Kabanga will cease to exist when the EAC Act on OSBPs comes into effect.

The World Bank has a program to upgrade border facilities to OSBPs under its East Africa Trade and Transport Facilitation Project. A consulting firm, Sai Consulting Engineers, Inc., was commissioned to prepare the engineering documents for four OSBPs, three on the Kenyan border (Horohoro, Sirari, and Holili) and one on the Ugandan border (Mutukula). With the World Bank, TradeMark East Africa (TMEA) is coordinating the financing of the Holili and Mutukula OSBPs. TMEA is also supporting OSBP construction at Kabanga. At the same time, JICA is assisting the development of OSBPs at Rusumo and Namanga, for which it is providing the technical and financial support for design, feasibility study, and construction work.

Developments at these various border crossing points are summarized below.

(1) Rusumo

Rusumo is a border crossing en route to Rwanda on the Central Corridor. The number of declarations at Rusumo in 2011 totalled 21,315 for transit cargo, with nearly 3,500 cargo declarations originating from Tanzania.

Construction of OSBP infrastructure including a new bridge was to commence in June 2012 with grant aid from JICA. The construction of both border facilities and a new two-lane bridge are scheduled to be completed in November 2014.

The new OSBP will have inspection facilities and an expanded area to allow for full clearances to be done at the border. The construction site has been identified and surveyed. Currently, operations are undertaken at a temporary office, which was also financed by JICA. New staff housing for officers of the Tanzania Revenue Authority (TRA) will be constructed.

A bilateral agreement on the establishment of an OSBP has been signed by the Governments of Tanzania and Rwanda.

The Environmental and Social Impact Assessment (ESIA) report was completed and presented to the GOT through TANROADS.

(2) Namanga

Namanga is a border crossing en route to Kenya on the road connecting Nairobi and Arusha. There were more than 25,000 cargo declarations at this border crossing in 2011 for traffic in both directions. There was little transit cargo.

The GOT has already paid compensation for relocation of inhabitants on the site. The Environmental and Social Impact Assessment report has been completed.

(3) Horohoro

Horohoro is a border crossing en route to Kenya near the coast line. There were nearly 12,000 cargo declarations at this border crossing in 2011 for traffic in both directions. There was little transit cargo.

With World Bank assistance, construction of the OSBP started in July 2011 by Siha Enterprise and completion was expected in September 2012.

(4) Sirari

Sirari is a border crossing en route to Kenya near Lake Victoria. There were more than 36,000 cargo declarations at this border crossing in 2011 for traffic in both directions. There was little transit traffic. Construction of the OSBP facility was contracted to Humphrey Construction Ltd. under the World Bank program and completion was expected in September 2012.

(5) Holili

Holili is a border crossing en route to Kenya near Moshi. In 2011 there were nearly 20,000 cargoe declarations at his border crossing for traffic from Mombasa to Tanzania. There was little transit cargo.

With TMEA assistance, construction of the OSBP was commenced in July 2011 by DB Shapriya & G Ltd. and completion was expected in September 2012.

(6) Mutukula

Mutukula is a border crossing en route to Uganda on the Central Corridor. In 2011 there were nearly 2,400 transit cargo declarations and 4,000 declarations for cargo originating from Tanzania.

With assistance from TMEA, the OSBP facility was planned by consultants and construction started in July 2011 by Lukolo Co. Ltd., with completion to be in September 2012.

(7) Kabanga

Kabanga is a border crossing en route to Burundi on the Central Corridor. In 2011 there were more than 17,000 for transit cargo declarations at this border crossing. There were only about 1,200 cargo declarations for traffic origination in Tanzania.

The terrain does not pose a problem, but utilities need to be addressed. Currently, the borders are far apart. The design should accommodate the introduction of an OSBP and clearance at the border. A temporary OSBP established at Kobero on the Burundi side became operational in April 2012. A bilateral agreement was signed by the two countries' Finance Ministers, and a construction site was identified. The funding agency is TMEA.

(8) Tunduma

Tunduma is a border crossing en route to Zambia on the TZAZARA (Dar es Salaam) Corridor. There were more than 60,000 cargo declarations at this border crossing in 2011. The crossing is the busiest border one in Tanzania for transit cargo. The volume of cargo declarations for traffic originating from Tanzania exceeded 35,000. During the site survey (November 2011), the JIC Study team observed considerable congestion with 150 container trailers and 50–100 tank

lorries a day travelling from Tanzania to Zambia, of which 95% transit from Dar es Salaam. There is also cargo from factories in Kenya coming through Namanga and Horohoro to Tunduma with the final destination in Zambia. Cargo from Zambia consisted of 60 trailers a day, hauling copper products such as copper brisket, copper cathode, and copper iodized wire.

The development of this station was initially handled by the Ministry of Industry and Trade, after which the process was taken over by TRA. Based on a June 2010 agreement, the customs procedure is completed before the cargo crosses the border. This procedure follows a request from Zambia because of the lack of inspection space on the Zambian side. There is a long queue of trailers for the inspection and clearance of customs procedure on the Tanzanian side.

The feasibility study and draft design were completed with the support of TMEA. The construction timetable had not yet been determined.

Table 7.13: Summary of One-Stop Border Post Development in Tanzania

No.	Border Crossing	Neighbour Country	Status	Bilateral Agreement	Funding Source
1	Sirari	Kenya	Handover of facility in October 2012	Now under preparation and to be facilitated by EAC OSBP Act	WB (USD 4 m)
2	Namanga	Kenya	To be completed in March 2013; USD 10 m for OSBP Part of Road Improvement Program		JICA AfDB (USD 10 m)
3	Holili	Kenya	Handover of facility in October 2012		TMEA (USD 4 m)
4	Horohoro	Kenya	Handover of facility in October 2012.		WB (USD 4 m)
5	Tunduma	Zambia	Site survey and selection of consulting engineer.	Yes (June 2012)	TMEA (USD 6.5 m)
6	Kabanga	Burundi	Temporary OSBP at Kobero	Yes (October 2011)	TMEA
7	Rusumo	Rwanda	Scheduled to be completed in 2014; Three components: (1) OSBP, (2) bridge, and (3) hydropower station	Yes	JICA
8	Mutukula	Uganda	Handover of facility in October 2012	EAC OSBP Act	TMEA (USD 4 m)

Abbreviations: AfDB = African Development Bank, EAC = East African Community, JICA = Japan International Cooperation Agency, OSBP = one-stop border post, TMEA = TradeMark East Africa, WB = World Bank
Source: JICA Study Team

7.3.2 Development Strategy for Other Stations

In response to concerns about customs procedures causing non-tariff barriers to trade, the World Customs Organization (WCO) has reviewed and revised the International Convention for Simplification and Harmonization of Customs Procedures, now known as the Revised Kyoto Convention, in order to reflect modern practices and serve as a blueprint for customs procedures.

The East African Trade and Transport Facilitation Project (EATTFP), TradeMark East Africa (TMEA), and JICA are the partners that so far have supported the establishment of one-stop border posts (OSBPs).

There are several other border stations but the roads are not paved and there is not much cargo passing through these stations.

Kasumulu is a border crossing with Malawi and its importance has been increasing. At the time of civil war in Mozambique in the 1980s, cargo, especially oil supply, was dependent on the

Tazara route. Thus, the GOT invested in the inland depot in Mbeya by establishing Malawi Cargo Center Ltd. (MCCL), and Kasumulu was the only supply gate. After the ceasefire, its importance decreased but there transit cargo from Dar es Salaam to Malawi still crosses through this border. The World Bank has indicated interest assisting a OSBP at Kasumulu.

Mtambaswala is a border crossing with Mozambique and there is a large bridge at Moja. It is a politically important border but very little transit cargo of automobiles from South Africa and import of *mninga* and *mkongo* hardwood passes through. Currently, TMEA is showing interest in its feasibility study.

Tarakea is a border crossing that will attract cargo from Nairobi once a project to improve the connecting road is completes. Tarakea is located near Holili, but the road network connects Holili to Mombasa.

Kasanga is a lake port that connects to the DRC. There is a road connecting Tunduma and Kasanga and currently the ferry from Kasanga cannot carry a lot of cargo. However, there is a road improvement project on the DRC side from Moliro, which is close to Kasanga. Therefore, an increase in traffic can be expected.

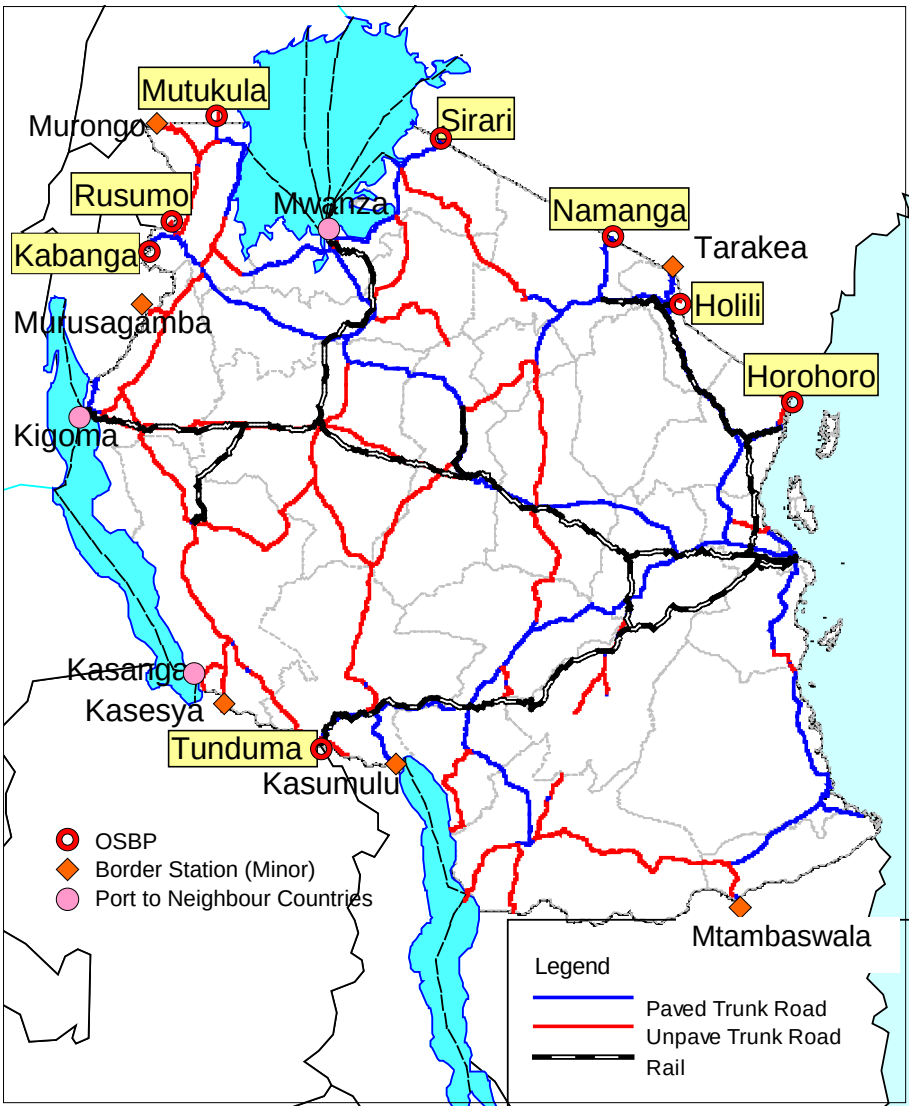


Figure 7.11: Location Map of Major Border Stations

Chapter 8 Institutional Development Strategy

8.1 Trade Facilitation

8.1.1 Facilitation Policy in Tanzania

Cargo throughput has increased rapidly in recent years in line with economic development and this trend is likely to continue over the coming years. Institutional improvements are vitally important to assure benefits from investments in ports and border facilities. While ports and border stations are mandated to examine all cargo for border control purposes, this takes time and incurs costs. Therefore, the international trend is to implement risk management and facilitate procedures by utilizing information and communications technology (ICT). Trade facilitation is a strategy to streamline cargo clearance procedures at borders by integrating the necessary steps and coordinating regulatory agencies in order to improve the level of service while maintaining the quality of control.

8.1.2 New System in the TRA Customs and Excise Department

The Tanzania Revenue Authority (TRA) Customs and Excise Department is planning to replace the Automated System for Customs Data (ASYCUDA)++ with a New Customs Automated System. ASYCUDA++ is the electronic customs clearance system currently used for automating paper-based declaration document procedures. However, this system cannot handle a large amount of cargo because there still remain cumbersome manual procedures for decision making and the approval of cargo release.

The New Customs Automated System features the following functions:

(i) improved user friendliness for both TRA and external users;
(ii) a cargo management system for all imports and exports including transfer to inland container depots (ICDs);
(iii) a risk management system for import and transit cargo;
(iv) e-banking capabilities with quick reporting to related institutions; and
(v) workflow tools for both customs managers and external stakeholders.

The New System will restructure the procedure with information sharing among customs and other regulatory agencies such as the Tanzania Bureau of Standards (TBS), the Tanzania Foods and Drug Authority (TFDA), Quarantine, and the Bank of Tanzania (BOT). This new system is intended to be accessible nationwide from seaports, airports, and land border stations.

8.1.3 Single Window System and the Port Community

The Tanzania Ports Authority (TPA) facilitated trade by implementing a Port Community System (PCS) and establishing a National Single Window (NSW) for international trade. The PCS consists of all port-related stakeholders and provides a common platform for the NSW. On this platform the New Customs System will operate together with other systems by streamlining the submission, exchange, and processing of documents between government and private sector stakeholders. The current scheme focuses on the Port of Dar es Salaam and will later be rolled out at other Tanzanian ports, airports, and borders.

It will take some time for the new system to operate sufficiently well to achieve the targeted objectives, but when it does so efficiency and effectiveness will be greatly advanced. The Automated Customs System together with the Single Window System will enable the inspection of declarations much more quickly and make the integrated processing of permits possible. The confirmation of duty payments will be automated, and advance information to port operators for

inspection of cargo will be provided. The inspections of other regulatory agencies will be notified early enough to be coordinated with customs inspections.

8.1.4 Improvements in Related Institutions

(1) Capacity Enhancement

In relation to the upgrading of ICT systems, a capacity enhancement program is important and has been conducted under the JICA Technical Cooperation Project for Capacity Building for the Customs Administrations of the Eastern African Region. Improvement of compliance by the private sector is one of the topics covered in the seminars under the program. Capacity enhancement of customs officers is also important, and training of trainers is progressing under the JICA project.

(2) Manifest Submission to be Two Days before Ship Arrival

Early transmission and single transmission of the cargo manifest is important to eliminate discrepancies in information caused by the sending of different copies to several different agencies. The NSW system will require the shipping agent to send the manifest only once, i.e., to the NSW. The manifest will then be sent to customs as early as possible. It is recommended that the EAC Customs Management Act 2004/2009 be amended in order to make it mandatory for shipping agents to submit manifests at least 48 hours prior to vessel arrival.

(3) Payment and Settlement with Improved Bank Information System

The Tanzania Interbank Settlement System (TISS) “communicates” with the TRA Customs and Excise Department and BOT. The latter will have a service level agreement with the Tanzania Bankers Association for a commitment on the time to be taken for completion of the transfer of funds to BOT. When the standard completion of duty payment is within 24 hours, cargo dwell time will be reduced by 1-2 days. The payment of port charges will be improved by the bank operation. Improvement in the confirmation in the bank information system is a requirement to enable quick removal of cargo.

(4) Improved Coordination among the Regulatory and Operational Bodies

Even after the information system connects regulatory agencies involved with the inspection and confirmation of cargo, there may be some cases in which port operators are not properly informed. Coordination will be undertaken in the NSW system, but it will be important for all stakeholders to participate in upgrading efforts and the coordination of operations.

(5) International through Bill of Lading

For the transit cargo, a declaration requirement at the seaport interferes with the efficiency of inland container depots (dry ports). There is large demand for transit cargo to be transported to inland depots after simple security and identification procedures at the entry port. After a cargo tracking system is in place and security is effectively implemented, the Government of Tanzania should allow consignors to address the bill of lading (B/L) to "actual destination through Tanzania". The international through B/L has been approved by many EAC countries including Kenya. In order to compete in terms of the facilitation of transit service, this system is important and follows international conventions.

(6) Cross-Border Facilities and One-Stop Border Posts

Among Tanzania’s many border stations, there are eight that are or will be one-stop border border posts (OSBPs). An OSBP is a joint effort with the neighbouring country to bring together border control activities in one place. The EAC is in the process of establishing a

OSBP Act.[1] Once enacted as a regional law, this Act will take precedence over the Partner States' national laws with respect to matters of border procedures and related issues.

8.2 Regulatory Framework to Facilitate Private Sector Involvement

8.2.1 Problems that Tanzania Faces in Implementing PPP Policies

Tanzania has faced various problems in implementing public private partnership (PPP) projects, including the lack of comprehensive policy, legal, and institutional frameworks that provide clear guidelines and procedures for development and implementation of PPPs, although a PPP Policy and PPP Act have recently been formalized. Tanzania also lacks sufficient capacity in negotiations, procurement, implementation, and management of PPPs. The Government of Tanzania (GOT) has not yet been able to establish appropriate risk sharing mechanisms.

Consider, as an example, the PPP project between Tanzania Railway Ltd. (TRL) and RITES, an engineering consultancy company established by the Government of India. Contract negotiations were initiated in 2002, and operations commenced in 2007. However, the delay in negotiations and an optimistic business forecast led to serious deterioration of TRL's assets, with consequent adverse effect on morale. The agreement was terminated and the project halted. This project indicates various problems that Tanzania faces in implementing infrastructure-related PPP projects. Lessons learned from this experience can be utilized to improve Tanzania's future PPP policies.

8.2.2 Institutional Development

(1) Development of Investment Promotion Framework

Proposal on Investment Encouragement System

As PPPs can make use of private sector funds and receive technology transfers and "knowhow" from the private sector, it is often more efficient than for the public sector to develop infrastructure. In implementing PPP projects, it is crucial that revenues be sufficient to allow for a certain level of profitability. In that sense, projects such as toll roads, port operation, and logistics centers near borders may be relatively favorable subject matters for implementing PPPs since they are relatively profitable.

It is important that governments have firm resolve to bear appropriate project costs in order to make the PPP project sufficiently profitable to sustain the business solely with project revenue, even in the business areas mentioned above. Otherwise, desirable investors will not bid, and eventually it will become rather difficult to form an appropriate PPP project with suitable project funds and technologies.

In the railway sector it is almost impossible to ensure profitability unless a rather large amount of funds is provided from the national budget for restoration of existing rail tracks and procurement of a sufficient number of locomotives and wagons. For the foreseeable future it will be desirable for the railway sector to continue to make efforts to improve the conditions of railway operations by utilizing development partner assistance, while seeking to attract increased volumes of heavy cargo, e.g., minerals transport.

[1] The EAC Partner States' Ministers responsible for Transport, Communications and Works directed the EAC Secretariat was to forward to the draft OSBP Bill to the 13th Sectoral Council on Legal and Judicial Affairs in 2012 for consideration and approval.

Improvement of the Regulatory Framework for PPP Investment Promotion

In developing PPPs in the transport sector, the risk of investment and project profitability vary substantially depending on business areas, scale of the projects, and competitiveness. Since road projects such as the construction of tollways, or port operation projects, produce relatively better outcomes, these business areas are less risky for the private sector. On the other hand, large-scale transport projects such as in the railway sector require a large investment cost, and it is usually hard to recover that cost due to competition from road transport.

However, in countries such as Tanzania in which the railway infrastructure has deteriorated significantly, large-scale development and upgrading of the infrastructure is indispensable to achieving national economic development. Since it will not be possible for the railway sector to set higher freight charges due to competition from the road sector, it is less likely to generate sufficient revenue to cover the project cost. However, the improvement of the railway sector will be indispensable for Tanzania to achieve its economic development in the future. Railway projects should be planned not only within MOT, but also as a part of the national industrial development plan, with coordination with other relevant ministries.

If a project is identified as part of the national strategic development plan, but still some private sector participation is sought through a PPP, it should not require capital investment from the private sector to ensure profitability. However, technology transfers and management knowhow should be utilized to the extent possible. In the case of PPPs for railway projects, a concession contract for management and operation services by the private sector may be considered.

(2) Improvement of the Investment Promotion System for Public Private Partnerships

Since Tanzania has a PPP Policy, a PPP Act, and an institutional framework for PPPs, the method for evaluating the feasibility, the method for risk management, and the processes of decision making are clear. Now it is required to develop a better business environment to attract private sector investors into the transport sector. It will be also necessary to develop a legal framework to assure appropriate competition between/among existing transport modes, e.g., to assist railway transport by providing subsidies. It will also be necessary to strengthen the legal framework for investment promotion, e.g., through an investment promotion program, export processing zones (EPZ) and special economic zones (SEZ) systems, as these incentive mechanisms are key factors for the private sector in making investment decisions.

In addition to the current legal framework, several issues need to be considered. One is the restriction on the foreign investment equity share. Since the investment incentives in the EPZ and SEZ regulations do not clearly address foreign equity shares, it might be possible for foreign investors to own a 100% share in EPZ or SEZ investments. However, it is recommended that the extent of foreign investment liberalization be clearly stated in the legal framework, since this will be an important factor for the private sector in seeking to reduce investment risks. It is also recommended that conditions regarding land ownership be stated clearly.

For foreign remittances, the investment incentive structure for SEZs defines that only so-called categories B and C assure unconditional transferability of income, dividends, and royalties. However, if it is applied to all business areas including category A, EPZs, and Tanzania Investment Centre (TIC) investment promotion business areas, it will be more attractive for private sector investors.

(3) Alignment with Regional Agreements

While the GOT has been striving to harmonize domestic investment promotion policies with its neighbours through regional agreements, such as those under the EAC, these efforts should be further strengthened. In addition, if any domestic laws/regulations contradict regional agreements, efforts should be made to align the domestic laws/regulations with the regional one(s). The Common Market to be achieved within the EAC aims to enhance regional integration. Many improvements have been materialized through such regional integration, such as the enhancement of direct investment in the region, integration of import duty systems, reduction of customs tariffs, elimination of non-tariff barriers, simplification of import and export procedures, agreements to prevent double taxation, and expedited visa issuance for business purposes. The GOT needs to keep moving forward with the regional integration agenda, and make further efforts to realize investment promotion from the regional countries.

8.3 Fiscal Measures

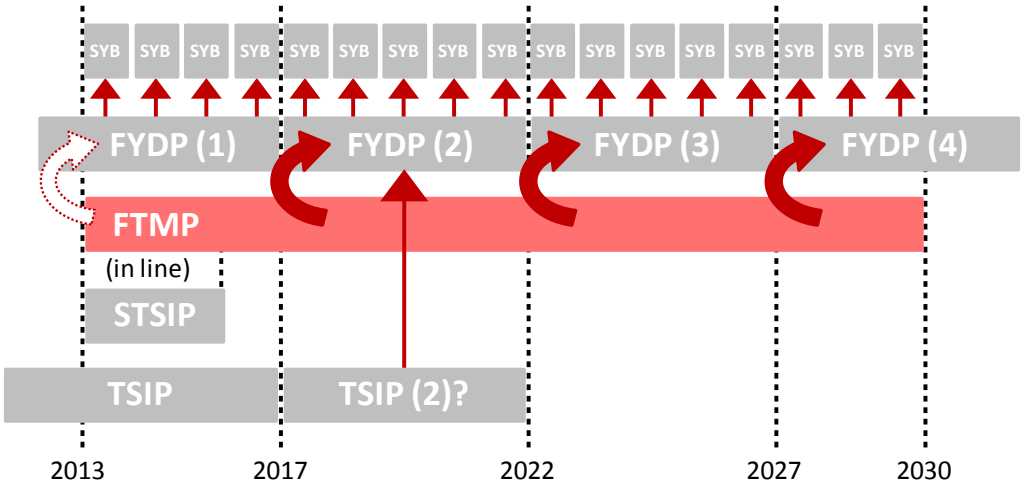
On the fiscal front, remaining inconsistencies between different planning frameworks need to be streamlined. To ensure such consistency, the relevancy of each framework to the budgeting process should be defined more clearly, to avoid any discrepancy or redundancy between/among the frameworks. On the subsector level, funding capability needs to be scrutinized, taking into account revenue-generating capacities. It is also important to improve the efficiency of budgetary execution, as well as to diversify the funding sources through new financing schemes. The general direction over the longer term should be characterized by a greater role of the private sector, as sought by the GOT.

8.3.1 Further Alignment between/among Different Planning Frameworks

As reviewed so far, planning frameworks for resource allocation to the transport sector are not necessarily consistent with each other. Particularly in the context of altering the composition of subsectors (as in the proposed increase in the share of the railway sector), it will become more important to ensure consistency between and among different plans. To make this happen more smoothly, each of the frameworks needs to be assigned a clearer definition of its relevancy to the budgeting process, with a view to avoiding discrepancies between longer-term plans with goals that are too aggressive and annual budgeting under tight fiscal constraints. As sought in Five Year Development Plan (FYDP), it will also be necessary that each of the frameworks be sufficiently flexible to be adjusted in line with ongoing changes in other frameworks.

Specifically, the medium term planning framework can be unified or integrated into the FYDP framework, which should be the sole basis for single-year budgeting. The existing Medium Term Expenditure Framework (MTEF), which is likely to be redundant after the FYDP starts fully functioning, can be eliminated. Also, the role of the Transport Sector Investment Program (TSIP) should change from a standalone investment plan to a more coherent part of the FYDP framework with exactly the same time frame (i.e., five years). The Short Transport Sector Investment Plan (STSIP), as an adjustment tool to bridge between medium term planning and single-year budgeting, can maintain its current role if necessary.

In this new structure, this master plan for the freight transport (or FTMP in Figure 8.1) can serve as a guide for formulating the expenditure plan for the freight part of the transport sector within the FYDP. Even for the current FYDP (FY2011/12–2016/17), the FTMP can provide important inputs on the financing side, which had not been finalized as of May 2012. For the second round of the FYDP (FY2017/18–2022/23) and onwards, the FTMP is expected to play a full role in the planning process.



Abbreviations: FYDP = Five Year Development Plan, FTMP = Freight Transport Master Plan (this master plan), STSIP = Short Transport Sector Investment Plan, SYB = single year budget, and TSIP = Transport Sector Investment Plan
Note: Arrows mean that the information included in the origin framework may be utilized to formulate the destination framework.
Source: JICA Study Team

Figure 8.1: Streamlining the Planning Frameworks

8.3.2 Additional Efforts toward Cost Recovery

As a part of the review of revenue sources, income generation capacity in each subsector needs to be further examined and maximized.

For the ***road*** sector, maintenance relies heavily on the Road Fund, financed through fuel levies (95% of total), transit charges, and overload fees. While the fund is currently under review for further expansion, it is less likely that the expansion will be sufficient to cover development. Another source could be toll revenues from the expressway projects proposed in this master plan. Included in the list are the Dar es Salaam Urban Expressway Network (in the medium-term category) and the National Motorway Network (in the long term category) projects. As also proposed in the FYDP, tapping into the fees related to road licenses, goods/motor vehicle licenses, and vehicle inspection fees (collected through vehicle insurance agencies) can fund development, although the contribution of these measures should be limited.

Similarly, establishment of a ***Railway Fund*** is currently under consideration. A proposal is being finalized by the Reli Asset Holding Company (RAHCO), to be submitted to MOT. The majority of the proposed fund is likely to rely on a transfer from the GOT, which will be followed by a transfer from TPA (in the form of cargo handling charges) and the fuel levy. The pool is likely be used to cover the maintenance of railway tracks and rolling stock. While it is reasonable to tap into available sources from the beneficiaries as a part of the longer-term strategy, immediate and desperate needs for maintenance (particularly those for the rehabilitation of old tracks and rolling stock) have to be, and actually are, in the process of being met by more urgent support from the development partner community.

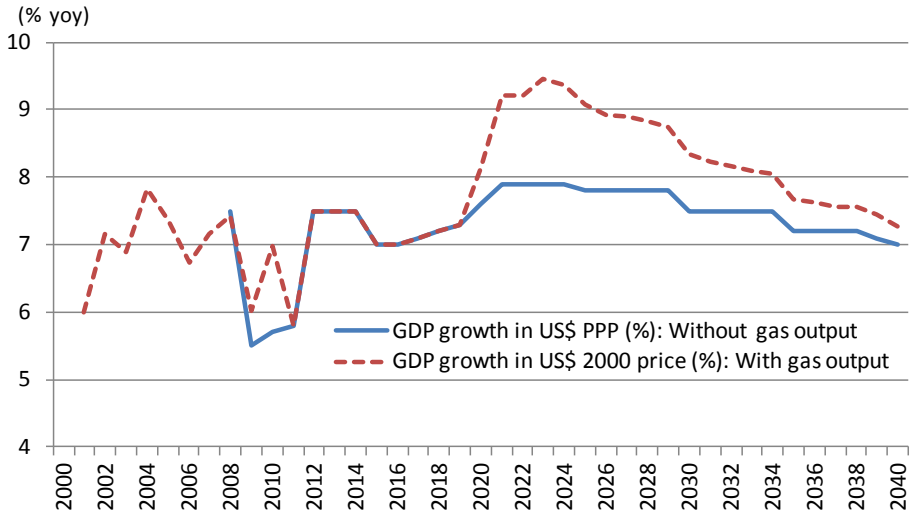
The ***port and aviation*** sectors are more self-sustaining on the back of relatively stable and commercial-based revenue sources, but sources are not unlimited. Regarding airports, for example, user charges and revenues from tenants can support operations, but only for a limited number (of a total of 58 airports) such as Dar es Salaam, Kilimanjaro, and Mwanza, attract a number of passengers beyond the breakeven point. This limitation requires a greater focus on strategic locations, which are sufficiently profitable to support local airports.

In addition, as a common challenge across subsectors, the increase in construction costs needs to be addressed by enhancing transparency in the ***procurement process*** and tighter monitoring of ***budget execution***. Also, efficiency in spending needs to be improved through reducing and streamlining current spending, ensuring timely and appropriate recurrent maintenance of infrastructure, and setting aside a minimum threshold for expenditures for development. As the direction is already proposed in the FYDP, specific action plans need to be included in the budget planning and execution processes.

8.3.3 Diversifying/Expanding Revenue Sources

In order to increase tax revenue, it will be necessary to: (i) cover the activities that are currently not fully captured, such as those in the informal sector, as well as in the natural resource sectors; (ii) remove unnecessary tax exemptions, (iii) monitor the application of tax exemptions more closely; and (iv) improve tax collection efficiency by minimizing loopholes and evasion. Regarding non-tax revenues, royalties from natural resources and the sale of shares or privatization proceeds of state enterprises could be candidate sources over the medium to long term.

Among these, the revenue source with probably the largest impact will be from ***deepwater gas development*** off the coast between Dar es Salaam and Mtwara. The reserve size of the first batch, identified by the British Gas, is conservatively estimated to be 7–10 trillion cubic feet (TCF) to be conservative, and the production is expected to start in FY2019/20, according to the Ministry of Energy and Minerals. This is expected to add USD 2.8 billion/year (in 2010 values) to the central government cash flow at its peak, which would equal half of the overall export from Tanzania and one third of the overall fiscal expenditure of the central government (FY2010/11).[2] Its impact on real GDP growth is shown in Figure 8.2.



Notes: 1. Cash flow numbers are based on Matt Wilks, BG Tanzania, 13 October 2011.
2. In calculating the GDP impact, only the first round effect (i.e., the increase in gas output) has been taken into account.
Source: JICA Study Team

Figure 8.2: Real GDP Impact of Deepwater Gas Production

[2] This has been reflected in the financing forecast detailed in Chapter 9.

With a view to more efficiently sourcing this revenue to the infrastructure projects in line with this master plan, a ***cross-ministry arrangement for revenue management***, such as the Gas Revenue Management Board, is proposed. While the fiscal forecast in Chapter 8 assumes a pro rata allocation of this additional cash flow to keep the fiscal impact even across sectors, it is further recommended that the actual allocation be discussed and coordinated under the FYDP framework. For the smooth operation of this arrangement, this body could be accompanied by a ***fund management function*** (as for a sovereign wealth fund) and a ***monitoring function*** to check if the relevant budget is executed in line with the original allocation plan. Considering the size of the potential impact on the economy, it is also critical to minimize negative side effects (e.g., so-called Dutch disease[3]) through strengthening the ***exchange rate management function***.

8.3.4 Expanding the Financing Sources

In the context of declining availability in development partner funds, especially for General Budget Support, the GOT will be required to identify alternative funding sources. In addition to diversifying the revenue sources as mentioned above, new financing sources will need to be found to sustain overall fiscal capacity.

On the domestic borrowing side, a 3.5% increase in domestic savings is expected in the current FYDP (2011/12–2015/16), creating greater capacity in domestic credit over the next five years. For road sector financing, this could be supported by the Road Fund as collateral for domestic borrowing from financial institutions. As for external borrowing, current market conditions are not favourable due to global credit contraction, but these are expected to turn around over a longer timeframe. Prior to the global financial crisis that began in 2008, there were active discussions in Tanzania about infrastructure bond focusing on the transport sector. The GOT will need to prepare to take advantage of any recovery in market momentum. One shortcut could be a joint regional effort (e.g., under the EAC) to package investments in regional/national infrastructure with a view to improving marketability and liquidity outside of the region.

Under the current difficult credit market conditions as well as depressed development partner financing, PPPs are expected to serve as an alternative financing measure, as detailed in the previous section. The process has just recently started, with the GOT issuing the National Public-Private Partnership Policy in November 2009 and Public-Private Partnership Act No.19 in August 2010. At present, the use of PPPs is constrained to the operation of relatively small existing projects (rather than new investments), due to the limited amount of domestic investment funds and the poor "appetite" of investors abroad. As a longer-term objective, a step-by-step strategy for expanding the investor base needs to be developed.

8.4 Specific Measures

Based on the strategies mentioned above, the necessary measures to take full advantage of the physical infrastructure development can be summarized as follows. These measures are not classified by timeframe as the physical projects, since they do not necessarily fit into the timeline for implementation, or facing the similar fiscal constraints. In other words, they need to be implemented as soon as possible, at least not to hinder the benefit of the project implementation mentioned above.

[3] "Dutch disease" is a concept that explains the apparent relationship between the increase in exploitation of natural resources and a decline in the manufacturing sector. The mechanism is that an increase in revenues from natural resources will make a nation's currency stronger compared to that of other nations, resulting in the nation's other exports becoming more expensive for other countries to buy, making the manufacturing sector less competitive.

(1) Trade Facilitation

- **New system in TRA Customs.** As already scheduled by TRA Customs, replacement of ASYCUDA++ with a New Customs Automated System will be necessary, as it helps restructure the procedure by sharing information nationwide among customs and other regulatory agencies more effectively.
- **Single Window System and the Port Community**. Organizing the Port Community System (PCS) and establishing a National Single Window (NSW) for international trade will be important to streamline the operation of the new customs system. The current scheme focusing on the Dar es Salaam Port needs to be expanded at later stage to other ports, airports, and other borders.
- **Capacity enhancement in related institutions.** In relation to the upgrade of ICT systems, capacity enhancement for the customs officer is important, by fully maximizing the impact of train-the-trainer system under the ongoing JICA project.
- **Standardizing the manifest submission process.** Early transmission and single transmission of manifest is important to eliminate the discrepancy among information utilized. As recommended earlier in this report, the EAC Customs Management Act 2004/2009 should be amended to make it mandatory for Shipping Agents to submit the manifest at least 48 hours prior to vessel arrival.
- **Improving banks' information system for streamlining the payment and settlement.** In order to materialize the commitment of the Tanzania Bankers Association to shorten the time for fund transfer to the Bank of Tanzania (BOT), streamlining the confirmation in the banks' information system will be required.
- **Improving coordination among the regulatory and operational bodies.** Operation of cargo is important for smooth flows for the inspection and take-out. Participation of all stakeholders in the improvement efforts and operational coordination will be critical to ensure smooth implementation.
- **International through B/L.** After the cargo tracking system is in place and security is effectively implemented, GOT should allow consignors to address the B/L to "actual destination through Tanzania".
- **Cross-Border Facilities and OSBPs.** In line with EAC's direction to establish an EAC Act on OSBP, GOT should also improve its border procedures by implementing OSBPs with neighboring countries.

(2) Regulatory Framework for Private Sector Involvement

- **Clarifying the foreign ownership.** Since the investment incentives for EPZs and SEZs do not mention clearly about the foreign ownership of equity share and land, it is recommended that the criteria be explicitly stated in the legal framework, so that the private sector can reduce its investment risks.
- **Expanding the allowance for profit repatriation.** Transferability of income, dividends, and royalties needs to be allowed, not only for the limited category within the incentive framework of SEZ, but in all business areas including category A, EPZ, and TIC investment promotion business areas.
- **Aligning the domestic regulations with the regional agreement.** As part of further promoting regulatory harmonization in line with the EAC, additional effort needs to be made if the GOT finds any conflicts with regional agreements. The GOT also needs to keep pushing regional integration ahead, as well as realizing investments from other the regions.

(3) Fiscal Measures

- **Establishment of an aligned structure for the planning frameworks.** To ensure consistency, the proposed planning frameworks need to be implemented, by replacing those coming to an end with new ones in line with the proposed structure. Also in that process, specific implementation plans for greater transparency in the ***procurement process*** and tighter monitoring of ***budget execution*** should be built into the planning framework.
- **Cost recovery efforts by sector.** For the ***road*** sector, it will be required that the toll revenues from expressway projects (e.g., the Dar es Salaam Urban Expressway Network, the National Motorway Network) be well implemented. In addition, the possibilities of new fees, such as those related to road licenses, goods/motor vehicle licenses, and vehicle inspection fees, should be fully examined and implemented where applicable. For the ***railway*** sector, the currently planned Railway Fund should be fully utilized, at least to finance the operation and maintenance costs.
- **Further scrutiny of tax revenue sources.** Thorough examination will be required to identify taxable activities that are not fully captured, as well as unnecessary tax exemptions for possible elimination. Once these are identified, monitoring procedures need to be further refined for the application of necessary tax exemptions.
- **Revenue management for the deepwater gas development**. As proposed, a cross-ministry arrangement for the revenue management with ***1) fund management function,*** **2)** ***monitoring function,*** and **3)** ***exchange rate management function*** needs to be established as soon as possible.
- **Expanding the Financing Sources.** As additional sources for financing the infrastructure development under this master plan, inter-ministry caucus should be re-established for the possible introduction of infrastructure bond, as well as for accelerating the effort toward packaged investments in regional/national infrastructure.

8.5 Planning Capacity Improvement: A Proposal for Establishing Institute of Transport and Trade System Development

This JICA study has sought to analyze and identify a set of strategies and projects for development of the national transport and trade system especially from the viewpoints of intermodal and interregional linkages. It is critically important to strengthen the capacity of the country to analyze and plan for the national transport and trade systems on a continuous basis. To this end, the JICA Study Team proposed establishing an institute specialized in transport and trade system development, tentatively named the Institute of Transport and Trade System Development (ITTSD). Policies, including those for transport and trade system development, could effectively be prepared, monitored, and revised based on a reliable and sustainable database. To date, such a database has been available, but only to a limited extent on a mode-by-mode basis. The current database is insufficient particularly in the following respects:

- Volumes of domestic and international/cross-border freight on annual basis, by origin and destination, by commodity group and by mode of transport;
- Information on the cost and time required for transporting, storing, and loading/unloading in the whole process from production centers to consumption centers, with special reference to commodities/commodity groups of national economic importance;
- Inventories of transporters, forwarders, and other relevant businesses involved in transport and trade systems at the local, regional, national, and international levels; and

- Practical methods to estimate the flows/volume of freight between/among regions in Tanzania as well as between Tanzania and surrounding countries, given the limited availability of reliable data.

Therefore, the JICA Study Team proposes to set up an ITTSD with the following objectives:

1. Continuous building and updating of a nationwide database on transport and trade systems;
2. Conducting survey research and consultancies to make and revise policies and plans in the transport and trade systems.
3. Providing training in transport and trade systems for the officials, experts, and managers of government organizations at both the national and district levels, as well as of public enterprises and private companies.

The study team recommends that the ITTSD be initiated by the Ministry of Transport (MOT) because of its mandate. ITTSD may need participation by other relevant organizations such as:

- Dar es Salaam University;
- East African Trade and Transport Authority;
- Ministry for Agriculture, Food Security and Cooperatives;
- Ministry for Energy and Mineral Resources;
- Ministry for Industries and Trade;
- Ministry for Works;
- Planning Commission, President's Office;
- Reli Assets Holding Company;
- Surface and Maritime Transport Regulatory Authority;
- Tanzania & Zambia Railway Authority;
- Tanzania Civil Aviation Authority;
- Tanzania National Roads Agency;
- Tanzania Port Authority;
- Tanzania Railway Limited; and
- Tanzania Revenue Authority.

ITTSD may comprise three major units for:

- Database development;
- Policy analysis and planning; and
- Training

ITTSD should be financially supported by MOT and other participating government organizations as well as by private enterprises that may be interested in the activities and information offered by ITTSD. International development partners will also be important in providing financial and technical support. ITTSD should be encouraged to secure its own revenue through research and consultancy activities in relevant fields.

Chapter 9 Master Plan Projects and Priorities

9.1 Plan Summary

9.1.1 Structure

This chapter sets out the package of projects included in the Master Plan and explains project priorities.

A summary of the entire plan is presented, in terms of budgetary requirements classified by the transport sector and planning period, i.e., short term (2013–2017), medium term (2018–2022), and long term (2023–2030).

Project descriptions follow by project and sector, in the following order: the port sector (sea and lake), the road sector, the railway sector, air transport and pipelines, institutional development, and environmental protection. Some 20 items associated with each project (e.g., contents, implementation, effects) are presented in a uniform format to facilitate easy understanding and comparison.

Each of the projects was set against a number of evaluation criteria not only to assess their economic worth but also to assess social desirability so that the relative priority of each project can be determined.

For those projects selected for early implementation within the short-term period of 2013–2017, an action plan is provided.

9.1.2 Funding Requirements by Sector and Time Period

The development expenditures for the projects included in this Master Plan are summarized below, by sector and timeframe. The road sector has the largest share in all time frames, followed by the railway and the port sectors. While the share of the port sector to overall expenditure peaks in the midterm, that of the railway sector will be largest in the long term, implying that the greater part of the outlays for the railway sector are expected after the impact of the temporary rehabilitation wanes. Investments in airports/air transport are rather limited, compared to the above three sectors, with the majority of outlays in the short and medium term. Outlays for pipelines were not included in the subtotal since most of these investments are likely to be made by the private sector.

The development expenditure for the entire master plan totals Tsh 28,934 billion (excluding the pipeline sector), with 21.6%, 31.3%, and 47.0% shares for the short, medium, and long term, respectively. The data is presented in tabular form in Table 9.1.

Table 9.1: Development Expenditure by Sector and Timeframe (2012/13–2029/30)

(1US$ = 1,580Tsh)

Sector	Short Term			Mid Term			Long Term			Total		
	(US$ mil.)	(Tsh bill.)	(%)	(US$ mil.)	(Tsh bill.)	(%)	(US$ mil.)	(Tsh bill.)	(%)	(US$ mil.)	(Tsh bill.)	(%)
Port	854	1,349	21.8	2,263	3,575	57.8	801	1,266	20.5	3,918	6,190	100
	21.6			39.4			9.3			21.4		
Road	2,711	4,283	20.1	3,171	5,009	23.6	7,577	11,971	56.3	13,458	21,263	100
	68.4			55.3			87.9			73.5		
Rail	374	591	41.3	293	463	32.4	238	376	26.3	905	1,430	100
	9.4			5.1			2.8			4.9		
Airport/ Air Transport	22	35	68.8	10	16	31.3	0	0	0.0	32	51	100
	0.6			0.2			0.0			0.2		
(Sub Total)	3,960	6,257	21.6	5,736	9,063	31.3	8,616	13,613	47.0	18,313	28,934	100
(%)	100	(Short)		100	(Mid)		100	(Long)		100	(Total)	
Rail(*)	0	0	0.0	0	0	0.0	2,100	3,318	100	2,100	3,318	100
Pipeline	0	0	0.0	4,388	6,932	38.5	7,020	11,092	61.5	11,408	18,025	100

Notes: 1. (*) Includes a construction of a new railway between Isaka and Kigali with a branch line from Keza to Musongati.
2. Construction of a new railway line between Arusha and Musoma is not included.

Source: JICA Study Team

In the estimation of the JICA Study Team, expenditures (both development and recurrent) can be sufficiently financed through: (i) government revenue, (ii) external debt, (iii) development partner support, and (iv) private sector participation. In estimating the overall funding structure, the following simplifications were adopted as basic assumptions. All figures have been calculated in nominal terms, based on the JICA Study Team's inflation projections.[1]

- Expenditures
  - For **development expenditures**, outlays will be evenly allocated over five years for the short- and medium-term projects, and over eight years for the long-term projects.
  - For **recurrent expenditures**, outlays for the existing infrastructure were assumed to be flat for the whole period (i.e., up to FY2029/30), whereas those for the new developments were calculated as a fixed proportion (23.0%) of development expenditures.

- Revenues
  - **Tax Revenues** were assumed to grow in parallel with nominal GDP, with a fixed margin on top of the GDP growth rate (for the mid-case scenario, using the growth rate between the upside and downside scenarios assumed in the demand forecasts).
  - **Other Government Revenues** were assumed to grow in parallel with nominal GDP.
  - **Donor (Development Partner) Funds** were assumed to grow at a declining rate with a recent one (18.8% year-on-year in FY2010/11) as the peak.
  - **Other Sources**, including the private sector, were expected to increase at an increasing rate year on year, starting from the average growth rate (24.5% year-on-year) over the past six years.

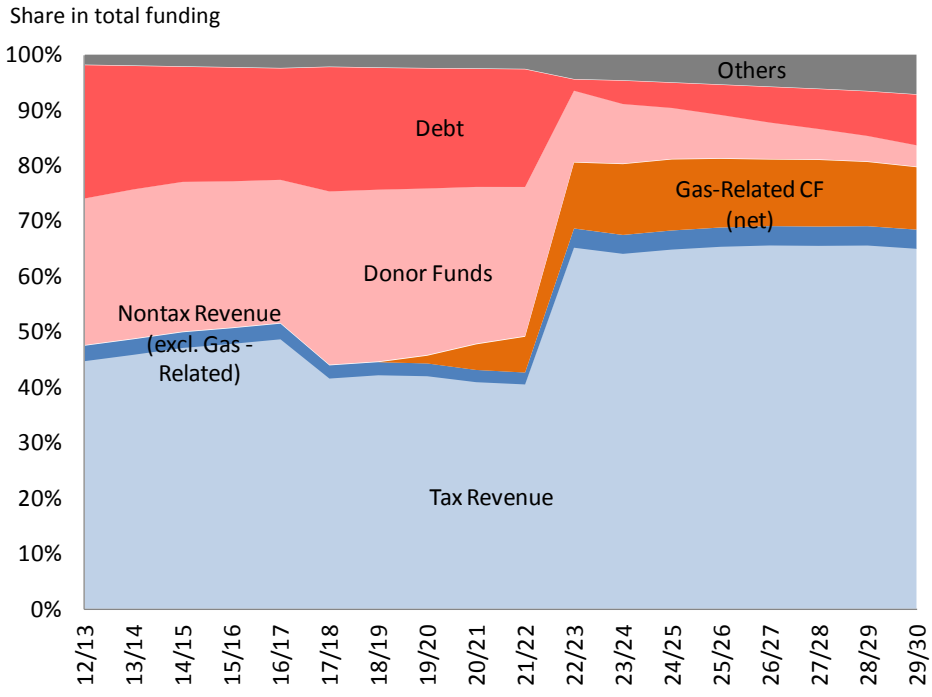
[1] Basing the assumption on the average consumer price index (CPI) inflation for the past seven years (7.6% p.a.), the impact of deep water gas development (with production starting in FY2019/20) has been added, assuming the sensitivity of the prices to the natural resource development in cross-national comparisons.

- Separately from "other sources", **Gas-Related Cash Flows** were added to the revenue side. The forecast numbers were based on an estimation by British Gas, which was made available at the Tanzania Mining and Energy Conference andExhibition in October 2011.[2] The numbers were reviewed and verified by the Ministry of Energy and Minerals, Tanzania, with "about 90% of probability."
- **Debts** (both domestic and external) were calculated as residuals to finance the gap between the total expenditure and the sum of the above financings.

- In this estimation, it was also assumed that the share of the transport sector to overall government expenditures would be in line with that of the recent average (around 11%), although there is fluctuation in the share depending on the variation in development expenditures. The average share of the transport sector for FY2012/13–29/30, as a result of above calculation, is 9.7%, which is lower and more conservative than the past average.

The summary result of this fiscal simulation is shown below, in the form of funding structure for the transport sector (in percentage terms to the overall funding).

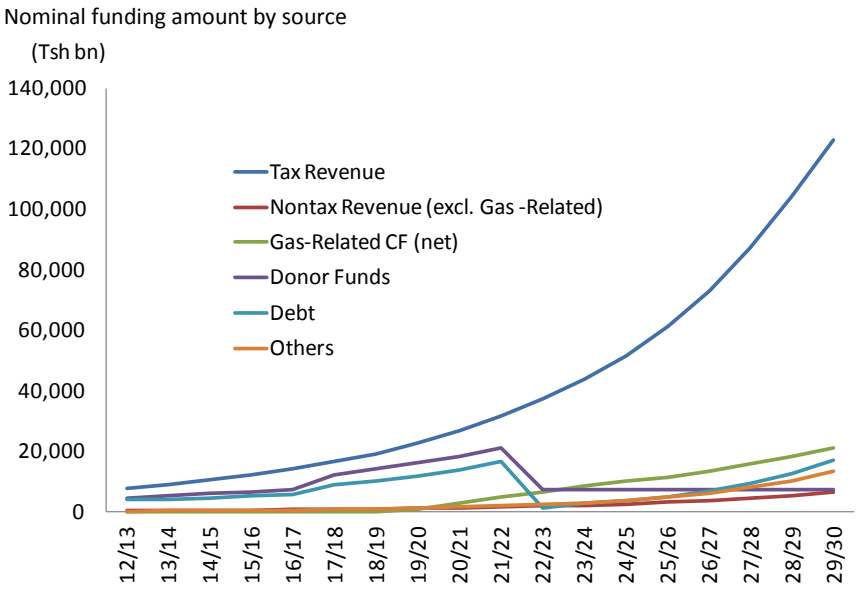
Figures 9.1 and 9.2 summarize the funding structure for the transport sector in the country, and the actual funding amounts by source, respectively.



Source: JICA Study Team

Figure 9.1: Funding Structure for the Transport Sector in Tanzania (2012/13–29/30)

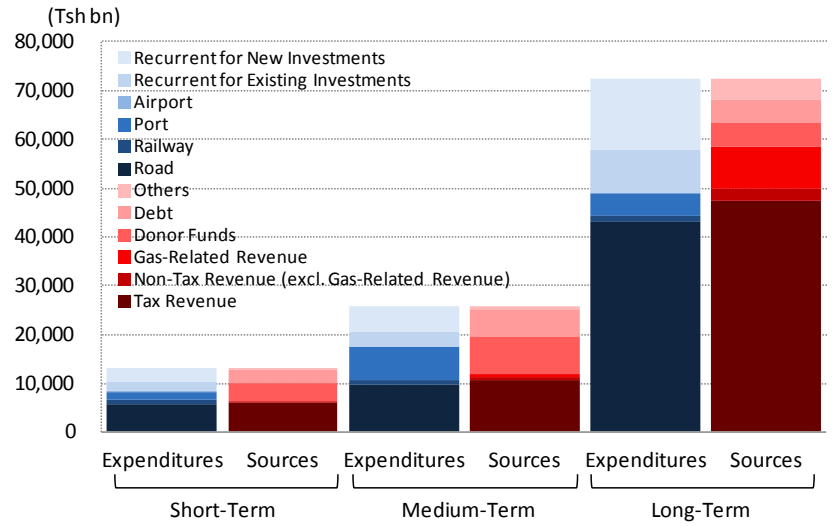
[2] Matt Wilks, BG Tanzania, October 13, 2011.



Source: JICA Study Team

Figure 9.2: Funding Projection for the Transport Sector in Tanzania (2012/13–29/30)

Assuming the revenue stream mentioned above, it was confirmed that the infrastructure projects proposed in this master plan can be sufficiently financed. It would be so, even under a declining share in development partner funding as well as debt financing. The big contributors to this result are: (i) the increase in government revenue (especially tax revenue) due to the assumed sustainable economic growth, (ii) gas-related revenues that should play an important role beginning in FY2019/20, and (iii) a greater presence of the private sector, which is reflected in the "others" category in the graph. Breakdown by term (short, medium, and long) with sector composition is shown in Figure 9.3.



Note: The aggregate numbers do not necessarily match those in Table 9.1 since the inflation factor was applied in Table 9.1.
Source: JICA Study Team

Figure 9.3: Funding Projection for the Transport Sector in Tanzania, Breakdown by Term (2012/13–29/30)

9.2 Strategic Environmental Assessment

9.2.1 General

In Tanzania, all master plan development studies must conduct a strategic environmental assessment (SEA), based on the SEA Law, and obtain approval of the Department of Environment (DoE), Vice-President's Office (VPO), United Republic of Tanzania. Master plan studies without such official approval cannot be regarded as official national development plans and/or strategies.

The SEA studies required for all master plan studies are similar to those conducted by the World Bank, but the required SEA studies require stakeholder meetings and all official SEA studies must be conducted by SEA consultants registered by the National Environment Management Council (NEMC).

Therefore, in order to have a successful SEA study for this comprehensive transport and trade master plan development study, it is essential to select a registered SEA consulting firm and develop an appropriate terms of reference (ToR) for the SEA study with an estimated level of tasks and workload. Accordingly, this study has drafted a ToR for the required SEA study based on a series of discussions with VPO, the Ministry of Transport (MOT), the Ministry of Agriculture, and NEMC.

9.2.2 Major SEA Task Components

Study Outline

The outline of an SEA study was developed through a series of discussions with DoE, VPO of Tanzania, following the Environmental Management Act (CAP. 191), published on 5 September 2008 (see Box 1).

Box 1: Outline of SEA, Specified by SEA Law (CAP. 191) of Tanzania

(1) Screening
(2) Scoping
(3) ToR Development
(4) Identification of Alternatives and Impact Assessment
(5) Stakeholder Analysis
(6) Institutional Analysis
(7) Stakeholder Consultation and Inter-Sectoral Co-ordination
(8) Preparation of SEA Report
(9) Consultation and Participation
(10) Revision of SEA Report and Preparation of Final Report
(11) Approval of SEA Final Report
(12) Monitoring of significant environmental impacts of implementation of a bill, regulation, policy, strategy, program, or plan

Source: Compiled from the SEA Law by the JICA Study Team

Box 2 summarizes the suggested table of contents, to be used for the main report of an SEA study.

Box 2 Suggested Table of Contents for an SEA Report

1. Background

2. Legal and Institutional Safeguard Framework

2.1 International Law and Treaties
2.2 Safeguard Policies of International Financial Institutions
2.2.1 JICA Guidelines for Environmental and Social Considerations (the new Guidelines, April 2010)
2.2.2 World Bank Safeguard Policies
2.2.3 African Development Bank Safeguard Policies
2.3 National Safeguard System
2.3.1 Legal Framework
2.3.2 Institutional Framework
2.4 EIA/IEE Process
2.4.1 Comprehensiveness of Legal Framework
2.4.2 Implementation Capacity
2.5 Consultation and Public Involvement
2.5.1 Consultation with Project Affected People
2.5.2 Involvement of Other Stakeholders
2.5.3 Civil Society Development
2.6 Vulnerable Groups and Cultural Integrity
2.7 Development Opportunities and Benefits

3. SEA Experience in Tanzania

4. Master Plan Outline

4.1 Port and Maritime Sector
4.2 Railway Sector
4.3 Road Sector
4.4 Pipeline Sector
4.5 Aviation Sector

5. Baseline Situation

5.1 National and Regional Key Issues
5.2 Descriptions of Area of Concerns

6. Environmental and Social Impacts

6.1 Generic Description of Potential Impacts
6.2 Summary of Environmental and Social Impacts of Planned Projects

7. Alternative Trade and Logistics Systems

8. Stakeholder Analysis

9. Institutional Analysis

10. Recommendations for Mitigation, Management, and Training

10.1 Introduction
10.2 Mitigation and Compensation Related to Construction and Operation
10.3 Compensatory Development and Management Programs
10.4 Initiatives for Nationwide Environmental Management
10.5 Planning and Assessment of Comprehensive Trade and Transport System
10.6 Training and Capacity Building
10.6.1 Funding Mechanisms
10.6.2 Capacity Building
10.6.3 Training Methods
10.7 Summary of Recommendations

11. Environmental and Social Monitoring

11.1 Introduction
11.2 Monitoring to Establish Baseline
11.3 Monitoring Construction Activities and Compensation Measures
11.4 Long term Environmental and Social Monitoring

Abbreviations: EIA = environmental impact assessment, IEE = initialenvironmental examination, JICA = Japan International Cooperation Agency
Source: JICA Study Team

Stakeholder Meetings

The stakeholder process, to be incorporated within the SEA study of this master planning study, consists of two parts: (i) a stakeholder meeting attended by the government officials; and (ii) a stakeholder meeting attended by all stakeholders including community people. The main reason to have a meeting attended by all stakeholders is to collect opinions/comments and/or questions from all stakeholders as much as possible in order to feed them back into project development while establishing a project consensus among all stakeholders. The SEA study, required by the SEA Law of Tanzania, takes time but enables establishment of long-term development policies, strategies and/or programs with almost unanimous agreement among stakeholders. The exact number of stakeholder meetings is to be determined based on discussions with DoE, VPO, and the finalized master plan.

The stakeholder meetings, to be conducted within this SEA, will consist of at least the following two meetings: (i) a "brainstorming" meeting, and (ii) a draft final review meeting. Table 9.2 summarizes key issues to be discussed within this stakeholder meeting process. As mentioned earlier, the entire stakeholder meeting framework, as required by the SEA Law of Tanzania, will be developed later.

Table 9.2: Core Parts of SEA Stakeholder Meetings

	Purpose
"Brainstorming" Meeting	The purpose of the meeting is to focus the study by identifying the main issues for analysis and discussion. • Clarification of Lead Agency • Clarification of Entire Process and Schedule • Clarification of Scope • Policy and Institutional Issues Logistics Planning • Assessment of Baseline Situation and Environmental Impacts • Consultation • Source of Information for the Study
Draft Final Report Review Meeting	The Ministry of Transport representative is to present the background and purpose of this master planning study and the selected consultant to give a presentation of the master plan outline and major findings of the study. All participants are to be asked to give their comments or ask questions for clarification of the report.

Source: JICA Study Team

Stakeholder Analysis

Key stakeholders within this transport and trade master plan study, are to be identified. Special focus will be on the most vulnerable and disadvantaged groups, and those groups who might oppose the reforms proposed in this transport and trade master plan (goals, reason for opposition, behaviour, interests). The analysis will be complemented with a discussion of the interests and

incentives underlying key stakeholders' behaviours. Therefore, the stakeholder analysis will identify potential winners and losers and tensions or conflicts between them as a result of the implementation of the master plan. These discussions will be summarized within the relevant section of the main report (e.g., Stakeholder Analysis, based on the suggested ToR).

Institutional Analysis

Strong institutions have increasingly been recognized as critical contributors to sustainable development, particularly in relation to (i) identifying needs and problems, (ii) balancing interests, and (iii) implementing solutions. The SEA will examine how the different groups identify environmental and social priorities, interact to balance the interests of different stakeholders and sectoral agencies, and implement sustainable solutions. These groups include the judiciary, trade, transport, environmental, development, social protection, and civil society institutions (representing the key private stakeholders' interests) as well as vulnerable groups and providers of transport services.

9.3 Evaluation

9.3.1 Methodology

When a decision regarding the implementation order of projects has to be made, it is beneficial to have a system that ranks projects in terms of their relative importance. For that purpose, a basic, yet effective method was devised in this Study. The system makes use of a multi-dimensional evaluation process in which the economic impact and the social/environmental impact of a project are separately assessed. The evaluation process takes into account the fact that it is easy to attach value to economic impacts but social/environmental impacts are difficult to unitize. They may vary from one project to another or differ among projects based on their urban and rural background (this is one of the reasons why political process is necessary in decision making). Consequently, these two aspects were assessed separately.

In this evaluation process, quantitative indicators were used to compare the relative significance of projects over multiple sectors. Scores were aggregated separately for economic impact and social/environmental impact. The scores were expressed visually as dots on a scatter diagram with the economic impact on one axis and social/environmental impact on the other axis. This diagram also shows information on investment size and the sector of the projects in order to identify effective combinations of the projects.

This evaluation process was applied to all the suggested projects in every sector (except for those in the pipeline and trade facilitation categories) with three different timeframes (short, medium, and long term).

9.3.2 Indicators

Two groups of indicators were examined in this analysis: (i) economic impact and (ii) social impact. Scores for these impacts were converted into standardized values in order to compare different indicators on a unified scale using the following formula:

$$Score_i = (X_i - x_i) / s_i$$

Where X: original data value, x: sample mean, s: sample standard deviation and i: *economic* and s*ocial*.

In this way, a score for each project, shown along the axes, was determined based on the distance from point zero, which is the average of all projects. All projects can be plotted on an X-Y plane according to their scores, relative to the average project value.

The score for the economic impact was calculated as a sum of standardized values of efficiency score and future demand of freight transport:

$$X_{economic} = Efficiency\ Score\ [standardized\ value] + Demand\ Score\ [standardized\ value]$$

In this analysis, efficiency score was defined as annual total transport cost reduction divided by total investment cost. Total transport cost is the sum of travel time cost and operating cost. Approximate estimations of these cost reductions were provided by each sector expert.

$$Efficiency\ Score_i = (Time\ Cost\ Reduction + Operating\ Cost\ Reduction) / Investment$$

The score for social/environmental impact consists of scores for social impact and environmental impact. Social impact score was represented as the standardized value of the population living in poverty in adjacent regions where the project is to be undertaken; it represents potential poverty reduction expected from the project.

$$X_{social} = Social\ Score\ [standardized\ value] + Environment\ Score\ [standardized\ value]$$

The above indicators are summarized in Table 9.3.

Table 9.3: Indicators for Project Evaluation

Category/Criteria			Description
A.	Economic Impact		(A1.) + (A2.) *
	A1.	Efficiency Score	((i.) + (ii.)) / (iii.)
		i. Time Cost Reduction	Estimation based on assumed travel time reduction (USD/year)
		ii. Operating Cost Reduction	Estimation based on assumed cost reduction in transport (USD/year)
		iii. Total Investment Amount	Based on planned amount (USD)
	A2.	Demand Score	(iv) *
		iv. Future Freight Demand	Based on forecast (tonnes/year)
B.	Social/Environmental Impact		(B1.) + (B2.) *
	B1.	Social Score	(v.) *
		v. Poverty Reduction Potential	Total number of persons living in poverty in regions around project site/section (persons)
	B2.	Environment Score	(vi.) *
		vi. Environmental Impact	Qualitative evaluation (1: very big negative impact ~ 5: no negative impact)

* Summation of standardized scores

9.3.3 Evaluation

Evaluation covers the candidate projects listed in Table 9.5 to 9.7. Following the above methodology, scores for the projects were calculated and illustrated on two dimensional graphs (Figure 9.4 to 9.6) according to the target timeframe. These figures indicate economic impact on the vertical axis, social impact on the horizontal axis, investment amount by the bubble size, and sector by the bubble colour (see Table 9.4). Attributes and evaluation scores of all the projects used in the evaluation process are shown in Appendix 11-3.

Table 9.4: Keys in Evaluation Graphs

Key	Description	Unit
Vertical Axis	Economic Impact	Standardized value (*)
Horizontal Axis	Social/Environmental Impact	Standardized value (*)
Bubble Size	Investment Amount	Million USD
Bubble Colour	Sector	Air, Inland port, Seaport, Road, Railway

(*) Scales for the standardized values are adjusted so that the scores represent the relative positions between 1 and 5.
Source: JICA Study Team

(1) Short Term

Port Sector

In the short term, "new berths development and dredging of Dar es Salaam Port" (Project No. 6) has high economic impact. However, its social benefit is low compared to other projects due to the limited potential for poverty reduction in the Dar es Salaam area. Two small-scale lake port projects (No. 4 and 5) have high scores in terms of both economic and social impacts. Although the Kisarawe Inland Clearance Depot (ICD)(No. 7) did not receive high evaluation scores both in economic and social/environmental terms, the project is expected to supplement and enhance the impact of Dar es Salaam Port development.

Road Sector

Road projects inside and around Dar es Salaam (No. 8, 9, 15, and 16) were scored high in economic impact due to the high transport demand in the area. The social impact of these projects was evaluated relatively low because of the low level of poverty among the population living in the area. These roads are expected to produce synergistic impacts, since they are part of multiple corridors (Central, Dar es Salaam, and Coastal) and connect to Dar es Salaam Port.

Rail Sector

"Rehabilitation and improvement of track and rolling stock of TRL" (No. 18) has the highest economic and social impact with a relatively low investment amount. This project would be more beneficial if it is implemented with "rehabilitation and improvement of track and bridges of TRL" (No. 17), as an improved TRL line would make Kigoma Port more attractive by linking it with Dar es Salaam Port. The economic impact of the TAZARA line (No. 19) also received a high evaluation score.

Airport/Air Transport

The economic impact of projects related to air transport is generally low due to the limited freight volume compared with that of other modes.[3]

(2) Medium Term

Port Sector

Among the medium-term projects, high economic impact is expected from "development of new port at Mbegani Bagamoyo" (No. 3); however, its social impact score is low, which needs to be addressed. "Kasanga Port development" (No. 2) is a small-scale project, in terms of investment size, but high economic and social impacts can be expected. Meanwhile, the scores for other seaports are low, due to the relatively low demand expected per investment amount.

[3] It is noted that this master planning study was focused on freight transport. That said, it is recognized that passenger transport is of greater importance in the aviation sector.

Road Sector

The "Ubungo-Nelson Mandela Flyover" (No. 12) has a high economic impact, since it would facilitate access from/to Dar es Salaam Port and would ease traffic congestion in the city. The economic impact of the "Chalinze-Morogoro Road" (No. 6) ranks the highest after that. This road section is a part of Central and Dar es Salaam corridors and is expected to benefit from the large volume of freight transiting through the section.

Rail Sector

As it is for the medium term projects evaluation, "rehabilitation and improvement of track and rolling stock of TRL" (No. 14) has the highest economic and social impact with a relatively low investment amount. This project would be more beneficial if implemented with "rehabilitation and improvement of track and bridges of TRL" (No. 13).

Airport/Air Transport

The economic impact of the suggested projects would be relatively low due to the limited freight volume compared to that of other modes.

(3) Long Term

Port Sector

Among the long-term projects, high economic impact is expected from "development of new port at Mbegani Bagamoyo" (No. 3), similar to the result of medium-term evaluation.

Road Sector

Road projects inside and around Dar es Salaam were scored high in terms of economic impact due to the high demand for transport in the area. Expressway projects would facilitate speedy freight transport from/to the surrounding areas. In particular, "Bagamoyo Expressway" (No. 8) would enhance competitiveness of the newly developed Bagamoyo Port. Projects No. 11 to 13 are on a continuous route as part of the Central and Dar es Salaam Corridors. Integrated development of this route will facilitate fast and reliable freight transport along these corridors.

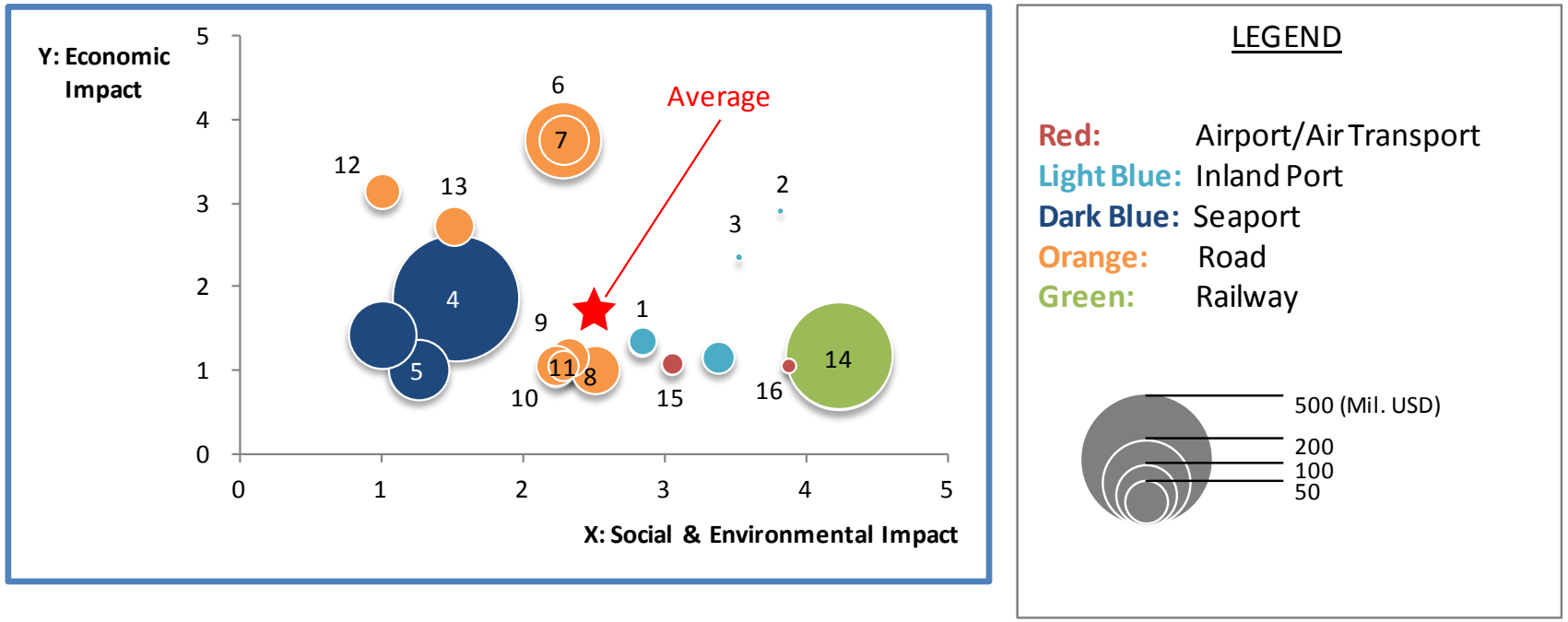
Rail Sector

"Rehabilitation and improvement of track and rolling stock of TRL" (No. 16) has high economic and social impact with a low investment amount. This project would be more beneficial if implemented with "rehabilitation and improvement of track and bridges of TRL" (No. 15). The impact of this new line construction would be relatively low, in spite of the large investment amount.

Table 9.5: Short-Term Candidate Projects

Sector	No.	Project Name	Corridor								
			1	2	3	4	5	6	7	8	9
Air	15	JNIA Cargo Terminal Development	✓	✓			✓				
	16	Mwanza Airport Cargo Terminal Development	✓						✓		
Inland Port	1	Refurbishment of Container Terminal for Kigoma Port	✓							✓	
	2	Community Service Project: Six Cluster Ports on Tanganyika and Kiwira on Nyasa	✓								
	3	Kasanga Port Development Phase I								✓	
Seaport	4	Development of New Container Terminal Berths 13 and14; Inclusive of dredging of Dar es Salaam Port entrance channel	✓	✓			✓				
	5	Establishment of cargo freight station (ICD) at Kisarawe	✓	✓							
Road	6	Kimara-Chalinze (94 km, Morogoro Rd. To be widened to 4-lane from existing 2-lane)	✓	✓							
	7	Widening of the Bagamoyo Road (Wazo Hill – Bagamoyo, about 40km)					✓				
	8	Kibaoni (Kizi)–Mpanda (95 km)								✓	
	9	Kidahwe–Kanyani–Kasulu (62 km)								✓	
	10	Mbinga–Mbamba Bay (66 km)				✓					
	11	Bagamoyo–Mlandizi (37 km)					✓				
	12	Outer Ring Road (Part1, 10 km)	✓	✓			✓				
	13	Ubungo–Nelson Mandela Flyover	✓	✓			✓				
Railway	14	Rehabilitation/improvement of track and bridges, Procurement of 6 new locomotives and 90 units of rolling stock, rehabilitation of 9 locomotives, procurement of spare parts, etc.	✓	✓							

Corridor: 1) Central, 2) Dar es Salaam, 3) Tanga, 4) Mtwara, 5) Coastal, 6) Namanga, 7) Sirari, 8) Sumbawanga, 9) Tan-Moz
Source: JICA Study Team



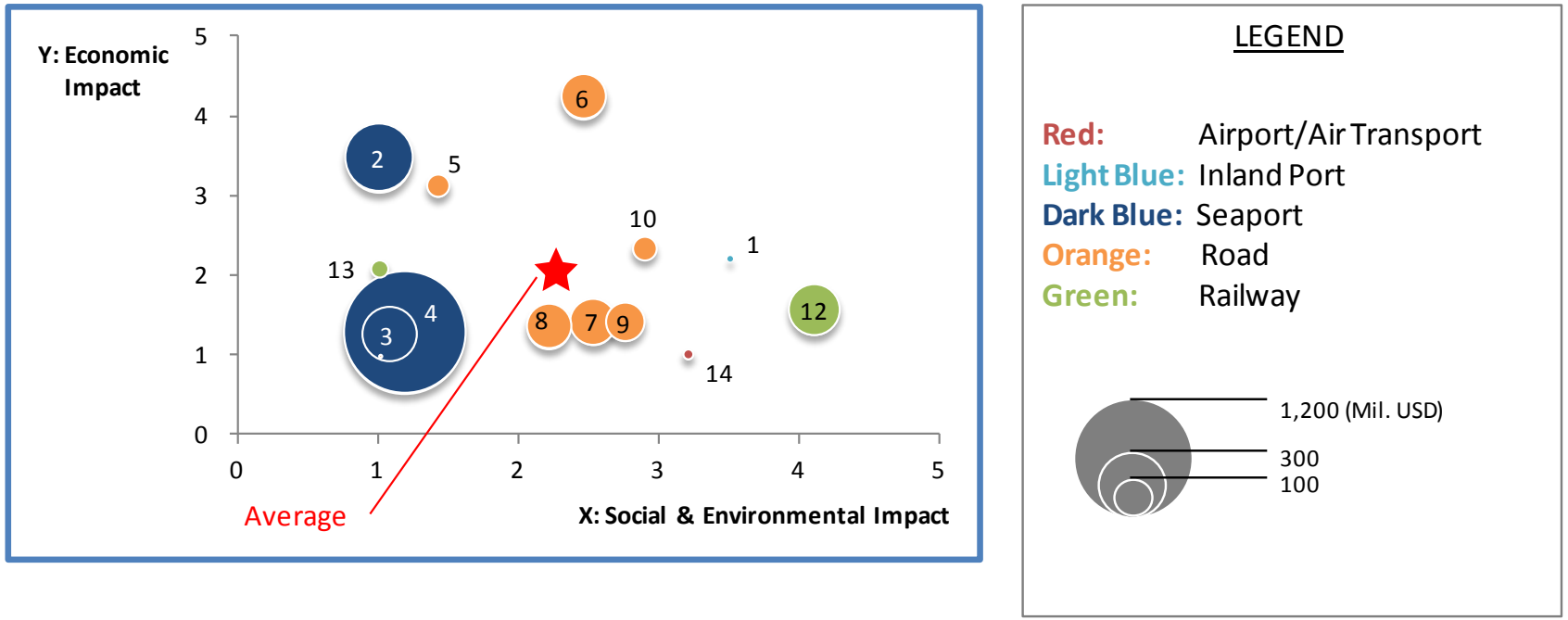
Note: Scales for the standardized values were adjusted so that the scores represent the relative positions between 1 and 5. The average score for all projects is shown with a star.
Source: JICA Study Team

Figure 9.4: Short-Term Project Evaluation Results

Table 9.6: Medium-Term Candidate Projects

Sector	No.	Project Name	Corridor								
			1	2	3	4	5	6	7	8	9
Air	14	KIA Cargo Terminal Development			✓						
Inland Port	2	Kasanga Port Development Phase II								✓	
Seaport	3	Development of New Port at Mbegani Bagamoyo					✓				
	4	Development of new deep water port at Mwambani Tanga			✓						
	5	Expansion of Mtwara Port				✓	✓				
Road	6	Chalinze–Morogoro (100 km)	✓	✓							
	7	Kibaoni–Mpanda–Kanyani (269 km)								✓	
	8	Kigoma (Kidahwe)–Nyakanazi (248 km)								✓	
	9	Kidahwe–Ilunde–Malagarasi–Kaliua (188 km)	✓								
	10	Manyoni–Itigi–Tabora Road (71 km)	✓								
	11	Ubungo–Nelson Mandela Flyover	✓	✓			✓				
	12	Outer Ring Road (Part 2, 20 km)	✓	✓			✓				
Railway	12	Rehabilitation/improvement of track and bridges	✓								
	13	New construction/expansion (Bagamoyo port connection)					✓				

Corridor: 1) Central, 2) Dar es Salaam, 3) Tanga, 4) Mtwara, 5) Coastal, 6) Namanga, 7) Sirari, 8) Sumbawanga, 9) Tan-Moz
Source: JICA Study Team



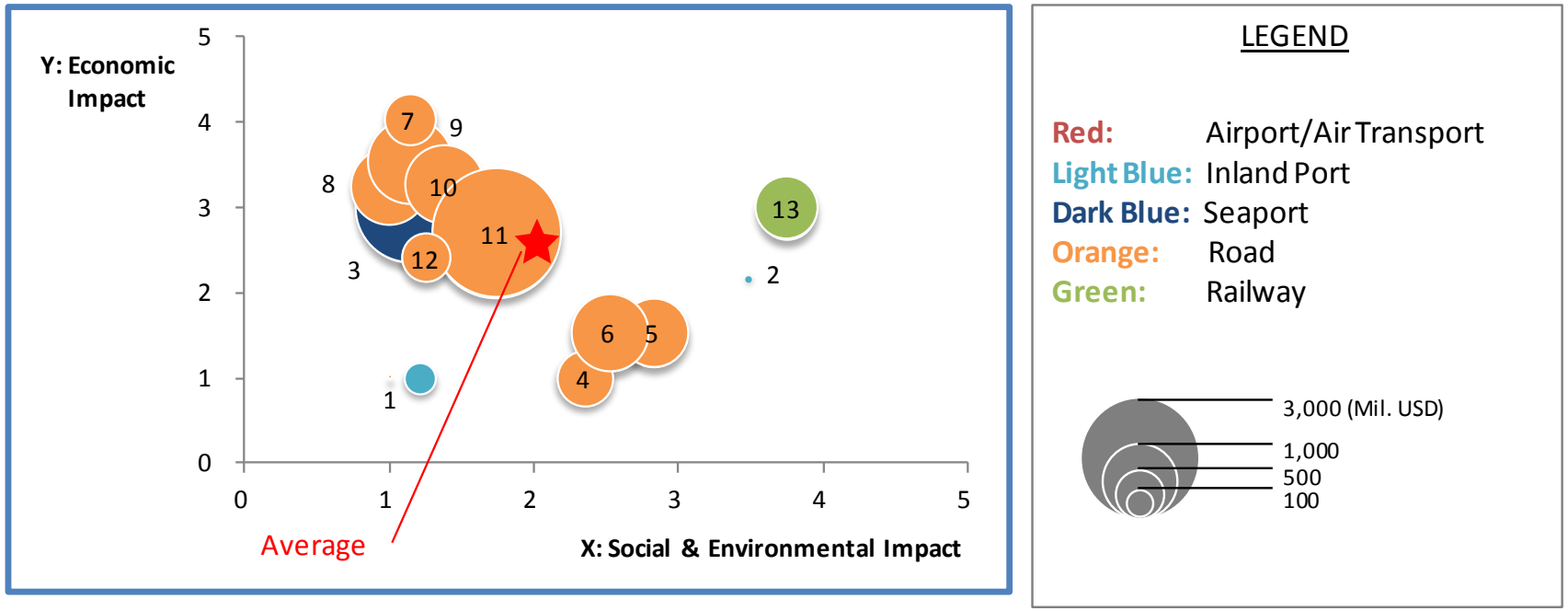
Note: Scales for the standardized values were adjusted so that the scores represent the relative positions between 1 and 5. The average score for all projects is shown with a star.
Source: JICA Study Team

Figure 9.5: Medium-Term Project Evaluation Results

Table 9.7: Long-Term Candidate Projects

Sector	No.	Project Name	Corridor								
			1	2	3	4	5	6	7	8	9
Inland Port	1	Container Terminal Development at Musoma Port			✓				✓		
	2	Kasanga Port Development Phase III								✓	
Seaport	3	Development of new port at Mbegani Bagamoyo					✓				
Road	4	Kasulo–Rusumo and Bugene–Murongo Bugene–Kikagati Roads (236 km)								✓	
	5	Tabora–Koga–Mpanda Road (359 km)									
	6	Chunya–Rungwa–Itigi–Mkiwa road (413 km)									
	7	Bagamoyo Expressway (40 km)					✓				
	8	Urban Expressway (59 km)	✓	✓			✓				
	9	Expwy Dar es Salaam–Chalinze (100 km)	✓	✓							
	10	Expwy Chalinze–Morogoro (90 km)	✓	✓							
	11	Expwy Morogoro–Dodoma (255 km)	✓								
	12	Arusha–Moshi–Himo Junction Dual Carriageway (105 km)			✓						
Railway	13	Rehabilitation/improvement of track and bridges	✓								

Corridor: 1) Central, 2) Dar es Salaam, 3) Tanga, 4) Mtwara, 5) Coastal, 6) Namanga, 7) Sirari, 8) Sumbawanga, 9) Tan-Moz
Source: JICA Study Team



Note: Scales for the standardized values were adjusted so that the scores represent the relative positions between 1 and 5. The average score for all projects is shown with a star.
Source: JICA Study Team

Figure 9.6: Long-Term Project Evaluation Results

9.4 Action Plan

9.4.1 Project Evaluation for Possible Actions

The projects reviewed in the previous section are summarized in Table 9.8 by sector and timeframe (short, medium, and long term), with the scores for the economic and social/ environmental impacts, along with the relevant corridors. The corridors are listed in accordance with the scores obtained through a separate evaluation of the nine corridors identified by the East African Community.

Table 9.8: Summary List of the Projects in the Master Plan

Sector	P/J No.	Projects: Short-Term	Medium-Term	Long-Term	Impact: Economic	Social/ Environmental	Corridor: Central	DSM	Tanga	Sumbawanga	Coastal	Sirari	Namanga	Mtwara	Tan-Moz
Air	S15	JNIA Cargo Tmnl			C	B+	✓	✓			✓				
	S16	Mwanza AirPt Cargo Tmnl			C	A-	✓					✓			
	M14		KIA Cargo Tmnl		C	A			✓						
Inland Port	S1	Refuebish Kigoma Tmnl			C	B	✓			✓					
	S2	Community Service P/J			B	A-	✓								
	S3	Kasanga Pt (1)			A	A-				✓					
	M2		Kasanga Pt (2)		B	A				✓					
	L1			Musoma Pt Container Tmnl	C	C			✓			✓			
	L2			Kasanga Pt (3)	B-	A				✓					
Sea Port	S4	Container tmnl berths @DSM			A	C+	✓	✓			✓				
	S5	ICD @Kisarawe			C	C	✓	✓							
	M3 L3	← Mbegani Bagamoyo Pt →			A	C	✓	✓							
	M4		Mwambani Tanga Pt		B	C			✓						
	M5		Expansion of Mtwara Pt		C	C					✓				✓
Road	S6	Kimara-Chalinze			B+	B	✓	✓							
	S7	Widening of Bagamoyo Rd			B+	B	✓	✓							
	S8	Kibaoni–Mpanda			B+	B				✓					
	S9	Kidahwe-Kanyani-Kasulu			C	B				✓					
	S10	Mbinga-Mbamba Bay			C	B									✓
	S11	Bagamoyo-Mlandizi			C	B	✓	✓							
	S12	Outer Ring Rd (1)			B+	C-	✓	✓			✓				
	S13 M11	← Ubungo-N.Mandela Flyover →			A	C	✓	✓			✓				
	M6		Chalinze-Morogoro		A	B	✓	✓							
	M7		Kibaoni-Mpanda-Kanyani		C	B				✓					
	M8		Kigoma-Nyakanazi		C	B				✓					
	M9		Kidahwe-Ilunde-Malagarasi-Kaliua		C	B+	✓								
	M10		Manyoni-Itigi-Tabora Rd		B-	B+	✓								
	M12		Outer Ring Rd (2)		B+	C	✓	✓			✓				
	L4			Kasulo-Rusumo & Bugene-Murongo Bugene-Kikagati Rd	C	B+				✓					
	L5			Tabora-Koga-Mpanda Rd	C	A-									
	L6			Chunya-Rungwa-Itigi-Mkiwa Rd	C	B+									
	L7			Bagamoyo Expwy	B+	C	✓	✓							
	L8			Urban Expwy	B+	C	✓	✓			✓				
	L9			Expwy DSM-Chalinze	B+	C	✓	✓							
	L10			Expwy Chalinze-Morogoro	B+	C+	✓	✓							
	L11			Expwy Morogoro–Dodoma	B	B-	✓								
	L12			Arusha-Moshi-Himo Junction Dual Carriageway	B-	C			✓						
Rail	S14 M12 L13	← Rehabil/improvement of track & bridges →			C	A	✓								
	S14 M12 L13	← Rehabil/improvement of track & wagons →			A	A	✓								
	S14 M12 L13	← Procurement/rehabil of locos & wagons →			B	C+		✓							
	M13		Bagamoyo Pt connection		B-	C	✓	✓							

Notes: 1. Project numbers correspond to those in the detailed analysis in Chapter 11 of Volume 3, with S, M, and L standing for short, medium, and long term, respectively.
2. Grades in the Impact column are based on the scoring in Chapter 11. The grades include A, A-, B+, B, B-, C+, and C.
3. For ease of interpreting the results, As in the Impact' column, as well as the checks in the top three corridors in the Corridor column are shaded dark, while Bs in the Impact column and the three second-tier corridors are shaded light.

Source: JICA Study Team

The combination of all these factors allow for grouping as follows.

The projects that have relatively **large economic and social/environmental impacts** (i.e., B or above) and, at the same time, **are located along corridors with a higher evaluation** (i.e., the top three) were put together in the first group (Table 9.9). These projects include: the Community Service Project for the inland port sector (S9), Kimara–Chalinze Road (S6), widening of Bagamoyo Road (S7), Chalinze–Morogoro Road (M6), Manyoni–Itigi–Tabora Road (M10), Morogoro–Dodoma Expressway (L11), and the rehabilitation/improvement of track and rolling stock for the railway sector (S14, M12, and L13).

These projects can be given higher priority when allocating fiscal resources.

Table 9.9: List of the Candidate Projects (Group 1)

Sector	P/J No.	Projects: Short-Term / Medium-Term / Long-Term	Impact: Economic	Impact: Social/ Environmental	Corridor: Central	DSM	Tanga	Sumbawanga	Coastal	Sirari	Namanga	Mtwara	Tan-Moz
Group 1: Large Economic & Social/Environmental Impacts, Top Tier Corridors													
Inland Port	S2	Community Service P/J	B	A-	✓								
Road	S6	Kimara-Chalinze	B+	B	✓	✓							
	S7	Widening of Bagamoyo Rd	B+	B	✓	✓							
	M6	Chalinze-Morogoro	A	B	✓	✓							
	M10	Manyoni-Itigi-Tabora Rd	B-	B+	✓								
	L11	Expwy Morogoro–Dodoma	B	B-	✓								
Rail	S14 M12 L13	← Rehabil/improvement of track & wagons →	A	A	✓								

Source: JICA Study Team

The second group (Table 9.10) includes those with relatively **large economic impact** (i.e., B or above) **along the corridors with high evaluations** (i.e., the top three), but with **relatively low social/environmental contribution** (C+ or below): Container Terminal Berths at Dar es Salaam Port (S4), Mbegani Bagamoyo Port (M3 and L3), Mwambani Tanga Port (M4), Ubungo–Nelson Mandela Flyover (S13 and M11), Outer Ring Road (S12 and M12), Urban Expressway (L8), Dar es Salaam–Chalinze Expressway (L9), Chalinze–Morogoro Expressway (L10), Arusha–Moshi–Himo Junction Dual Carriageway (L14), and procurement/rehabilitation of locomotives (S14, M12, and L13) come within this group.

As suggested by the scores, these projects should be implemented with maximum consideration of their social and/or environmental impacts. It should be noted, however, that the social impacts might be underestimated due to limitations of this analytical framework. To offset this downside, the positive spillover effect of this urban infrastructure in rural areas along the corridor should also be considered.

Table 9.10: List of the Candidate Projects (Group 2)

Sector	P/J No.	Projects: Short-Term / Medium-Term / Long-Term	Impact: Economic	Impact: Social/ Environmental	Corridor: Central	DSM	Tanga	Sumbawanga	Coastal	Sirari	Namanga	Mtwara	Tan-Moz
Group 2: Economic > Social/Environmental Impacts, Top Tier Corridors													
Sea Port	S4	Container tmnl berths @DSM	A	C+	✓	✓			✓				
	M3 L3	Mbegani Bagamoyo Pt	A	C	✓	✓							
	M4	Mwambani Tanga Pt	B	C			✓						
Road	S12	Outer Ring Rd (1)	B+	C-	✓	✓			✓				
	S13 M11	Ubungo-N.Mandela Flyover	A	C	✓	✓			✓				
	M12	Outer Ring Rd (2)	B+	C	✓	✓			✓				
	L7	Bagamoyo Expwy	B+	C	✓	✓							
	L8	Urban Expwy	B+	C	✓	✓			✓				
	L9	Expwy DSM-Chalinze	B+	C	✓	✓							
	L10	Expwy Chalinze-Morogoro	B+	C+	✓	✓							
	L12	Arusha-Moshi-Himo Junction Dual Carriageway	B-	C			✓						
Rail	S14 M12 L13	Procurement/rehabil of locos & wagons	B	C+		✓							
	M13	Bagamoyo Pt connection	B-	C	✓	✓							

Source: JICA Study Team

The third group Table 9.11) include projects with a relatively **large social/environmental contribution** (i.e., B or above) **along corridor(s) with high evaluations** (i.e., top three) but with **relatively low economic impact** (C+ or below): Airport cargo terminals at Mwanza (S16) and KIA (M14), Refurbishment of Container Terminal for Kigoma Port (S1), Bagamoyo-Mlandizi Road (S11), Kidahwe–Ilunde–Malagarasi–Kaliua Road (M9) and the rehabilitation/improvement of track and bridges for the railway sector (S14, M12, and L13) were categorized in this group.

To take advantage of relatively large social impact and/or less damage to the environment of these projects, implementation of these projects may require greater commitment to allocate fiscal resources to cover relatively small economic impacts.

Table 9.11: List of the Candidate Projects (Group 3)

Sector	P/J No.	Projects: Short-Term / Medium-Term / Long-Term	Impact: Economic	Impact: Social/ Environmental	Corridor: Central	DSM	Tanga	Sumbawanga	Coastal	Sirari	Namanga	Mtwara	Tan-Moz
Group 3: Economic < Social/Environmental Impacts, Top Tier Corridors													
Air	S15	JNIA Cargo Tmnl	C	B+	✓	✓			✓				
	S16	Mwanza AirPt Cargo Tmnl	C	A-	✓					✓			
	M14	KIA Cargo Tmnl	C	A			✓						
Inland Port	S1	Refuebish Kigoma Tmnl	C	B	✓			✓					
Road	S11	Bagamoyo-Mlandizi	C	B	✓	✓							
	M9	Kidahwe-Ilunde-Malagarasi-Kaliua	C	B+	✓								
Rail	S14 M12 L13	Rehabil/improvement of track & bridges	C	A	✓								

Source: JICA Study Team

The last group (Table 9.12) is the one with projects along **second tier corridors**, but which have **relatively large economic and/or social/environmental impacts** (B or above): Kasanga

Port (S3, M2 and L2), Kibaoni–Mpanda Road (S8), Kidahwe–Kanyani–Kasulu Road (S9), Kibaoni–Mpanda–Kanyani Road (M7), Kigoma–Nyakanazi Road (M8), and Kasulo–Rusumo and Bugene–Murongo Bugene–Kikagati (L4).

These projects may fall behind in terms of priority, particularly in the context of maximizing synergies along highly strategic corridors. Along with the remaining "unclassified" projects along the corridors with relatively low scoring, and with relatively low evaluations both in terms of economic and social/environmental impacts, priorities need to be identified depending on the balance between fiscal and institutional capacity.

Table 9.12: List of the Candidate Projects (Group 4)

Sector	P/J No.	Projects			Impact		Corridor								
		Short-Term	Medium-Term	Long-Term	Economic	Social/ Environmental	Central	DSM	Tanga	Sumbawanga	Coastal	Sirari	Namanga	Mtwara	Tan-Moz
Group 4: Large Economic or Social/Environmantal Impacts, Second Tier Corridors															
Inland Port	S3	Kasanga Pt (1)			A	A-				✓					
	M2		Kasanga Pt (2)		B	A				✓					
	L2			Kasanga Pt (3)	B-	A				✓					
Road	S8	Kibaoni–Mpanda			B+	B				✓					
	S9	Kidahwe-Kanyani-Kasulu			C	B				✓					
	M7		Kibaoni-Mpanda-Kanyani		C	B				✓					
	M8		Kigoma-Nyakanazi		C	B				✓					
	L4			Kasulo-Rusumo & Bugene-Murongo Bugene-Kikagati Rd	C	B+				✓					

Source: JICA Study Team

Another way of assessing the projects is by their relevance to the five strategies detailed in the Chapter 4 (Table 9.13).

From the sector point of view, the largest part of the resources will be allocated to the road sector, the contribution of which is skewed to "meeting domestic transport demand" (Strategy 3). The road sector projects are also seen in Strategy 1 ("strengthening international corridors") and 4 ("alleviation of bottlenecks in Dar es Salaam area"), depending on area in which the projects are located. Railway sector projects, particularly rehabilitation projects, are expected to contribute to Strategies 1 to 3. Projects for ports and airports are skewed towards Strategies 1 and 2 ("establishing a comprehensive transport network with a balanced modal mix"), while inland ports are also expected to contribute to Strategy 3.

Looking at the projects from the viewpoint of strategy (Table 9.14)[4] with the aggregate development expenditures, Strategy 3 has the largest investment of USD 14,182 million (USD 14.182 billion), due mainly to the road sector, which accounts for 90.1% of allocations to Strategy 3. This is followed by Strategy 1 (USD 6,490 million, or USD 6.490 billion), of which the road and port projects account for 54.6% and 29.6%, respectively. The third largest group is Strategy 2 (USD 5,032 million, or USD 5.032 billion), of which the port projects account for the largest share (70.0%), followed by the railway projects at 17.4%. This is followed by Strategy 4 (USD 2,365 million, or USD 2.365 billion), again with the road (62.8%) and port (28.5%) projects accounting for the majority. For Strategy 5 ("clear regulatory/financing frameworks"), no projects with budgetary allocations were explicitly assigned, although institutional measures introduced in Chapter 9 are listed in the table.

[4] The aggregate numbers for the different strategies include overlapping projects, since the projects classified into two or more strategies are double (or even triple) counted.

Table 9.13: Candidate Projects and Relevant Strategies

Sector	Projects	Term S: Short M: Mid L: Long	Strategy				
			1. Strengthening international corridors	2. Developing infrastructure for the optimal modal share	3. Meeting the domestic transport demand	4. Alleviation of bottlenecks in DSM area	5. Clear regulatory / financing framework
Inland Port	Refurbish Kigoma Tmnl	S	○	○			
	Community Service P/J Lake Tanganyika/Nyasa	S					○
	Kasanga Pt (1)	S			○		
	Kasanga Pt (2)	M			○		
	Musoma Pt Container Tmnl	L	○	○			
	Kasanga Pt (3)	L	○	○			
Sea Port	Container tmnl berths @DSM	S		○	○	○	
	ICD @Kisarawe	S	○				
	Mbegani Bagamoyo Pt	ML		○			
	Development of new deep water port at Mwambani Tanga Pt	M	○	○			
	Expansion of Mtwara Pt	M	○	○			
Road	Kimara-Chalinze	S	○		○	○	
	Widening of Bagamoyo Rd	S			○	○	
	Kibaoni–Mpanda	S			○		
	Kidahwe-Kanyani-Kasulu	S			○		
	Mbinga-Mbamba Bay	S	○		○		
	Bagamoyo-Mlandizi	S			○	○	
	Outer Ring Rd (1)	S		○	○	○	
	Ring Road around Big Cities	ML	○		○		
	Ubungo-N.Mandela Flyover	SM	○		○	○	
	Regional Road	SML			○		
	Roadside Service Facilities	SML	○		○		
	Chalinze-Morogoro	M	○		○		
	Kibaoni-Mpanda-Kanyani	M			○		
	Kigoma-Nyakanazi	M			○		
	Kidahwe-Ilunde-Malagarasi-Kaliua	M			○		
	Manyoni-Itigi-Tabora Rd	M	○		○		
	Outer Ring Rd (2)	M		○	○	○	
	Kasulo-Rusumo & Bugene-Murongo Bugene-Kikagati Rd	L	○		○		
	Tabora-Koga-Mpanda Rd	L			○		
	Chunya-Rungwa-Itigi-Mkiwa Rd	L			○		
	Bagamoyo Expwy	L			○	○	
	Urban Expwy	L	○	○	○	○	
	Expwy DSM-Chalinze	L	○		○	○	
	Expwy Chalinze-Morogoro	L	○		○		
	Expwy Morogoro–Dodoma	L	○		○		
	Arusha-Moshi-Himo Junction Dual Carriageway	L			○		
Rail	Rehabil/improvement of track, bridges & wagons	SML	○	○	○		
	Procurement/rehabil of locos & wagons	SML	○	○	○	○	
	Bagamoyo Pt connection	M	○			○	
Air	JNIA Cargo Tmnl	S	○	○		○	
	Mwanza AirPt Cargo Tmnl	S	○	○			
	KIA Cargo Tmnl	M	○	○			
Pipeline	New pipelines / oil refineries		○				
Institution	Border facilities		○				
	Implementation of PPP regulation / incentives		○	○	○	○	○
	Streamlining the planning framework						○
	Expanding revenue sources						○
	Expanding financing sources						○

Source: JICA Study Team

Table 9.14: Development Expenditures for the Five Strategies

(Unit: USDmn)

Strategy	Inland Port	Sea Port	Road	Rail	Air	Total
1 Strengthening international corridors	121	1,920	3,542	875	32	6,490
2 Establishing a comprehensive transport network	121	3,524	480	875	32	5,032
3 Meeting domestic transport demand	3	524	12,781	875		14,182
4 Alleviation of bottlenecks in DSM area		674	1,485	191	15	2,365
5 Clear regulatory / financing framework	60					60

Source: JICA Study Team

9.4.2 Key Issues/Perspectives

Another critical aspect that calls for close attention in prioritizing the immediate actions is the project timeframe. Particularly in determining the short-term actions, the framework should include the following components: (i) **implementation of the short-term projects** with immediate effects, (ii) **refining the design of the medium-term projects** for future implementation, and (iii) **drawing up a grand design of the long-term projects** to facilitate future development.

For (i) and (ii), it will be important to **revisit the existing implementation plans or the project designs, with the aim of eliminating redundancies** resulting from the overlaps of the different development frameworks. In that process, project prioritization through the aforementioned scoring can be fully utilized as a guide in order to streamline and rationalize decision making.

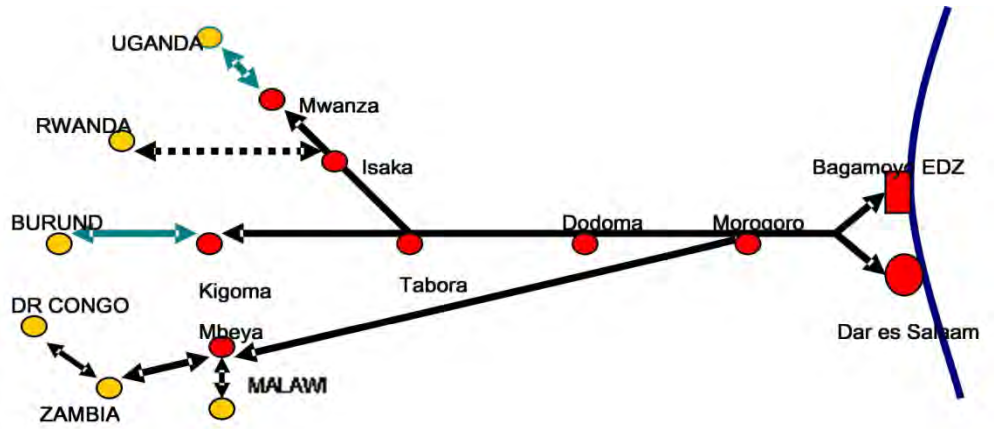
A grouping that takes into account the corridor evaluation should help maximize synergies in developing the infrastructure for different modes. In this Master Plan, greater emphasis was placed on the **Central Corridor and Dar es Salaam area**, as already indicated in earlier chapters. In line with this emphasis, rehabilitation of the railways (in Group 1 and 3) along the Central Corridor, as well as the development of Mbegani Bagamoyo Port (in Group 2), were classified as key components. Similarly, projects for the road network surrounding Dar es Salaam will have a great impact in easing bottlenecks on outward freight flows from Dar es Salaam along the key corridors.

For (iii), not only the design of the physical infrastructure but also the **institutional underpinning** to facilitate the overall development process is critical. As mentioned, development of Mbegani Bagamoyo Port, as a key component of this master plan, requires a much greater scale of development plan than that for a single port facility. To streamline the coordination process among various stakeholders, including construction firms, real estate developers, shippers, transporters, and potential industrial firms and commercial tenants, the JIC Study Team recommends establishing a coordinating body (e.g., a Bagamoyo Seaboard Development Authority) led by the public sector with active participation of the private sector stakeholders. On the fiscal front, as mentioned in the previous chapter, a set of actions need to be taken to establish a cross-ministry body to manage windfall revenue from the deepwater gas development.

9.5 Economic Benefits of the Central Corridor

9.5.1 Master Plan Projects along the Central Corridor

The Central Corridor is a critical logistics corridor in Tanzania linking the Port of Dar es Salaam via Dodoma and Tabora with the inland countries via Mwanza, Kigali (Rwanda), and Kigoma/Bujumbura (to Burundi), as shown in Figure 9.7.



Source: Ministry of Industry and Trade "Integrated Industrial Development Strategy 2025" 2011

Figure 9.7: Growth Corridors of Tanzania

This chapter analyzes the economic benefits realized from the short-, medium-, and long-term projects on the Central Corridor summarized in Table 9.15 to 9.17.

Table 9.15: Short-Term Projects along the Central Corridor

No.	Project Name	Sector	Total Investment (Mil USD)	Freight Volume (tonnes/year)	Total Cost Saving (USD/year)	Year
1	JNIA Cargo Terminal Development	Airport	15	27,545	820,520	
2	Mwanza Airport Cargo Terminal Development	Airport	7	10,000	297,883	
3	Rehabilitation/improvement of track, bridges and wagons + Procurement/rehabilitation of locomotives and wagons	Rail	374	424,453	40,840,594	
4	Rehabilitation/improvement of track and wagons	Rail	16	1,377,000	14,429,556	
5	Widening of the Bagamoyo Road (Wazo Hill – Bagamoyo, about 40 km)	Road	28	133,923,000	28,437,871	
6	Kimara-Chalinze	Road	67	133,923,000	66,799,281	
7	Outer Ring Road	Road	14	137,684,000	7,397,559	
8	Ubungo-Nelson Mandela Flyover	Road	17.7	137,684,000	3,811,333	
9	Development of New Container Terminal Berths 13 and 14.	Port	524	42,081,000	163,374,838	
10	Refurbishment Mwanza South Port to have Container Terminal	Port	33.4	884,000	3,432,032	
11	Establishment of cargo freight station (CFS) at Kisarawe	Port	120	190,932	741,272	
12	Strengthening/Upgrading of Berths 1-7 and modernization of general cargo operations	Port	150	9,447,000	36,676,935	
13	Refurbishment of Container Terminal for Kigoma Port	Port	25	1,492,000	5,792,525	
14	Community Service Project: Six Cluster Ports on Tanganyika and Kiwira on Nyasa	Port	0.8	283,000	1,098,716	
15	Kasanga Port Development Phase I	Port	0.4	100,000	388,239	
	Total		1,392	599,530,930	374,339,153	2017

Table 9.16: Medium-Term Projects along the Central Corridor

No.	Project Name	Sector	Total Investment (USD million)	Freight Volume (tonnes/year)	Total Cost Saving (USD/year)	Year
1	Rehabilitation/improvement of track, bridges and wagons + Procurement/rehabilitation of locomotives and wagons	Rail	266	736,420	73,805,632	
2	Rehabilitation/improvement of track and wagons	Rail	49	1,377,000	14,429,556	
3	Bagamoyo Port connection	Rail	30	2,555,000	15,589,588	
4	Chalinze-Morogoro	Road	71	116,387,000	61,771,883	
5	Kidahwe-Ilunde-Malagarasi-Kaliua	Road	53	8,426,000	8,647,652	
6	Manyoni-Itigi-Tabora Road	Road	20	26,066,000	10,103,581	
7	Ubungo-Nelson Mandela Flyover	Road	17.7	137,684,000	3,811,333	
8	Development of new port at Mbegani Bagamoyo	Port	462			
	Total		951	155,547,420	184,347,892	2023

Table 9.17: Long-Term Projects along the Central Corridor

No.	Project Name	Sector	Total Investment (USD million)	Freight Volume (tonnes/year)	Total Cost Saving (USD/year)	Year
1	Rehabilitation/improvement of track, bridges and wagons + Procurement/ rehabilitation of locomotives and wagons	Rail	238	1,377,000	173,320,640	
2	Rehabilitation/improvement of track and wagons	Rail	153	1,377,000	14,429,556	
3	Outer Ring Road		28	137,684,000	14,762,961	
4	Urban Expressway	Road	127	137,684,000	43,571,637	
5	Expressway DSM – Chalinze	Road	156	133,923,000	71,861,026	
6	Expressway Chalinze-Morogoro	Road	135	116,387,000	56,198,174	
7	Expressway Morogoro – Dodoma	Road	361	84,943,000	116,209,866	
8	Bagamoyo Expressway (40 km)	Road	57	133,923,000	36,257,756	
9	Development of New Port at Mbegani Bagamoyo	Road	739	83,466,000	324,047,533	
	Total		1,994	830,764,000	850,659,149	2030

9.5.2 Assumptions for the Economic Analysis

For the purpose of analysis, the following assumptions were made to allow for calculation of economic benefits.

Timing of Achieving Operational Benefits

- Short-term projects to have a construction period of four years with operation commencing in 2017
- Medium-term projects to have a construction period of four years with operation commencing in 2023
- Long-term projects to have a construction period of seven years with operation commencing in 2030
- Operational benefits of phased projects identified under both Short and Medium, or Medium and Long, will only be realized after the later phase is completed, unless otherwise stated

Financial Assumptions

- Government of Tanzania 10-Year Bond Rate of 14.80% used for the Discount Rate
- Inflation not accounted for
- Planning horizon up to 2030 and all projects assumed to be completed by 2030
- In order to realize the economic benefit of long-term projects, in addition to the planning horizon, the evaluation period was assumed to be up to 2050

9.5.3 Net Benefits from Short-, Medium-, and Long-Term Projects along the Central Corridor

Total cost savings (time cost savings and transport cost savings) for each Master Plan project along the Central Corridor have been used to calculate the costs and benefits of projects along the Central Corridor. Table 9.18 below shows the total construction costs of projects by term (short, medium, and long) as well as annual cost savings generated from the projects in the initial year of operation.

Table 9.18: Short-, Medium-. and Long-Term Project Construction Cost and Cost Savings in Initial Year of Operation

Project Period	Construction Period	Operation Start Year	Construction Cost USD	Cost Saving in Initial Year of Operation USD/year
Short Term	4 years	2017	1,392,300,000	374,339,000
Mid Term	4 years	2023	968,200,000	188,159,000
Long Term	7 years	2030	1,993,500,000	850,659,000

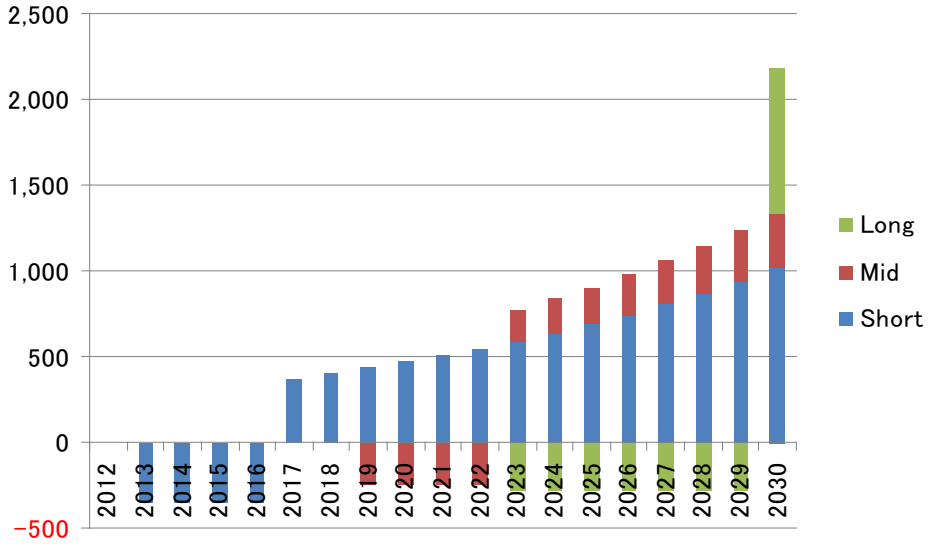
The sum total and net present value (NPV) of construction costs and cost savings of the above projects up to 2030 and 2050 are summarized in Table 9.19. When the costs and benefits up to 2030 are analyzed, the benefits from the long-term projects are not realized, and both the sum total and NPV show a negative result. However, the 2050 analysis shows that the total sum of costs and benefits is positive, but since the benefits are realized later in the evaluation period, the NPV is still negative.

Table 9.19: Sum Total and NPV of Construction Cost and Cost Savings

Unit: USD

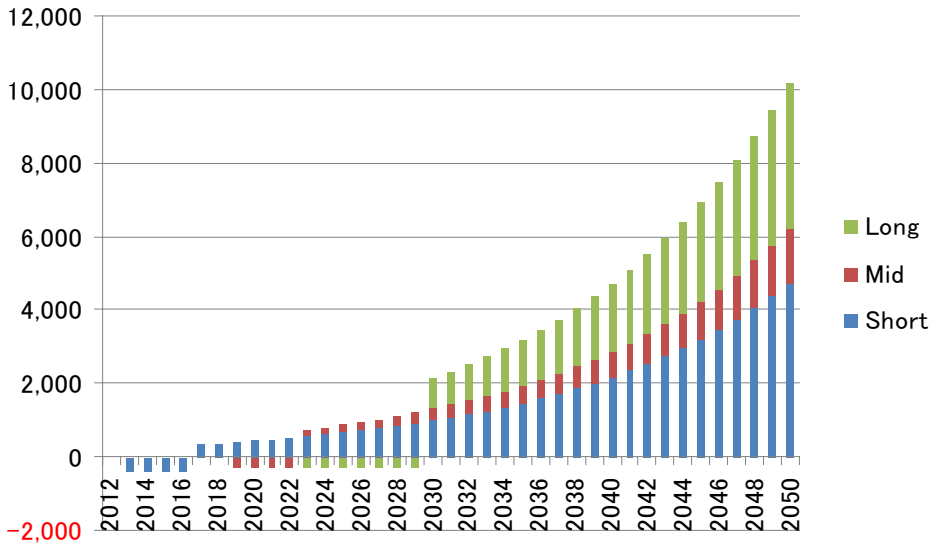
Up to 2030	Total	7,562,632,000
	NPV	488,255,000
Up to 2050	Total	115,857,773,000
	NPV	2,270,494,000

Figures 9.8 and 9.9 show the annual construction costs and cost savings for the 2030 and 2050 analysis. The figures show that greater economic benefits from cost savings are realized in the later years of the evaluation period.



Note: Y-Axis: 1M USD, and Y-Axis: Year

Figure 9.8: Annual Construction Costs and Savings (2030 Analysis)



Note: Y-Axis: 1M USD, and Y-Axis: Year

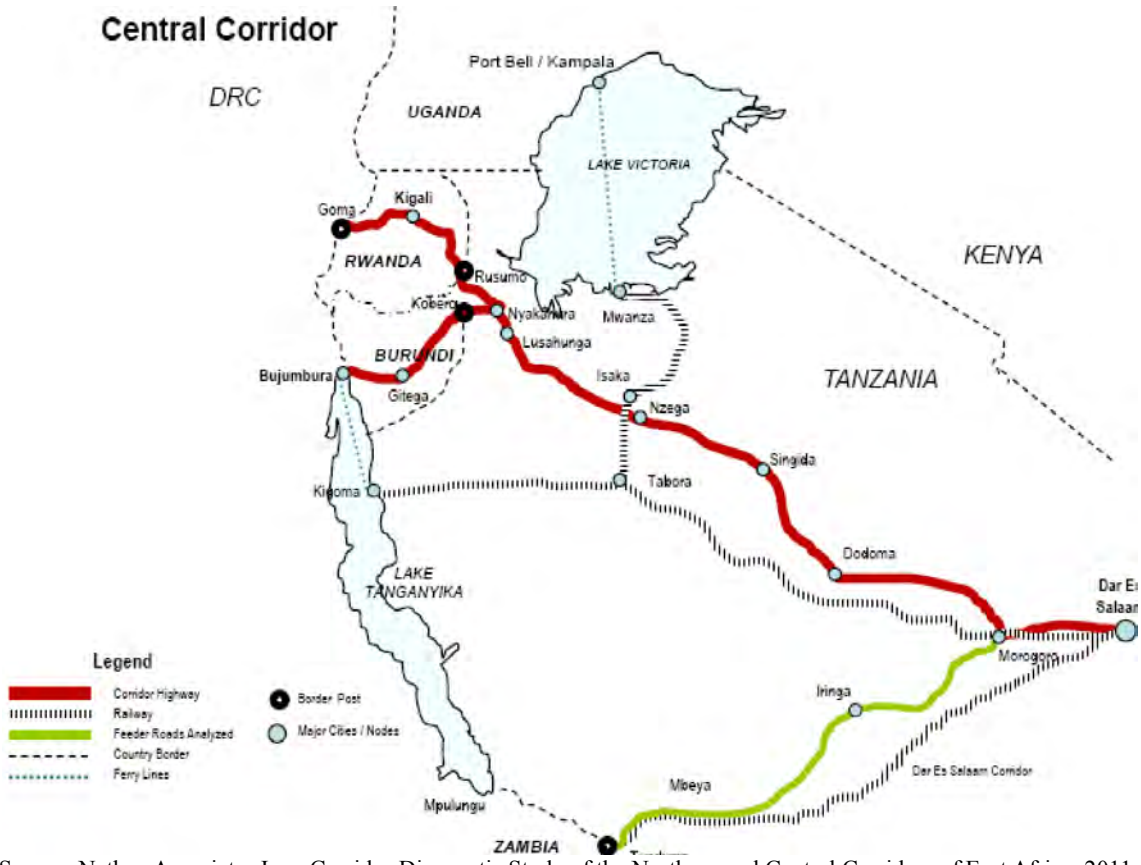
Figure 9.9: Annual Construction Costs and Savings (2050 Analysis)

9.5.4 Benefits from Shortened Path

The land network of the Central Corridor can be categorized into rail and road. As shown in Figure 9.10 and the listing out of the respective connections below, the rail and road networks along the corridor are not aligned. The road network of the Central Corridor starts at Dar es Salaam and branches off at Nyakanazi to three destinations: Mwanza, Kigali, and Kigoma. The rail network of the Central Corridor starts at Dar es Salaam and branches off at Tabora to Kigoma and Mwanza.

Current Road Connection:
1. Dar es Salaam – Chalinze – Morogoro – Dodoma – Manyoni – Singida – Nzega – Shinyanga – Mwanza
2. Dar es Salaam – Chalinze – Morogoro – Dodoma – Manyoni – Singida – Nzega – Kigali (Rwanda)
3. Dar es Salaam – Chalinze – Morogoro – Dodoma – Manyoni – Singida – Nzega – Kalusu – Kigoma

Current Rail Connection
4. Dar es Salaam – Chalinze – Morogoro – Dodoma – Manyoni – Tabora – Uvinza – Kigoma
5. Dar es Salaam – Chalinze – Morogoro – Dodoma – Manyoni – Tabora – Isaka – Mwanza



Source: Nathan Associates Inc., Corridor Diagnostic Study of the Northern and Central Corridors of East Africa, 2011

Figure 9.10: Central Corridor Road and Railway Routes

For road traffic from Dar es Salaam to Kigoma, the current lack of a direct satisfactory road network forces traffic to detour northwards towards Nyakanazi once before heading south to Kigoma. The distance of detour is about 250 km, as shown in Table 9.20.

Table 9.20: Road Detour Distance along the DSM – Kigoma Route

Current Road Route			**Master Plan Road Route**		
(Detour Route)			(Direct Shortest Route)		
Dar es Salaam – Morogoro	190	km	Dar es Salaam – Kigoma (along TRL route)	1,251	km
Morogoro – Dodoma	255	km			
Dodoma – Singida	239	km			
Singida – Kigoma	817	km			
Total	1,501	km			

Volumes transported along the Dar es Salaam – Kigoma route are summarized in Table 9.21.

Table 9.21: Volumes Transported along the DSM – Kigoma Route

Traffic Volume (1,000 tonnes)		**Domestic**		**Transit**		**TOTAL**
DAR – Kigoma, Burundi, DRC		**to DAR**	**from DAR**	**Import**	**Export**	
2010	Road	473	261	512	69	1,315
	Railway	0	15	91	14	119
2030 5%	Road	1,596	1,545	1,811	416	5,368
	Railway	0	102	389	86	577
2030 8%	Road	2,727	2,899	2,173	532	8,332
	Railway	0	191	417	112	719

With the master plan projects, a direct road network from Dar es Salaam to Kigoma will result in a 250 km decrease in transport distance due to the elimination of the detour. The sum total and NPV of the consumer surplus due the 250-km decrease are summarized on Table 9.22.

Table 9.22: Sum Total and NPV of Cost Savings from 250 km Decrease

Unit: 1,000 USD

Up to 2030	TOTAL	6,470,000
	NPV	1,088,000

9.5.5 Total Impact on GDP

Total increases in traffic volumes in all of Tanzania and along the Central Corridor due to implementation of projects in the Master Plan (short, medium, and long term) are summarized in Table 9.23 and 9.24. These tables suggest that the Central Corridor accounts for about 12% of all traffic volume in Tanzania in the 2030 Target Case.

Table 9.23: Total Increase in Traffic Volume Due to Projects for Tanzania

1,000 tonnes

Tanzania Total	**2010**	**2030 Conservative Case**	**2030 Target Case**
Bilateral Trade	13,801	66,088	113,667
Domestic	34,236	143,988	268,982
Transit	2,831	10,491	15,213
TOTAL	50,868	220,567	397,862

Table 9.24: Increase in Traffic Volume Due to Projects for the Central Corridor

1,000 tonnes

Central Corridor	2010	2030 Conservative Case	2030 Target Case
Domestic	6,357	23,168	40,002
Import	896	4,066	5,088
Export	94	835	1,155
Total	7,347	28,069	46,245

Table 9.25 shows the GDP value in USD million, for the conservative (5% growth) and target (8% growth) cases. It was assumed that the difference in GDP value for the conservative and target case scenarios result from increased economic activity facilitated by infrastructure improvements from the Master Plan.

Table 9.25: GDP Value for Conservative and Target Growth Cases

USD million

GDP (Million USD)	2,010	2,030
Conservative Case	19,955	84,359
Target Case	19,955	94,791

The sum total and NPV of the the total impact on GDP is summarized on Table 9.26.

Table 9.26: Sum Total and NPV of Total Impact on GDP

USD million

Up to 2030	TOTAL	12,731
	NPV	2,141

9.5.6 Cost Savings along the Central Corridor Realized by Other Countries

Uganda

Table 9.27 shows the sum total and NPV of consumer surplus from the Central Corridor Master Plan Projects for Uganda.

Table 9.27: Sum Total and NPV of Consumer Surplus for Uganda

Unit: USD

Up to 2030	Total	18,542,000
	NPV	3,119,000

Rwanda

Table 9.28 shows the sum total and NPV of consumer surplus from the Central Corridor Master Plan Projects for Rwanda.

Table 9.28: Sum Total and NPV of Consumer Surplus for Rwanda

Unit: USD

Up to 2030	Total	4,644,000
	NPV	781,000

Burundi

Table 9.29 shows the sum total and NPV of consumer surplus from the Central Corridor Master Plan Projects for Burundi.

Table 9.29: Sum Total and NPV of Consumer Surplus for Burundi

		USD
Up to 2030	Total	32,000
	NPV	5,000

9.5.7 Summary

Table 9.30 and 9.31 summarize the analysis conducted in this chapter. The increased value of economic activity generated from the increase in traffic volume along the Central Corridor due to the projects proposed in this Master Plan will be significant. However, it is also important to note that these results are based on the assumptions set out in subsection 9.5.2. While it is difficult to predict economic conditions to 2030 and 2050, it is evident that the achieving the potential of the Central Corridor will be a key factor in economic growth of the Republic of Tanzania.

Table 9.30: Summary of Economic Benefits of the Central Corridor for Tanzania

TANZANIA	Sum Method		NPV Method	
	2030	2050	2030	2050
1 Net Benefit	USD 7,562,632,000	USD 115,857,773,000	USD 488,255,000	USD 2,270,494,000
2 Consumer Surplus from 250 km Reduction on Road Corridor	USD 6,470,000		USD 1,088,000	
3 Other Benefits (Increased Economic Activity)	USD 5,161,898,000		USD 1,651,657,000	
4 Total Impact on GDP	USD 12,731,000,000		USD 2,141,000,000	

Note: Economic benefits for Tanzania and other countries should be considered separately to avoid double counting.

Net Benefit Break Down	Sum Method		NPV Method	
	2030	2050	2030	2050
Costs	-USD 4,354,000,000	-USD 4,354,000,000	-USD 1,394,348,000	-USD 1,394,348,000
Benefits	USD 11,916,632,000	USD 120,211,773,000	USD 1,882,603,000	USD 3,664,842,000
Net Benefit	USD 7,562,632,000	USD 115,857,773,000	USD 488,255,000	USD 2,270,494,000
Benefit/Cost Ratio	2.74	27.61	1.35	2.63

Table 9.31: Summary of Economic Benefits of the Central Corridor for Other Countries

Other Countries	Sum Method	NPV Method
	2030	2030
5 Uganda Consumer Surplus	USD 18,543,000	USD 3,119,000
6 Rwanda Consumer Surplus	USD 4,644,000	USD 781,000
7 Burundi Consumer Surplus	USD 32,000	USD 5,000

Note: Economic benefits for Tanzania and other countries should be considered separately to avoid double counting.

Chapter 10 Environmental and Social Considerations

10.1 SEA System in Tanzania, Related Authorities

The Strategic Environmental Assessment (hereinafter referred to as "SEA") Regulation (CAP.191, 2008), to be described later, requires that all strategies and master plan development studies conducted in Tanzania must obtain approval from the Minister of State responsible for Environment, through the Vice President's Office (hereinafter referred to as "VPO"), as SEA Authority in Tanzania, regarding appropriate SEA study and its evaluation process. This comprehensive transport and trade system development study consists of the following two parts: (i) Master Plan development study and (ii) Pre-Feasibility studies. The Master Plan development study, based on strategic alternatives, was therefore subjected to undergo the SEA study and required approval. Pre-feasibility studies are to be selected after contents of this master plan are consolidated. Afterward, relevant environmental license approval processes for selected pre-feasibility studies are to be initiated eventually.

10.1.1 Related Authorities and Summary of Environmental Codes in Tanzania

The highest-level organizations of environmental administration in Tanzania are the Minister of State Responsible for Environment and the National Environmental Advisory Committee (hereinafter referred to as "NEAC"), both above the VPO. It shall be noted that no ministry directly responsible for environmental administration at the national level exists in Tanzania. Instead, the Minister of State Responsible for Environment commands and supervises the following two environmental subsections: (i) Division of Environment and (ii) National Environment Management Council (hereinafter referred to as "NEMC"). Major roles and functions of each organization are briefly described below.

(1) NEAC (National Environmental Advisory Committee)

This committee is an advisory body to the Minister of State Responsible for Environment and the Sector Ministry on any environmental issues at the national level. The NEAC is composed of members from various fields of environmental management from the public and private sectors and civil society.

(2) The State Minister Responsible for Environment

The Minister has overall responsibility for the protection and management of the environment in Tanzania. The Minister may issue general guidelines to the Sector Ministries, Government Departments, the Council, NEAC, City, Municipal or District Environmental Management Committees, agency or any other public or private institution for the successful implementation of the Environmental Management Act, 2004 (No. 20 of 2004), described later.

(3) Division of Environment, VPO

This Division within VPO, is responsible for the (i) coordination of various environmental management activities to be implemented by other agencies; (ii) the integration of environmental considerations into development policies, plans, programmes, strategies, projects; and (iii) undertaking SEA to be applied for all Master Plan Development Studies.

(4) NEMC (National Environment Management Council)

This Council is to undertake enforcement, compliance, review and monitoring of environmental impact assessment, and, in that regard, shall facilitate public participation process within environmental decision making, exercise general supervision and coordination for all environmental issues.

As for the core related authorities in terms of the SEA procedure of this subjected Master Plan is MOT, as the Sector Ministry stipulated in the SEA Regulation 2008, and VPO, as the SEA Authority, along with the NEAC. The Minister of State responsible for Environment, under advisory support from NEAC, supervises the Division of Environment in VPO and NEMC (NEMC functions for facilitation of the public participation process within the environmental decision making during the SEA procedure), and is responsible for making final approvals in each step of the SEA procedure.

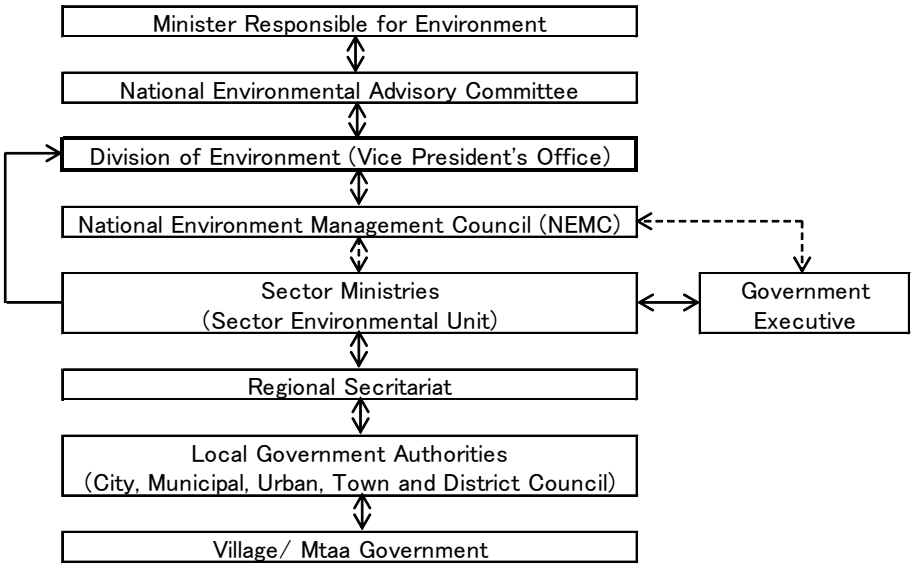


Figure 10.1: Environmental and Social Consideration Related Authorities in Tanzania

Summary of Current Environmental Codes

Basically, GN. No. 20 of 2004, described later, is a core environmental code in Tanzania. Based on this code, two more relevant environmental laws, GN. No. 348 of 2005 and GN. No.349 of 2005, have been issued.

Several environmental standards such as emissions and effluents were approved in December of 2007 in Tanzania. Also, a new SEA Law (CAP.191, 2008) was enacted in 2008. Basically, all master plan development studies shall conduct SEA to obtain the approval from VPO. Several important environmental codes are described in this section.

The Environmental Management Act, 2004 (G.N. No. 20 of 2004)

This law consists of 20 parts. The outline of the environmental approval process for infrastructure development projects and relevant Environmental Impact Assessment (hereinafter referred to as "EIA") are described in Part VI. Also, general descriptions about SEA are provided in Part VII.

The Environmental Regulations, 2005 (G.N. No. 348 of 2005)

This law consists of 7 parts and describes the registration system of environmental experts to be in charge of EIA studies. It shall be noted that all official the environmental impact statement (hereinafter referred to as "EIS") documents, described later, shall be prepared and submitted to NEMC by a registered EIA consultant. Otherwise, the project owner can not apply for the

official environmental license of the project of concern. The entry and the validity of the registration are specified in Part V.

The Environmental Impact Assessment and Audit Regulations, 2005 (G.N. No. 349 of 2005)

This law consists of 12 parts and describes in more detail the EIA study procedures and its approval process. Project registration and its preliminary screening are specified in Part III while ToR development process with NEMC is described in Part IV.

The Environmental Management Act, 2008 (G.N. No. 153 of 2008)

This law consists of 8 parts and describes in more detail the SEA study procedure and its approval process. Basically, all strategies and master plan development studies must undergo SEA and obtain approval from the State Minister responsible for Environment through the Vice President's Office. The main objective of SEA, to be required for all master plan development studies in Tanzania is to disseminate relevant information among stakeholders and have common understanding and knowledge of the master plan of concern. In other words, establishments of good inter-ministry communications and/or liaison among various stakeholders play a vital role within the SEA process. So that, most of SEA studies, conducted so far, takes more than 1 year to obtain the approval from Vice President Office.

10.1.2 The Strategic Environmental Assessment (SEA) Procedure in Tanzania

As mentioned earlier, a comprehensive transport and trade system development master plan (under combination of strategies) is to be developed in this study. Then, several prioritized short-term development projects (i.e., pre-feasibility studies) are to be selected. In other words, the master plan to be developed needs an appropriate SEA study while prioritized projects (i.e., pre-feasibility studies) requires Initial Environmental Evaluation (hereinafter referred to as "IEE") and/or EIA later on, depending on the magnitude of potential negative impacts to be caused by those implementations. Application procedures of both SEA and EIA/IEE are described separately in the following sections.

(1) The Strategic Environmental Assessment (SEA) Procedure

The SEA shall be initiated at the commencement of the preparation of a bill, regulation, policy, strategy, programme or plan, and continue throughout the process to the stage of promulgation of such Bill, regulation, policy, strategy, programme or plan. A Sector Ministry (i.e., the Ministry of Transport within this Master Plan study), government agency or department shall, where it is found necessary at the commencement of preparation of a Bill, regulation, policy, strategy, programme or plan form a team to carry out the SEA. The SEA study team shall comprise of experts in SEA or environmental and natural resources management from a Sector Ministry, the government agency, the department and public higher learning and research institutions or registered environmental experts. The following is the outline of SEA Examination steps (see below Figure 10.2, showing the entire SEA approval system in Tanzania.

1) Screening

The Sector Ministry shall prepare a summary of its views as to whether or not a Bill, regulation, policy, strategy, programme or plan is likely to have significant environmental effects at the beginning of the entire SEA process. The Sector Ministry shall send a summary to the Director of Environment and other relevant Ministries for consideration. Each relevant Ministry shall respond to the Director of Environment within twenty one (21) days of the receipt of the summary.

2) Scoping

The Sector Ministry shall conduct scoping in order to determine and establish the Terms of Reference (hereinafter referred to as "TOR") of the SEA study to be required for the examination of a Bill, regulation, policy, strategy, programme or plan.

3) TOR Development

And the level of detail of the information to be included in the SEA report to be prepared while identifying key authorities to be consulted, providing opportunities for public consultation and determining the consultation period it intends to use.

4) Identification of Alternatives and Impact Assessment

5) Preparation of the SEA Report (D/F).

The report shall identify, describe and evaluate the significant effects on the environment and health for implementing a Bill, regulation, policy, strategy, programme or plan.

6) Consultation and Participation

7) Revising of the SEA Report (D/F) and Preparation of Final Report

8) Approval of the SEA Final Report

The Minister shall take into account the review process and makes one of the following decisions:

(i) SEA Report is approved;
(ii) SEA Report is not approved; or
(iii) SEA Report is conditionally approved subject to incorporating the relevant authority's recommended changes.

9) Monitoring of significant environmental impacts of implementation of a Bill, regulation, policy, strategy, programme or plan.

The Sector Ministry shall monitor the significant environmental effects of implementation of a Bill, regulation, policy, strategy, programme or plan for which it has carried out the SEA.

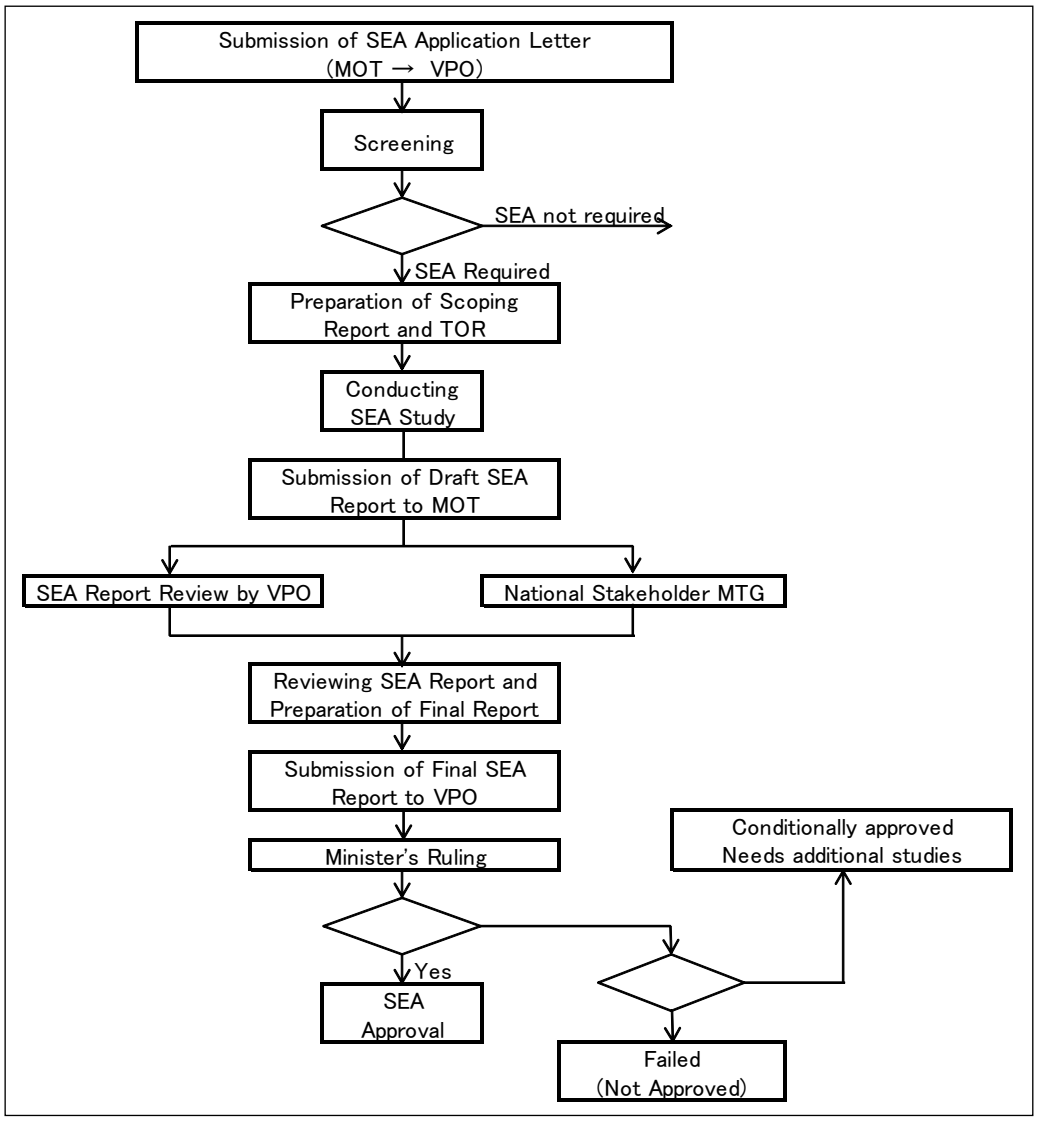


Figure 10.2: SEA Approval Process in Tanzania

As for this subjected Master Plan Study, MOT as the Sector Ministry, in cooperation and by financial assistance by Japan International Cooperation Agency (hereinafter referred to as "JICA"), a local SEA Study Team (by Inter-Consult Ltd.; hereinafter referred to as "ICL") was formed, comprising NEMC registered Environmental Consults, etc. in line with the requirements of the SEA Regulation.

As per the requirement based on the stipulation of the SEA Regulation 2008, the SEA Study and procedure for gaining approval from the State Minister responsible for Environment, took place as follows:

Firstly, the SEA Application document prepared by ICL was submitted by MOT to the Division of Environment, VPO as the SEA Authority in Tanzania, in early April 2013. Although the screening procedure took a while till its result was officially revealed by VPO on 5 July (noting that for this M/P, the SEA procedure must be applied according to the SEA Regulation), stakeholder consultations at the subjected regions was conducted based on prior go-ahead notice from VPO, from 2 May to 7 June to reflect its results into the SEA Scoping Report and the SEA TOR Report.

The draft Final SEA Scoping Report and draft Final SEA TOR Report was presented at the stakeholder brainstorming meeting held on 18 July 2013, to ask for its relevancy to undergo the actual SEA Study by the suggested scope and TOR. The Scoping Report and SEA TOR Report included description of the alternatives to be considered, along with the simple explanation on the so called Analytic Hierarchy Process (hereinafter, referred to as "AHP") Methodology to be applied for consideration of the most preferable alternative (see item 10.3.3 for details on the Methodology). They also included the scope and TOR respectively, for undergoing the impact assessment at SEA level, whereby describing that the mandatory environmental and social impact items stipulated in the Third Schedule of the SEA Regulation shall be assessed. Other requirements stipulated in the Regulation, such as consideration of mitigation measures, and setting forth of the monitoring plan, was also incorporated. The result of this brainstorming meeting along with comments from MOT and JICA were reflected into the Final Scoping Report and Final SEA TOR Report, submitted by MOT to VPO on 6 August and then approved by VPO on 20 August 2013.

The draft SEA Report was then drafted in line with the contents of the approved Final Scoping Report and Final SEA TOR Report, and the final stakeholder meeting at the national level was held on 1 October 2013 for the stakeholders to determine the relevancy of its content. The result of this stakeholder meeting was reflected into the Final SEA Report (see attached Appendix 3), along with the comments from MOT, VPO and related stakeholders, and the Final SEA Report was submitted by MOT to VPO on 6 January 2014.

The Vice President's Office, upon approval by the State Minister responsible for Environment, finally gave approval on the Final SEA Report on 10 February 2014 (see Appendix 3).

10.1.3 The Environmental Impact Assessment (EIA) Procedure in Tanzania

As explained above, later on after the formation of this subjected Master Plan, the prioritized projects (i.e., pre-feasibility studies) under this Master Plan, shall be subjected for IEE and/or EIA later on. The required IEE/EIA procedures to be applied shall be explained as follows:

(1) The Environmental Impact Assessment (EIA) Procedure in Tanzania

Basically, the entire environmental licensing and its relevant EIA examination process in Tanzania consist of the following four (4) steps: (i) project registration and screening, (ii) TOR development and its approval; (iii) relevant environmental studies and the preparation of EIS report; and (iv) EIS evaluation and its license approval. The following is the outline of these IEE/EIA Examination steps.

1) Submit an official application form for an environmental impact assessment certificate to NEMC with a project brief that summarizes the project and the surrounding bio-physical and socio-cultural environment of the project site. This project brief shall be prepared by the registered EIA experts.
2) NEMC starts the screening of the project brief and evaluates the magnitude of possible negative impacts to be caused by the proposed project. This project brief evaluation takes at most forty five (45) days.
3) If NEMC concludes that the proposed project will not cause severe negative environmental impacts, or the environmental mitigation programme attached therein is comprehensive and sufficient, NEMC may recommend the Minister responsible for Environment (hereinafter referred to as "Minister") to approve the project.
4) If NEMC concludes that the proposed project will cause significant negative environmental impacts, and/or environmental mitigation programme, described in the project brief, is not

sufficient, then NEMC will ask the project owner to conduct either (i) **Preliminary Assessment,** or (ii) **full-scale EIA**, depending the temporal and spatial scale of the possible negative environmental impacts to be caused by the implementation of the proposed project. It shall be noted that **Preliminary Assessment** is equivalent to IEE used in general EIA-related terminology.

Preliminary Assessment

5) TOR of environmental studies to be required for this preliminary assessment do not need approval from NEMC prior to implementation, whereas it is mandatory for full-scale EIA studies. Therefore, upon reviewing the guideline for preliminary assessment specified in GN. NO. 349 of 2005, the project owner can start relevant environmental studies and submit documentations required for the approval.

6) If NEMC concludes that the proposed project will not cause severe negative environmental impacts and the environmental mitigation programme attached therein is comprehensive and sufficient, the NEMC may recommend the Minister to approve the project. Otherwise, the NEMC will inform the project owner to undertake a full-scale EIA.

Full-scale EIA

7) As mentioned above, the project owner shall obtain approval of TOR of relevant EIA-related environmental studies from NEMC, and this TOR development shall be conducted through a series of consultation processes with NEMC. This EIA study shall be conducted by registered EIA experts.

8) During the EIA study period, the project owner shall conduct relevant PAPs identification work and discuss the necessity of public meetings with the NEMC.

9) Based on study results of the EIA study, the project owner shall prepare the EIS. This EIS shall be signed by each of the individuals involved the assessment works. The project owner shall submit fifteen (15) sets of original copies and one (1) electronic copy of the EIS to the NEMC.

10) Examination of a submitted EIS report is to be conducted by a cross-sectoral technical advisory committee set up by the NEMC. Within fourteen (14) days of receipt of the EIS report, the NEMC submits a copy to any relevant Ministry and public institutes. Also, the NEMC will issue a public announcement for public review, inviting the general public for their comments. The examination of a submitted EIS is to be done by the Advisory Committee, line ministry, public institutions and the general public, separately. Within thirty (30) days of receipt of the EIS, the NEMC also has to decide whether or not to convene a public hearing.

11) Comments from the line ministry and public institutes are to be summarized within thirty (30) days of the receipt of the EIS report. Upon considering the overall features of proposed project, this examination period may be extended by NEMC.

12) The NEMC will undertake the review of a submitted EIS. Meantime, the NEMC may arrange on-site technical visits with the project owner. It shall be noted that relevant travel expense and per diem shall be paid by the project owner.

13) Upon completion of all review processes, the NEMC will prepare a report of the review of submitted EIS, and submit this report to the Minister. Then, the Minister will give his decision on the submitted EIS within thirty (30) days of receiving recommendations from the NEMC.

The and shows the schematic diagram of the entire environmental license approval system in Tanzania.

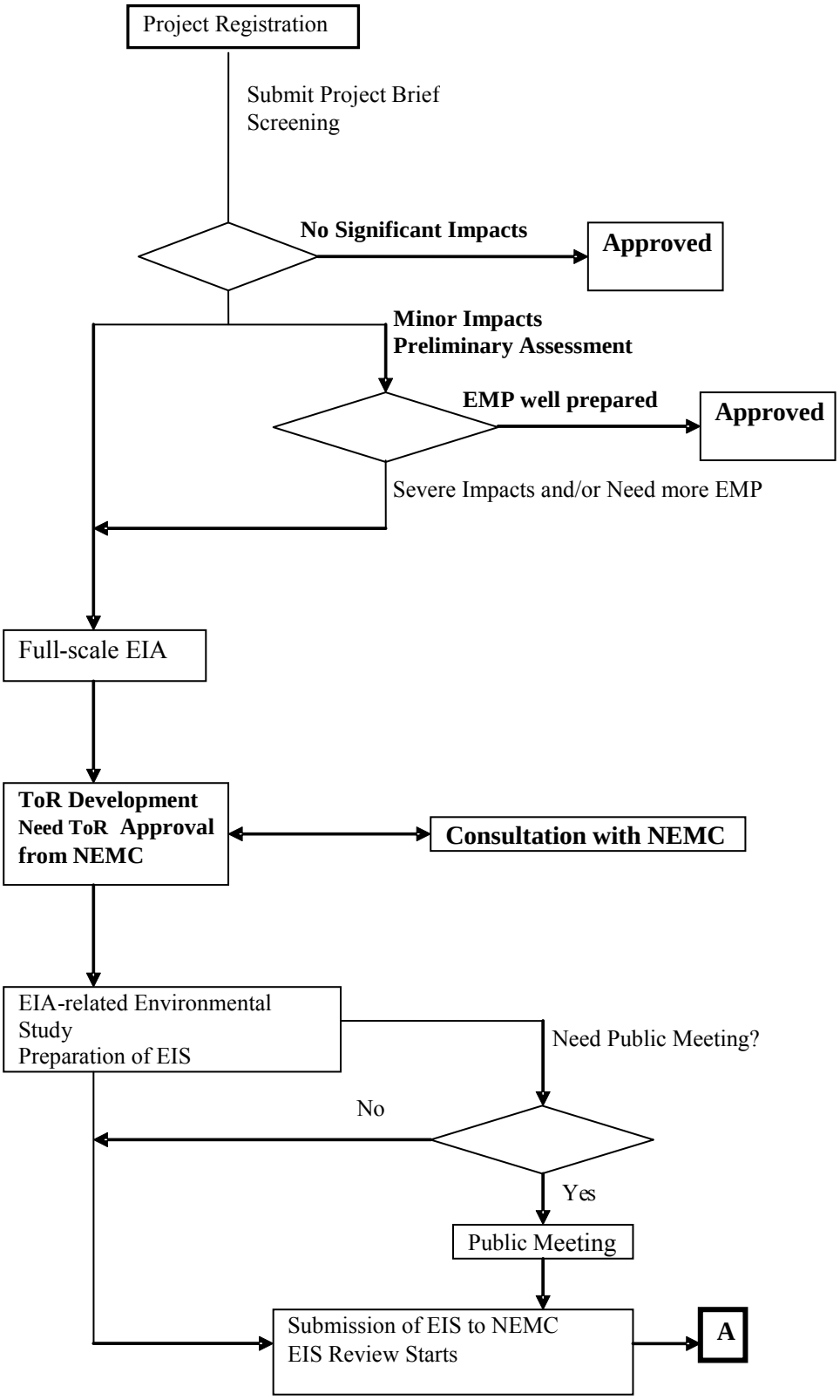


Figure 10.3: Environmental License Approval Process in Tanzania

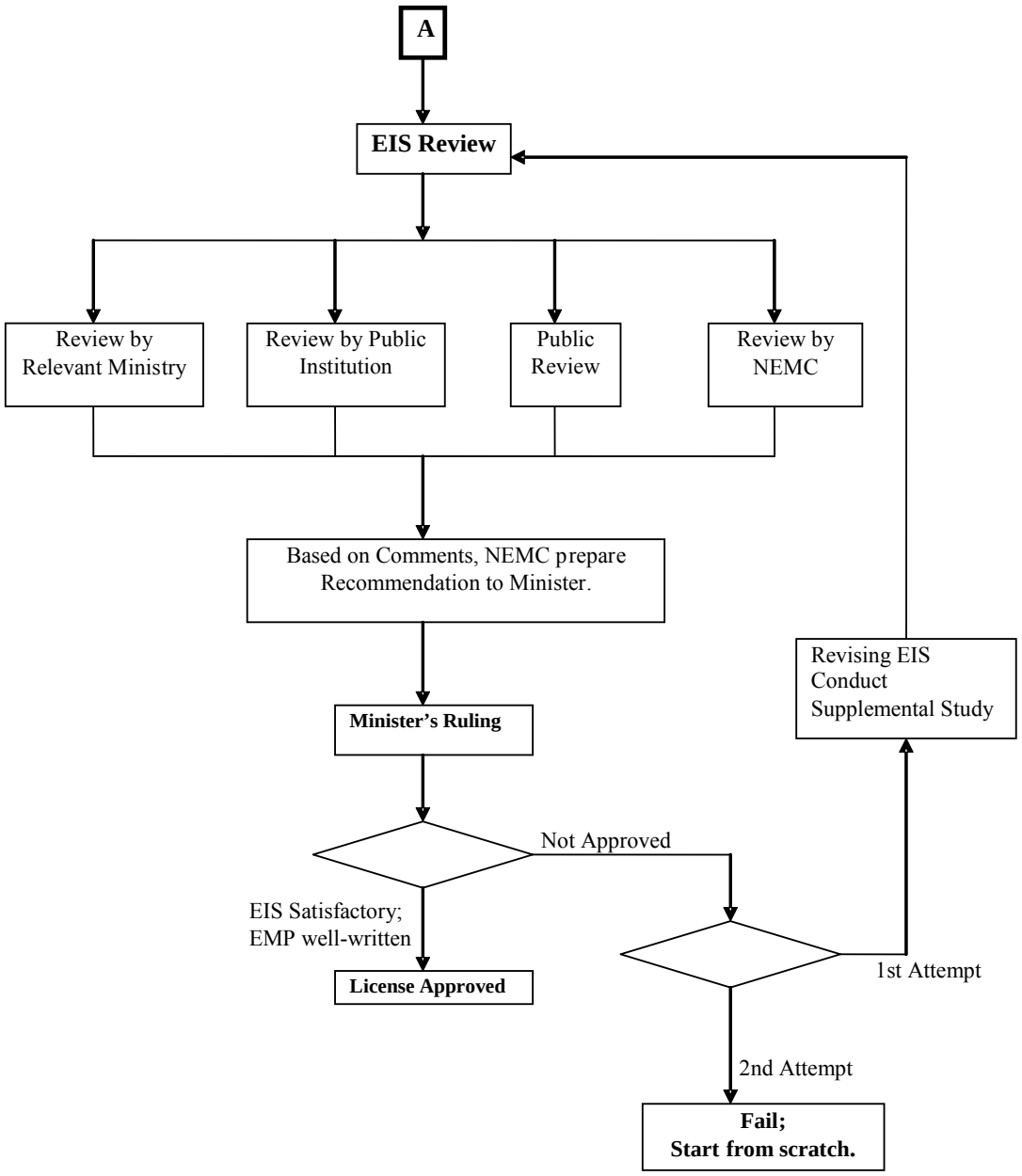


Figure 10.3: Environmental License Approval Process in Tanzania (continued)

10.2 Outline of Environmental and Social Baseline Situation of Subjected Regions of the Master Plan

As for the baseline study, its studying outline was firstly presented in Task 4: Baseline data collection, of the Final SEA TOR Report. The environmental and social impact items selected are based upon the mandatory studying items set forth by the Third Schedule of the SEA Regulation 2008. As for collection of region-wise baseline information on these subjected environmental items, social items were used to determine indicative quantitative data and related qualitative information for assessing the assumed impacts and their degrees later on. Focal issues and points to be taken into consideration were set as per the following table:

Table 10.1: Focal Assessing Issues of Environmental and Social Impact Items Subjected for SEA

Impact Items	Main Indicators	Focal Assessing Issues
Biodiversity, flora, fauna	• Area occupied for forest and game reserves • Area covered by natural vegetation (E.g. mangrove).	• Loss of biodiversity, unique, rare and threatened species
Population	• Regional total population and density	• Resettlement
	• Regional poverty line	• Vulnerability
	• Minority Groups	• Vulnerability
	• Ethnic Groups	• Vulnerability
Social	• Gross Regional Product (GRP) • Gross Regional Domestic Product (GDP)	• Socio-economic conditions
	• Number of hospitals, schools, religious facilities	• Loss of social amenities • Access to social services
Human Health	• Prevalence of communicable diseases • Prevalence of non-communicable diseases	• Health conditions
Soil	• Soil suitability • Soil productivity	• Loss of suitable and productive soils
Water	• Area covered by water bodies (e.g. rivers, lakes, etc. • Wetland areas	• Water Pollution
Air	• Ambient air quality	• Air pollution
Climatic factors	• Flood prone areas • Drought prone areas	• Vulnerability to climate change
Material assets	• Areas with mineral resources (e.g. quarry sites)	• Loss of material assets
	• Utilities	• Loss of access to social service utilities
Cultural heritage (including architectural and archaeological heritage)	• Cultural sites • Historic sites • Archaeological sites	• Loss of cultural, historic, archaeological properties
Landscape	• Unique landscape areas • Areas prone to soil erosion, tectonic effects, etc.	• Loss of landscapes with aesthetic values

The actual baseline study results are presented in Chapter 5.0 and 6.0 of the "Final SEA Report" (to avoid unnecessary duplication, its actual contents will be omitted here. Pls. refer to the actual report – Appendix 3). Chapter 5.0 presents the overall state of environment of Tanzania by elaborating on (a) location and land area, (b) topography, (c) geology and soils, (d) climate, (e) administrative set up, (f) land use distribution, (g) surface and ground water resources, (h) ecosystems, (i) fauna and flora, (j) protected areas, (k) forest and woodland resources, (l) wildlife resources, (m) cultural and world heritage sites, (n) mineral resources, and (o) energy resources.

After that, Chapter 6.0 of the "Final SEA Report" illustrates the characteristics of the existing environment (relevant to the Master Plan) and the likely changes which might take place without the implementation of the Master Plan; in other words, the chapter explains the state of environment if the zero option of the Master Plan is selected.

Some basic background information, maps and statistics where collected or developed in order to clarify the basis of the baseline study. For example, maps on protected areas and demographic distributions in combination with project site areas were studied. Below are supplementary maps and data related to this Study for the sole purpose of reference.

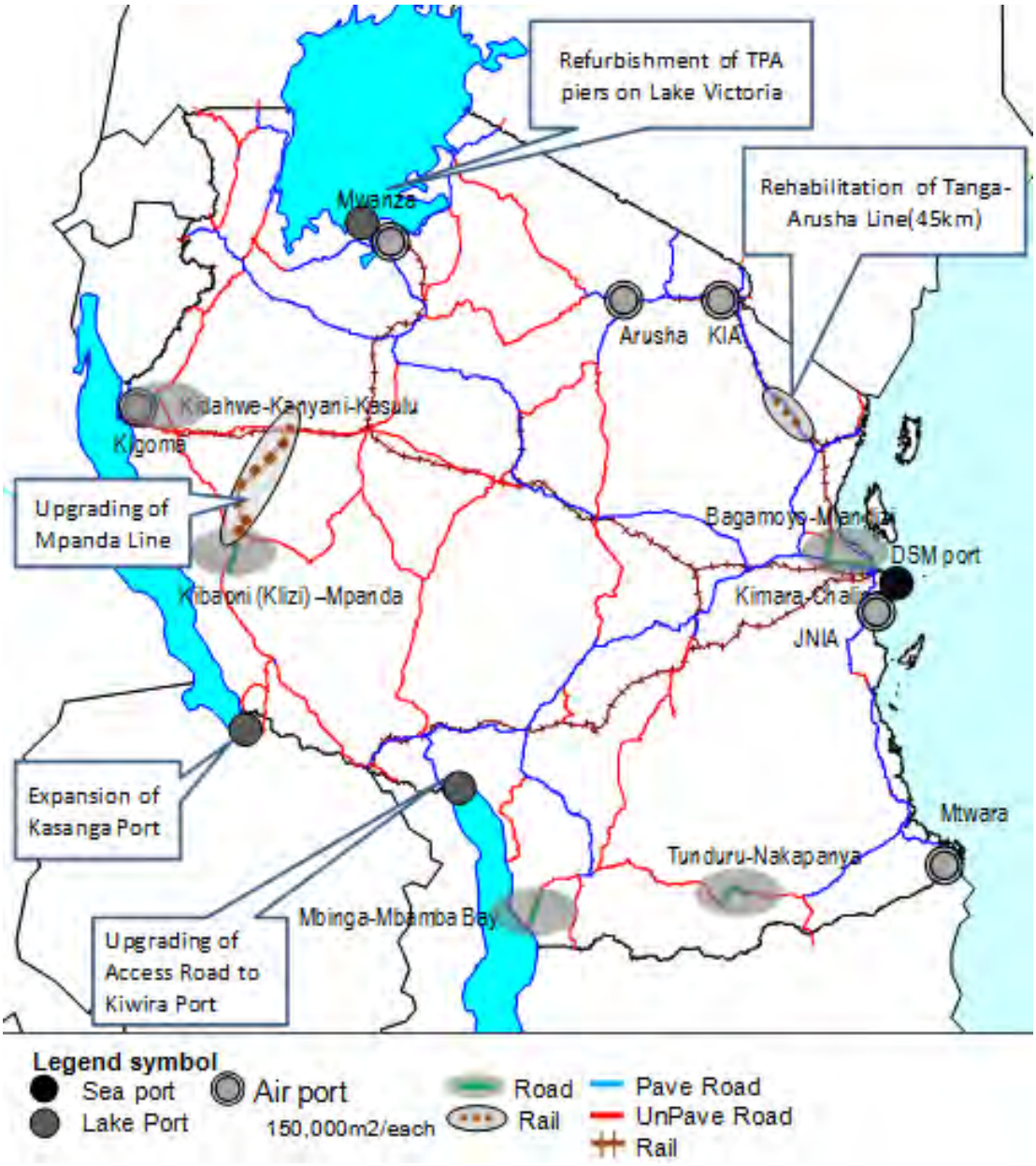


Figure 10.4: Map on Major Project Site Locations Planned under the Transport Master Plan

Table 10.2: National Parks and Game Reserves in Tanzania

National Parks and Game Reserves

National Parks

No.	Name	Area (sq. km)
01	Serengeti	14,750
02	Ruaha	13,000
03	Ngorongoro	8,320
04	Mikumi	3,230
05	Tarangire	2,600
06	Katavi	2,252
07	Saadani	1,100
08	Udzungwa	1,000
09	Kilimanjaro	750
10	Rubondo	460
11	Kitulo	442
12	Mahale	410
13	Lake Manyara	325
14	Arusha	117
15	Gombe Stream	52

Source: Ministry of Natural Resources and Tourism

Game Reserves

No.	Name	Area (sq. km)
1.	Selous	50,000
2.	Ruangwa	9,000
3.	Kigosi	8,000
4.	Moyowosi	6,000
5.	Ugalla	5,000
6.	Uwanda	5,000
7.	Burigi	2,200
8.	Maswa	2,200
9.	Kizigo	2,000
10.	Umba	1,500
11.	Biharamulo	1,300
12.	Mkomazi	1,000
13.	Kilimanjaro	900
14.	Mount Meru	300
15.	Ibanda	200
16.	Saa Nane Island	50

Source: Ministry of Natural Resources and Tourism

Table 10.3: Population Distribution, Population Density and Average Annual Intercensal Growth Rate (Percentage) by Region: 2012 Census

Region	Population		Land Area (Sq. km)	Population Density 2012	Intercensal Growth Rate
	2002	2012			
Tanzania	**34,443,603**	**44,928,923**	**885,803**	**51**	**2.7**
Tanzania Mainland	**33,461,849**	**43,625,354**	**883,343**	**50**	**2.7**
Dodoma	1,692,025	2,083,588	41,311	50	2.1
Arusha	1,288,088	1,694,310	37,576	45	2.7
Kilimanjaro	1,376,702	1,640,087	13,250	124	1.8
Tanga	1,636,280	2,045,205	26,677	77	2.2
Morogoro	1,753,362	2,218,492	70,624	31	2.4
Pwani	885,017	1,098,668	32,547	34	2.2
Dar es Salaam	2,487,288	4,364,541	1,393	3,133	5.6
Lindi	787,624	864,652	66,040	13	0.9
Mtwara	1,124,481	1,270,854	16,710	76	1.2
Ruvuma	1,113,715	1,376,891	63,669	22	2.1
Iringa	840,404	941,238	35,503	27	1.1
Mbeya	2,063,328	2,707,410	60,350	45	2.7
Singida	1,086,748	1,370,637	49,340	28	2.3
Tabora	1,710,465	2,291,623	76,150	30	2.9
Rukwa	729,060	1,004,539	22,792	44	3.2
Kigoma	1,674,047	2,127,930	37,040	57	2.4
Shinyanga	1,249,226	1,534,808	18,901	81	2.1
Kagera	1,791,451	2,458,023	25,265	97	3.2
Mwanza	2,058,866	2,772,509	9,467	293	3
Mara	1,363,397	1,743,830	21,760	80	2.5
Manyara	1,037,605	1,425,131	44,522	32	3.2
Njombe	648,464	702,097	21,347	81	0.8
Katavi	408,609	564,604	45,843	15	3.2
Simiyu	1,317,879	1,584,157	25,212	63	1.8
Geita	1,337,718	1,739,530	20,054	28	2.6
Tanzania Zanzibar	**981,754**	**1,303,569**	**2,460**	**530**	**2.8**
Kaskazini Unguja	136,639	187,455	470	399	3.2
Kusini Unguja	94,244	115,588	854	135	2
Mjini Magharibi	390,074	593,678	230	2,581	4.2
Kaskazini Pemba	185,326	211,732	574	369	1.3
Kusini Pemba	175,471	195,116	332	588	1.1

Source: 2012 population and Housing Census, NBS

10.3 Scoping

10.3.1 Scope and TOR for Consideration of Strategic Alternatives

The below table illustrates the considered strategic alternatives, in terms of the subjected Master Plan.

Alternative 1 is composed of five strategies put forward in the Master Plan study. The other three alternatives (i.e. A2, A3 and A4) have been formulated by replacing one of the strategies in Alternative 1 with either one of the following three other proposed strategies by the Master Plan study team.

- Drastic expansion of the railway share to overall transport volume
- Ensuring comprehensive railway operations through integration of relevant operators and asset management companies.
- Ensuring balanced development of Tanzania by achieving an 'even' development of corridors across the nation.

Table 10.4: Considered Strategic Alternatives

A1 = Strategy 1: Strengthening of International Corridors; Strategy 2: Establishing a Comprehensive Transport Network with a Balanced Modal Mix; Strategy 3: Meeting Domestic Transport Demand; Strategy 4: Alleviating Bottlenecks in the Dar es Salaam Area; and Strategy 5: Establishing a Clear Regulatory/Financing Framework.
A2 = Strategy 1: Strengthening of International Corridors; Strategy 2: Establishing a Comprehensive Transport Network with a Balanced Modal Mix; Strategy 3: Meeting Domestic Transport Demand; Strategy 4: Drastic expansion of the railway share to overall transport volume and ensuring comprehensive railway operations through integration of relevant operators and asset management companies; Strategy 5: Establishing a Clear Regulatory/Financing Framework.
A3 = Strategy 1: Strengthening of International Corridors; Strategy 2: Establishing a Comprehensive Transport Network with a Balanced Modal Mix; Strategy 3: Ensuring balanced development of Tanzania by achieving an 'even' development of corridors across the nation; Strategy 4: Alleviating Bottlenecks in the Dar es Salaam Area; and Strategy 5: Establishing a Clear Regulatory/Financing Framework
A4 = Strategy 1: Drastic expansion of the railway share to overall transport volume and ensuring comprehensive railway operations through integration of relevant operators and asset management companies; Strategy 2: Establishing a Comprehensive Transport Network with a Balanced Modal Mix; Strategy 3: Meeting Domestic Transport Demand; Strategy 4: Alleviating Bottlenecks in the Dar Es Salaam Area; and Strategy 5: Establishing a Clear Regulatory/Financing Framework.

10.3.2 Environmental, Social and Economical Criteria

Environmental, Social and Economical criteria (5 criteria each) were set up as follows, for undergoing the so called AHP Methodology by determining the weight (according to related stakeholders' vote on preference of importance by comparison of set criteria) of each criteria, and for evaluation of preference of alternatives by pairwise comparison (taking note of assumed environmental and social impacts in reference to baseline study results, etc.).

Table 10.5: Environmental, Social and Economic Criteria Set Forth in Undergoing the AHP (Analytic Hierarchy Process) Analysis for Consideration of Alternatives

Environmental Criteria	**Description of Criteria**
C1 – Atmospheric emissions	Produce lower CO2 and greenhouse gas (GHG) emissions with impact on climate change, especially with regard to railway transport, and alleviate traffic congestion in Dar Es Salaam through widening of existing roads and development of outer ring roads and bypasses.
C2 – Biodiversity	Cause less damage and disturbance to areas with high biodiversity in terms of flora and fauna, including important marine (aquatic) and terrestrial habitats.
C3 – Environmentally Sensitive areas	Cause less impact on environmentally sensitive areas like game reserve, national parks and wetlands.
C4 – Water and Soil	Have less impact on both inland and coastal water bodies and fewer disturbances on valued soils.
C5 – Landscape	Cause fewer disturbances on landscape.
ECONOMIC CRITERIA	Description of criteria
C6 – Economic efficiency	Favour low transportation costs in terms of time and money spent and handle large amount / volume of freight / cargo.
C7 – Access to domestic and external market.	Provide opportunity to access domestic (internal) and foreign (external) markets.
C8 - Trade facilitation	Streamline clearance procedures to overcome existing inefficiencies in cargo handling and promote private sector participation.
C9 – Freight / cargo handling capacity.	Provide solutions related to forecasted transport demand and cater to large amount of freight / cargo handling needs.
C10 – Cost effectiveness	Promote low investment cost and meet the needs for immediate solution to increasing transport demand.
3. SOCIAL CRITERIA	Description of criteria
C11-Involuntary Resettlement	Ensure affordable and reliable transport to people along the corridors.
C12-Easy access to social services	Meet the transport demands for the greatest number of people both along the corridor and remote areas enabling easy access to social services e.g. schools, health facilities etc.
C13-Public Health and Safety	Minimize risks to public health and increase safety (reduced accidents) through improved infrastructure. (E.g. paved roads).
C14- Standard of Living	Exploit opportunity to improve the Standard of living through improved access to external markets for local products and produce.
C15-Cultural Heritage	Ensure easy access to well preserved cultural heritage

10.3.3 The AHP (Analytic Hierarchy Process) Methodology

The JICA Environmental and Social Consideration Guideline 2010, basically demands a quantitative analysis approach to be applied when evaluating alternatives. Although there are no certain fixed analytic methodology applied in consideration of alternatives at SEA level, the so called AHP methodology can be noted as the most commonly utilized quantitative analytic approach known world-wide.

In basic terms, the outline of AHP methodology applied in this respect was explained in detail in item 4.2.1 of the Final SEA Scoping Report. However, one unique characteristic of the AHP

methodology that should be pointed out is that human judgment of stakeholders, and not just scientific assessment, are reflected in the consideration. Criteria set forth to evaluate the alternatives are compared with one another by human judgment to determine the weight according to the preference of importance by the people. As the stakeholders select the criteria which comparatively seems more important to them based on their interests and decisions, the weight given to each set criterion reflects their commitment to that particular alternative. On the other hand, the other focus of AHP is on scientific evaluation in terms of preference of criteria-wise alternatives based on assumed degree of negative and positive impacts by implementation of the subjected alternative in question (transport mode-and strategy wise, for each alternative).

All of the above points describe the reason why the AHP methodology was selected and applied (the relevancy for its application to this study as a well known methodology world-wide which takes into perspective the stakeholders' opinion into its quantitative analysis and the scientific approach for evaluation of pair-wise comparison of impact degrees of each alternative).

10.3.4 The Scope and TOR of Environmental and Social Impact Assessment

Taking note of the baseline study for the Environmental and Social Impact Assessment (hereinafter referred to as "ESIA"), the focal points to be covered were clarified in item 2.0 "The Scope of SEA Study" of the Final SEA TOR Report (subjected impact items to be assessed are the mandatory items stipulated in the Third Schedule of the SEA Regulation 2008). These include,

a) Relevant aspect of the current state of the environment (however, the likely evolution thereof without the Master Plan shall be dealt within the context of consideration of alternatives)
b) The environmental characteristics of areas likely to be significantly affected (information collected during the stakeholder consultations in the regions, and other opinions raised during national level public hearing sessions shall be utilized)
c) Any existing environmental problems which are relevant to the Master Plan (source shall be the same as above)
d) Environmental protection objectives, established at national level, relevant to the Master Plan, and the way those objectives and any environmental considerations have been taken into account during preparation.
e) Likely significant effects on the environment (regarding above set up studying items based on the Third Schedule), would include short, medium and long term effects, likelihood of occurrence, reversibility, permanent and temporary effects, and secondary, cumulative and synergetic effects.

As per the SEA Regulation 2008, the ESIA were to be accompanied with appropriate mitigation measures for each impact item according to the result of each impact assessment (estimated impact area, kind and degree of impact) and a monitoring plan to be applied was to be prepared for the subjected Master Plan.

10.3.5 Stakeholder Analysis

The outcome of the Stakeholder analysis was conducted during the drafting of the scoping report; the outcome is shown in items A & B of Appendix 7 of the attached Final SEA Report (see Appendix 3).

The stakeholder analysis table comprises stakeholders of related authorities at national level (including Environmental authorities, related Ministries and Departments) and at regional level including Regional Administrative Secretaries (RAS) and Municipal/ City/ Town Councils, related governmental agencies at national level as well as at regional level (such as TANROADS, TPA, TRL, TAA, etc.), private operators, related infrastructure users and traders, and major NGOs. The list was analyzed to indicate whether they were beneficiaries or individuals to-be-influenced by implementation of the Master Plan, or both.

10.3.6 Result of Stakeholder Consultations at Regional Level

Stakeholder consultations in the subjected regions were conducted from 2 May to 7 June 2013. The subjected regions included, related stakeholders in Dar es Salaam, Mbeya, Pwani, Rukwa, Ruvuma, Tanga, Mwanza and Kigoma regions.

Some issues of concern related to projects planned under the subjected Master Plan were raised from stakeholders. Some examples are as follows:

(1) Expansion of Kimara–Chalinze (94 km, Morogoro Rd) Road to 4-lane from existing 2-lane

There could be extra-ordinary claims to the government as there are numerous filling stations that would be affected. Nevertheless, these claims would depend on whether the filling station investors erected their facilities before the Tanzanian Road Reserves regulations came into force. In addition, the benefits outweigh the costs in the long term. Furthermore, there could be a substantial decrease in potential claims during project implementation (i.e. by passing some of these facilities).

(2) Development of Deep Water Port at Mwambani Tanga

Mwambani has been reserved as a Marine Park. This area hosts silicate fish (i.e. very rare specie), therefore the construction of Mwambani Port could deplete this type of fish.

(3) Construction of Mbinga-Mbamba Bay Road

Livingstone waterfalls, a tourist attraction, could be affected. However, the risk stemming from this factor could be mitigated by passing the area during project implementation.

(4) Construction of Chunya–Rungwe–Itigi–Mkiwa Road

There will be tremendous resettlement costs at Makongoros village. This is based on the fact that the area has a lot of business activities and is highly congested. Nevertheless, substantial costs could be avoided during project implementation (i.e. by passing the area).

(5) Expansion of Kasanga Port

Some of the area that could be taken belongs to the Ministry of Defense (i.e. army). This could create conflicts between the Ministry of Transport and the Ministry of Defense as the area could be a strategic point of the Tanzanian Army.

The outcome obtained through these stakeholder consultations at the subjected regions were evaluated and then reflected into the Final SEA Report according to its necessity, especially within analysis of environmental and social impact assessment at this SEA Study level. It must be noted, however, that since this is an SEA, its assessment stays at area specified level regulated by the SEA Regulation, unlike EIA which assesses up to the point detailed within the project site level.

10.3.7 Result of the Stakeholders' Brainstorming Meeting at National Level

The Stakeholders' Brainstorming Meeting at National level was held on 18 July 2013. 45 participants from among the invited stakeholders from the subjected regions and Dar es Salaam attended this meeting. The main objective of this meeting was to ask the stakeholders the relevancy of the content of the draft Scoping Report and draft SEA TOR Report, and to receive their comments on carrying out an SEA Study according to these finalized Reports. Some major comments were raised and were responded respectively although there were no major objection to the content of the draft Scoping Report and draft SEA TOR Report:

In accordance with the SEA consultant team and MOT's final decision, some major comments found relevant to the SEA Study were incorporated to the Final Scoping Report and Final SEA TOR Report, which was then submitted by MOT to VPO on 2 August 2013.

Also, as for the evaluation criteria for consideration of alternatives, the participated stakeholders voted on to whichever criteria they thought to be more important than others. The below table shows the outcome in which the "weight" of each criterion was determined, which was applied later on for the AHP analysis to undergo consideration of alternatives during the SEA study conducted by the SEA consultants.

According to this result, attended stakeholders voted most for the Economic criteria – Economic efficiency (with 10% weight), followed by Trade facilitation (9.5%) and thirdly Access to domestic and external market (8.3%) and the Social criterion – Easy access to social services (8.3%) with the same weight. On the other hand, stakeholders voted least for the Environmental criterion – Landscape (2.9%) followed by the Social criterion – Cultural Heritage (3.4%) and third from bottom, the Environmental criterion – Water and Soil (4.6%).

As can be confirmed from the below table, further input from stakeholders also was set forth in the re-evaluation of criteria of importance according to related stakeholders' interest, based on detailed evaluation according to transport mode. This re-evaluation was requested by the stakeholders themselves, during the Stakeholders' Brainstorming Meeting at the National level, and hence, this result was applied and reflected into the AHP analysis rather than the above result achieved in general terms. As can be confirmed below, the Economic criteria on Accessibility to Domestic & External Market – C12 (8.9%) and Economic Efficiency – C11 (8.7%), along with Standard of Living – C9 (8.7%) gained the highest weight values, whereas, Freight and Cargo Handling Capacity – C14 (2.0%), Cultural Heritage – C10 (3.6%) and Landscape – C5 (4.7%) showed the lowest weight values.

Table 10.6: Criteria Weight Determination, Based on Transport Mode (by Voting Input from the Stakeholders at Brainstorming Meeting at National Level)

CRITERIA DETERMINATION WORKSHEET – BASED ON TRANSPORT MODE

	Environmental					Social					Economic				
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15
1	6	7	4	4	6	7	8	6	8	3	8	10	9	9	5
2	1	5	6	3	6	2		6	2	5	9	7	4	2	4
3	4	2		1	2	6	2	3	5	3	2	4	3	4	3
4	4	4	1	2	2	4	6	5	6	5	5	6	5	4	4
5	1	10	1	8	3	1	2		7	1		5	4	1	3
6	3	2	1	2	2	2	2	2	2	3	1	4	2	4	4
7	8	3	4	6	4	3	2	5	5	2	7	5	5	3	6
8	6	4	3	5	5	6	2	2	2	3	7	7	5	6	6
9	3	3	3	3	2	3	2	4	3	6	5	4	5	5	4
10	1		1			1	1	1	1		1	1		1	1
11	1	2	2	1	1	2	1	1	2	1	2	1	2	1	2
12	2	5	5	5		8	5	3	6	2	5	5	4	6	4
13	2	2	3	2	2	4	2	2	6	4	3	5	5	3	3
14	4	4	4		2	2	3	3	6	2	6	6	3	6	2
15	2	4	6		2	6	2	4	2		2	2	4	2	2
16	1	1	1	1	1	1	1	1	1	1	2	3	2	2	2
17	2	4	4	1	1	4	3	1	3		6	5	5	3	4
18	1	2	1			4	5		4		10	8	10	4	
19	8	9	9	8	8	9	8	7	6	4	5	5	9	6	6
20	4	2	1	2	1	1	2	1	1	1	2	2	2		3
21	4	3	2	3		3	3	2	2		3	3	2	2	
22	4	4	4	4		8	9	6	8		12	10	10	10	9
23	12	6	6	6	6	10	5	12	11	1	11	11	11	9	10
24	5						3		11		11	10	10	10	10
25	9	10	10	9	10	6	4	2	9	2	7	7	2	4	4
26	1	2	2	2	3	4	6		6	2	4	3	3	5	7
27	1	2	4	2	3	5	5	3	5	1	2	3	3	5	3
28	3	8	4	2	2	6	4	1	4	1	5	4	4		6
29	6	6	6	6	4	4	5	4	7	5	6	6	5	7	6
30	3	2	2	2	2	1	1	1	3	2	3	2	1	3	2
31	1	3	3	3	3	4	6	7	10	4	3	5	3	6	1
32	113	121	103	93	83	127	110	95	154	64	155	159	142	133	126
C WT	0.064	0.068	0.058	0.052	0.047	0.071	0.062	0.053	0.087	0.036	0.087	0.089	0.080	0.020	0.071

Note: CWT = Criteria Weighting

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15
0.064	0.068	0.058	0.052	0.047	0.071	0.062	0.053	0.087	0.036	0.087	0.089	0.080	0.020	0.071

10.4 SEA Result: Selected Most Preferable Strategic Alternative

By applying the AHP methodology for consideration of alternatives, it was found that Alternative 1 was the most preferable alternative in planning the subjected Master Plan (achieving the top score of 0.2914 = 29.14%, after generalization of the assessment, see Table 10.9 below).

10.4.1 Result of SEA Quantitative Analysis by AHP Methodology

After allocating the weights to the set criteria through voting input from stakeholders during the Brainstorming Meeting at the National level, as explained in item 10.3.7 above, the analysis for selecting the most preferable alternative shifted in determination of the criteria-wise weight of alternatives (or weight of preference of alternatives) by conducting the below analysis.

With regard to pairwise comparison of alternatives based on AHP methodology, this process was somewhat modified by assessment of criteria-wise impacts according to transport mode and strategies, focusing on determining the weight or preference of alternatives. The criteria-wise assessment score on impact was then summed up according to each alternative. The criteria-wise assessment scores were then divided by its grand total score according to each alternative, giving its normalized figure or weight of alternative (whereby the total normalized figure according to each alternative should be summed up as 1.0 = 100%). The figures achieved can then be assumed as the degree of preference of each alternative with the higher score indicating higher preference (or less negative impact).

The generalization of the assessment to identify the most preferable alternative was achieved by multiplying the result of the weight of alternatives through assessment of the criteria-/alternative-wise degree of impacts with the previously achieved weight of each criteria (with the highest score result indicating the most preferable alternative). Alternative 1 achieved the highest score of approx. 0.29, therefore was selected as the most preferable alternative.

Table 10.7: Assessment of Criteria- /Alternative-wise Impacts, According to Transport Mode and Strategies (1)

CONSIDERED ALTERNATIVES	TRANSPORT MODES	Environmental criteria					Social criteria					Economic criteria				
		Atmospheric emissions	Biodiversity	Environmentally Sensitive areas	Water and soil	Landscape	Involuntary Resettlement	Easy access to social services	Public Health and Safety	Standard of Living	Cultural Heritage	Transportation cost	Accessibility to domestic and external markets	Faster movement of freight and cargo	Freight / cargo handling capacity.	Low investment cost
		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15
Alternative A1																
Strategy 1:	Road	1/9	1/7	1/7	1/5	1/7	1/5	9	1/7	9	1/5	1/3	9	9	8	1/7
	Inland Port	1/5	1/7	1/7	1/5	1/7	1/5	5	1/3	7	1/5	1/3	7	7	7	1/5
	Sea Port	1/7	1/7	1/7	1/5	1/7	1/7	5	1/3	7	1/7	1/3	7	7	7	1/7
	Railway	1/5	1/5	1/5	1/5	1/5	1/5	8	1/5	7	1/5	1/3	8	8	9	1/3
	Air transport	1/7	1/3	1/3	1/3	1/3	1/3	4	1/3	5	1/3	1/7	5	9	3	1/3
Strategy 2:	Road	1/9	1/7	1/7	1/5	1/7	1/5	9	1/7	9	1/5	1/3	9	9	8	1/7
	Inland Port	1/5	1/7	1/7	1/5	1/7	1/5	5	1/3	7	1/5	1/3	7	7	7	1/5
	Sea Port	1/7	1/7	1/7	1/5	1/7	1/7	5	1/3	7	1/7	1/3	7	7	7	1/7
	Railway	1/5	1/5	1/5	1/5	1/5	1/5	8	1/5	7	1/5	1/3	8	8	9	1/3
	Air transport	1/7	1/3	1/3	1/3	1/3	1/3	4	1/3	5	1/3	1/7	5	9	3	1/3
Strategy 3:	Road	1/9	1/7	1/7	1/5	1/7	1/5	9	1/7	9	1/5	1/3	9	9	8	1/7
	Inland Port	1/5	1/7	1/7	1/5	1/7	1/5	5	1/3	7	1/5	1/3	7	7	7	1/5
	Sea Port	1/7	1/7	1/7	1/5	1/7	1/7	5	1/3	7	1/7	1/3	7	7	7	1/7
	Railway	1/5	1/5	1/5	1/5	1/5	1/5	8	1/5	7	1/5	1/3	8	8	9	1/3
	Air transport	1/7	1/3	1/3	1/3	1/3	1/3	4	1/3	5	1/3	1/7	5	9	3	1/3
Strategy 4:	Road	1/9	1/7	1/7	1/5	1/7	1/5	9	1/7	9	1/5	1/3	9	9	8	1/7
	Inland Port	1/5	1/7	1/7	1/5	1/7	1/5	5	1/3	7	1/5	1/3	7	7	7	1/5
	Sea Port	1/7	1/7	1/7	1/5	1/7	1/7	5	1/3	7	1/7	1/3	7	7	7	1/7
	Railway	1/5	1/5	1/5	1/5	1/5	1/5	8	1/5	7	1/5	1/3	8	8	9	1/3
	Air transport	1/7	1/3	1/3	1/3	1/3	1/3	4	1/3	5	1/3	1/7	5	9	3	1/3
Strategy 5:	**No project**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
		3 1/5	3 6/7	3 6/7	4 1/2	3 6/7	4 1/3	124	5 3/8	140	4 1/3	6	144	160	136	743 1/7
		3.1873	*3.8476*	*3.8476*	*4.5333*	*3.8476*	*4.3048*	*124.0000*	*5.3714*	*#######*	*4.3048*	*5.9048*	*144.0000*	*160.0000*	*136.0000*	*743.1492*
Alternative A2																
Strategy 1:	Road	1/9	1/7	1/7	1/5	1/7	1/5	9	1/7	9	1/5	1/3	9	9	8	1/7
	Inland Port	1/5	1/7	1/7	1/5	1/7	1/5	5	1/3	7	1/5	1/3	7	7	7	1/5
	Sea Port	1/7	1/7	1/7	1/5	1/7	1/7	5	1/3	7	1/7	1/3	7	7	7	1/7
	Railway	1/5	1/5	1/5	1/5	1/5	1/5	8	1/5	7	1/5	1/3	8	8	9	1/3
	Air transport	1/7	1/3	1/3	1/3	1/3	1/3	4	1/3	5	1/3	1/7	5	9	3	1/3
Strategy 2:	Road	1/9	1/7	1/7	1/5	1/7	1/5	9	1/7	9	1/5	1/3	9	9	8	1/7
	Inland Port	1/5	1/7	1/7	1/5	1/7	1/5	5	1/3	7	1/5	1/3	7	7	7	1/5
	Sea Port	1/7	1/7	1/7	1/5	1/7	1/7	5	1/3	7	1/7	1/3	7	7	7	1/7
	Railway	1/5	1/5	1/5	1/5	1/5	1/5	8	1/5	7	1/5	1/3	8	8	9	1/3
	Air transport	1/7	1/3	1/3	1/3	1/3	1/3	4	1/3	5	1/3	1/7	5	9	3	1/3
Strategy 3:	Road	1/9	1/7	1/7	1/5	1/7	1/5	9	1/7	9	1/5	1/3	9	9	8	1/7
	Inland Port	1/5	1/7	1/7	1/5	1/7	1/5	5	1/3	7	1/5	1/3	7	7	7	1/5
	Sea Port	1/7	1/7	1/7	1/5	1/7	1/7	5	1/3	7	1/7	1/3	7	7	7	1/7
	Railway	1/5	1/5	1/5	1/5	1/5	1/5	8	1/5	7	1/5	1/3	8	8	9	1/3
	Air transport	1/7	1/3	1/3	1/3	1/3	1/3	4	1/3	5	1/3	1/7	5	9	3	1/3
Strategy 6:	Railway	1/5	1/9	1/9	1/7	1/9	1/9	8	1/8	7	1/9	1/9	8	8	9	1/9
Strategy 5:	**No project**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
		2 3/5	3	3	3 1/2	3	3 1/3	101	4 1/7	112	3 1/3	4 1/2	116	128	111	598 1/2
		2.5905	2.9968	2.9968	3.5429	2.9968	3.3397	101.0000	4.1536	112.0000	3.3397	4.5397	116.0000	128.0000	111.0000	598.4964

Table 10.8: Assessment of Criteria- /Alternative-wise Impacts, According to Transport Mode and Strategies (2)

Alternative A3																
Strategy 1:	Road	1/9	1/7	1/7	1/5	1/7	1/5	9	1/7	9	1/5	1/3	9	9	8	1/7
	Inland Port	1/5	1/7	1/7	1/5	1/7	1/5	5	1/3	7	1/5	1/3	7	7	7	1/5
	Sea Port	1/7	1/7	1/7	1/5	1/7	1/7	5	1/3	7	1/7	1/3	7	7	7	1/7
	Railway	1/5	1/5	1/5	1/5	1/5	1/5	8	1/5	7	1/5	1/3	8	8	9	1/3
	Air transport	1/7	1/3	1/3	1/3	1/3	1/3	4	1/3	5	1/3	1/7	5	9	3	1/3
Strategy 2:	Road	1/9	1/7	1/7	1/5	1/7	1/5	9	1/7	9	1/5	1/3	9	9	8	1/7
	Inland Port	1/5	1/7	1/7	1/5	1/7	1/5	5	1/3	7	1/5	1/3	7	7	7	1/5
	Sea Port	1/7	1/7	1/7	1/5	1/7	1/7	5	1/3	7	1/7	1/3	7	7	7	1/7
	Railway	1/5	1/5	1/5	1/5	1/5	1/5	8	1/5	7	1/5	1/3	8	8	9	1/3
	Air transport	1/7	1/3	1/3	1/3	1/3	1/3	4	1/3	5	1/3	1/7	5	9	3	1/3
Strategy 7:	Road	1/9	1/7	1/3	1/5	1/7	1/5	7	1/7	7	1/5	1/3	7	9	9	1/7
	Sea Port	1/7	1/7	1/7	1/7	1/7	1/7	7	1/3	7	1/5	1/3	7	7	7	1/7
Strategy 4:	Road	1/9	1/7	1/7	1/5	1/7	1/5	9	1/7	9	1/5	1/3	9	9	8	1/7
	Inland Port	1/5	1/7	1/7	1/5	1/7	1/5	5	1/3	7	1/5	1/3	7	7	7	1/5
	Sea Port	1/7	1/7	1/7	1/5	1/7	1/7	5	1/3	7	1/7	1/3	7	7	7	1/7
	Railway	1/5	1/5	1/5	1/5	1/5	1/5	8	1/5	7	1/5	1/3	8	8	9	1/3
	Air transport	1/7	1/3	1/3	1/3	1/3	1/3	4	1/3	5	1/3	1/7	5	9	3	1/3
Strategy 5:	**No project**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
		2 2/3	3 1/6	3 1/3	3 3/4	3 1/6	3 4/7	107	4 1/2	119	3 5/8	5	122	136	118	634 8/9
		2.6444	3.1714	3.3619	3.7429	3.1714	3.5714	107.0000	4.5048	119.0000	3.6286	5.0952	122.0000	136.0000	118.0000	634.8921
Alternative A4																
Strategy 8:	Railway	1/5	1/9	1/9	1/7	1/9	1/9	8	1/8	7	1/9	1/9	8	8	9	1/9
Strategy 2:	Road	1/9	1/7	1/7	1/5	1/7	1/5	9	1/7	9	1/5	1/3	9	9	8	1/7
	Inland Port	1/5	1/7	1/7	1/5	1/7	1/5	5	1/3	7	1/5	1/3	7	7	7	1/5
	Sea Port	1/7	1/7	1/7	1/5	1/7	1/7	5	1/3	7	1/7	1/3	7	7	7	1/7
	Railway	1/5	1/5	1/5	1/5	1/5	1/5	8	1/5	7	1/5	1/3	8	8	9	1/3
	Air transport	1/7	1/3	1/3	1/3	1/3	1/3	4	1/3	5	1/3	1/7	5	9	3	1/3
Strategy 3:	Road	1/9	1/7	1/7	1/5	1/7	1/5	9	1/7	9	1/5	1/3	9	9	8	1/7
	Inland Port	1/5	1/7	1/7	1/5	1/7	1/5	5	1/3	7	1/5	1/3	7	7	7	1/5
	Sea Port	1/7	1/7	1/7	1/5	1/7	1/7	5	1/3	7	1/7	1/3	7	7	7	1/7
	Railway	1/5	1/5	1/5	1/5	1/5	1/5	8	1/5	7	1/5	1/3	8	8	9	1/3
	Air transport	1/7	1/3	1/3	1/3	1/3	1/3	4	1/3	5	1/3	1/7	5	9	3	1/3
Strategy 4:	Road	1/9	1/7	1/7	1/5	1/7	1/5	9	1/7	9	1/5	1/3	9	9	8	1/7
	Inland Port	1/5	1/7	1/7	1/5	1/7	1/5	5	1/3	7	1/5	1/3	7	7	7	1/5
	Sea Port	1/7	1/7	1/7	1/5	1/7	1/7	5	1/3	7	1/7	1/3	7	7	7	1/7
	Railway	1/5	1/5	1/5	1/5	1/5	1/5	8	1/5	7	1/5	1/3	8	8	9	1/3
	Air transport	1/7	1/3	1/3	1/3	1/3	1/3	4	1/3	5	1/3	1/7	5	9	3	1/3
Strategy 5:	**No project**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
		2 3/5	3	3	3 1/2	3	3 1/3	101	4 1/7	112	3 1/3	4 1/2	116	128	111	598 1/2
		2.5905	2.9968	2.9968	3.5429	2.9968	3.3397	101.0000	4.1536	112.0000	3.3397	4.5397	116.0000	128.0000	111.0000	598.4964

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15
A1	3.187	3.848	3.848	4.533	3.848	4.305	124.000	5.371	140.000	4.305	5.905	144.000	160.000	136.000	743.149
A2	2.590	2.997	2.997	3.543	2.997	3.340	101.000	4.154	112.000	3.340	4.540	116.000	128.000	111.000	598.496
A3	2.644	3.171	3.362	3.743	3.171	3.571	107.000	4.505	119.000	3.629	5.095	122.000	136.000	118.000	634.892
A4	2.590	2.997	2.997	3.543	2.997	3.340	101.000	4.154	112.000	3.340	4.540	116.000	128.000	111.000	598.496
TOTAL:	11.013	13.013	13.203	15.362	13.013	14.556	433.000	18.183	483.000	14.613	20.079	498.000	552.000	476.000	2575.034
A1	0.289	0.296	0.291	0.295	0.296	0.296	0.286	0.295	0.290	0.295	0.294	0.289	0.290	0.286	0.289
A2	0.235	0.230	0.227	0.231	0.230	0.229	0.233	0.228	0.232	0.229	0.226	0.233	0.232	0.233	0.232
A3	0.240	0.244	0.255	0.244	0.244	0.245	0.247	0.248	0.246	0.248	0.254	0.245	0.246	0.248	0.247
A4	0.235	0.230	0.227	0.231	0.230	0.229	0.233	0.228	0.232	0.229	0.226	0.233	0.232	0.233	0.232
	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Table 10.9: Generalization of Assessment for Selection of the Most Preferable Alternative

Assess Value	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15
A1	0.2894	0.2957	0.2914	0.2951	0.2957	0.2957	0.2864	0.2954	0.2899	0.2946	0.2941	0.2892	0.2899	0.2857	0.2886
A2	0.2352	0.2303	0.2270	0.2306	0.2303	0.2294	0.2333	0.2284	0.2319	0.2285	0.2261	0.2329	0.2319	0.2332	0.2324
A3	0.2401	0.2437	0.2546	0.2436	0.2437	0.2454	0.2471	0.2477	0.2464	0.2483	0.2538	0.2450	0.2464	0.2479	0.2466
A4	0.2352	0.2303	0.2270	0.2306	0.2303	0.2294	0.2333	0.2284	0.2319	0.2285	0.2261	0.2329	0.2319	0.2332	0.2324

Weight	0.0640	0.0680	0.0580	0.0520	0.0470	0.0710	0.0620	0.0530	0.0870	0.0360	0.0870	0.0890	0.0800	0.0750	0.0710	
Generalization	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	Gen.AssessValue
A1	0.0185	0.0201	0.0169	0.0153	0.0139	0.0210	0.0178	0.0157	0.0252	0.0106	0.0256	0.0257	0.0232	0.0214	0.0205	0.2914
A2	0.0151	0.0157	0.0132	0.0120	0.0108	0.0163	0.0145	0.0121	0.0202	0.0082	0.0197	0.0207	0.0186	0.0175	0.0165	0.2309
A3	0.0154	0.0166	0.0148	0.0127	0.0115	0.0174	0.0153	0.0131	0.0214	0.0089	0.0221	0.0218	0.0197	0.0186	0.0175	0.2468
A4	0.0151	0.0157	0.0132	0.0120	0.0108	0.0163	0.0145	0.0121	0.0202	0.0082	0.0197	0.0207	0.0186	0.0175	0.0165	0.2309

10.4.2 Assessment of Assumed Environmental and Social Impacts*, Possible Mitigations Measures

Possible mitigation measures were considered as countermeasures to the identified assumed environmental and social negative impacts. The impact items subjected for assessment were set in accordance with the mandatory items stipulated in the Third Schedule of the SEA Regulation.

According to the SEA Final Report, among the impact assessment result (pls. see Appendix 22, of attached Appendix 3 SEA Final Report), the following areas have been identified as anticipated areas of possible "significant" negative impact by implementation of the Master Plan along with the desirable mitigation measures to counter such adverse impacts.

1. Coastal areas (Mwambani – Tanga; Mbegani – Bagamoyo), Lake Tanganyika area (Kasunga Port), Lake areas (Mwanza Port, Musoma Port and Kasanga Port)
   Possible "significant" impact: Destruction of natural habitats of aquatic flora and fauna
   Mitigation measure: Minimize destruction of natural habitats of terrestrial and aquatic flora and fauna by confining construction works within permitted areas only.

2. Highly populated areas (Mbegani – Bagamoyo; Mwambani – Tanga; Kasanga Port; Chunya – Rungwa – Itigi – Mkiwa Road; Dar es Salaam – Chalinze Road; Tnaga-Musoma railway line; Bagamoyo Port railway connection; Morogoro-Chalinze road; Dar es Salaam ring road):
   Possible "significant" impact: Involuntary resettlement of people
   Mitigation measure: (1) To avoid involuntary resettlement as much as possible, based on (2) consideration of numerous alternatives, including the zero option.

3. Bugene – Morongo – Kikagati Road; Kibaoni – Mpanda – Kanyani Road; Tabora – Koga – Mpanda Road; Kidahwe – Ilunde – Malagarasi – Kaliua Road; Chunya – Rungwa – Itigi – Mkiwa Road; Tanga – Musoma railway line:
   Possible "significant" impact: Creation of soil erosion
   Mitigation measure: Minimize soil erosion by using good engineering designs and construction methods. Confine construction works to permitted sites.

4. Mbegani – Bagamoyo, Mwambani – Tanga, Mbinga – Mbamba Bay Road, Kasanga Port (Lake Tanganyika); Chunya – Rungwa – Itigi – Mkiwa Road; Dar es Salaam – Chalinze Road; Dar es Salaam Ring Road; Bagamoyo – Chalinze; Kimara – Chalinze; Chalinze – Morogoro; Tanga – Musoma railway line; Bagamoyo Port railway connection:
   Possible "significant" impact: Loss of material assets due to land acquisition
   Mitigation measure: Payment of compensation in accordance with the Tanzanian legislation and in respect of the JICA Environmental and Social Consideration Guideline 2010 and related World Bank operational policies.

The assessment also included identification of cumulative, secondary/ indirect and synergetic impacts as stipulated in the Third Schedule of the SEA Regulation 2008.

10.4.3 Outline of SEA Monitoring Plan

As a good example, Article 10 of the EU SEA Directive demands EU member states to monitor significant environmental effects during the course of implementation of the plans and programmes in order to identify at an early stage, unforeseen adverse effects so it is possible to undertake appropriate remedial action; though they may use existing monitoring arrangements, if appropriate, to avoid duplication. Tanzania should also follow suit to such environmentally advanced regions in the world.

The monitoring objective should therefore be focused on the assumed significant adverse impacts (to monitor such assumed significant impacts so that they may not lead to a greater "issue" of concern in the subjected region to a level where the sustainability of the triple bottom line might lose balance or be threatened), and that existing monitoring arrangements (such as by existing monitoring stations) should also be utilized and taken into consideration to reduce the budget for monitoring. Monitoring should also include implementation of appropriate mitigating countermeasures, if problems are found during the course of such monitoring.

As for this Master Plan, the monitoring period was set in line with the Master Plan implementation period, which is the life span of the M/P, and the implementation of monitoring activities is to be carried out once in each phase of the Master Plan. A monitoring objective was also set to monitor the anticipated "significant" impact areas to see if such impacts do not lead to "issues" of concern, disrupting the sustainability of the triple bottom line (environmental, social and economic aspects).

The actual content of the monitoring plan is described in Appendix 23 of the attached SEA Final Report (see Appendix 3). It is important that the Ministry of Transport (MOT) adopt this drafted monitoring plan in order for it to be applied to the monitoring of this Master Plan.

10.4.4 Result of Second Stakeholder Meeting at National Level

Although the tentative Draft SEA Report had been drafted and sought consent from the stakeholders, the second national level stakeholder meeting was held on 1 October 2013. In general, many criticizing comments were raised from the stakeholders, in short, stating that the drafted Report was not yet fulfilling all the requirements set forth in the Environmental Management Act Cap 191 and the SEA Regulation 2008.

Some of the major comments raised were: (1) access to institutional information on different issues and those specific to the sectors addressed in the master plan had not yet been comprehensively considered, (2) cumulative impacts in relation to the existing or proposed master plans, guidelines and programmes of subjected sectors had not been analyzed, and (3) no institutional master plan, individual plan, programme or guideline has been consulted and discussed within the SEA Report. Others were on more minor issues such as application of latest information and maps rather than outdated ones, etc.

The comments discussed were taken into consideration for amendment to be reflected into the Final SEA Report. However, in case of comment (3) above related to consistency with other master plans, individual plans and programmes, etc., some explanation ought to be added from a professional point of view. Firstly, although in item 1 of the SEA Regulation 2008 tells us to indicate the relationship of the master plan and strategies with other plans and strategies, it does not restrict us to organize a master plan that must be fully consistent with the rest of existing plans and strategies. It is all the more natural to also mention that in any other country, not just a single comprehensive master plan exists under consideration, and no such master plan meets fully the demands of all the rest. It is therefore rather a matter of the sector ministry or related authority or agency's choice to determine the most comprehensive and relevant master plan for implementation in order to meet the future demands of that subjected sector and, at the same time, to seek relevancy from the perspective of the environmental and social consideration. Secondly, however, the Master Plan in itself must meet the national level policies, laws and regulations as a matter of fact (the suggested Master Plan has been planned to fully meet such basic mandatory requirements). Thirdly, analysis on cumulative impact should be focused on assumed cumulative impacts that derive from numerous project planned under the suggested Master Plan alone, and not by keeping in perspective other master plans, individual plans, etc. The SEA Regulation 2008 does not regulate such analysis.

Apart from the comments raised by the general stakeholders, some further comments were raised from the SEA Authority, VPO. Appropriate measures to incorporate VPO's comments and/or to revise the content of the SEA Report were taken, and the finally revised Final SEA Report was submitted to VPO on 6 January 2014 by the sector Ministry in charge, MOT. The State Minister responsible for Environment, then approved the Final SEA Report in February 2014 and revealed supplementary conditions upon its approval. This subjected M/P Study Report was then finally revised, reflecting the SEA results.