Chapter 4 Road Sector

4.1 Road Network

4.1.1 Overall Conditions

(1) Road Network among EAC Corridors

The ability to move goods and passengers safely, quickly, efficiently and cost effectively from one place to another is important for international trade, national distribution, and economic development of the countries or regions. The rapid increase in global trade within EAC countries need and thus depend on smooth, fast, and less costly mode of transportation.

The road network for the transportation of goods and passengers among other transportation modes contributes to the social and economic development of the country. The EAC Roads Sector Development Program[1] has identified road network corridors that play an important role within the EAC as a whole and forms the foundation to support and sustain social and economic development within the EAC and all its Member States.

The EAC Road network corridors are summarized below followed by a detailed description Table 4.1.

Table 4.1: Major Road Corridors in the EAC Countries

EAC Road Corridor Name	EAC Road Corridor Description	Length (rounded)
Northern Corridor	Mombasa–Voi–Eldoret–Bugiri–Kampala–Masaka– Kigali–Kibuye–Kayanza–Bujumbura	1,800 km
Central Corridor	Dar es Salaam–Morogoro–Dodoma–Singida–Nzega–Nyakanazi–Burundi–Kigali–Gisenyi	3,100 km
Dar es Salaam (TAZARA) Corridor	Morogoro–Iringa–Mbeya–Tunduma	1,100 km
Namanga Corridor	Iringa–Dodoma–Kalema–Arusha–Nairobi–Thika–Muranga–Embu–Nyeri–Nanyuki–Isiolo–Marsabit–Moyale	1,800 km
Sumbawanga Corridor	Tunduma–Sumbawanga–Kasulu–Makamba–Nyanza-Lac–Rumonge–Bujumbura	1,300 km
Sirari Corridor	Lokichokio–Lodwar–Kitale–Bungoma–Kisumu–Kisii–Mwanza–Biharamulo	1,500 km
Coastal Corridor	Mingoyo–Dar es Salaam; Chalinze –Vanga–Mombasa–Malindi–Lamu	1,500 km
Mtwara Corridor	Mtwara–Mingoyo–Masasi–Tunduru–Songea–Mbamba Bay	800 km
Arusha Corridor	Arusha–Moshi–Himo–Lushoto–A1	500 km
Gulu Corridor	Nimule–Bibia–Gulu–Lira–Soroti–Mbale–Tororo	600 km
Total EAC Road Corridor Network Length		14,100 km

Source: Africon, 2010

Note: All lengths are approximate. Lengths may differ from those used by other agencies (e.g. corridor agencies, EAC amongst others) because of overlapping sections, or the resolution of the GIS.

[1] Source: East African Transport Strategy and Regional Road Sector Development Program, Final Report, Part III Roads Development Program, July 2011

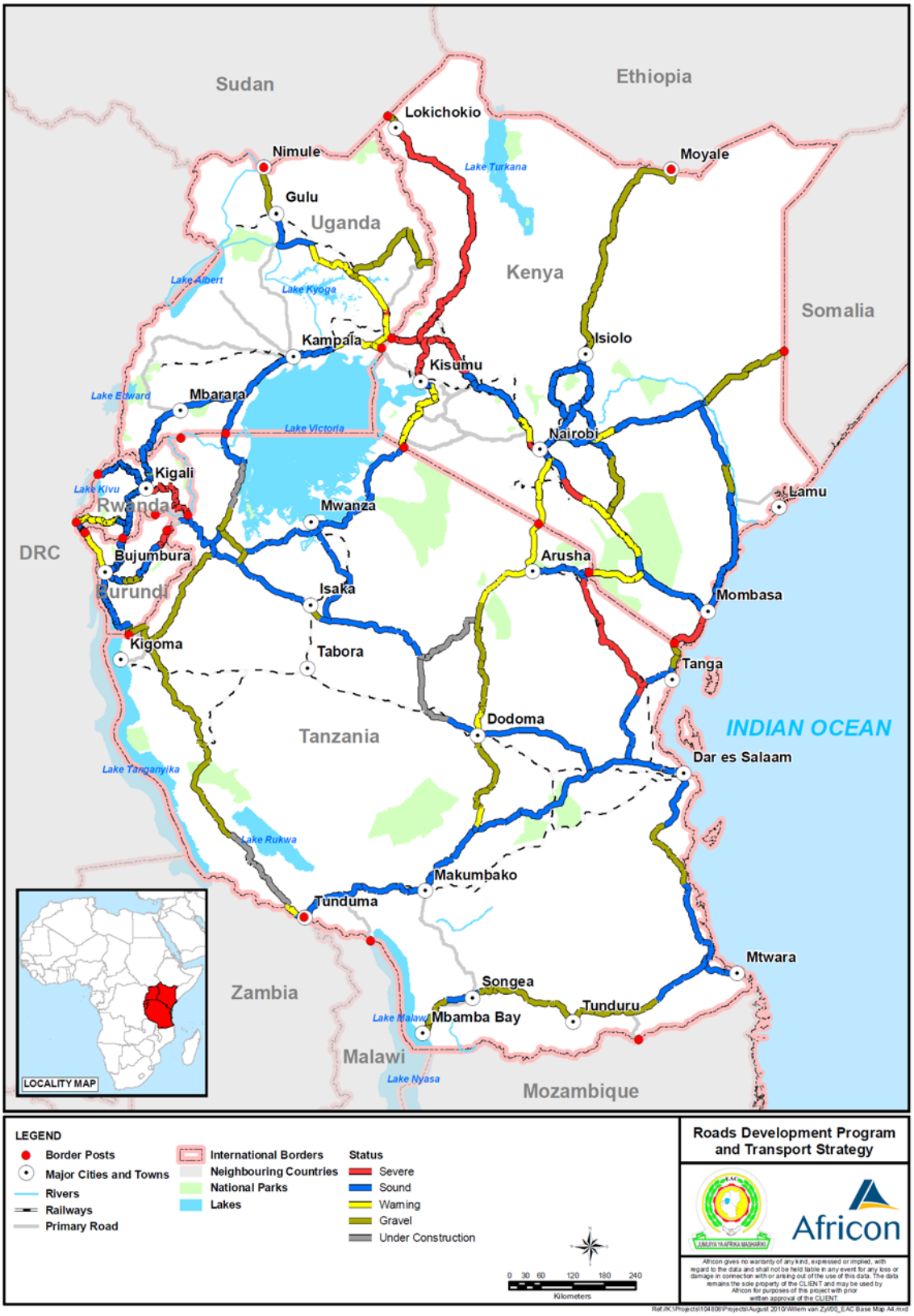


Figure 4.1: Major Road Corridors in the EAC Countries

(2) EAC Corridors in Tanzania

As can be seen from the figure, Tanzania's position is very important for international trade from the Indian Sea to inland countries such as Uganda, Burundi, Rwanda, DRC and even Zambia and Malawi. Among EAC road corridors there are four major east-west corridors that contribute to transport from coastal areas to inland Tanzania and inland countries. They are:

- Arusha (Tanga) Corridor (Arusha–Moshi–Himo–Lushoto–Tanga)
- Central Corridor (Dar es Salaam –Morogoro –Dodoma –Singida –Nzega –Nyakanazi – Rusumo)
- Dar es Salaam (TAZARA) Corridor (Morogoro–Iringa-Mbeya–Tunduma)
- Mtwara Corridor (Mtwara–Mingoyo–Masasi–Tunduru–Songea–Mbamba Bay)

Same importance will be given to the three corridors that contribute to north-south transport and connect north and south regions along the corridors within the territory of Tanzania. In addition, there are other highway links that will enhance and supplement each major corridor. They are:

- Coastal Corridor (Mtwara–Mingoyo–Dar es Salaam; Chalinze–Vanga)
- Namanga Corridor (Iringa–Dodoma–Kalema–Arusha)
- Sumbawanga Corridor (Tunduma–Sumbawanga–Kasulu)
- Additional corridors and links

(3) Road Network in Tanzania

The geography of Tanzania, its size, scattered settlement pattern, diversity and dispersion give roads a special role in the integration of the national economy. Many people well understand the importance of better roads in improving the economy of Tanzania, especially due to the currently poor railway service that is supposed to contribute to long-distance transport of goods and passengers. Therefore, road transport is the major mode of transportation carrying over 90% of the passengers and over 75% of the freight traffic in Tanzania. In particular, roads serve not only major transport demand from sea port to inland on trunk roads but also provide door-to-door services more effectively than any other modes of transport in rural areas where the people need freedom to move.

Presently, there are five categories for roads in Tanzania, namely:

(i) Trunk Roads;
(ii) Regional Roads;
(iii) District Roads;
(iv) Feeder Roads; and
(v) Urban Roads.

The Trunk Roads and the Regional Roads are under the responsibility of the Tanzania National Roads Authority (TANROADS). TANROADS is an Executive Agency under the Ministry of Works, established under section 3 (1) of the Executive Agencies Act and came into operation in July, 2000. The local authorities 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), for opening up existing and potential rural productive areas for agriculture, small-scale mining and rural tourism.

The classification of the roads in Tanzania has been based on the hierarchical functions, given as follows:

- Trunk Roads: The primary national and international through routes that link several regions and provide access to important border posts and ports
- Regional Roads: The secondary routes connecting district centres in a region or connecting important centres to a trunk road
- District Roads: The tertiary route linking: (i) district headquarters with ward centres; (ii) important centres within the district; and (iii) important centres to a higher class road
- Feeder Roads: The village access roads linking important centres within a ward to the rest of the network
- Urban Roads Within the urban centres: (i) Arterial Roads; (ii) Collector Roads; (iii) Local Collector Roads; and (iv) Access Roads

The total classified road network in Tanzania Mainland is estimated to be 91,532[2] km based on the TANROADS and PMO-RALG reports in 2011. The Ministry of Works through TANROADS is managing the national road network of about 33,495 km comprising 12,197 km of Trunk and 21,298 km of Regional roads as of June 2011. The remaining network of about 58,037[3] km of Urban (5,995 km), District (29,338 km) and Feeder (22,709 km) roads is under the responsibility of the Prime Minister's Office Regional Administration and Local Government (PMO-RALG).

Table 4.2: Ordinance Summary as of June 2011

Region	Trunk Roads (km)			Regional Roads (km)			Total Network (km)		
	paved	unpaved	total	paved	unpaved	total	paved	unpaved	total
Arusha	328	213	540	28	690	718	355	902	1,258
Coast	396	106	502	17	867	884	412	973	1,385
DSM	120	0	120	136	304	440	256	304	1,695
Dodoma	201	354	555	14	1,127	1,141	214	1,481	1,695
Iringa	479	385	864	31	1,220	1,251	510	1,605	2,115
Kagera	446	460	906	178	1,045	1,224	624	1,505	2,129
Kigoma	95	563	658	0	467	467	95	1,030	1,125
Kilimanjaro	295	0	295	133	545	678	428	545	973
Lindi	334	14	348	34	911	945	368	926	1,293
Manyara	71	140	211	8	1,393	1,401	79	1,533	1,612
Mara	171	242	412	30	775	805	200	1,017	1,217
Mbeya	367	443	810	25	1,426	1,451	393	1,869	2,262
Morogoro	443	403	846	43	1,006	1,049	486	1,409	1,895
Mtwara	171	113	284	48	724	772	219	837	1,056
Mwanza	376	34	409	17	1,107	1,124	393	1,140	1,533
Rukuwa	14	873	887	6	1,280	1,285	20	2,153	2,172
Ruvuma	191	734	925	13	977	990	204	1,711	1,915
Shinyanga	330	326	656	11	1,183	1,194	341	1,509	1,850
Singida	286	388	674	21	994	1,015	308	1,382	1,689
Tabora	152	815	967	6	992	999	158	1,807	1,965
Tanga	272	55	328	50	1,416	1,466	322	1,472	1,794
Total	**5,537**	**6,660**	**12,197**	**847**	**20,451**	**21,298**	**6,384**	**27,111**	**33,495**

Source: TANROADS

The National Trunk and Regional Road Network consist of:

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

Paved ratio of the trunk road and regional road is 45% and 4% respectively.

[2] Estimates of TANROADS (33,495 km) and PMO-RALG Report (58,037 km) road lengths in 2011.
[3] 5th Joint Infrastructure Sector Review Meeting, Roads under Local Government Authorities, October 2011

Figure 4.2: Trunk and Regional Road Network

4.1.2 Network by Corridors

As can be seen from Figure 4.1 “Major Road Corridors in the EAC Countries”, and 4.1.1 (2) “EAC Corridors in Tanzania” as previously mentioned, major corridors and important links in Tanzania are described in detail in the following sub-sections.

(1) Tanga Corridor

Tanga Corridor is equivalent to the Arusha Corridor in the EAC report. The section starts from Segero (junction to T13 toward Tanga) and passes major cities and towns such as Mombo, Same, Moshi, and Arusha and finally reaches Namanga, border to Kenya. The section from Segero to Tanga (T1) of which the distance is 71km, is a part of the corridor. The total distance from Arusha to Tanga is 540 km. All the stretches of the corridors are paved.

Overall traffic volume is moderate of one to two thousands vehicles/day in 2004 or 2008 except Arusha area where the volume reaches about 16,000 vehicles/day in 2008. The carriageway width ranges between 6 and 7 m with a shoulder width of on the average 1.0 m. The narrow carriageway width of 5.0 m was recorded near Longido and Namanga, which was recently upgraded to a normal paved section.

Photo 4.1:
Newly Paved Arusha–Namanga

Photo 4.2:
Paved Road in Tanga

(2) Central Corridor

This corridor has the overlapping section with the Dar es Salaam Corridor (T1) between the start in Dar es Salaam and Morogoro of about 190 km. The main route of the corridor starts from Dar es Salaam, passes major cities and towns such as Chalinze, Morogoro, Dodoma, Manyoni, Singida, Nzega, Kahama, Nyakanazi and reaches Rusumo, border to Rwanda. The total length of the main route is about 1,190 km, 95% of which is paved. However, the majority of the paved sections are surface treatment (ST), which is subject to wearing by the tyres of heavy trucks within a relatively short time period.

The traffic volume (AADT) at the east end in Dar es Salaam area is the highest of about 47,000 vehicles/day and 35,000 vehicles/day near Ubungo bus terminal and tapers out to around 27,000 in the four lane section of about 15 km. The traffic volume even in the two-lane, two-way section exceeds the capacity. Fortunately the traffic volumes of other sections in the rural region such as the sections west of Dodoma are low except near the centre towns of the region. The traffic volume varies between 1,000 vehicles/day and several hundred on the surface treatment sections.

There are branch sections of the Corridor connecting between Nzega, Shinyanga and Mwanza (T8 & T4), of which the distance is 238 km. The paved ratio of this section is 93%. The majority of the section is asphalt pavement (AM). The pavement conditions are good to fair.

Photo 4.3:
Morogoro Rd. 4-lane Near DSM

Photo 4.4:
Morogoro Rd. 2-lane

(3) Dar es Salaam Corridor (TAZARA Corridor)

This corridor starts from the centre of Dar es Salaam and ends at the border to Zambia (Tunduma). The section between Dar es Salaam and Morogoro (T1) is the same as the Central Corridor route. Major cities and towns that this corridor passes are Dar es Salaam, Chalinze, Morogoro, Mikumi, Iringa, Makombako, Mbeya and finally reaching Tunduma, which is the border to Zambia.

The total length is about 925 km and all sections are paved. The surface conditions are between good and fair on the asphaltic pavement (AM) and there are some sections on the surface treatment (ST) that would need regular maintenance and rehabilitation. The traffic volume (AADT) near the Dar es Salaam urban area is the highest of about 47,000 vehicles/day and 35,000 vehicles/day near Ubungo bus terminal and tapers out to around 27,000 within the four lane section of about 15 km. The traffic volume even in the two-lane two-way section (from 17,000 vehicles/day to 12,000 vehicles/day) up to the border of Dar es Salaam and Coastal Region exceeds the capacity of the road thus creating daily traffic congestion on this road.

In addition, traffic congestion in the Dar es Salaam area has worsened near the intersection of major roads because the total traffic volumes of intersecting legs are far more than the intersection capacity. Unless grade separate structure is constructed it will be difficult to relieve the traffic jam. Comprehensive traffic management suggested by the "Dar es Salaam Transportation Master Plan" should be implemented.

Although the paved ratio is high on this corridor, rehabilitation is necessary especially the surface treated pavement section such as Ivovi to Mafinga, where rehabilitation work is on-going. There are some stretches that have deteriorated due to heavy loading and along the steep slope where heavy trucks move slowly resulting in undulations of the pavement surface.

Photo 4.5:
T1 Road near Mbeya

Photo 4.6:
Newly Rehabilitated Section of T1

(4) Mtwara Corridor

The Mtwara Corridor starts from the port of Mtwara and passes several major cities such as Mingoyo, Masasi, Tunduru, and Songea and reaches Mbamba Bay, which is facing Lake Nyasa. The total length of the corridor is 825 km. The length of the paved section and unpaved section are 231 km and 594 km respectively. The paved ratio of this corridor is 28%, making it one of the lowest among major east-west corridors. The traffic volume on this road is relatively low, several hundred to less than one hundred vehicles/day depending on the location. The roadway is a two-way two-lane road and carriageway width is, as a result, about 6m and utmost 7 m with a very narrow shoulder of around 1.0m that is less than the standard of 1.5 m. The narrow carriageway may cause failure of the pavement edges when heavy trucks pass each other.

Photo 4.7:
Mtwar–Lindi Section

Photo 4.8:
Paved Road Section

(5) Coastal Corridor

Coastal Corridor (T7 and T2) starts from Mtwara and passes Mingoyo, Lindi and Dar es Salaam. It starts again from Chalinze and reaches Segero, which is the junction to Tanga. The distance from Mingoyo to Dar es Salaam is 479 km, of which 422 km is paved and the remaining 57 km is not paved. The section from Chalinze to Segero is about 174 km and is paved. The road is two-way, two-lane road of the carriage width is around 6–7 m. Most of the corridor is paved except the section from Somanga to Nyamwage of 60 km, where upgrading to bitumen standard is currently going on.

Photo 4.9:
Newly Paved T7

Photo 4.10:
T7 Under Construction

(6) Namanga Corridor

This corridor handles the north-south traffic starting from Arusha, Babati, Karema, and Dodoma and reaches Iringa, which is the city on the TAZARA Corridor. This is an important north-south connection in the middle of the country between Tanga Corridor and TAZARA Corridor via Dodoma, which is the political capital.

The total length of the corridor (T5) is 689 km. The paved section is 196 km and unpaved section is 493 km. The paved ratio is about 28%. In order to improve the situation ADB/JICA/ GOT allocated funds for the upgrading of the section from Dodoma to Iringa

(7) Sumbawanga Corridor

This corridor (T9) starts from Tunduma, connection to the TAZARA Corridor, and passes Sumbawanga, Mpanda and Kasulu. The road T9 continues to Kalebezo via Kibondo, Nyakanazi, which is the junction to the Central Corridor, and reaches Kibondo. The Sumbawanga Corridor branches off at Kasulu, which is about 80 km from Kigoma port via T19, toward the border of Burundi, enters Burundi, passes Mabando, Nyanza-Lac and finally reaches Bujunbura.

Photo 4.11:
Kigoma–Mugina Rd. Paved

Photo 4.12:
Mabena–Munia Rd. Unpaved

The whole section of the corridor within Tanzania is about 720 km. The total stretch of T9 from Tunduma to Nyakanazi is 997 km. The paved ratio of the corridor is very low at 2.3%, and the same ratio of all of T9 is also very low of 1.9%. Traffic volume along this stretch is low with only several hundred (2007 and 2008 data) due to unpaved conditions of the roads. However, the road passes many towns and villages along the highland area, where the future potential would be very high for agriculture production especially between Tunduma and Sumbawanga.

Photo 4.13:
Tunduma–Ikana under Const.

Photo 4.14:
Laela–Sumbawanga under Const.

(8) Additional Links

Singida-Babati road (T14) section is currently unpaved and is a connection between the Tanga Corridor and the Central Corridor. Currently the extended stretch Singida–Babati–Minjingu Road is under upgrading works. The project involves upgrading of the 223.5 km road to bituminous standard. The project is jointly financed by African Development Bank (AfDB) and Government of Tanzania (GOT).

The section from Singida to Babati goes through a mountainous area and is not paved. The section from Babati to Minjingu is partly paved but paved sections are short. The paved ratio of this stretch is about 7%. The carriageway width varies between 5.0 m near Babati, and 7.4 m near Nanguwa. Most of the section has 6.0 m or more in carriageway width.

Kasulu- Nyakanazi road is a part of the T9 road. This stretch is a part of the connection from Kigoma port to the Central Corridor of Nyakananzi. The total distance from Kigoma port to Nyakananzi (T19 and T9) is about 350 km. The paved ratio of the Kasulu–Nakananzi is extremely low of 1%. The average paved ratio from Kigoma to Nakkananzi is 3.2%. The road passes through a low land area especially in the middle of the section. Therefore, the road is impassable during rainy season.

Mbeya-Ngeza road is a part of T8 and connects TAZARA Corridor and Central Corridor. T8 road section from Ngeza to Mwanza is a branch of the Central Corridor and is paved. The section starts from Mbeya and passes Chunya, Rungwa, Ipole, Tabora and reaches Ngeza. Ngeza to Tabora section of T8, about 115 km and Mbeya to Chunya section of T8, about 72 km are under construction by Tanzania Government fund. The section length from Mbeya to Tabora is about 568 km and the paved ratio is 1.5%. The part of the road south of Tabora is impassable during rainy season due to it being a low land area. Therefore the current traffic volume on this road is very low.

Photo 4.15:
Gravel Road, T8

Photo 4.16:
Typical Earth Road, T8

New Bagamoyo Port Access road is an important connection to Dar es Salaam, to Arusha via Msata and to Morogoro via Chalinze. Currently there are three access roads from Bagamoyo where a new port has been planned according to the Master Plan financed by WB. The frequently used and heavily trafficked connection is the Bagamoyo Road (between DSM and Bagamoyo) which is paved and construction to widen it from a two-lane to four-lane road is on-going. The shortest connection that is about 38km to Morogoro Road is an unpaved local road and is in very poor condition.

Photo 4.17:
Widening Work of Bagamoyo Road

Photo 4.18:
Unpaved Local Roads

Another connection from Bagamoyo toward west used to be an earth/gravel road and is currently undergoing upgrading construction to bitumen standard. The upgrading work started from the west, Msata that branches off from the road toward Tanga.

Photo 4.19:
Newly Paved Msata–Bagamoyo

Photo 4.20:
Pavement Work

The construction progress on the east section is still at its earthwork stage as of October 2011. This connection still has an earth road section with narrow bridges in the low land area. The maintenance work of the earth road section has been implemented using a grader and a roller.

Photo 4.21:
East End of Construction Site

Photo 4.22:
Narrow Bridge near Bagamoyo

Figure 4.3 shows major corridors and important links. As can be seen from the map, even among major corridors and important links, all of which are trunk roads, the paved ratio hardly reaches 50%. The paved ratio of all the trunk roads combined from Table 4.2 is 45%.

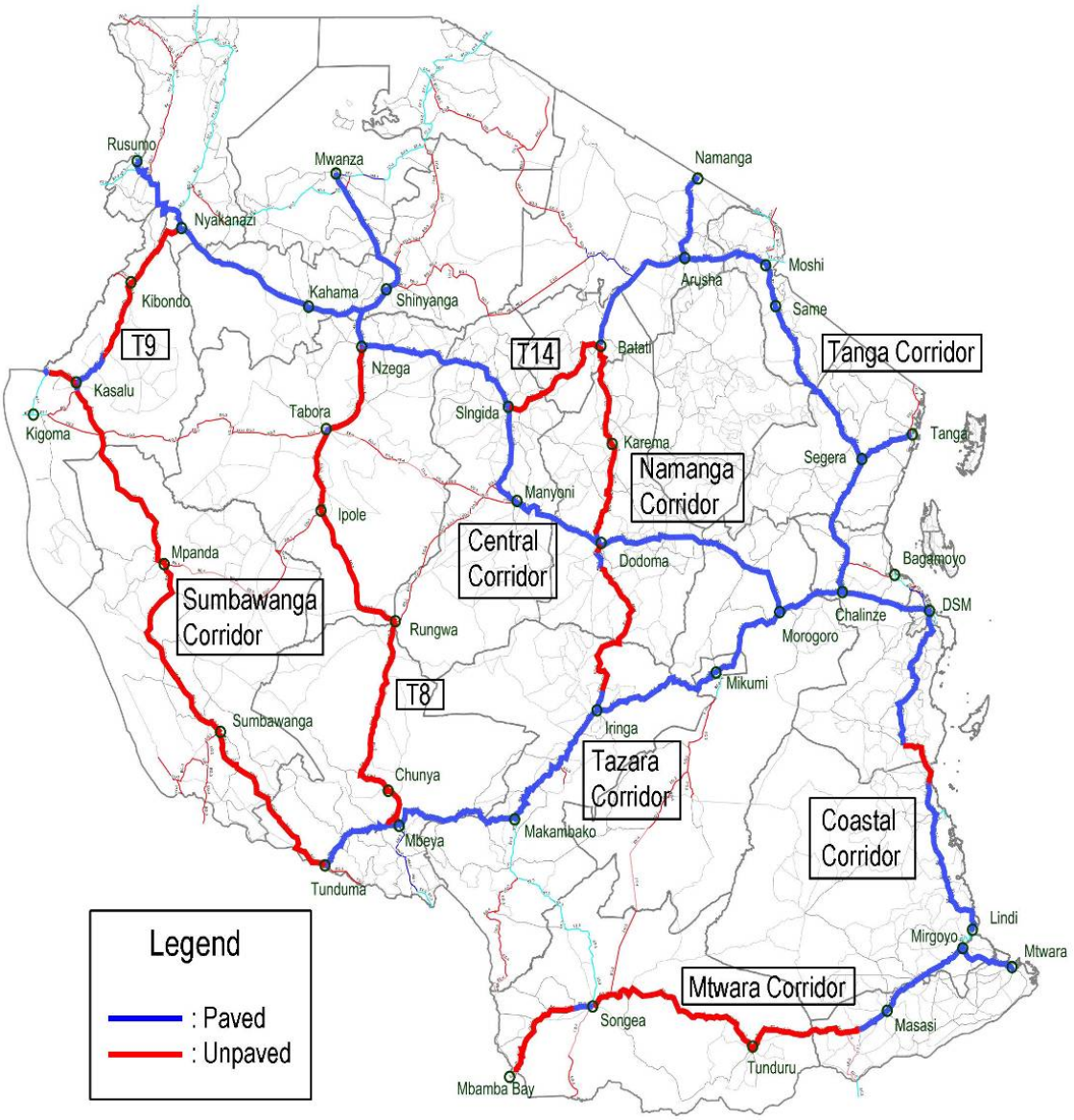


Figure 4.3: Major Corridors and Links in Tanzania

4.1.3 Road Conditions

The network condition: The road conditions of trunk and regional roads have steadily improved due to the various maintenance/rehabilitation and development activities which are carried out on the road network. The 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 actual implementation of projects started. Of the paved trunk roads, 77% have been rated good, whereas only 27% of unpaved trunk roads have been rated good.

The pavement conditions of regional roads still remain unsatisfactory. Only 31% of the roads are rated good, 51% fair and 17% poor in comparison to 39% good, 38% fair, and 23% poor conditions in 2008 shown in Table 4.3. and 4.4. It can be said that although the road surface is paved, the rating of the majority of the regional roads fall under the fair or poor categories.

Table 4.3: Pavement Conditions (in 2010)

Unit: km

Type	Pavement	Good	Fair	Poor	Total
Trunk	Paved	4,111	827	409	5,347
		(2,739)	(900)	(274)	(3,913)
	Unpaved	1,333	2,746	839	4,918
		(1,927)	(2,493)	(1,589)	(6,009)
	Sub total	5,444	3,573	1,249	10,266
		(4,666)	(3,393)	(1,863)	(9,922)
Regional	Paved	336	205	203	744
		(278)	(41)	(7)	(326)
	Unpaved	5,537	9,450	3,086	18,073
		(7,029)	(7,191)	(4,285)	(18,555)
	Sub total	5,873	9,655	3,289	18,817
		(7,357)	(7,232)	(4,292)	(18,881)

Source: TANROADS RMMS
Note: Numbers in the parenthesis are in 2008 conditions.

Table 4.4: Proportion of Pavement Rating

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

Source: TANROADS RMMS (2010)
Note: Numbers in the parenthesis are in 2008 conditions.

(1) Pavement Evaluation

Pavement evaluations have been conducted by TANROADS RMMS to determine functional and structural conditions of a road section either for the purposes of routine maintenance or improvement planning. Functional condition is primarily concerned with the riding quality or surface texture of a road section. Structural condition is concerned with the structural capacity of the pavement as measured by deflection, layer thickness, and material properties. Structure condition also determines drive ability of unpaved roads by trucks and automobiles for transportation of goods and passengers.

At the network level, routine evaluations can be used to prioritize maintenance or rehabilitation works and funding. At the project level, evaluations are more focused on establishing the root causes of existing distress in order to determine the best rehabilitation strategies and precise locations and sections.

Visual condition surveys cover aspects of both functional and structural pavement conditions, but generally serve as a qualitative indicator of the overall condition. Specialized equipment can be used to quantify both functional and structural properties of the pavement structure. Ideally, for any given section of highway, two or more evaluators would arrive at the same assessment of the section's current condition. However, there still remain many aspects of subjective

pavement evaluation. For example, in visual condition surveys, the percent of surface area affected by alligator cracking is highly dependent upon the visual judgments of the evaluator.

(2) Testing Methods

Generally there are two types of testing: non-destructive testing and destructive testing. Non-destructive data collected in the field are generally objective in nature, but often subjectivity appears in the data analysis and interpretation. Non-destructive testing is the collective term for evaluations of an existing pavement structure that do not require subsequent maintenance work to return the pavement to its pre-testing state. This is generally desirable to minimize disturbance to traffic, and is essential as a screening tool to determine locations for further material sampling and testing for material properties in the laboratory. Non-destructive testing methods can assess either functional or structural condition.

Destructive testing provides more detailed data about the pavement condition that would not possible to obtain through non-destructive testing. Such detailed data include:

- laboratory mechanical, physical, and chemical properties (obtained through coring, Shelby tubes, and trenching), and
- visual inspection of pavement layers through coring and trenching.

(3) TANROADS Evaluation Criteria[4]

The assessment of paved road conditions is conducted by a specially prepared condition data collection vehicle. The collection vehicle is operated by a driver and two specially trained observers/recorders. One observer is responsible for the automatic measurement of roughness and the recording of assessed defect using the keypad connected to the specially prepared computer system. The driver of the vehicle is responsible for driving the vehicle at a fixed speed of 30 km/h in the lane wheel path.

TANROADS sets ratings of overall pavement conditions by,

1) **Very good:** Shape and condition of the surface is in the as built condition. IRI is less than 4m/km.
2) **Good:** Positive camber of crossfall with no stagnant of water with low frequency of defects of low severity. The camber of crossfall will be greater than 4%. IRI is 4–6 m/km.
3) **Fair:** Camber or crossfall is at its minimum required to shed water. Insignificant stagnant of water with low frequency of defects with medium severity. Medium frequency of defects with low severity. (Light grading capable of restoring surface condition unless extensive pot holes and concave shape exist, otherwise heavy grading required for restoring surface conditions). IRI is 6–9 m/km.
4) **Poor:** Camber or crossfall is insufficient to shed water and water stagnant in ruts or areas of concave shaping up to 150 mm deep. Medium frequency of defects with high severity, or high frequency of defects with medium severity. (Reprocessing suitable under most conditions, otherwise light or heavy reshaping required). IRI is 9–15 m/km.
5) **Very poor:** Substantial loss of camber or crossfall and water stagnant in ruts or areas of concave shape in excess of 150–300 mm. High frequency of defects with high severity. (Light or heavy reshaping essential to restore shape). IRI is greater than 15 m/km.

[4] TANROADS RMMS

The following table (Table 4.5) shows the basic concept of pavement evaluation done by TANROADS, although they use a different file system**.** As can be seen from the concept table the evaluation is performed for each subsection all along the trunk and regional roads. For example, the section from Dar es Salaam to Akiba, which has 5.0 m carriageway width paved road of the Morogoro Rd. falls in the category "fair" because the overall condition is 3) above.

Table 4.5: Basic Concept of Pavement Evaluation

Link	Length	Surface	Shoulder	EIRI	Loss of Surface	Overall Condition	Ruts	Pot holes	Patch	Wide cracks	Raveling	Bleed of strips	Drainage	Urgent work	Date of measure
		Road: T001		From: Dar es Salaam						To: Akiba					
1		AM		5.32	0	3	2	1	2	2	1	1	3	No	'11
1		AM		5.12	0	3	1	1	2	1	0	0	2	No	'09
1		AM		5.55	0	3	2	1	1	1	1	1	2	No	'08
	0.91 km Ordinance length														
		Road:T001		From Akiba						To: Tanzania Legion					
1		AM		3.07	0	2	2	0	0	1	1	1	3	No	'11
1		AM		3.34	0	2	1	0	0	0	0	0	1	No	'09
1		AM		3.57	0	1	1	0	0	1	1	1	1	No	'08
1		AM		2.68	0									No	'06
	0.39 km Ordinance length														

Surface Type:
AM: Asphalt concrete (mix)

(4) Unpaved Road Application

Network level condition data for unpaved roads are collected during a drive over survey data recording for each one kilometre of sub-link. The frequency of survey is not yet fixed but is likely to be between one and three years. Between 60 km and 90 km of survey can be performed in a day, depending on survey routes and severity of defects. The techniques used are all observational. No measurements are required and require scores to be entered from a menu of options for each particular item. The contents of surveys comprise key performance factors in the provision and maintenance of unpaved roads.

Surface Type

The definition of surface types of unpaved road:

- **Engineered gravel (EG)** roads have a controlled horizontal and vertical alignment, and also have a consistent cross section with appropriate camber and side ditches. The surface materials will normally be imported gravel. The road is expected to be passable in all seasons.
- **Engineered earth (EE)** roads have a controlled horizontal and vertical alignment, and also have a consistent cross section with appropriate camber and side ditches. The surface materials will be the in-situ soil. The road would be impassable for some periods especially during the rainy season.
- **Non-engineered earth or gravel (NE)** roads do not have a controlled horizontal and vertical alignment, nor have a consistent cross section with appropriate camber and side ditches. Typically the camber would be flat, rutted or concave and retain surface water in places. The side ditches may be non-existent or inadequate. The road width may vary

in most of cases. The surface materials would be in-situ soil or gravel. The road would be impassable for some periods in the rainy season.

Overall condition ratings applied to unpaved roads are the following:

1) **Very good**; Shape and condition of the surface in the as built condition. IRI is less than 4m/km.
2) **Good;** Positive camber of crossfall with no stagnant of water with low frequency of defects of low severity. The camber of crossfall will be greater than 4%. IRI is 4–6 m/km.
3) **Fair**; Camber or crossfall at minimum required to shed water. Insignificant stagnant of water with low frequency of defects with medium severity. Medium frequency of defects with low severity. (light grading capable of restoring surface condition unless extensive pot holes and concave shape exist, otherwise heavy grading required to restore surface conditions). IRI is 6–9 m/km.
4) **Poor**; Camber or crossfall insufficient to shed water and water stagnant in ruts or areas of concave shaping up to 150 mm deep. Medium frequency of defects with high severity, or high frequency of defects with medium severity. (Reprocessing suitable under most conditions, otherwise light or heavy reshaping required). IRI is 9–15 m/km.
5) **Very poor**; Substantial loss of camber or crossfall and water stagnant in ruts or areas of concave shape in excess of 150–300 mm. High frequency of defects with high severity. (Light or heavy reshaping essential to restore shape). IRI is greater than 15 m/km.

Each evaluation item in the table has different criteria such as:

- **Drainage:** Overall conditions and effectiveness of the drainage system is assessed based on two elements, one of which is overall condition and another is length of section requiring a new drain or reconstruction;
- **Slopes:** No damage (0), Moderate damage (1) and Badly damaged (2);
- **Shoulder:** Good or no damage (0), Moderate damage (1) and Severe damage (2);
- **Shape:** Classified by Very good, Good, Average, Poor, Very poor and Failed;
- **Surface:** Classified by Very good, Good, Average, poor, very poor;
- **Urgent:** Urgent action required (Y), or No urgent action required (N);
- **Gravel thickness:** Existing thickness adequate and no punching through to sub-grade observed (Y), Thickness inadequate (N), and Surface is natural earth thus there are no imported gravels;
- **Culverts**: The number of silted, defective or damaged existing culverts to be noted and the number of new culverts required should be noted;
- **Bridges**: The number of damaged existing bridges should be noted as well as damages that require a detail inspection.

Note: The numbers and Y or N in parentheses are written in the pavement evaluation table.
As a result, overall road conditions of nationwide trunk roads are shown in the following figure.

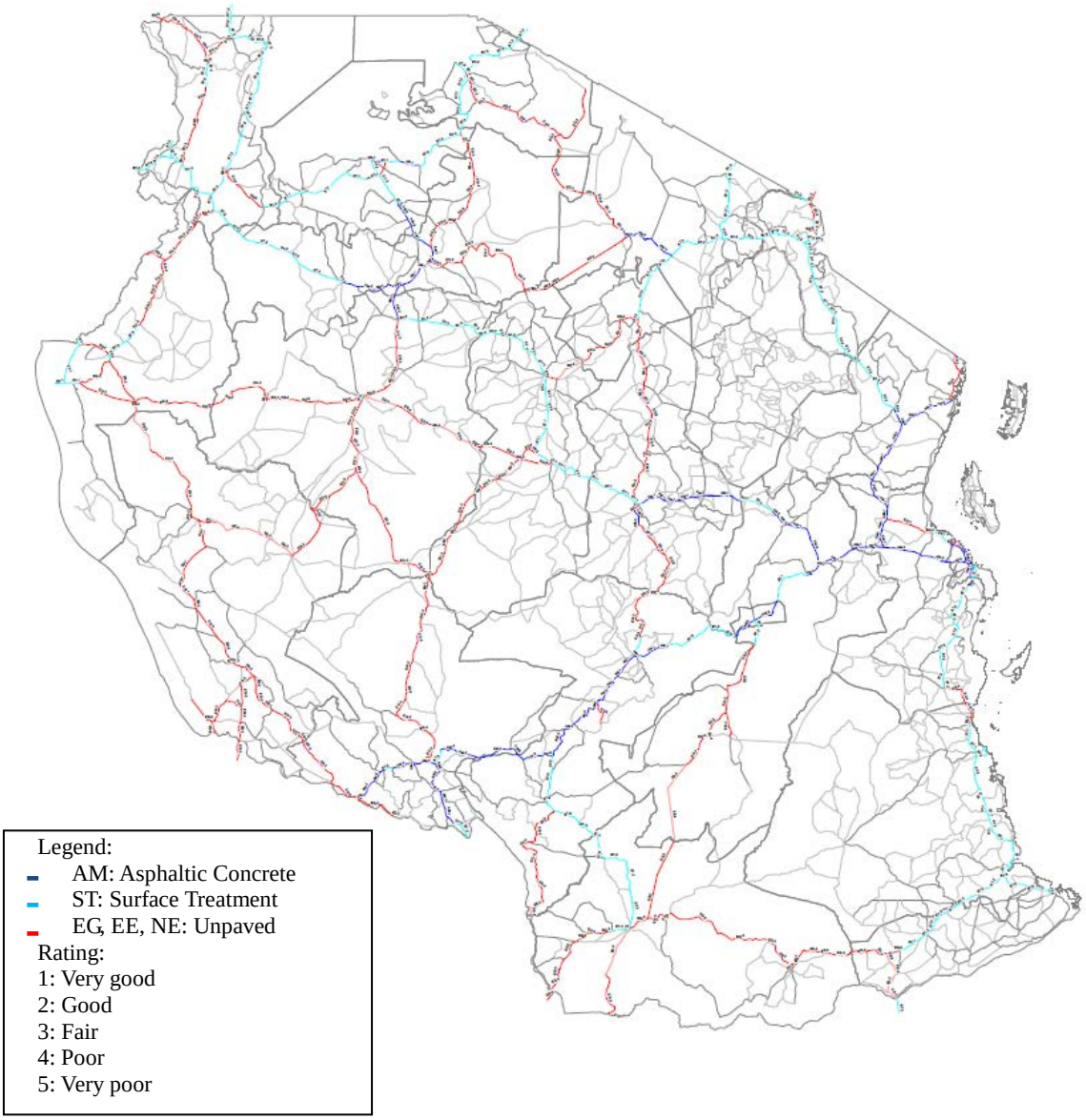


Figure 4.4: Overall Paved and Unpaved Trunk Road Conditions

4.1.4 Progress in Road Network Development

(1) General

TANROADS have no sources of funds of its own for development projects such as upgrading of a road, widening, improvements in geometric design and rehabilitation of trunk and regional roads. However, TANROADS is normally fully funded by the Government of Tanzania (GOT) and/or by multilateral and bilateral Development Partners. TANROADS manages development projects through three stages:

- Planning stage;
- Procurement stage; and
- Constructing stage.

It uses consulting firms to carry our feasibility studies, EIA, detailed engineering designs, preparation of tendering documents and supervision of works contracts. The actual process of

consultancy services procurement and works procurement is however normally done by TANROADS own staff.

The Development Program is managed by the Directorate of Projects. The Directorate manages projects through three Project Managers namely; the Manager for Government Funded Projects, the Manager for the Multilaterally Funded Projects (i.e. by World Bank, ADB, EU, OPEC, BADEA etc) and the Manager for Bilaterally Funded Projects (DANIDA, JICA, NORAD etc). The projects funded by the Millennium Challenge Compact (MCC) of USA are managed by a special unit at MOF and coordinated by a special unit on the TANROADS side.

(2) Annual Financial Plan[5]

In this FY 2010/11 the approved budget for the development programme is Tsh 694,360.26 million out of which Tsh 266,396.66 million is from the Government (GOT) and Tsh 427,963.60 million is from the Development Partners.

The allocation for trunk roads is Tsh 229,687.41 million in local and Tsh 417,732 million in foreign and that for regional roads is Tsh 36,709.25 million local and Tsh 10,231.6 million foreign.

The approved budget of 10% Roads Fund contribution to development projects is Tsh 19,917.57 million in local and Tsh 5,650.0 million in foreign being support from Development Partners to Roads Fund.

Out of the above amount from the Road Fund, the Trunk Roads/Rehabilitation and Studies have been allocated Tsh 10,896.7 million in local and Tsh 5,650 million in foreign. Regional roads have been allocated Tsh 9,020.87 million.

(3) Annual Physical Plan

Based on the approved budget plans were in place to carry out the upgrading of roads to bitumen standard, rehabilitation to bitumen and gravel standard, construction/rehabilitation of bridges and studies/ design during the FY 2010/11 as follows:

Trunk Roads

1) Upgrading to bitumen standard: 392.1 km
2) Rehabilitation to bitumen standard: 216.8 km
3) Rehabilitation to gravel standard.: 120 km
4) Construction/rehabilitation of bridges: 10 Nos.

Regional Roads

1) Rehabilitation to gravel standard: 1,350.9 km
2) Upgrading to bitumen standard: 98.55 km
3) Construction of Bridges: 17 Nos

(4) Completed Projects

Table 4.6 shows a list of recently completed road projects.

[5] TANROADS Annual Progress Report for FY 2010/11

Table 4.6: Completed Projects

NO.	Project Name	Length (km)	Cost (US$ million)	Commencement Date	Completion Date	Contractor	Financier
1	Tinde–Mwanza/SHY Border (Shinyanga)	96.0	53.23	11-Feb-04	30-Jun-2007	GRENAKER LTA	EU/GOT
2	Nzega–Tinde–Isaka (Shinyanga)	73.0	41.55	26-May-2004	24-May-2007	GRENAKER LTA	EU/GOT
3	Backlog Maintenance of Morogoro–Dodoma Roada (Morogoro)	256.0	EU 42.5 mil.	29-Jun-2004	30-Jun-2007	NCC INTERNATIONAL DENMARK A/S	EU/GOT
4	Mkurunga–Kibiti (Coast)	60.0	17.52	July-2003	2008	INHOUSE	OPEC/GOT
5	Package 1: Singida–Iguguno (Singida)	34.0	19.35	23-May-2005	19-Oct-2008	CHICO	IDA & GOT
6	Package 2: Iguguno–Sekenke (Singida)	42.0	14.44	12-May-2005	11-Nov-2007	CHICO	IDA & GOT
7	Package 3: Sekenke–Shelui (Singida)	33.0	20.61	11-Feb-2005	10-Feb-2007	CHICO	IDA & GOT
8	Rombo Mkuu–Tarakea (Kilimanjaro)	32.0	15.78	14-Sep-2006	13-Apr-2009	GENERAL NILE -DOTT JV	BADEA/GOT
9	Shelui–Nzega (Tabora)	112.0	20.723	8-Apr-2002	8-Oct-2005	CHINA GEO	ADB/GOT
10	Masasi–Mangaka Phase I (Mtwara)	15.0	6.8	2-Nov-2007	31-Mar-2009	TOKURA CORP.	JICA & GOT
11	Masasi–Mangaka Phase II (Mtwara)	17.6	11.4	28-Nov-2008	31-Mar-2010	TOKURA CORP.	JICA/GOT
15	Dodoma–Manyoni	127.0	103.40	1-Apr-03	11-Sep-2009	KONOIKE CONSTR. CO. LTD / ESTIM	GOT
16	Isuna–Singida (Singida)	63.0	30.42	14-Feb-03	2-Jul-2008	SIETCO	GOT
17	Mbwemkuru–Mingoyo (Lindi)	95.0	51.49	25-Feb-03	10-Dec-2007	M.A KHARAFI & SONS	GOT
18	Nangurukuru–Mbwemkuru* (Lindi)	95.0	39.24	25-Feb-03	25-Jan-2008	CICO	GOT*
19	Tarakea–Rongai–Kamwanga (Kilimanjaro)	32.0	14.42	25-Oct-04	2-Mar-2007	SIETCO	GOT
20	Unity Bridge and Approach roads (Mtwara)	10.7	24.55	10-Nov-2005	10-Nov-2008	CHINA GEO ENGINEERING	GOT
21	Kyamyorwa–Buzirayombo (Kagera)	120.0	49.13	10-Feb-2005	9-Feb -2008	CHINA GEO ENGINEERING	GOT
22	Sengerema–Usagara	40.00	35.786	7-Jan-2008	7-Aug-2010	SINOHYDRO	GOT
23	Manyoni–Isuna	54.0	30.24	7-Jan-2007	7-Jan-2011	CHINA GEO ENGINEERING	GOT
24	Mwandiga–Manyovu	60.00	53.600	5-Aug-2008	31/Oct/2010	CHICO	GOT
25	Nelson Mandela	15.6	41.222	1-Oct-2007	21-Jul-2011	MSS JV	EU
26	Kigoma–Kidahwe	35.70	32.543	12-Jun-2008	8-June-2010	CHICO	GOT
27	Masasi–Mangaaka Phase II	17.6	11.400	28-Nov-2008	31-Mar-2010	TOKURA CORP.	JAPAN/GOT
28	Kilwa Road Phase II	5.1	15.780	13-Apr-2008	30-Sept-2009	KAJIMA	JAPAN/GOT
29	Buzirayombo–Geita (Mwanza)	100.0	41.14	10-Feb-2005	31-Jan -2008	SINOHYDRO	GOT
30	Sam Nujoma (DSM)	4.0	12.97	8-Jun-2006	7-Apr-2008	CHIKO	GOT
31	Ruvu Bridge (Coast)	1.NO	4.43	18-May-2006	9-Oct-2008	CHINA HENAN	GOT
32	Geita–Sengerema	50	39.592	1-Feb-2008	31-Jan-2010	SINOHYDRO	GOT
	GRAND TOTAL	**1741.8**	**24,913.309**				

Source: TANROADS Website, 2011

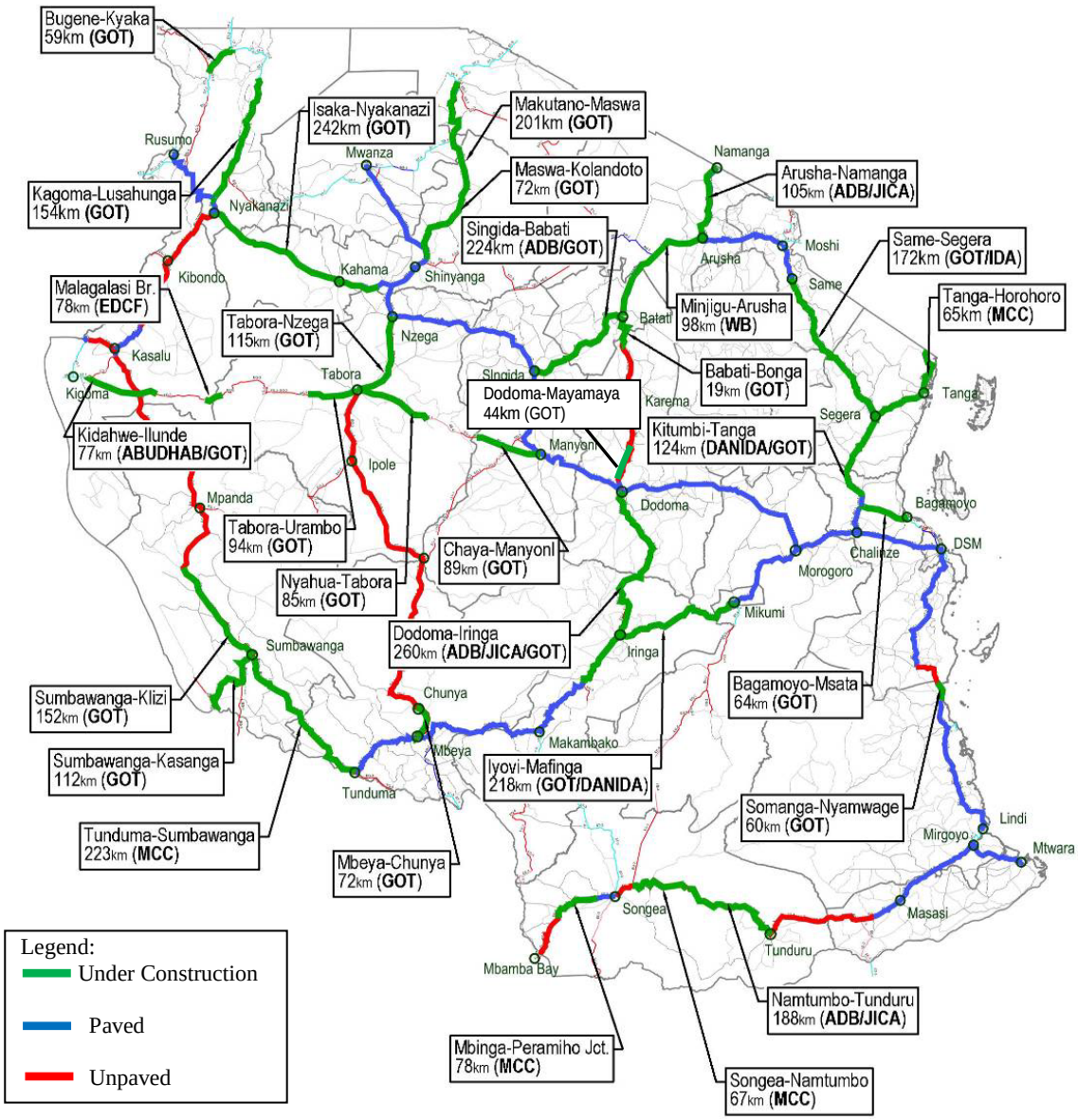
(5) Project under Construction

There are many on-going projects financed by either Tanzania Government or other international lending organizations as shown in the following table.

Table 4.7: On-going Projects

Road Section	Financier	Km	Remarks
Mbeya–Chunya	GOT	72	T8, unpaved trunk road
Mbinga–Peramiho Jct.	MCC	78	Mtwara Cor., T12 unpaved
Songea–Namtumbo	MCC	67	Mtwara Cor., T6 unpaved
Namtumbo–Tunduru	ADB/JICA	188	Mtwara Cor., T6 unpaved
Somanga–Nyamwage	GOT	60	Coastal Cor., T7 unpaved
Bagamoyo–Msata	GOT	64	Trunk Rd, unpaved
Kitumbi–Tanga	DANIDA/GOT	124	Coastal Cor. T2 Rehabilitate, Paved
Dodoma–Iringa	ADB/JICA/GOT	260	North-south Cor. T5, unpaved
Iyovi–Mafinga	GOT/DANIDA	218	TAZARA Cor. T1 Rehabilitate, Paved
Chaya–Manyoni	GOT	89	West of Manyoni, unpaved
Nyahua–Tabora	GOT	85	Tabora area. Alternative route to the Central Corridor. Unpaved.
Tabora–Urambo	GOT	94	Same as above.
Malagalasi Br. + Road Approaches (48 km)	EDCF	78	Alternative route to the Central Corridor. Unpaved.
Kidahwe–Ilunde	ABUDHAB/GOT	77	Alternative route to the Central Corridor. Near Kigoma. Unpaved.
Tabora–Nzega	GOT	115	T8, unpaved trunk road. Part of north-south link from Mwanza to Mbeya. Unpaved.
Singida–Babati	ADB/GOT	224	This road connects Tanga Cor. To Central Cor. Via Singda. Unpaved and mountainous road.
Babati–Bonga	GOT	19	Namanga Cor. T5, unpaved.
Minjigu–Arusha	WB	98	Tanga Cor. T2 Rehabilitate, Paved
Arusha–Namanga	ADB/JICA	105	Tanga Cor. T2 Rehabilitate, Paved
Tanga–Horohoro	MCC	65	Coastal Cor. T13, unpaved.
Makutano–Maswa	GOT	201	Unpaved , rehabilitate
Maswa–Kolandoto	GOT	72	Unpaved
Isaka–Nyakanazi	GOT	242	Central Cor. T3, rehabilitate, paved.
Kagoma–Lusahunga	GOT	154	Connection to Central Cor. T4, rehabilitate, paved
Bugene–Kyaka	GOT	59	Victoria Lake, unpaved.
Same–Segera	GOT/IDA	172	Tanga Cor. T2 Rehabilitate, Paved
Tunduma–Sumbawanga	MCC	223	Sumbawanga Cor. T9 unpaved.
Sumbawanga–Klizi	GOT	152	Sumbawanga Cor. T9 unpaved.
Sumbawanga–Katanga	GOT	112	Katanga Port access, unpaved.
Dodoma-Mayamaya	GOT	44	Namanga Corridor, unpaved

Source: TANROADS as of Sept. 2011



Source: TANROADS as of Sept. 2011

Figure 4.5: On-going Projects of Trunk Roads

(6) Project under Procurement

The list of projects under procurement as of September 2011 is shown in the following table.

Table 4.8: Consultancy Services under Procurement

Road Section	Financier	Km	Remarks
Kia–Mererani Rd.	GOT	26	Supervision of upgrading to bitumen standard
Bwanga–Uyovu Section	GOT	43	Supervision of upgrading to bitumen standard
Sibiti Br. and Approach Rd.	GOT		Supervision of Construction
Kyaka–Bugene–Kasulo Rd.	GOT	160	F/S, E/SIA, DD, Preparation of Tender Documents for upgrading to bitumen std.
(Lot 2) Bugene–Kasulo Section	GOT	121	Same as above
Ipole–Rungwa Rd.	GOT	172	F/S, E/SIA, DD, Preparation of Tender Documents for upgrading to bitumen std.
Kidatu–Ifakara–Lupilo–Malinyi–Londo–Lumecha Rd.	GOT	512	F/S and Preliminary Design for upgrading to bitumen standard.
Mtwara–Newala–Masasi Road Mwiti Br. (72 km) included	GOT	211	F/S and E/SIA, DD and Preparation of Tender Documents for upgrading to bitumen std.
Same–Himo–Marangu Rd.	WB	93	F/S, Preliminary E/SIA, DD, and Preparation of Tender Documents for rehabilitation to bitumen std.
Mombo–Lushoto Rd.		32	F/S, Preliminary E/SIA, DD, and Preparation of Tender Documents for upgrading to bitumen std.
Mtwara–Mingoyo–Masasi Rd.	WB	200	F/S, Preliminary E/SIA, DD, and Preparation of Tender Documents for rehabilitation to bitumen std.
Lusahunga–Rusumo Rd.	WB	91	F/S, Preliminary E/SIA, DD, and Preparation of Tender Documents for rehabilitation to bitumen std.
Nyakasanza–Kobero Rd.		58	
Mafinga–Igawa Rd.	WB	142	F/S, Preliminary E/SIA, DD, and Preparation of Tender Documents for rehabilitation.

Source: TANROADS

(7) Project Implementation Challenges

The projects implementation challenges that TANROADS is facing, affect performance of project progress. They are from the Financiers, Consultants (design and supervising) and Contractors.

Delays caused by External Project Financiers

Lengthy procurement procedures, review and approval procedures often lead to delay in providing 'No Objection' for the procurement of various projects and in effecting payments to Contractors/Consultants. Proposed remedial measure would be for the Development Partners to channel their support through GBS and for MOF to establish a dedicated mechanism to ensure prompt disbursement of funds to TANROADS.

Inefficiencies of Design and Supervising Consultants

There are, sometimes consultants' problems related to roads and bridges engineering designs during the implementation of projects. These include faulty survey data and inadequate materials investigations. Poor performance of some Supervising Consultants lead to non or delayed advice to the Client on issues with adverse effect to the projects implementation.

Inefficiencies caused by Contractors

Most Contractors show some weaknesses during the execution of their contracts. These include slow mobilization of key equipment and staff, poor contract management, inadequate and aged equipment and deployment of incompetent personnel. Many local contractors do not own necessary plant and equipment for road works. They depend on hiring. There are few equipment hire companies in the country that do not suffice equipment needs.

4.1.5 Maintenance

Tanzania National Roads Agency (TANROADS) was established in 1997 under the Executive Agencies Act and became operational on 1 July, 2000. The core business of the agency is the development, maintenance and management of 33,495 km of roads made up of 12,197 km of trunk roads and 21,298 km of regional roads as of June 2011. The Agency is also responsible for managing the following three subsidiary businesses:

- Central Materials Laboratory and 20 Regional materials Laboratories;
- Weighbridges located at various points of the trunk roads; and
- Equipment hire units located in Lindi, Mbeya, Tanga and Morogoro regions.

(1) Maintenance of Trunk and Regional Roads

The 33,495 km of roads managed and maintained by TANROADS are composed of paved and unpaved roads as shown in the following table:

Table 4.9: Paved and Unpaved Roads

Unit: km

Category	Paved	Unpaved	Total
Trunk Roads	5,537	6,660	12,197
Regional Roads	847	20,451	21,298
Total	6,384	27,111	33,495

Source: TANROADS

TANROADS' current organisational set up consists of five directorates. These include planning, projects, procurement and contracts, maintenance and business support services. The various road maintenance operations are carried out through the respective Regional Managers with the maintenance directorate being responsible for monitoring and support services.

The main responsibilities of the Agency in relation to the maintenance of the road network include:

- Road network maintenance planning (Strategic Plan)
- Determination of annual road and bridge maintenance programmes,
- Preparation of guidelines and procedures for maintenance works, supervision and monitoring of the regions in the management of contracts,
- Supervision of physical implementation of maintenance programmes in the regions,
- Coordination of all maintenance works on the trunk and regional roads network in accordance with the Agency's strategic and business plans,
- Implementation of Axle load Control programme along the Trunk and Regional roads to prevent overloading, and
- Enforcement of the Road Act 2007 in relation to protection and safe use of National Roads and the Road Reserve.

However, TANROADS has no systems of its own for the maintenance of its roads. The Government has established a Road Fund whose funding is field user charge via the MOF as the main source of finance for road maintenance. The amount of roads fund varies from year to year depending on how much is allocated and actually released to TANROADS from the Roads Fund Board (RFB). For this purpose, every year, TANROADS signs a Performance Agreement with the Roads Fund Board in which the obligations and rights of each party, for the year, are provided.

(2) Physical and Financial Performance (Roads Fund for FY 2010/11)

Road maintenance obligations of TANROADS can be categorized into eight groups, separately for trunk and regional roads, and with physical and financial targets for each group.

The physical and financial performance up to the fourth quarter was assessed to be 88% (Physical) and 85% (Financial) for trunk roads; and 99% (physical) and 84% (financial) for regional roads when compared to annual targets.

Table 4.10 and 4.11 show the performance of the main maintenance activities for trunk and regional roads respectively.

Table 4.10: Trunk Roads Performance (4th Quarter FY 2010/11)

			Physical		Financial (million Tsh)	
No.	**Maintenance Activity**	**Unit**	**Annual Plan**	**Achieved**	**Annual Plan**	**Achieved**
1	Routine-paved	km	4,314	104%	8,240	91%
2	Routine-unpaved	km	5,040	92%	6,493	108%
3	Periodic maintenance – paved	km	319	79%	32,361	80%
4	Periodic maintenance – unpaved	km	512	99%	9,319	91%
5	Spot improvement – paved	km	8	58%	651	87%
6	Spot improvement – unpaved	km	64	115%	918	93%
Subtotal			10,262	97%	57,983	
7	Bridge prevention	Nos	1,087	91%	1,308	82%
8	Bridge repairs	Nos	53	94%	2,812	62%
Subtotal Bridge			1,140	91%	4,121	
Overall Percentage			88%		85%	

Source: TANROADS Annual Report FY 2010/2011

Table 4.11: Regional Roads Performance (4th Quarter FY 2010/2011)

			Physical		Financial (million Tsh)	
No.	**Maintenance Activity**	**Unit**	**Annual Plan**	**Achieved**	**Annual Plan**	**Achieved**
1	Routine-paved	km	730	97%	914	104%
2	Routine-unpaved	km	17,093	95%	18,989	93%
3	Periodic maintenance – paved	km	68	93%	16,220	64%
4	Periodic maintenance – unpaved	km	1,767	99%	24,914	87%
5	Spot improvement – paved	km	9	83%	431	93%
6	Spot improvement – unpaved	km	387	107%	5,907	85%
Subtotal			20,055	96%	67,377	83%
7	Bridge prevention	Nos	1,050	96%	1,684	77%
8	Bridge repairs	Nos	79	113%	8,402	91%
Subtotal Bridge			1,129	97%	10,086	88%
Overall Percentage			99%		84%	

Source: TANROADS Annual Report FY 2010/2011

The relative low financial expenditure when compared to physical performance is attributed to the time lag between receiving funds and payment of outstanding certificates especially the funds received at the end of the financial year. Where physical targets have been exceeded is due to revised maintenance programme during mid – year review. The original annual plans have been retained as contained in the signed Performance Agreement and this is causing the performance to exceed 100%.

Photo 4.23:
Compacting Earth Road by a Roller

Photo 4.24:
Upgrading to Bitumen Standard

Photo 4.25:
Small Scale Repair Work

Photo 4.26:
LB Maintenance Work of the Pavement

(3) New Maintenance Activities by TANROADS

Performance-based Management and Maintenance of Roads (PMMR)[6] is a pilot project covering a total of 1,076 km of unpaved roads located in Tanga, Mwanza and Rukwa regions. The project consists of six contract packages whereby for each contract, a contractor is required to assure certain pre-defined service levels at all times during five years of the contracts. The six packages are: Package 1: Mwanza West (208 km); Package 2: Mwanza East (139 km); Package 3A: Rukwa South (116 km); Package 3B: Rukwa North (115) km; Package 4: Tanga West (228 km) and Package 5: Tanga East (117 km).

Status of the Project

PMMR project implementation began in January 2008 for the packages in Mwanza and Rukwa. Initial rehabilitation works of 320 km in Mwanza and 300 km in Rukwa were completed in year 2010 and now the roads are under full maintenance. The progress for the two regions of Mwanza and Tanga is satisfactory.

In case of Tanga region, the works contract for Tanga East package was signed in January 2009 and works commenced in April 2009. For the Tanga West package the works contract was signed in March 2009 and works started on July 2009. The performance of the Tanga West package is satisfactory and for Tanga East package is poor.

The following are the notable achievements for packages with satisfactory performance:

[6] TANROADS Paper for Fifth Infrastructure Review Meeting, August 2011

- Roads are maintained at all times with contractors available at site even for emergencies
- Permanent reduction in travel times (in other cases by more than 50%)
- Significant traffic increases on many roads as a result of acceptable road service levels
- Increased passenger transport at lower fares as many buses are available hence competition drives fares down
- Reduced workload for Agency staff

Way Forward for PMMR Project

PMMR is a pilot project whose ultimate aim is to gather enough experience of running such a project during its implementation period (five years) and later to replicate its method or approach to all other regions.

TANROADS is now finalizing a review of the impacts of the pilot PMMR project so as to recommend to the Government on the way forward i.e. whether to continue and roll out PMMR to other regions or not.

Labour Based Technology

Labour-based methods are used in maintaining roads through contracts. The maintenance activities undertaken in the regions have been accomplished through use of equipment and or local labour. Local labourers employed were mostly from villages and community groups adjacent to the roads.

(4) Road Maintenance Challenges[7]

A number of challenges are experienced which have an impact on the road maintenance operations and the overall performance of TANROADS. The external challenges include the low capacity of the local construction industry and delays in disbursement of funds from the Roads Fund. For the internal challenges, these include keeping supervising staff up to date in contracts management skills; insufficiency of supervision staff and facilities and deficient axle load control facilities. The challenges are elaborated as follows:

Low Capacity of the Local Construction Industry

Many contractors lack equipment and financial capital to execute major maintenance works. Paved road works are particularly affected due to lack of specialized equipment for works involving bitumen, even for small works. The effort on part of TANROADS includes improving the packaging of contracts to sizes that could enable contractors to invest in equipment; and guaranteeing payment to suppliers for loaned/hired equipment.

Contracts Management Skills among Supervising Staff

Training in project or contracts management and procurement is being provided continuously to the staff mainly through courses offered within the country. Various development partners are also assisting in this area and these include DANIDA, JICA, EU and World Bank.

Insufficient Supervision Capacities

The capacities for supervision in terms of vehicles and technical staff are still not enough to effectively supervise all works sites on the roads. Shortage of technical staff is being experienced in the regions. The issue is to fill vacant positions in the new organisational structure that requires additional personnel coupled with deaths, dismissals, retirement,

[7] TANROADS Paper for Fifth Infrastructure Review Meeting, August 2011

resignations of permanent staff and relocation. Recruiting temporary staff is normally done to bridge the gap.

Inadequacy of Axle Load Control

The current operations for axle load control are mainly concentrated on major corridors leaving a number of roads without any kind of enforcement. Roads in regions without temporary or permanent weighbridges are prone to damage due to overloaded vehicles and hence face rapid deterioration.

TANROADS continues to evaluate the situation and plan accordingly for installation of weighbridges within the allocated budget. The total numbers of operational permanent weighbridges as of June 2011 stood at 25 and for mobile weighbridges at 17.

In the fourth quarter 2010/2011, a total of 684,600 vehicles were weighed throughout the country; out of these, 167,310 vehicles were found overloaded which is 24.44%. Out of the overloaded vehicles only 8,856 (1.30%) were overloaded beyond the permitted 5% and hence were charged accordingly. As indicated above, about 98.67% of overloaded vehicles were within the 5% this indicates that, most of vehicles are overloaded either due to shifting of cargo or poor arrangement of the same within the vehicle.

Vandalism, Theft, Damage to Road Facilities

Traffic lights, streetlights, road signs, etc are knocked down frequently especially in urban areas. Road furniture like road signs, guide rails, etc. are being vandalized /stolen along the roads.

4.1.6 Issues

(1) Paved Ratio

The paved ratio of the trunk roads is 45%, and regional roads is 4% as of June 2011 (refer to Table 4.2). The corridors that are almost fully paved either by asphalt pavement or asphalt treatment are the Central Corridor, Dar es Salaam (TAZARA) Corridor, and the Tanga Corridor. Other east-west and north-south corridors are partially paved or almost unpaved. Although the paved ratio increased over the years, “good” condition of paved trunk roads is 77% and for regional roads that is 45% respectively. On the other hand the 17% of unpaved roads for both trunk and regional road conditions remain in the classification of “poor” conditions.

It is absolutely crucial to improve at least the trunk and regional network paved for the economic development of the country. Unless trunk and regional roads are fully paved the transportation costs continues to be high.

(2) Improvement of Geometry

In order to provide safe, efficient and reliable transport of goods and passengers the road geometry should be improved at some sections of the trunk and regional roads. There are some sections that the vertical alignment (profile) does not satisfy the required length for overtaking safely on some sections of the roads.

Photo 4.27:
Steep Horizontal Curve

Photo 4.28:
Steep Slope with Short Sight Distance

According to the Road Traffic Act of 1973, the maximum allowable vehicle size is as follows:

- Overall width is 2.6 m;
- Overall height is 4.6 m from the road surface;
- Overall length of rigid vehicle is 12.5 m;
- Overall length of articulated vehicles is 17.0 m; and
- Overall length of any combination of vehicles is 22.0 m.

Therefore it is necessary to provide at least 7 m of two-lane paved width for carriageway plus 0.5~0.75 paved verges on both sides of the road. It is also recommended to provide a paved shoulder of 1.5~2.5 m on both sides for emergency parking of breakdown vehicles.

(3) Lack of Service Facilities along the Major Corridors

As can be seen from the list of east-west the corridors especially from coastal areas to inland Tanzania or neighbouring countries are long in distance, being more than 1,000 km. There are towns and villages along the route of built-up regions. However, due to low density especially along inland areas, service facilities that are usually provided in towns and villages such as restaurants, markets, repair shops, fuel station and the like are very rare. Even north-south corridors also pass through less populated areas or mountains.

In order to assure safety of traffic, efficient transportation, and comfort of drivers roadside facilities are crucial. Such roadside facilities should be equipped with nice and clean toilets, ample parking space, repair shop, fuel station, in some cases restaurants.

(4) Upgrading from ST to AM (Hot Mix Asphalt Pavement)

Although the paved ration of the trunk roads is currently 45% this pavement includes both asphalt mix and surface treatment (ST). Figure 4.4 “Overall Paved and Unpaved Trunk Road Conditions” indicates the significant proportion of paved roads is the asphalt surface treatment (ST), which evidently is less lasting especially when the traffic volume is high. It should be important to increase paved ratio of both trunk roads and regional roads. The upgrading of the quality of the paved roads should be implemented as well with a limited amount of budgets. TANROADS puts emphasis on the rehabilitation work of such ST sections along the major corridors and already started construction

(5) Financial Sources for Infrastructure Development

The Road Fund Board (RFB) receives money from road users (as fuel levy) through MOF. The Road Fund Board in turn distributes the money to implementing agencies for road maintenance

and monitors the impact of the same. The implementing agencies are TANROADS and Local Government Authorities through Prime Minister's Office Regional Administration and Local Government (PMORALG). Although the amount of budget for road maintenance since July 2007 increased substantially, upgrading and maintenance are not satisfactorily done. It seems necessary to widen the financial sources from other sources not limited to fuel levy and overloading charges.

(6) Traffic Jam in DSM

According to the Dar es Salaam Transportation Master Plan, BRT system will be introduced along major roads in DSM. Unless prior provision of an outer ring road, widening of existing trunk roads, and grade separated structures of major intersections, BRT introduction may worsen the traffic jam in the city area.

4.2 Road Haulage Industry

4.2.1 Current Conditions

The road transport is the major mode of transportation carrying over 90% of the passengers and over 75% of the freight traffic in Tanzania. Tanzania's road network, however, presents some challenges at times. Some of the unpaved roads often turn impassable in rainy season and might be closed for traffic for considerable time.

(1) Summary of Road Haulage

The Tanzanian economy is very dependent on the road transport due to the poor condition of other modes of transport, especially the railway. The largest market sector of transport market in Tanzania is inter-region freight, which accounts for about 75% of the total demand for road haulage.

The freight companies transport agriculture input from Dar es Salaam to inland regions, where agricultural products are transported from regional centres to processing centres and exports warehouse. Thus, haulage demand is essential due to the needs for transport of harvested crops, and inputs such as fertilizer and chemicals to match the growing season. The demands are also high for transport of imported industrial commodities and consumer products.

On the other hand, international haulage is divided into two: to transit cargoes to neighbouring countries and import/export cargoes to Tanzania through Dar es Salaam Port. The climate of the international haulage business is mostly dependent on the handing capacities/efficiency of cargo throughput in Dar es Salaam Port in comparison with the other international ports located in neighbouring countries.

(2) Summary of Road Haulage Industries

Over 95% of operators are private companies with public operators accounting for less than 5%. Operators from neighbouring countries compete in the market for back-hauls. The international operators tend to have larger fleet sizes and operate the largest vehicle configurations. It is estimated that there are about 50 companies in the international market with fleets of 300 to 500 trucks.

The major national road transport association is Tanzania Truck Owners Association, located in Dar es Salaam; number of membership counts approximately 270 operators, and additionally more than 200 operators not belonging to the association.

Local and domestic operators tend to use smaller vehicles from 7 to 15 tonnes and numbers of operators also have businesses outside the transport sector. There are a significant number of owner-drivers with one vehicle, constantly competing for business at the low end of the market.

Major transport companies are required to install the capacity investment corresponding to the request from cargo owners and the international standard requirement from global logistics system. Some of international transport companies (e.g., the trucking company/fleet owner or freight forwarder) have already installed electric tracking systems (e.g., GPS trucking system, cargo tracing system, etc.) and can log on to the system via the internet using a secure password to supervise the Truck movement/performance and obtaining the location updates.

(3) Road Haulage Cost

The following table indicates the road haulage charge of the northern corridor through hearing investigation with several private trucking companies. Generally the haulage charge is divided by cargo types, container and break bulk. In addition, tariff systems are highly dependent on the availability of return loads.

However, in reality, road haulage tariffs are deregulated and negotiable depending on road conditions, length of haul, weight of load, and tariffs have reduced due to the use of larger and more economic vehicles as well as from competition between operators.

Table 4.12: Examples of Land Haulage Charge

Route	Break-Bulk Cargo (USD/tonne)	Container (USD/TEU)
Mzuzu–Mbeya	41	613
Lilongwe–Mbeya	75	1,138
Blantyre–Mbeya	93	1,400

Note: The charge of FEU is supposed to be double of TEU's charge in general.
Source: JICA Study Team

The cost of land haulage in Tanzania is high, making Tanzania less competitive in the global market and providing an obstacle for agricultural and industrial development, growth and poverty reduction.

One of the reasons why land transport costs is high is because the police stop trucks frequently along the way. In addition trucks spend considerable time at the weigh station. This condition shows that trucks experience considerable delays due to police stops and weigh bridges. This undoubtedly increases the cost of logistics in Tanzania. The following figure shows "Police Stop Zone" on the main truck route.

Source: JICA Study Team, base map is sourced from UN website.

Figure 4.6: Location of Police Stop on Main Truck Route

Source: JICA Study Team

Photo 4.29:
Weigh Station on RN

Source: JICA Study Team

Photo 4.30:
Weigh Station Office

(4) ICD (Inland Container Depot)

The entities that have a dry port or ICD in Tanzania are the Tanzania Port Authority, the Tanzania Railway Company (TRC) and Private Transportation Companies (e.g., trucking companies, freight forwarder, shipping lane, etc.).

The Tanzania Port Authority has sanctioned the development of a new container depot to help reduce congestion at the port of Dar es Salaam. Many private companies are constructing new ICD near the port of Dar es Salaam in these years.

Source: JICA Study Team

Photo 4.31:
Private ICD under Construction at Dar es Salaam Port 1

Source: JICA Study Team

Photo 4.32:
Private ICD under Construction at Dar es Salaam Port 2

Almost major transportation companies in Tanzania own ICD corresponding to both domestic and international container facilities located in strategic points in Tanzania.

There are many private ICD in Mbeya and Morogoro currently. Mogoro is located 110km from Dar es Salaam. Mbeya plays a strategic role as a logistics centre of the south-west region.

Mbeya is positioned as a gateway to SADC region as one of the strategic points of international road haulage. In this respect, possibilities of working with the Spoornet (South African Railways) are being explored to provide seamless rail service (i.e., complete train of engine plus wagon) moving across all borders from Johannesburg by rail all through to Mbeya where cargo will be transshipped on to road trucks to points in Malawi.

Otherwise, the Government plans to enhance existing ICD at Ilala (Dar es Salaam) and to build new ICDs, one in Shinyanga and another in Mwanza. This project is financed by the Tanzanian Government and Belgian Government support, and aims to reduce the turnaround time of container wagons from the current 13.9 days to 9 days between loadings, and hereby contribute to improve capacity to domestic transport and transit freight in Tanzania.

4.2.2 Issues and Findings

The following points show the current issues through the hearing investigation with several private land haulage companies in Tanzania;

- Non-tariff expense on the trucking route brings logistics cost to increase and efficiency to decrease. Consequently international cargo owners or freight forwarders hesitate to use the Tanzanian trucking route;
- Checking procedure in ICD takes up too much time in Tanzania;
- Rest facilities for truck driver and maintenance workshops of large truck are needed on the logistics corridors, especially the corridor between Morogoro and Mbeya. ; and
- Not only maintenance workshops but also technicians of truck maintenance are lacking in comparison to the neighbouring countries. There exist educational courses or academies of maintenance technicians for large trucks in South Africa whereas there are

no educational courses nor academy in Tanzania. Lack of truck maintenance capacity reduces the competitiveness of international logistics business indirectly.

Source: OILCOM Tanzania Co., Ltd.

Photo 4.33:
Traffic Accident Site on the Corridor

Source: OILCOM Tanzania Co., Ltd.

Photo 4.34:
Effect of the Accident in Road-Side Village

Chapter 5 Rail Sector

5.1 Network

5.1.1 Network Map (TRL and TAZARA)

Figure 5.1 presents a map showing the Tanzanian railway network.

Source: Tanzania Railway Limited

Figure 5.1: Map Showing the TRL and TAZARA Railway Networks

5.1.2 TRL

The Tanzania Railway Limited (TRL) network has a track gauge of 1,000 mm (metre gauge) and comprises seven lines with a total route length of 2,724 km (see Figure 5.1). Of this network, three lines are not currently in full operation: (i) the Mruazi Junction–Arusha section of the Tanga-Arusha Line due to floodwater damage to structures; (ii) the Mikumi Line, from which services were withdrawn by Rail India Technical and Economic Services (RITES) in 2008; and (iii) the Singida Line, which was formerly used occasionally to transport wheat, but is now completely out of operation. The Link Line (which provides access to the Tanga Line) is understood to be operated occasionally.

5.1.3 TAZARA

The Tanzania Zambia Railway Authority (TAZARA) operates a line with a track gauge of 1,067 mm (Cape Gauge) running from Dar es Salaam in Tanzania to New Kapiri Mposhi in Zambia, a distance of 1,860 km, 975 km of which is in Tanznia and 875 km in Zambia. It is physically interlinked to the Railway System of Zambia (RSZ) at New Kapiri Mposhi and through this link to the 11 railway networks of the Southern Africa Development Community (SADC) with a common (1,067 mm) gauge. The TAZARA Line interfaces with the TRL network in Dar es Salaam Port, as well as at Kidatu (terminal station on the Mikumi Line, now not operating).

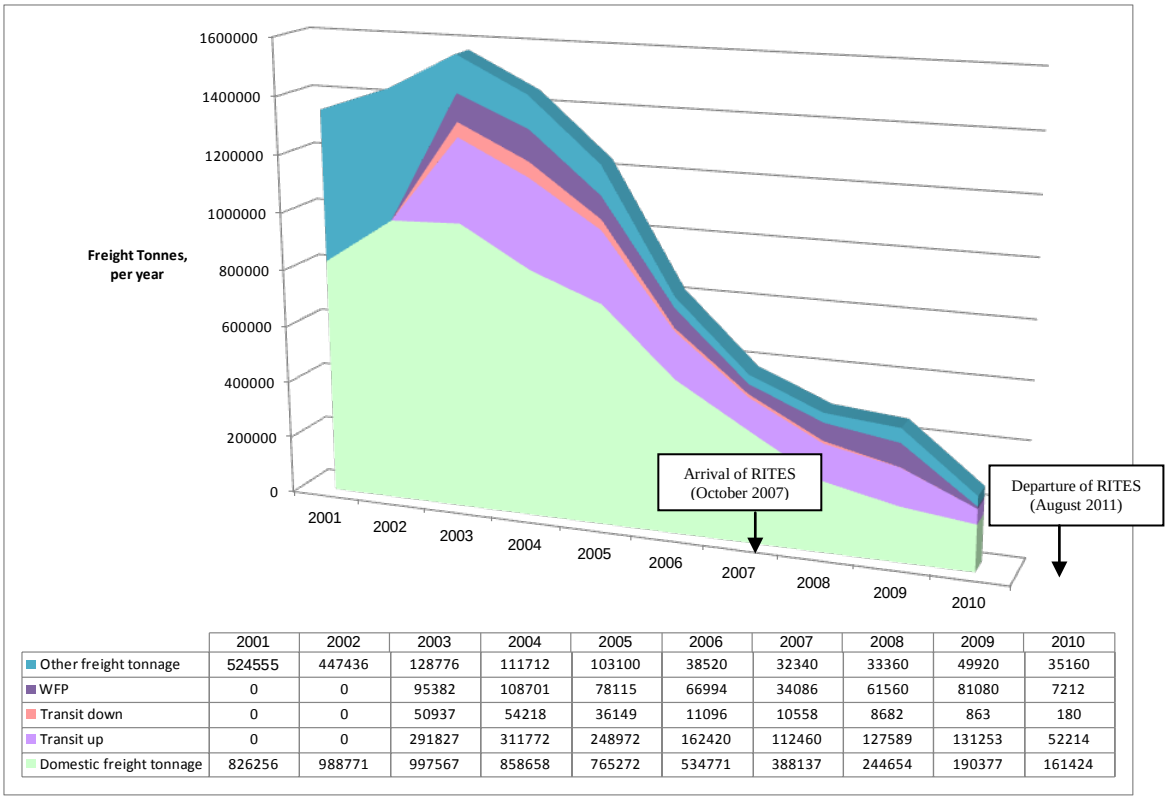
5.2 Trends in Demand and Capacity

5.2.1 TRL

(1) Demand

Data received from TRL indicate that the total freight tonnage handled on the TRL network grew at a rate averaging 7.6% per annum between 2001 and 2003. The tonnage handled in 2003 (1,564,489 tonnes) in fact represented a peak, since in subsequent years the total freight tonnage fell sharply. During the three years preceding the start of the RITES concession (2004–2006), it decreased at a rate averaging −19.6% per annum, and during the term of the RITES concession (2007–2010), it fell at an even faster rate, −25.1% per annum. *The freight tonnage hauled by TRL in 2010 (256,190 tonnes) represented only 16.4% of the tonnage hauled in the peak year*. The overall trend by traffic segment is shown in Figure 5.2.

In the peak year, when operating conditions might be described as “normal”, domestic freight accounted for nearly two-thirds of all freight carried by TRL and seven commodities (general cargo, petroleum products, cement, maize, sugar, grain, and cotton) accounted for 82% of domestic volume. Freight hauled on behalf of transit customers and the World Food Programme (WFP) accounted for 28% of total freight tonnage.

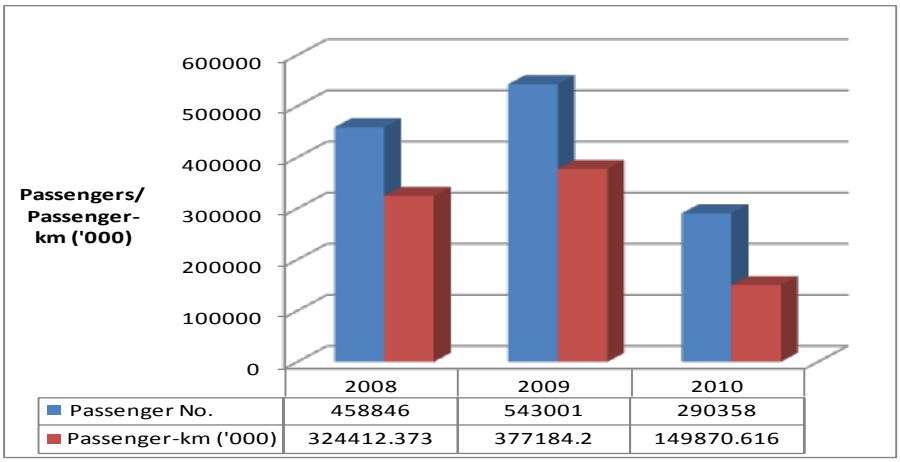


	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Other freight tonnage	524555	447436	128776	111712	103100	38520	32340	33360	49920	35160
WFP	0	0	95382	108701	78115	66994	34086	61560	81080	7212
Transit down	0	0	50937	54218	36149	11096	10558	8682	863	180
Transit up	0	0	291827	311772	248972	162420	112460	127589	131253	52214
Domestic freight tonnage	826256	988771	997567	858658	765272	534771	388137	244654	190377	161424

Source: Chief Commercial Manager, TRL (October 2010)

Figure 5.2: TRL Freight Tonnage Trend, 2001–2010

The trend in number of passengers and passenger-km on the TRL network is shown in Figure 5.3. Unfortunately, passenger data were not available for the same time span as given for freight in Figure 5.1. However, in 2010, the data indicate a sharp drop in the passenger indicators as compared with the two preceding years (2008 and 2009). The number of passengers in 2010 reflects a drop of nearly 50% over the corresponding number in 2009. At the same time, the average trip distance (calculated as the division of passenger-km by passenger volume) declined from 707 km in 2008 to 695 km in 2009 and 516 km in 2010.



Source: Chief Commercial Manager, TRL

Figure 5.3: TRL Passenger and Passenger-km Trend, 2008–2010

(2) Capacity

The sharp decline in the traffic of TRL since 2003 is almost wholly attributable to a severe shortage of locomotives, which has arisen as a result of TRL being deprived of adequate funds to purchase the spare parts needed to carry out major "F" overhauls on its mainline and shunting locomotive fleets. As a result, TRL has had to defer most of these required, leading to unacceptably high rates of in-service failure and poor rates of availability. The lack of locomotives for revenue-earning service has in turn resulted in train cancellations and a loss of customers, many of whom have had to invest in trucks in order to meet their transport needs.

The current situation concerning locomotive availability is shown in Table 5.1. Of a total of 27 working mainline locomotives, only 12 on average are now available per day for operation.

Table 5.1: Locomotive Availability Position as at 24 October 2011

Locomotive class	Horsepower	Total fleet	Working fleet (no,)	Defective (No.)	Average number available per day (as at 24/10/2011)	% Working fleet available
73	1,150	10	10	0	5	50.00%
88	1,880	26	12	14	6	50.00%
88U	2,150	2	2	0	1	50.00%
89	2,000	6	3	3	0	0.00%
Sub-total (mainline)		***44***	***27***	***17***	***12***	***44.44%***
37			3		2	66.67%
64			6		2	33.33%
65			2		1	50.00%
Sub-total (shunting)			11		5	45.45%
Total			***38***		***17***	***44.74%***

Note: Class 88U locomotives are Class 88 locomotives which were upgraded in India during the period of the RITES concession.
Source: Acting Chief Mechanical Engineer, TRL

This compares with an average of 23 available mainline locomotives a year ago (October 2010) and 27 in January 2010. *Obviously, the situation is deteriorating rapidly and if not corrected very soon, could result in a total suspension of service.*

The effect of the reduced locomotive availability on freight traffic generation can be determined from the net availability position, after allowing for assignment of mainline locomotives to other tasks, as shown below:

Gross number of available mainline locomotives per day:	12
Less number required for passenger service:	3
Less number required for banking of trains on heavy grades:	1
Less number required for work trains (movement of sleepers, ballast, etc):	2
Gives net number available for moving freight:	*6*

It can be shown that a reliable locomotive with a 75% rate of availability can be expected to haul 26,000 tonnes of freight per year (see the calculations inTable 5.2, following this paragraph). If only six locomotives per day can be made available for this task, the maximum freight volume that can be handled by TRL would stand at *only 156,000 tonnes per year*. This number compares with an achieved freight volume of 256,190 tonnes in 2010, indicating the extent of the deterioration in freight haulage capacity within the space of only one year. Based on advice given by the Acting Chief Mechanical Engineer of TRL, the number of wagons

available every day (638) is sufficient to transport 621,000 tonnes of freight per year, so that the wagon fleet is not expected to impose capacity constraints in the immediate future.

Table 5.2: Calculation of Annual Freight Haulage Capacity for a Reliable Locomotive

Assumed operating days per year	365
Assumed availability rate for reliable locomotive	75%
= available days per year	273.75
= available hours per year	6570
If hauling freight trains to Kigoma:	
Assumed average speed (km/hour)	14
Distance (km)	1250
Assumed loading/unloading time (hours)	12
Average train configuration (no.wagons)	20
Average payload per wagon (tonnes)	40
Average trainload (tonnes)	800
Average transit time (hours)	89.28571
No.of round trips per year	32.433
Average freight haulage capacity per loco, tonnes per year	25946.4

Source: Consultant's estimate

5.2.2 TAZARA

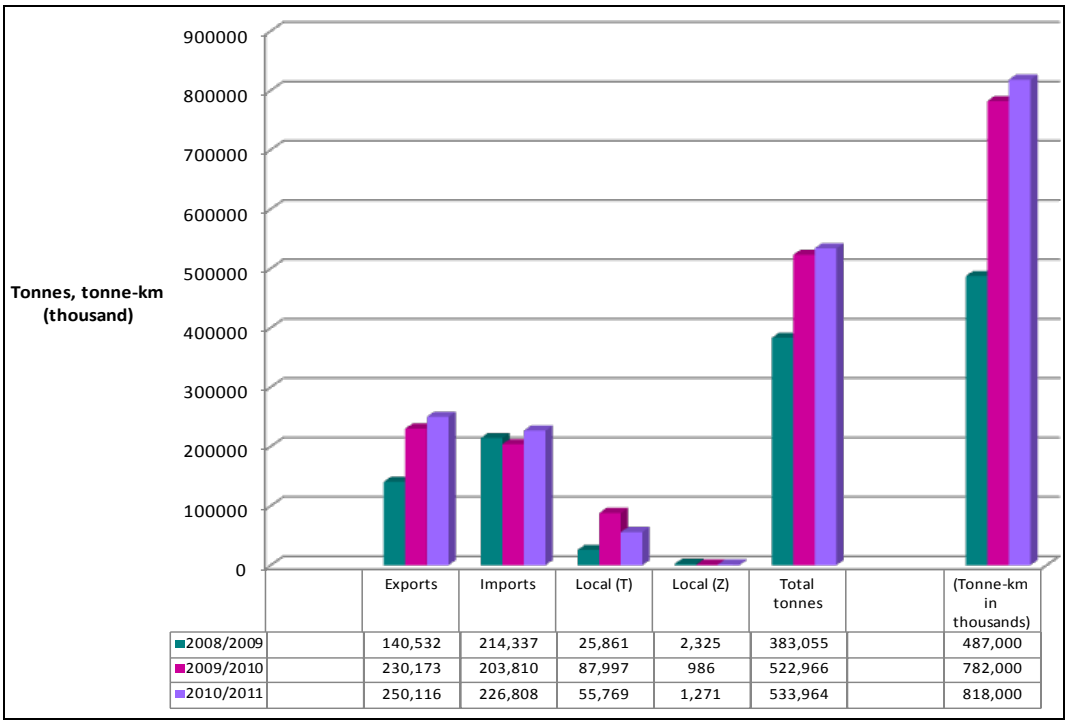
(1) Demand

During the past three years, the total freight tonnage transported on the TAZARA Line increased at a rate averaging 18.1% per annum, from 383,055 tonnes in 2008/09 to 533,964 tonnes in 2010/11 (Figure 5.4). Since the 2008/09 volume was depressed as a result of the global economic downturn, much of this growth reflected a recovery to prerecession tonnage levels. The year-on-year freight volume growth between 2009/10 and 2010/11 was only 2.1%. The slight improvement in 2010/11 was attributed to the success of the locomotive rehabilitation programme of the Mbeya workshops in improving the overall availability and reliability of the locomotive fleet.[1] The freight volume transported in 2010/11 is still below the average of 600,000 tonnes per annum achieved over the past 10 years.

By comparison with TRL, TAZARA appears not to have suffered nearly as dramatic a decline in its freight volume. It achieved its peak freight volume of 1.2 million tons per annum as long ago as 1986, suggesting a steadier decline in freight volume over a longer period than was the case with TRL. It remains to be seen whether the measures being taken to relieve the shortages of locomotives and rolling stock will result in a traffic revival.

Except for 2008/09 when export freight volumes were depressed as a result of the global economic downturn, it can be seen that export and import freight volumes are reasonably balanced (in 2010/11 accounting for 47% and 44% respectively of total freight volume).

[1] TAZARA, *Rail Sub-Sector Review Paper for the 5th Joint Infrastructure Review (JISR)*, October 2011.

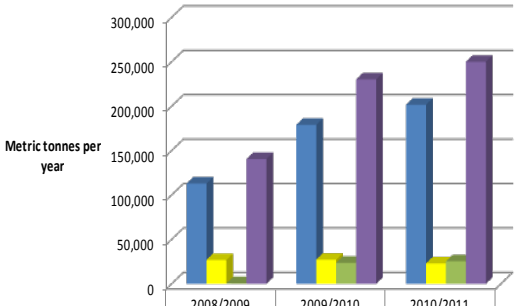


	Exports	Imports	Local (T)	Local (Z)	Total tonnes	(Tonne-km in thousands)
2008/2009	140,532	214,337	25,861	2,325	383,055	487,000
2009/2010	230,173	203,810	87,997	986	522,966	782,000
2010/2011	250,116	226,808	55,769	1,271	533,964	818,000

Source: TAZARA

Figure 5.4: TAZARA Freight Tonnage Trend, 2008/09–2010/11

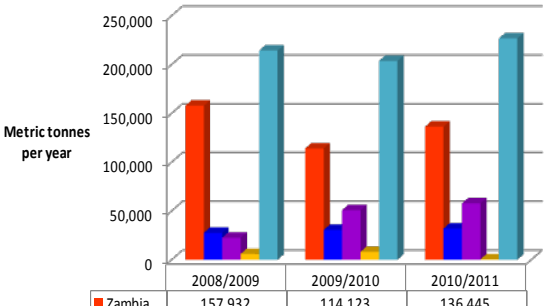
As may be inferred from Figure 5.5 and Figure 5.6, about 80% of TAZARA's export volume and about 60% of its import volume is accounted for by Zambia. The Democratic Republic of Congo (DRC) is the second most important source of export volume, while Malawi has overtaken the DRC as the second most important destination for import volume.



	2008/2009	2009/2010	2010/2011
Zambia	112,907	179,032	201,705
Tanzania	27,033	27,287	23,038
DRCongo	592	23,854	25,373
Total	140,532	230,173	250,116

Source: TAZARA

Figure 5.5: Trend in TAZARA Export Volume



	2008/2009	2009/2010	2010/2011
Zambia	157,932	114,123	136,445
DRCongo	27,740	30,509	32,045
Malawi	22,687	50,982	57,908
Tanzania	5,978	8,196	410
Total	214,337	203,810	226,808

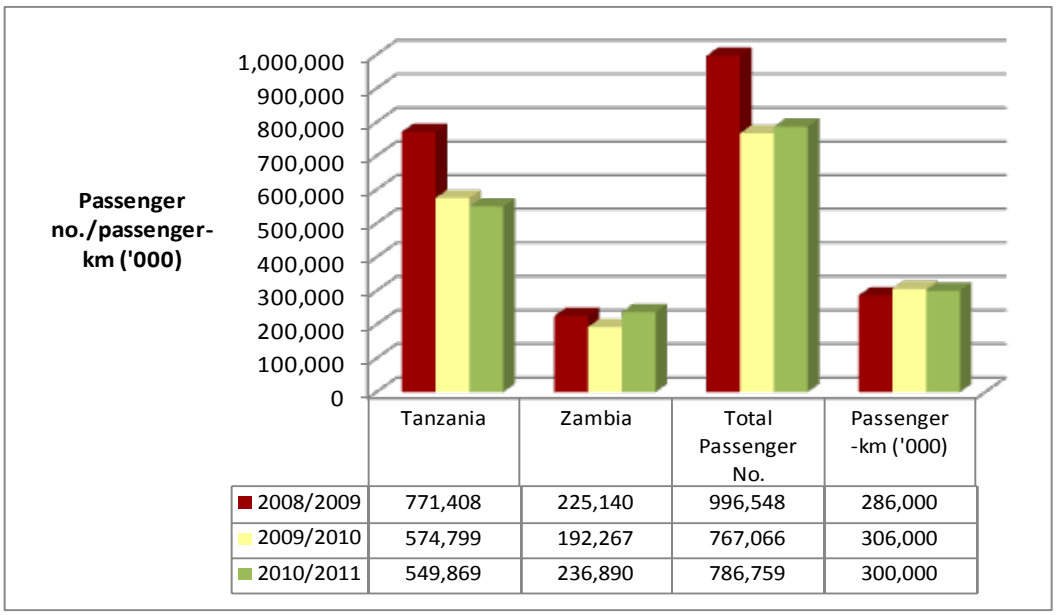
Source: TAZARA

Figure 5.6: Trend in TAZARA Import Volume

In 2010/11, copper accounted for 83% of Zambian export volume transported by TAZARA, Manganese export volume was growing about three times as fast as copper volume and already accounted for 16% of TAZARA's total export freight volume from Zambia.

Between 2008/09 and 2010/11, TAZARA's freight tonne-km increased by more than two-thirds, from 487 million to 818 million, and the average haul distance by more than 20%, from 1,271 km to 1,532 km.

The trend in the number of passengers and passenger-km on the TAZARA Line is shown in Figure 5.7. In 2009/10 there was a substantial drop in the number of passengers originating at both Tanzanian and Zambian stations. This was attributed to locomotive shortages as well as to the poor state of the passenger rolling stock as a result of deferred maintenance due to financial restrictions. While the Zambian passenger volume had recovered by 2010/11, the Tanzanian passenger volume continued to decline. In 2010/11 the total passenger volume, which stood at 786,759 passengers, was still less than 80% of the volume in 2008/09.



	Tanzania	Zambia	Total Passenger No.	Passenger -km ('000)
2008/2009	771,408	225,140	996,548	286,000
2009/2010	574,799	192,267	767,066	306,000
2010/2011	549,869	236,890	786,759	300,000

Source: TAZARA

Figure 5.7: TAZARA Passenger Volume and Passenger-km Trend, 2008/09–2010/11

(2) Capacity

As is the case with TRL, TAZARA faces serious shortages of locomotives and rolling stock due to high rates of in-service failure and poor rates of availability, caused by deferred maintenance, which is in turn the result of an insufficient budget to purchase spare parts. Nearly half of all mainline locomotives on the register are more than 25 years old, and many of these have missed their scheduled overhauls by several years.

Data supplied by the TAZARA Mechanical Engineering Department and excerpted in Table 5.3 shows the disposition of the operational fleet of mainline and shunting locomotives, as at 4 October 2004.

Table 5.3: TAZARA Locomotive Availability Position as at 4 October 2011

Locomotive make/model	Horsepower	Operational fleet (no,)	No. out of service, awaiting spare parts	Average number available per day (as at 04/10/2011)	% Working fleet available
U30C (DE)	3,000	14	7	7	50.00%
CKD	2,900	4	2	2	50.00%
DFH2R	2,000	3	2	1	33.33%
DFH1R	1,000	2	0	2	100.00%
Sub-total (mainline)		***23***	***11***	***12***	***52.17%***
CK6	1,000	6	3	3	50.00%
Sub-total (shunting)		6	3	3	50.00%
Total		***29***	***14***	***15***	***51.72%***

Source: TAZARA Mechanical Engineering Department

Currently, TAZARA has an operational fleet of 23 locomotives, of which only 12 on average are available every day for revenue earning and service trains. The balance (11 locomotives) is out of service awaiting the supply of spare parts necessary for repairs and overhauls. It has been estimated that 28 mainline locomotives are needed to fully satisfy daily demand,[2] which would suggest that train cancellations and loss of traffic are frequent outcomes. The locomotive supply situation was relieved slightly with the completion of overhauls on 13 mainline locomotives at the Mbeya Workshops in August 2011, *but at current availability levels it is unlikely that freight and passenger traffic can increase much beyond the level achieved in 2010/2011.*

Wagon availability also imposes a severe constraint on capacity. Of a total of 2,260 wagons in the inventory, only 1,390 (61%) are working and 870 are defective. Of the latter, only 494 are repairable. Many of the operating fleet of 1,390 wagons are unreliable and prone to in-service failure due to deferred maintenance and resulting problems of excessive wear of bearings and other components.

As a result of deferred maintenance, the fleet of 119 passenger coaches is in poor technical condition and therefore prone to in-service failure. This is reported to have been partly responsible for the downturn in passenger traffic that was experienced in 2009/10.

Recently, TAZARA has attempted to relieve critical shortages of locomotives and rolling stock by applying internally generated funds to:

- Overhaul 13 mainline locomotives at its Mbeya Workshops (programme completed in August 2011); and
- Rehabilitation of dilapidated passenger coaches, with the allocation of USD 8,000 every fortnight for this purpose.

These initiatives have resulted in a slight improvement of the situation, but *at current availability levels it is unlikely that freight and passenger traffic can increase much beyond the level achieved in 2010/2011.*

A further improvement is expected to result from the receipt during 2011 of a soft loan from China in the amount of *USD 39.9 million* that will cover:

- purchase of six new 3,000 horsepower (HP) locomotives, the rehabilitation of 9 more, and the purchase of 90 new freight wagons;

[2] TAZARA (2011).

- rehabilitation of four cranes and two rescue cranes;
- purchase of raw materials for rail underlining bars;
- purchase of spare parts for 1,200 wagons; and
- employee training.

5.3 Infrastructure and Operation (including Rail Related ICD and Transshipment Facilities)

5.3.1 TRL

(1) Track and Structures

The major part of the TRL network is laid in lightweight rail of 56.12 lbs per yard, or less, much of it dating back to the German colonial era. The distribution of route length by rail weight on the network is given in Table 5.4.

Table 5.4: Distribution of Route-km by Weight of Rail

Line	Weight of rail in lbs per yard						
	45	50	55	56.12	60	80	Total Km
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					352		352
Moshi-Arusha	86						86
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%

Source: TRL Civil Engineering Department

The maximum axle load allowable on the network is 16 tonnes, but this applies only to those parts of the network which are laid in heavier (60 lbs per yard or more) rail. Those sections laid in rail of 56.12 lbs per yard are capable of accepting the heaviest locomotive (the Class 88 with an axle load of 13.7 tonnes), while the sections laid in rail lighter than 56.12 lbs per yard are restricted to the operation of lighter locomotives (e.g., the Class 73, with an axle load of 12 tonnes).

Throughout the network, track is laid on steel sleepers, some of them also dating back to the German colonial era, pre-World War I.

There are approximately 5,200 bridges on the network, 2,300 of them with a span of 2 m or more. A soft copy of the Bridge Register, last updated in 2006, was given to the JICA Study Team. No bridge rehabilitation has been undertaken since 2006 (i.e., the year the RITES concession was granted), but except for some bridges damaged by floodwaters in the past two years, most are understood to be in good condition. This was confirmed during track inspections carried out in October 2011 on the Central and Mwanza lines by the JICA Study Team.

A review of track condition during the inspections carried out in October 2011 resulted in the following findings:

- Central Line (1,254 km): excellent 416 km (80lb/yd rail section), fair 283 km (60 lb/yd rail section), poor 466 km (56.12 lb/yd rail section), and very poor 89 km (56.12 lb/yd rail section);

- Mwanza Line (378 km, 60 lb/yd *welded rail*): fair 338 km and poor 40 km;
- Mikumi Line (108 km): No operation due to damage to track structure by flooding; the Mikumi–Kidatu section (40 km approx.) seems operable.

(2) Signals and Telecommunication

There is almost no signalling left on the TRL network. Previously, there was a 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, station masters can communicate with trains via high frequency radio.

If the budget were available, 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.

(3) Workshops

The JICA Study Team inspected workshops and running depots at the following locations:

- Dar es Salaam, TRL carriage and wagon workshops;
- Morogoro, TRL locomotive workshops;
- Tabora, TRL locomotive running shed;
- Kigoma, TRL locomotive and wagon running depot; and
- Mwanza South, TRL locomotive and wagon running depot.

None of the above listed TRL facilities appeared not to have any problems with the supply, functioning and maintainability of their equipment. Especially, in Dar es Salaam, Morogoro and the various TRL running depots visited, the critical shortage of spare parts was identified as the single most persistent factor preventing an adequate supply of locomotives to work trains. Additionally, a recurring serious shortage of diesel fuel (as a result of budgetary restrictions) was reported by the Assistant District Mechanical Engineer in Tabora.

(4) ICD and Other Rail Related Transshipment Facilities

The JICA Study Team inspected TRL and TAZARA rail access tracks in Dar es Salaam Port as well as rail access facilities at Kigoma and Mwanza Ports.

In Dar es Salaam Port, TRL access is from the north and TAZARA is access from the south. Three TRL tracks were observed to run along the berth face adjacent to Berths 3–8. There was no activity or rolling stock on these tracks at the time of the team's visit. TAZARA access is provided in the form of two tracks serving the warehouse area and one track serving the container stack behind Berths 3–8. At the time of the team's visit, several rakes of covered and open wagons were seen to occupy tracks in front of the copper handling warehouse, while in the tracks adjacent to the container stack, urea was observed being loaded onto trains for movement to Zambia. Security in the copper handling warehouse was noted to be strictly applied.

In the case of Kigoma and Mwanza Ports, there appeared to be no problems with rail access, but there was an almost total absence of railway activity at these locations, owing to ongoing lack of traffic due to ongoing problems with locomotive availability. Mwanza Port is equipped with a

link-span bridge for the loading/off-loading of wagons to/from the rail-deck roll-on/roll-off (RORO) ferry plying between Mwanza and Kampala, Uganda.

During its track inspection of the Mwanza Line, the JICA Study Team visited inland container/clearance depot (ICD) facilities at Shinyanga and Isaka.

Shinyanga Dry Port is intended to handle cargo for domestic destinations including imported containerised and break-bulk cargo transported under bond from Dar es Salaam Port. So far, it has handled no cargo (due to locomotive shortages and an absence of cargo transported by rail). Isaka ICD, on the other hand, is intended to handle transit cargo to/from Rwanda and Burundi. **Why both of these activities could not be undertaken at a single facility was not immediately obvious to the Railway Team.** Reli Assets Holding Company (RAHCO) is the owner of both facilities and leases them out to TRL for operation.

Shinyanga Dry Port (Km 197) is a new facility, constructed over a period of eight months ending in December 2010, but which thus far has yet to start operation. It has one track of 140 m for wagons carrying containers and another of the same length for wagons carrying break-bulk cargo, a bonded warehouse with a 35 m platform (can discharge two wagons at a time) and a small container yard. The container yard was reported as having a pavement depth of 30 cm, which would make it suitable for reach-stacker operation. At end October 2011, TRL dry port management personnel were expecting to take delivery of 2 reach-stackers for container lifting in the container yard and four small forklifts for operation in warehouse.

Currently, maize from Mpanda is offloaded at Shinyanga for local consumption, but unloading happens in the station yard. It is understood that four trains per week are received at Shinyanga – two from Mpanda and two from Dar es Salaam.

The Isaka ICD was constructed in the early 1990s. It incorporates one container track (with space for 11 wagons), one platform track for break-bulk cargo, a bonded warehouse with a capacity of 3,000 tonnes of cargo, and a container yard with an area of 12,350 square metres and capacity for 360 TEUs stacked two-high. In the container yard, there is a 42-tonne capacity reach-stacker (Fontuzzi) equipped with a spreader for container lifting and a 36-tonne capacity Piacenza toplifter equipped both with spreader for loaded container lifting and heavy duty forks for empty container lifting. At the time of the team's visit, both items of equipment were idle due to a lack of traffic at the ICD. Other equipment, also observed idle in the container yard, included 5- and 3-tonne forklifts, a Unilok shunting tractor that can pull up to three empty wagons, and a Wiedemar tractor that can pull 40 tonnes. Previously, 37 or 64 class locomotives were made available by Tabora for shunting of the ICD, but shunting is now performed with the ICD's own equipment when traffic is available.

In the entire month of October 2011, the ICD had handled only 674 tonnes of break-bulk cargo (comprising 428 tonnes of wheat from Bakhresa; 176 tonnes of fertilizer; and 70 tonnes of WFP cargo). During the same period, the ICD handled only 4 × 20 ft containers, carrying cement from Tanga. Bakhresa cargo was offloaded from 52 covered goods wagons, each carrying 40 tonnes.

The JICA Study Team has concluded that no improvements to these ICD facilities will be necessary during the short to medium term, although strong consideration should be given to their combination or rationalization.

(5) TRL Operations

Due to the lack of traffic caused by a lack of locomotives, very few trains are currently operated on TRL lines:

- On the Central Line, approximately two passenger trains and two freight trains are operated in each direction per week between Dar es Salaam and Kigoma;
- On the Mpanda Line, two passenger trains operate in each direction per week between Mpanda and Dar es Salaam, while on the Mpanda and Mwanza lines, two freight trains operate in each direction per week conveying maize from Mpanda to Shinyanga and Mwanza; and
- On the Central and Mwanza lines, two freight trains in each direction per week operate from Dar es Salaam to Shinyanga and Mwanza, conveying cement and wheat loading (the latter for Uganda).

On track laid with light rail, speeds are restricted to 25–30 kph and on the Mpanda Line only lighter locomotives (of the 73 class) are permitted to operate.

The standard freight train configuration consists of 20 wagons hauled by a single locomotive, with a gross trailing load of 800 tonnes. Train length is determined by the length of crossing loops and sidings, which are usually no longer than 450 m. In the steep track section of the Central Line between Makutupora (Km 546) and Aghondi (Km 610), an additional locomotive is provided for the banking of westbound trains.

5.3.2 TAZARA

(1) Track Structure

The whole section of the TAZARA line is laid in 80 lb per yard rail on pre-stressed concrete sleepers. However, the JICA Study Team had no chance to inspect the track condition of TAZARA line except at Kidatu station where transfer facilities were provided between TRL and TAZARA lines.

(2) Workshop

The team inspected the TAZARA's locomotive and rolling stock workshop in Dar es Salaam.

The TAZARA workshop in Dar es Salaam, unlike that of TRL, was found to be experiencing significant problems with the maintainability of its equipment, many items of which were imported from China many years ago and are now out of order (e.g., testing equipment for locomotive fuel injectors).

5.4 Future Traffic Demand Scenarios

5.4.1 TRL

Guidelines recently offered for the direction of the Master Plan suggest that gross freight tonnage in Tanzania in 2030 will be roughly four times the current amount, if an economic growth rate of at least 5% is achieved. It was acknowledged that, given the recent decline in freight carried by rail, the railways will first have to recover their lost freight volumes before they can pursue the 2030 fourfold volume target.

In the case of TRL, last year's freight volume, 256,190 tonnes, was only 16% of what it was in the peak year of 2003. It is unrealistic to assume that TRL will in the short term be able to recover to its peak year volume of more than 1.5 million tonnes.

The JICA Study Team has received from TRL a proposal for the heavy overhaul of 6 mainline locomotives and 7 shunting locomotives, as well as for the re-manufacturing of another 7 mainline locomotives. The total cost of the overhaul programme will be about USD 5.3 million and the re-manufacturing will cost another USD 12.6 million. At best, the overhaul programme will make available for traffic an additional 9 mainline locomotives (6 plus 3 released from shunting duties) and will provide capacity for haulage of an additional 234,000 tonnes—in other words, not quite a doubling of last year's tonnage. Re-manufacturing would add another 182,000 tonnes, which would bring TRL back to a capacity of around 670,000 tonnes of freight per annum, which volume would still be less than that handled in 2006 (the year preceding the advent of privatization).

Of course, there are other short-term rehabilitation initiatives, such as re-railing of the Mpanda Line, which we will be assessing as a means of increasing freight tonnage capacity. However, at best it appears likely that TRL freight tonnage will only recover to a level that is about half its peak-year level. This then should be the starting point for the application of long-term growth assumptions. However, *it should first be determined whether customers who switched to road transport after the RITES debacle will automatically return to rail once it can again provide service, or whether they will require other inducements.*

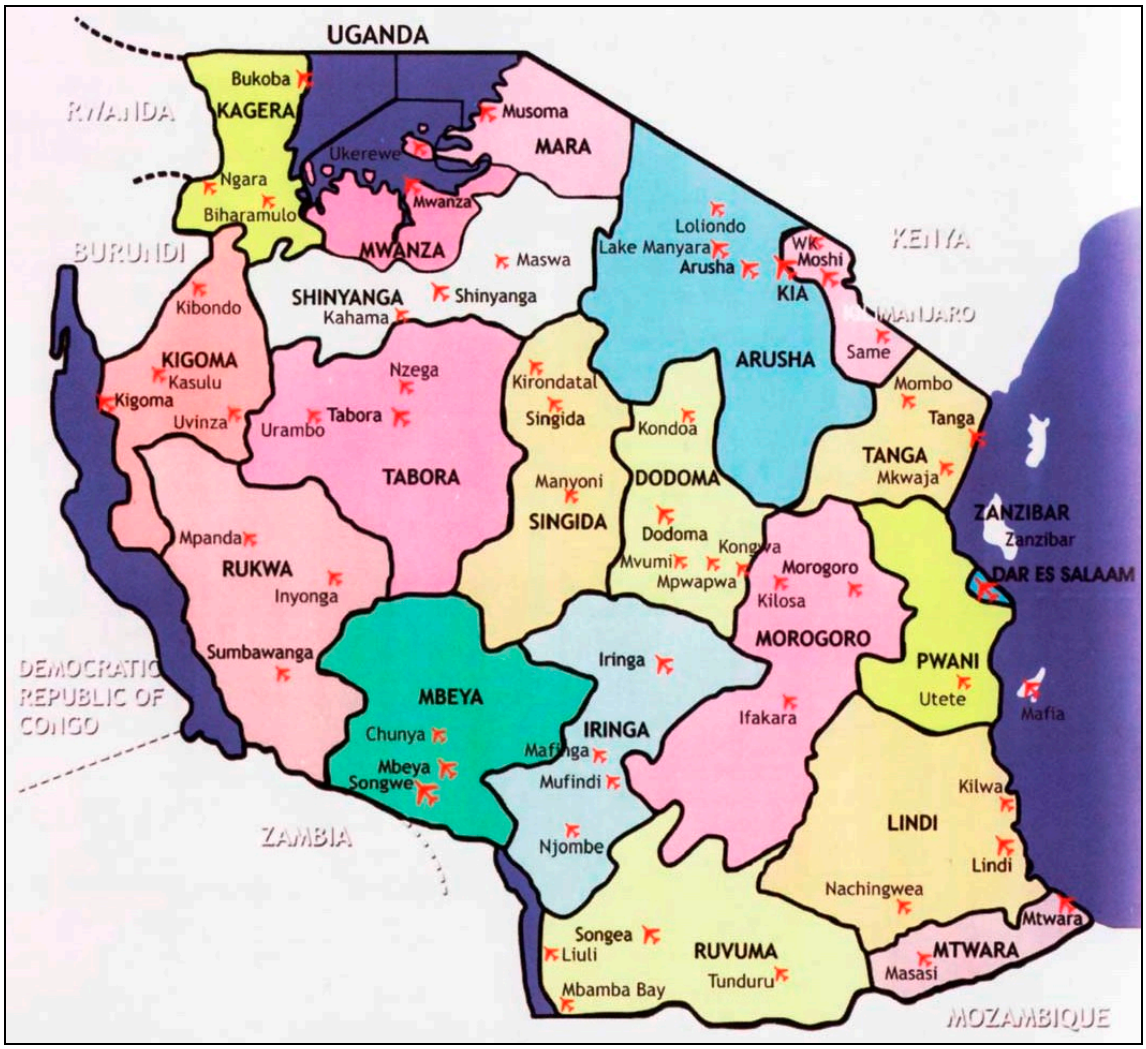
Chapter 6 Other Modes and Facilities

6.1 Airports/Air Transport

6.1.1 General

Tanzania is a vast country with diverse habitats and wildlife surrounded by mining and tourism industries. The country, however, has limited accessibility to distant and remote areas. Among the different transport modes, air transportation plays a significant role to ensure sustainable access to cities and markets for passengers and freight such as perishable and valuable goods.

Tanzania has a total 368 aerodromes, which consist of airports and airstrips, of which 58 are managed by the Tanzania Airports Authority (TAA) on behalf of the government and the rest by other entities. The Kilimanjaro Airports Development Corporation (KADCO) operates the Kilimanjaro International Airport, while the Revolutionary Government of Zanzibar is responsible for Zanzibar International Airport and Pemba airport. Figure 6.1 shows the major airports in Tanzania.



Source: TAA

Figure 6.1: Major Airports in Tanzania

The Aeronautical Information Publication (AIP) contains aerodromes information in Tanzania, including categorization of each airport into categories A, B, C, D and E. Primary international aerodromes are under Category A; secondary international aerodromes under Category B; and public and private aerodromes are under Categories C, D, E. Aerodromes in Tanzania are categorized as follows:

- ✈ Category A (3) : Julius Nyerere International Airport (JNIA), Kilimanjaro International Airport (KIA) and Zanzibar International Airport
- ✈ Category B (10) : Dodoma, Kigoma, Mbeya, Mtwara, Musoma, Mwanza, Ngara, Pemba, Tabora, Tanga airports
- ✈ Category C, D (41) : Arusha, Bukoba and 39 other aerodromes
- ✈ Category E : Other small aerodromes

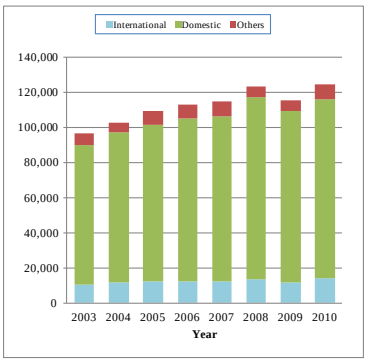
TAA also classified four types of airport according to strategic location for development, which are listed as follows:

- ✈ Type 1/ International (4) : JNIA, KIA, Zanzibar and Mwanza
- ✈ Type 2/ Strategic (4) : Arush, Lake Manyara, Mafia and Ngara
- ✈ Type 3/ Major Domestic (14) : Bukoba, Dodoma, Kigoma, Lindi, Mbeya, Mtwara, Musoma, Mwanza, Shinyanga, Songea, Songwe, Sumbawanga, Tabora, and Tanga
- ✈ Type 4 Small : 36 small airports

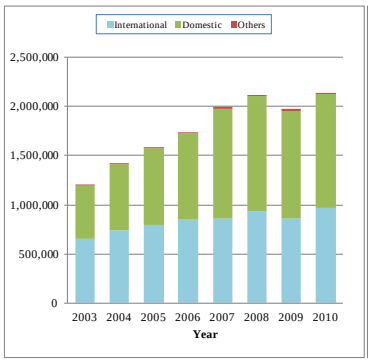
6.1.2 Overall Situation

Air traffic in Tanzania has been moderately growing in the past years. Aviation traffic features in Tanzania such as aircraft movement, cargo tonnage and passenger volume, which were acquired from TAA, are shown in Figure 6.2.

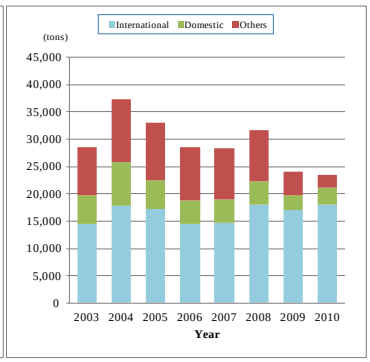
The air transport traffic in TAA airports has constantly increased from 2003 to 2010, in terms of passengers and aircraft movements, while the cargo volume has not constantly increased over the said period. Cargo tonnage decreased by 3% between 2009 and 2010. On the other hand, passenger volume has grown by 108% between 2009 and 2010, with the increase of international and domestic flights by 112% and 106%, respectively.



Aircraft Movement



Passenger Volume



Cargo Tonnage

Source: TAA

Figure 6.2: Aviation Traffic Features of Airports in 2003–2010 Managed by TAA

6.1.3 Current Situation of Major Airports

The JICA Study Team investigated and collected information and data from major airports, which were selected based on discussions with TAA and Tanzania Civil Aviation Authority (TCAA). Major airports in Tanzania are selected according to the top five airports with the highest cargo tonnage and passenger volume in 2010. The airports chosen were JNIA, KIA, Mwanza, Arusha and Kigoma. Zanzibar International Airport was not included as it is outside the scope of the project. The current characteristics of the major airports are listed in Table 6.1.

Table 6.1: Current Characteristics of Major Airports

No	Airport	Elevation (m)	Runway Length and Width (m)	Cargo (ton)	Passenger (thousand)	Aircraft Movements
1	JNIA	55.5	3000 × 46, 1,000 × 30	19,675	1,556	62,620
2	KIA	894.3	3607 × 45	3,098	477	16,640
3	Mwanza	1147.7	3300 × 45	2,419	227	14,118
4	Arusha	1387.8	1620 × 30	813	19	19,460
5	Kigoma	823.5	1767 × 30	138 (2009)	28	1,645
6	Mtwara	113.2	2258 × 30, 1,158 × 30	124	28	1,954

Source: AIP, TAA

(1) JNIA

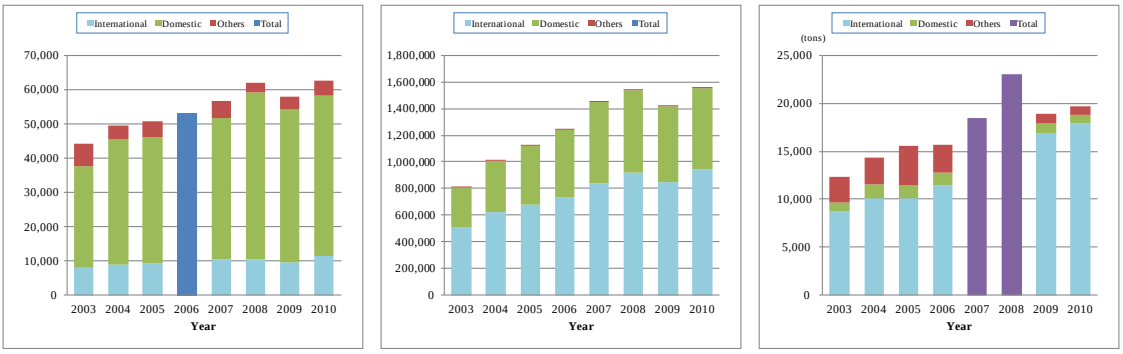
JNIA serves as the gateway for international air traffic and hub for domestic airports at Dar es Salaam City in Tanzania, which is located about 10 km from the city centre. JNIA is situated at an altitude of 55.5 m MSL with two runways, two passenger terminal buildings and related airport facilities. The main runway has a precision classified under Category I (CAT-I). Photo 6.1 shows the image of JNIA Terminal II.

Source: JICA Study Team

Photo 6.1: View of JNIA Terminal II from Control Tower

JNIA is positioned for growth in the aspect of Tanzania's economy, as well as foreign currency income. In 2010, JNIA had 60% of its total passenger traffic from international flights and 40% from domestic flights. Furthermore, JNIA had 50% of the total flights in Tanzania in 2010.

The aviation features of JNIA from 2003 to 2010 constantly increased, as shown in Figure 6.3.



Aircraft Movement　　Passenger Volume　　Cargo Tonnage

Source: TAA

Figure 6.3: Aviation Traffic Feature of JNIA in 2003–2010

Major Airport Facilities

Table 6.2 shows the outline of airside civil facilities of JNIA.

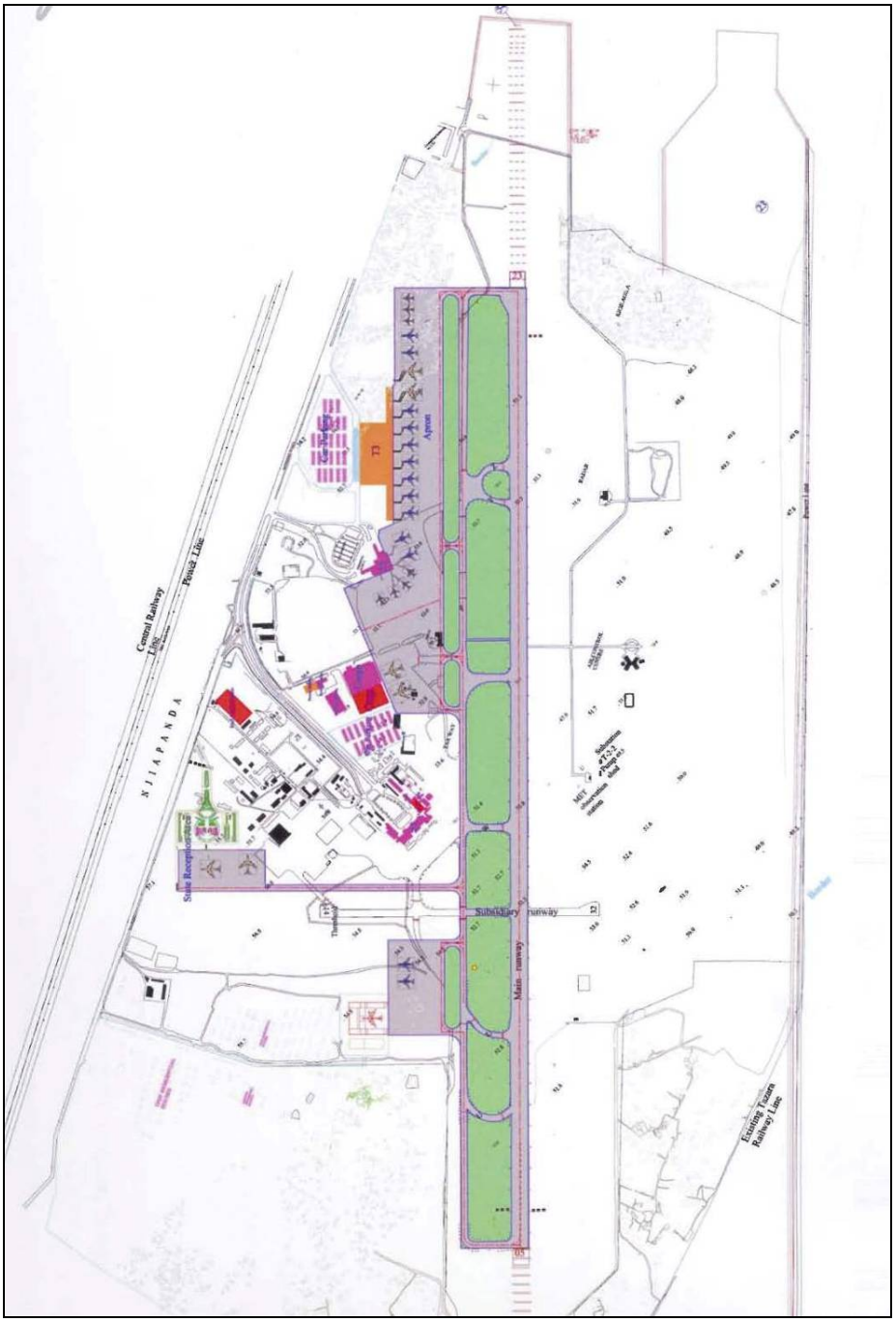
Table 6.2: Major Facilities of JNIA

Item	**Name**		**Description**		
Principal Feature	Name		Julius Nyerere International Airport (JNIA)		
	Operation		International and domestic		
	Code		ICAO: HTDA IATA:DAR		
	Location		Latitude: 06º52'41.20"S		
			Longitude: 039º12'09.45"E		
	Access to airport		10 km from Dar es Salaam City centre, approx. 30 min. by vehicle		
	Reference ground elevation		55.5 m +MSL		
	Temperature		Average 32.2ºC		
	Operation		24 hours (Air Traffic Services: ATS)		
	Operator		Airport facility: TAA, Navigation system: TCAA		
Runway	No.	Dimension	PCN	Slope	Strip Dimension
	05/23	3,000 m × 46 m	63/F/A/W/T	1.20%	3,320 m × 300 m
	14/32	1,000 m × 30 m	15/F/B/Y/U	1.20%	1,372 m × 213 m
Taxiway	width		PCN	surface	
	23 m, 46 m		63/F/A/W/T	Concrete, Tarmac	
Aircraft Parking Apron	PCN			surface	
	Terminal 1: 50/F/A/X/U		Terminal 2: 56/F/A/W/T	Concrete, Tarmac	
Approach and Runway Lighting	RWY05: Precision Approach CAT-I 900M from THR RWY05				
	RWY23: SALS Hight intensity				

Source: AIP

Current Facilities

JNIA had its runways, taxiways, aprons and other pavements completed as part of the airside rehabilitation project in 2011, financed by the Dutch government through the ORET programme and ING Bank loan. Currently, its airside facilities are in quite good condition. On the other hand, the capacity of the passenger terminal building has already saturated. Furthermore, the total floor area of Terminal I, which is for non-scheduled and chartered flights are 5,000 m^2, while that of Terminal II, which serves international and domestic flights are 20,000 m^2.



Source: TAA

Figure 6.4: JNIA Terminal III Master Plan

However, the current passenger volume has already reached beyond the design capacity of 1.2 million passengers per annum. Thus, it is urgently necessary to expand the passenger building to alleviate the congestion.

TAA has received several proposals for development of the new Terminal III from more than ten countries, including China, UK, the Netherlands, Russia, and Arab countries. However, TAA has already prepared its own master plan for Terminal III which will accommodate 8 million passengers per annum, with a total floor area of about 120,000 m^2 as shown in Figure 6.4.

Its air cargo tonnage volume was 19,675 tonnes in 2010. JNIA had 75% of its total cargo tonnage from international flights, while 30% were from domestic flights. Moreover, JNIA had 70% total tonnage of all Tanzania airports in 2010. Since 1985, Swissport Tanzania Ltd. has been operating ground cargo handling, which includes handling of passengers, ramps and cargos. The existing cargo facility is around 8,000 m^2, which is enough for the current cargo handling condition.

Based on the TAA Master Plan, the existing Terminal II and the new Terminal III, as well as the cargo terminal, will be expanded.

the access road to the airport is through Nyerere Road. In October 2011, the left side of Photo 6.2 shown the plan of Terminal III made by a Chinese company. In March 2012, the image plan and entity name have deleted as shown the right side figure. It can be confirmed the changing terminal development project situation in Tanzania by two photographs such as left side on October 2011 and right one on March 2012.

Taken on October 2011

Taken on March 2012

Source: JICA Study Team

Photo 6.2: Terminal III Advertisement by A Chinese Company

(2) KIA

KIA is located between the cities of Arusha and Moshi, 50 km away from both cities. It is situated at the foot of Mount Kilimanjaro, the highest mountain in Africa. KIA serves as the main gateway airport for the wildlife tourism of Tanzania as it provides access to the northern tourist circuit of Serengeti National Park of the Ngorongoro Conservation Area.

KIA is situated at an altitude of 894.3 m MSL with a 3,607 m runway, a passenger terminal building and related airport facilities.

KIA was the first public-private partnership (PPP) international airport in Africa. The Government of Tanzania (GOT) signed a 25-year concession agreement for the airport, lasting from 1998 to 2023, and effectively placing the airport under the management of KADCO, which comprises of the companies Mott McDonald, South African Infrastructure Fund, Tanzanian firm Inter-Consult Ltd., and GOT. In 2009, KADCO's concession essentially fell apart, with the share of Mott McDonald being purchased back by the GOT. Currently, KIA is operated by KADCO and owned by GOT. Photo 6.3 shows the overview of the passenger terminal area of KIA.

Source: KADCO

Photo 6.3: Overview of KIA Passenger Terminal Area

Major Airport Facilities

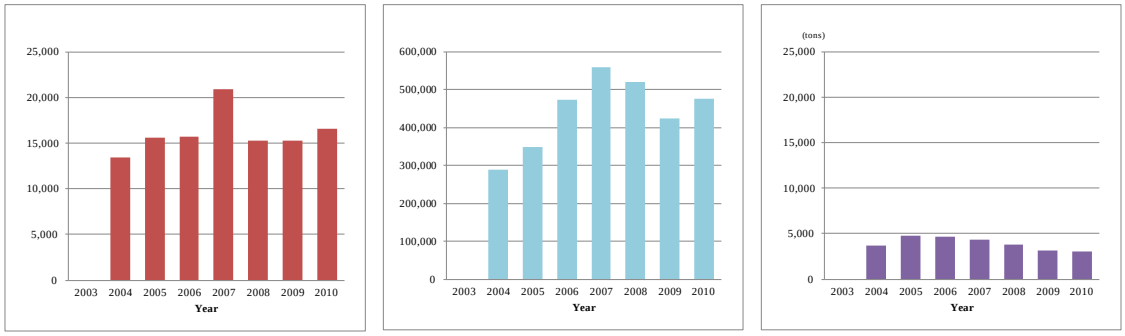
Table 6.3 shows the outline of airside civil facilities of KIA.

Table 6.3: Airside Facilities of KIA

Item	Name	Description			
Principal Feature	Name	Kilimanjaro International Airport (KIA)			
	Operation	International and domestic			
	Code	ICAO: HTKJ IATA:JRO			
	Location	Latitude: 03º25'45.86"S			
		Longitude: 037º04'28.06"E			
	Access to airport	50 km from Arusha and Moshi City centre, approx. 60 min. by vehicle			
	Reference ground elevation	894.3 m +MSL			
	Temperature	Average 33ºC			
	Operation	24 hours (ATS)			
	Operator	Airport facility, Navigation system: KIA			
Runway	No.	Dimension	PCN	Slope	Strip Dimension
	09/27	3,607 × 45	60/F/A/W/U	0.36, 1.26%	3,727 × 305
Taxiway	width		PCN	surface	
	23 m		47/F/A/W/T	Tarmac	
Aircraft Parking Apron	PCN				
	Main: 48/F/A/W/T		GA: 24/F/A/W/T	Hanger: 125/R/B/W/T	
Approach and Runway Lighting	RWY09: ALS High intensity				
	RWY27: SALS				

Source: AIP

KIA is strategically located for the wildlife tourism of Tanzania. TAA has specified KIA to be the international gateway and domestic hub for tourism in the Northern region. KIA has roughly 70% of its total air traffic from international flights and 30% from domestic flights. In 2010, about 22% of the total flights in Tanzania were accommodated by KIA. The features of aviation statistics of KIA from 2003 to 2010 went sideways, as shown in Figure 6.5.



Aircraft Movement | Passenger Volume | Cargo Tonnage

Source: TAA

Figure 6.5: Aviation Traffic Features of KIA in 2003–2010

Current Facility Features

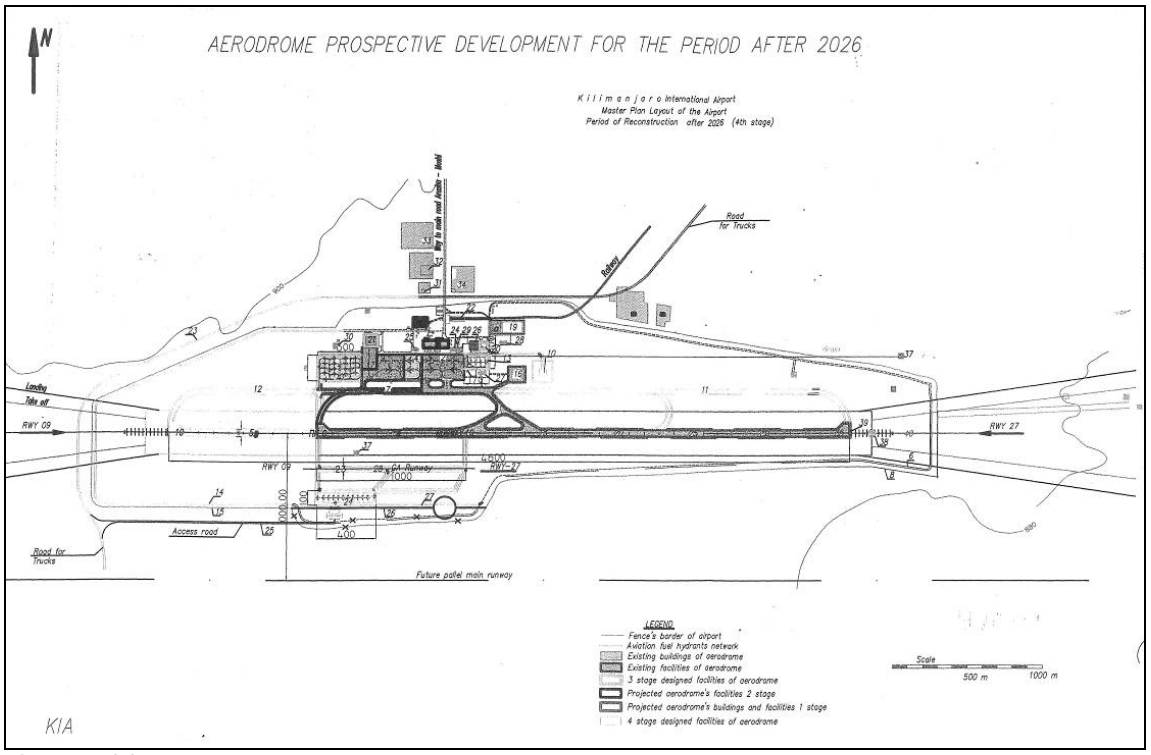
Rehabilitation of KIA's airside facilities such as runway, taxiway and other pavements has been carried out in 1999, financed through a loan from World Bank. Currently, its airside facilities are in good condition. However, considering future traffic demand, the taxiway must be upgraded to a connected taxiway or parallel taxiway.

The total floor area of its passenger terminal building is 8,140 m^2 while the cargo terminal building is 2,900 m^2. Based on the KIA Master Plan Report of May 2007 by TAA (hereinafter referred to as KIA M/P), the current passenger volume has already reached beyond the design capacity in 2006. Furthermore, the JICA Study Team has investigated the congestion in the arrival baggage area (refer to Photo 6.4). The JICA Study Team recognized that the passenger volume of the terminal building has already saturated during peak hours. Ground handling of cargo, passenger and ramp services has been operated by Swissport Tanzania Ltd. since 1990.

On the other hand, the current handling situation of cargo facility is adequate based on KIA M/P and from the investigation of the JICA Study Team. However, the cargo facility has no exclusive aircraft parking apron, which is necessary in the near future.

Source: JICA Study Team

Photo 6.4: Arrival Baggage Area of KIA



Source: TAA

Figure 6.6: KIA Master Plan Layout

(3) Mwanza Airport

Mwanza Airport is located beside Lake Victoria at an altitude of 1,147 m in Mwanza City, which is the second biggest city in Tanzania with a population of around 476,646 according to the 2002 census. The airport is around 10 km from the city centre, and has a runway, related airside facilities, and passenger and cargo facilities including tentative customs, immigration, and quarantine (CIQ) for international flights. The Mwanza Region plays an important role in export as it provides fresh fish such as the Nile Perch and Tilapia from Lake Victoria, and, recently, gold from mines in Kahama, Geita and other towns. Fish exports lead to demands for chartered flights to Europe around 10 years ago. Unfortunately, current traders transport fish through land travel to Nairobi in Kenya, and fly from there to Europe.

Source: JICA Study Team

Photo 6.5: Mwanza Airport Terminal Area

Major Airport Facilities

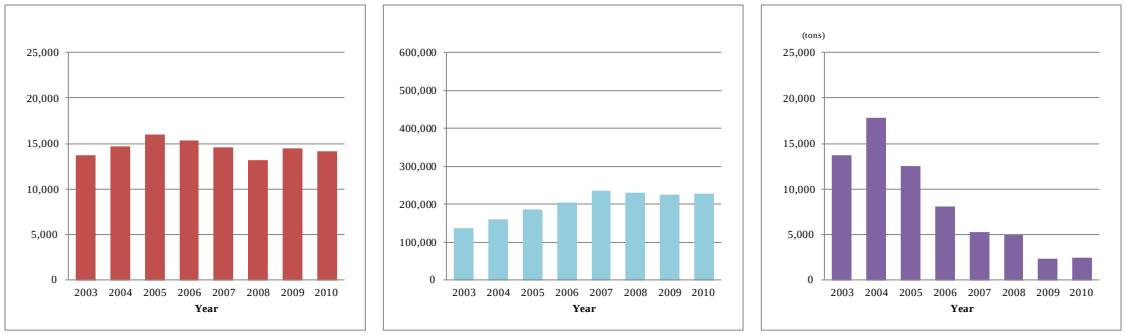
Table 6.4 shows the outline of airside civil facilities of Mwanza Airport.

Table 6.4: Airside Facilities of Mwanza Airport

Item	Name	Description			
Principal Feature	Name	Mwanza Airport			
	Operation	Domestic			
	Code	ICAO: HTMW IATA:MWZ			
	Location	Latitude: 02º26'38.86"S			
		Longitude: 032º55'54.96"E			
	Access to airport	10 km from Mwanza City centre, approx. 15 min. by vehicle			
	Reference ground elevation	1147.7 m +MSL			
	Temperature	Average 24.9ºC			
	Operation	24 hours (ATS)			
	Operator	Airport facility: TAA, Navigation system: TCAA			
Runway	No.	Dimension	PCN	Slope	Strip Dimension
	12/30	3,300 × 45	60/F/C/X/U	0.50%	3,300 × 140
Taxiway	width		PCN	surface	
	N/A		30/F/C/X/U	Tarmac	
Aircraft Parking Apron	PCN		Surface		
	30/F/C/X/U		Concrete, Tarmac		
Apporch and Runway Lighting	RWY12: Nil				
	RWY30: SALS				

Source: AIP

Mwanza Airport is the main export point of Tanzania due to its location, which is the most highly populated area in the northern region, as well as being situated beside Lake Victoria. Recent aircraft movement and passenger volume have not increased, while cargo tonnage has been decreasing since 2004.



Aircraft Movement Passenger Volume Cargo Tonnage

Source: TAA

Figure 6.7: Aviation Traffic Feature of Mwanza Airport in 2003–2010

Current Facility Features

The passenger terminal of Mwanza Airport is located 60 m away from its runway centre line, which is inadequate based on International Civil Aviation Organization (ICAO) standard, and is classified as a 4D airport. Therefore, most regular flight aircrafts cannot park in front of the terminal area and planes must be parked at the apron, which is east of the terminal.

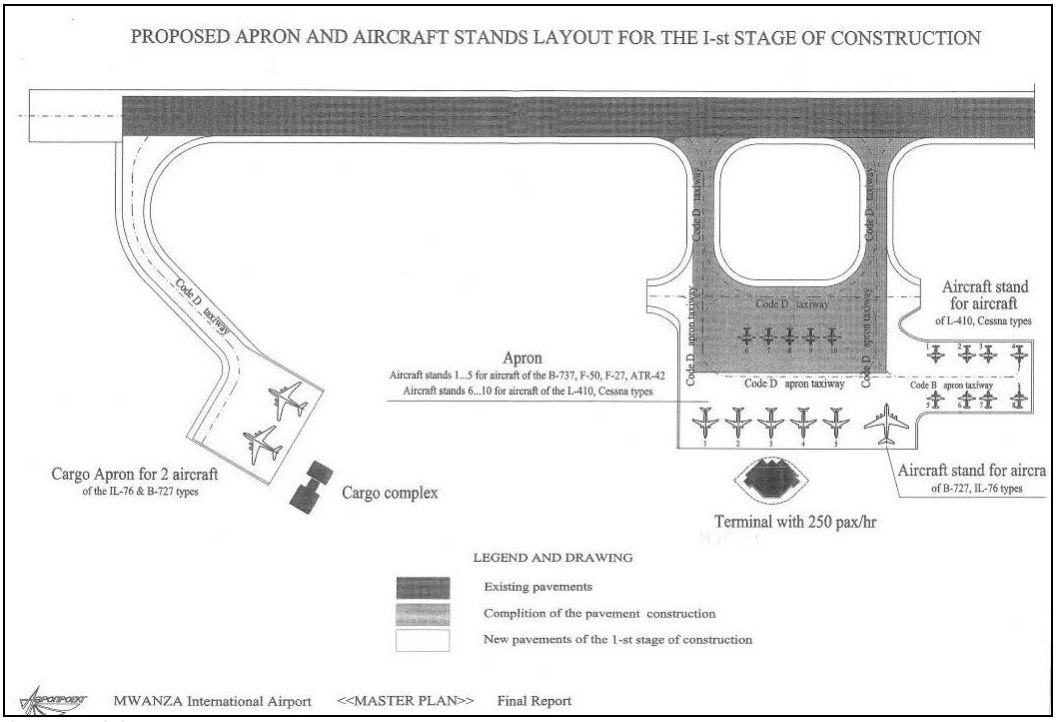
The cargo facility located beside the new apron is quite inadequate as it has a limited storage area of around 360 m^2 (refer to Photo 6.6).

Source: JICA Study Team

Photo 6.6: Mwanza Airport Cargo Storage Area

Its passenger terminal is also deemed inadequate as its distance from aircraft parking stand is far. Its floor area is only around 900 m^2, and the waiting lounge for passengers for international and domestic flights is not separated.

Recently, the runway extension project for the Mwanza Airport has been initiated through funding from GOT, Arab Bank for Economic Development in Africa (BADEA) and OPEC Fund for International Development (OFID). The project will commence in January 2012. Moreover, TAA has carried out a master plan study for the new cargo apron with taxiway and new passenger terminal area including the expansion of the existing apron. Figure 6.8 shows the master plan layout for the Mwanza Airport.



Source: TAA

Figure 6.8: Mwanza Airport Master Plan

(4) Arusha Airport

Arusha City is a major international diplomatic centre and serves as the capital of the east African community. It is also the centre for wildlife tourism in the northern area of Tanzania as it is surrounded by famous national parks.

Arusha Airport is located about 7 km from the Arusha City centre, and 50 km from KIA. The airport has a 1,620 m runway, which mostly caters general and small chartered flights.

Major Airport Facilities

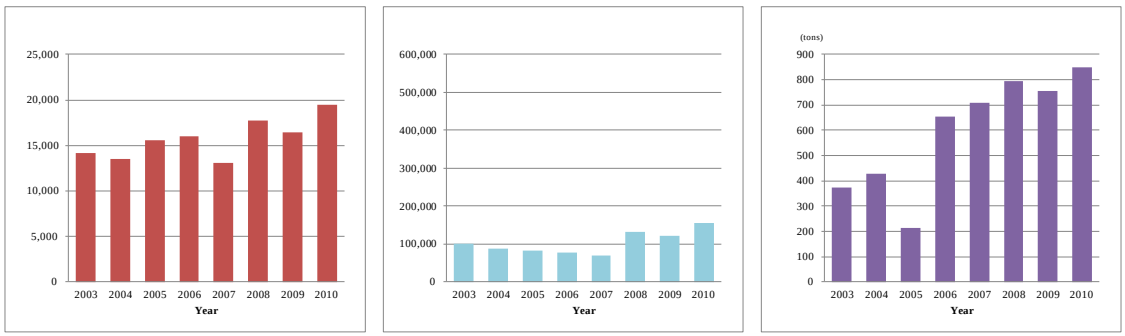
Table 6.5 shows the outline of airside civil facilities of Arusha Airport.

Table 6.5: Airside Facilities of Arusha Airport

Item	Name	Description			
Principal Feature	Name	Arusha Airport			
	Operation	Domestic			
	Code	ICAO: HTAR IATA:ARK			
	Location	Latitude: 03º22'04.06"S			
		Longitude: 036º37'13.47"E			
	Access to airport	7 km from Arusha City centre, approx. 15 min. by vehicle			
	Reference ground elevation	1387.8 m +MSL			
	Temperature	Average 23.1ºC			
	Operation	06:30 to 19:00 (ATS)			
	Operator	Airport facility: TAA, Navigation system: TCAA			
Runway	No.	Dimension	PCN	Slope	Strip Dimension
	09/27	1,620 × 30	15/F/B/Y/T	1.5, 0.7%	N/A
Taxiway	width		PCN	surface	
	N/A		N/A	N/A	
Aircraft Parking Apron	PCN		Surface		
	N/A		N/A		
Approach and Runway Lighting	Nil				

Source: AIP

Arusha Airport is the second busiest airport in Tanzania, with its air traffic gradually increasing through the years. Figure 6.9 shows the aviation traffic features of Arusha Airport in 2003–2010.



Aircraft Movement Passenger Volume Cargo Tonnage

Source: TAA

Figure 6.9: Aviation Traffic Features of Arusha Airport from 2003–2010

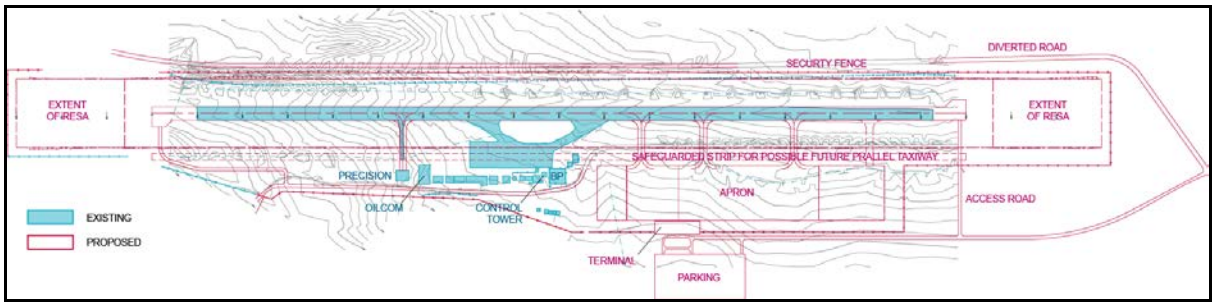
Current Facility Features

Pavement of the Arusha Airport runway has been repaired. But other sections along the runway as well as the apron also exhibit poor pavement condition. Passenger service and cargo handling area is very small, and the waiting lounge only has a roof between the check-in area and security house. Photo 6.7 shows the terminal area of Arusha Airport from the control tower.

Source: JICA Study Team

Photo 6.7: View of Airside of Arusha Airport from the Control Tower

TAA has already conducted a feasibility study that also contains budget allocation for the improvement of the current situation of Arusha Airport. A consultant and contractor for the runway pavement improvement project, including a 420 m extension, have been selected. The proposed plan for upgrading the airport is shown in Figure 6.10.



Source: TAA

Figure 6.10: Location Plan Showing Proposed Upgrading of Arusha Airport

(5) Kigoma Airport

Kigoma is a big town beside Lake Tanganyika, having a potential market for the fish industry. Kigoma Airport is located around 10 km from Kigoma town centre. The airport has a 1,767 m unpaved runway that caters domestic flights and services refugee relief base for Rwanda, Burundi and the Democratic Republic of Congo (DRC).

Major Airport Facilities

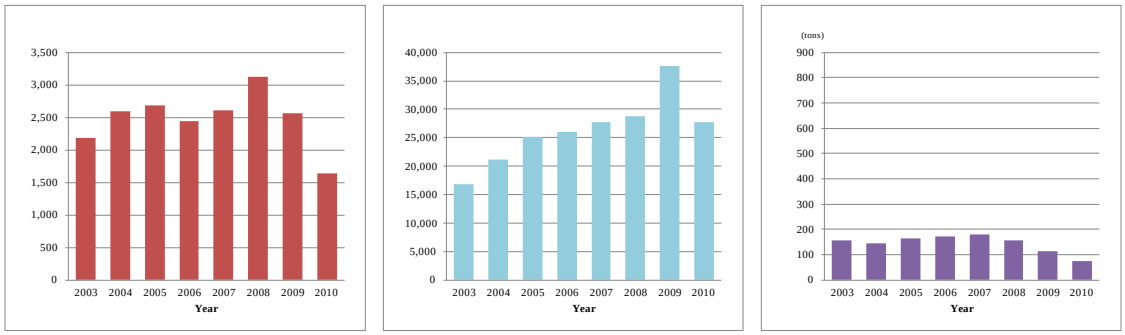
Table 6.6 shows the outline of airside civil facilities of Kigoma Airport.

Table 6.6: Airside Facilities of Kigoma Airport

Item	Name	Description			
Principal Feature	Name	Kigoma Airport			
	Operation	Domestic			
	Code	ICAO: HTKA IATA:TKQ			
	Location	Latitude: 04º53'30.6"S			
		Longitude: 029º40'12.7"E			
	Access to airport	5 km from Kigoma City centre, approx. 10 min. by vehicle			
	Reference ground elevation	823.5 m +MSL			
	Temperature	Average 26.3ºC			
	Operation	08:00 to 18:30 (ATS)			
	Operator	Airport facility: TAA, Navigation system: TCAA			
Runway	No.	Dimension	PCN	Slope	Strip Dimension
	16/34	1,767 × 30	15/F/B/Y/U	N/A	N/A
Taxiway	width		PCN	surface	
	N/A		N/A	N/A	
Aircraft Parking Apron	PCN		Surface		
	15/F/B/Y/U		Concrete, Tarmac		
Approach and Runway Lighting	Nil				

Source: AIP

Among the five selected airports, Kigoma Airport ranks fourth in terms of passenger handling volume in Tanzania. Meanwhile, its air traffic movement has gradually increased until 2009. Figure 6.11 shows the air traffic features of Kigoma Airport in 2003–2010.



Aircraft Movement Passenger Volume Cargo Tonnage

Source: TAA

Figure 6.11: Aviation Traffic Feature of Kigoma Airport in 2003–2010

Current Facility Features

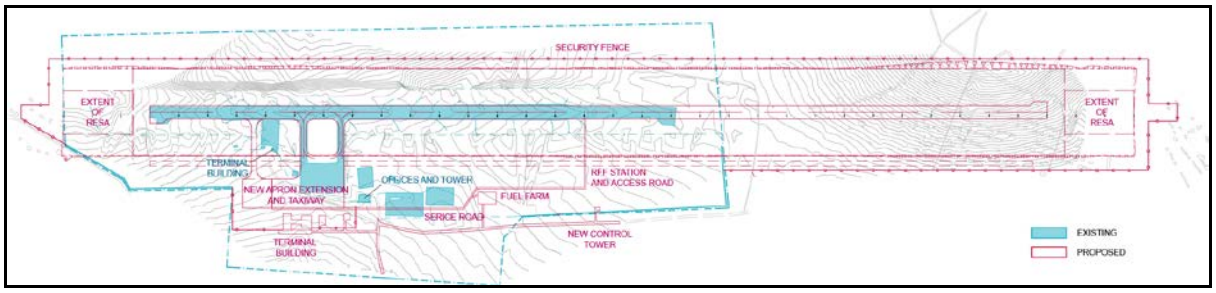
During the site investigation, the flight from Mwanza to Kigoma was delayed for around 6 hours due to heavy rains in Kigoma. At Kigoma Airport, the JICA Study Team observed that the runway is unpaved and its surface is unstable condition. Thus, the urgency of improving the runway should be realized for safety operation. Moreover, passenger service and cargo handling facilities have very limited area.

Photo 6.8 shows the view of the airside of Kigoma Airport from the control tower.

Source: JICA Study Team

Photo 6.8: View of Kigoma Airport Airside from Control Tower

TAA has already conducted a feasibility study to improve the current situation of the airport. A consultant and contractor have been selected for the runway pavement improvement project. The location plan of the proposed airport upgrade is shown in Figure 6.12.



Source: TAA

Figure 6.12: Location Plan Showing the Proposed Upgrading of Kigoma Airport

(6) Mtwara Airport

Mtwara Town is situated on the coastal area of southern Tanzania, approximately 40 km from Mozambique border. Mtwara Airport is located at an altitude of 55.5 m MSL, and from about 6 km to the south of Mtwara Town.

Major Airport Facilities

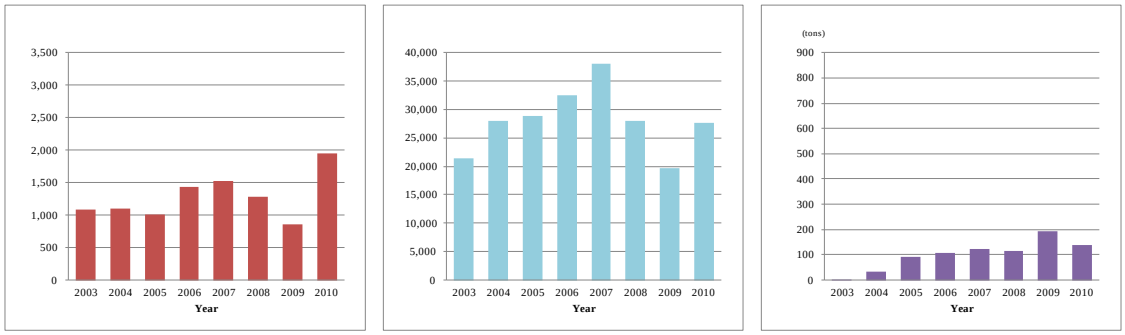
Table 6.7 shows the outline of airside civil facilities of Mtwara Airport.

Table 6.7: Airside Facilities of Mtwara Airport

Item	Name	Description			
Principal Feature	Name	Mtwara Airport			
	Operation	Domestic			
	Code	ICAO: HTMT IATA:MWY			
	Location	Latitude: 10º20'10.02"S			
		Longitude: 04º10'55.26"E			
	Access to airport	6 km from Mtwara City centre, approx. 10 min. by vehicle			
	Reference ground elevation	113.2 m +MSL			
	Temperature	Average 28.6ºC			
	Operation	8 hours (ATS)			
	Operator	Airport facility: TAA, Navigation system: TCAA			
Runway	No.	Dimension	PCN	Slope	Strip Dimension
	01/19	2,258 × 30	32/F/B/Y/U	N/A	N/A
	08/26	1,158 × 30	13,600kg Grass	N/A	N/A
Taxiway	width		PCN	surface	
	14 m		32/F/B/Y/U	Asphalt, Concrete	
Aircraft Parking Apron	PCN		Surface		
	32/F/B/Y/U		Asphalt, Concrete		
Approach and Runway Lighting	Nil				

Source: AIP

Mtwara Airport is the fifth busiest airport in Tanzania, and its air traffic has been gradually increasing in recent years.



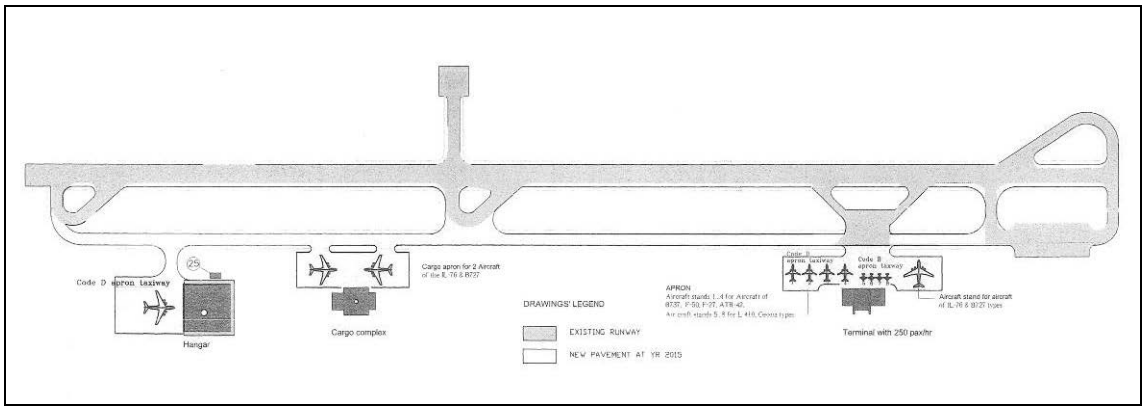
Aircraft Movement Passenger Volume Cargo Tonnage

Source: TAA

Figure 6.13: Aviation Traffic Features of Mtwara Airport in 2003–2010

Current Facility Features

Based on the Master Plan of Mtwara Airport by TAA, the runway will be widened from 30 m to 45 m. Proposed improvement works will include runway pavement upgrading, and construction of parallel taxiway, passenger terminal and cargo terminal. The proposed Master Plan layout is shown in Figure 6.14.



Source: TAA

Figure 6.14: Mtwara Airport Master Plan

6.1.4 Air Cargo Situation

As mentioned in the previous clause, its cargo tonnage has been moderately increasing in recent years. The role of the air cargo is to provide rapid, punctual and reliable delivery services. The following tables show the air cargo items in 2010, which should be accommodated in order to provide the mentioned characteristics of air cargo. In 2010, JNIA mostly handled air cargo items for import while KIA mainly handled export cargos.

JNIA

The ratio of JNIA cargo handling is 90% for imports, with machinery and electrical products as the major goods. Table 6.8 and Table 6.9 show the cargo items of JNIA in 2010 for export and import, respectively.

Table 6.8: JNIA Air Cargo Items in 2010 (Export)

	Weight		Value	
Row Labels	**(net kg.)**	**ratio**	**(Tsh. ,000)**	**ratio**
Animal & Animal Products	490,477	25%	7,239,00	12%
Machinery/Electrical	386,997	20%	14,831,963	25%
Metals	264,945	13%	1,647,503	3%
Stone/Glass	207,870	10%	6,689,808	11%
Grand Total	1,984,446	100%	60,123,487	100%

Source: JICA Study Team

Table 6.9: JNIA Air Cargo Items in 2010 (Import)

Row Labels	Weight		Value	
	(net kg.)	**ratio**	**(Tsh. ,000)**	**ratio**
Machinery/Electrical	4,746,688	36%	350,412,223	45%
Stone/Glass	2,613,133	20%	43,712,666	6%
Chemicals & Allied Industries	902,421	7%	56,492,104	7%
Transportation	544,990	4%	59,031,761	8%
Grand Total	13,114,390	100%	779,337,505	100%

Source: JICA Study Team

Photo 6.9 shows the import storage area of JNIA cargoes containing various electrical/ electronic goods such as printers, computers and other information technology (IT) items.

Source: JICA Study Team

Photo 6.9: JNIA Import Storage Area

KIA

About 60% of the total cargoes handled are for export, of which vegetables are the main products; while chemicals and allied industrial products are the main imported products. Table 6.10 and Table 6.11 show the items with their respective weights and values for export and import. Photo 6.10 shows the situation of the cold storage handling in KIA, which is operated and managed by Swissport Tanzania Ltd.

Table 6.10: KIA Air Cargo Items in 2010 (Export)

	Weight		Value	
Row Labels	**(net kg.)**	**ratio**	**(Tsh.,000)**	**ratio**
Vegetable Products	1,171,040	43%	22,701,437	52%
Metals	474,658	17%	1,336,435	3%
Machinery/Electrical	404,221	15%	5,284,095	12%
Raw Hides, Skins, Leather & Furs	53,703	2%	3,441,848	8%
Grand Total	2,728,149	100%	43,979,516	100%

Source: JICA Study Team

Table 6.11: KIA Air Cargo Items in 2010 (Import)

	Weight		Value	
Row Labels	**(net kg.)**	**ratio**	**(Tsh.,000)**	**ratio**
Chemicals & Allied Industries	555,778	39%	1,381,335	5%
Machinery/Electrical	258,561	18%	8,205,546	30%
Transportation	97,863	7%	1,646,995	6%
Vegetable Products	90,928	6%	5,380,156	20%
Grand Total	1,412,578	100%	27,084,037	100%

Source: JICA Study Team

Source: JICA Study Team

Photo 6.10: KIA Export Storage Area

6.1.5 Airport Development Plans

The Tanzanian air transport sector has three main agencies: the Ministry of Transport (MOT), which is responsible for policy, investment, and performance monitoring; TCAA as the main regulating and overseeing agency; and TAA as the operating and managing agency for airports.

Table 6.12 summarizes the airport development plans and their status, which are included in the TAA Strategic Plan issued in September 2011 during the Fifth Joint Infrastructure Sector Review (JISR) meeting.

TAA

Table 6.12: Development Project Status for FY 2010/2011

SN	Project Name	Status
1	Construction of Songwe Airport	Phase III of the project, which is being implemented under GOT, BADEA and OFID funding, is currently ongoing. All earthworks and the construction of pavement works have been completed, and the construction terminal building, sewerage and waste water facility, control tower and fire station have been constructed. Completion is expected in March 2012.
2	Rehabilitation of Arusha Airport	The procurement of contractor and consultant for the project was done in October 2011. Project consists of runway pavement (420 m) and a security fence (264 m).
3	Rehabilitation of Mafia Airport	The procurement of consultant for design review and construction supervision was done in November 2010 through Millennium Challenge Corporation (MCC). Construction commenced at the end of September 2011.
4	Rehabilitation of Mwanza Airport	Redesign and preparation of tender documents funded by GOT, BADEA and OFID was finished in April 2011. Construction will commence in January 2012.
5	Rehabilitation and Upgrading of JNIA	The project component consisting of a taxiway, wastewater treatment system, airfield lighting, internal road, access roads and related facilities finished in 2008. Funding was from ORET grant and loan to GOT.

SN	Project Name	Status
6	Rehabilitation and Upgrading of Bukoba Airport	The consultant and contractor for the runway rehabilitation project have been procured under the funding of World Bank, European Investment Bank (EIB) and GOT.
7	Rehabilitation and upgrading of Kigoma Airport	The consultant and contractor for the runway rehabilitation project have been procured through the funding of World Bank, EIB and GOT.
8	Rehabilitation and upgrading of Tabora Airport	The consultant and contractor for the runway rehabilitation project have been procured through the funding of World Bank, EIB and GOT.
9	Rehabilitation and upgrading of Sumbawanga and Shinyanga Airport	The consultant and contractor for the runway rehabilitation project have been procured through the funding of EIB and GOT.
10	Feasibility Study and Preliminary Design for the New Msalato Airport in Dodoma	The final reports were submitted and approved by TAA. The preparations for the project such as site clearance, construction of access road and security fence are initiated by GOT.
11	Rehabilitation and Upgrading of Mpanda Airport	The project covers the upgrading of the runway pavement and construction of a new apron and taxiway that have been constructed in 2011. The project is financed by GOT and UNHCR.
12	JNIA Terminal development	The project covers the preparation for a feasibility study and detailed design for Terminal III. GOT is currently following up on the funding initiatives for the development of Terminals II and III.
13	KIA	TAA is in the process of procuring a transaction advisor for tendering out for a new strategic investor. ORIO (Netherlands) programme has expressed interest in financing the rehabilitation of the taxiway and apron

Source: TAA

TCAA

TCAA provides air navigation services including air traffic management, aeronautical information services and communication, navigation and surveillance (CNS) systems. The services are provided in the airspace defined as Dar es Salaam Flight Region (FIR), which encompasses the territory of Tanzania, the upper airspace over Rwanda and Burundi, and a portion of the airspace over the Indian Ocean high seas, up to Longitudinal 44 East.

The key result areas and strategic objectives of TCAA in the second Five-Year Strategic Plan for FY 2009/10–2013/14 are summarized in Table 6.13.

Table 6.13: TCAA Strategic Plans and Key Result Areas

KRA 1	**Safe and secure civil aviation system**	
	Strategic objective 1	To decrease accident and incident rates by 15 % from 2007/08 rate of 2.22 accidents and 14.40 incidents per 100,000 departures over the five year period.
	Strategic objective 2	To prevent the acts of unlawful interferences against civil aviation.
	Strategic objective 3	To minimise the adverse effects of civil aviation activities on the environmental.
KRA 2	**Orderly Development of Air Transport**	
	Strategic objective 1	To undertake active advisory role in civil aviation policy making.
	Strategic objective 2	To promote effective competition and economic efficiency.
	Strategic objective 3	To protect the interest of consumers and investors.
	Strategic objective 4	To facilitate air transport.
KRA 3	**Safe, Orderly and Expeditions Flow of Air Traffic**	
	Strategic objective 1	To prevent aircraft collision and reduce the rate of air traffic incidents by 50 % over the five years period from the 2007/08 rate of 0.62 per 10,000 aircraft movements.
	Strategic objective 2	To ensure the efficient provision of air navigation services.
	Strategic objective 3	To strengthen the Civil Aviation Training Centre.
KRA 4	**Organizational Excellency**	
	Strategic objective 1	To maintain a surplus of revenue over operating expenditure.
	Strategic objective 2	To attract and retain a highly skilled and motivated workforce.
	Strategic objective 3	To benchmark the Authority's services against best practices.
	Strategic objective 4	To participate and influence the development of civil aviation regionally and internationally.

Source: TCAA

6.2 Pipelines and Oil Terminals

6.2.1 Field Survey Results

The JICA Study Team carried out a field survey in Tanzania to collect information and facility data from the following institutions:

- Ministry of Energy and Minerals
- Energy and Water Utilities Regulatory Authority
- Tanzania Petroleum Development Corporation
- Tanzania Port Authority
- Tanzania Airport Authority
- Tanzania Civil Aviation Authority
- Privet Oil and Gas Marketing Companies

Tanzania has three (3) long-distance pipelines as of 2011. The TAZAMA Pipeline with a distance of 1,710 km transports crude oil from Dar es Salaam to Ndola refinery terminal in Zambia. The second pipeline with a distance of 232 km including a submarine part transports gas from Songo-Songo Island to Dar es Salaam. The third pipeline with a distance of 28 km transports gas from Mnazi Bay Field to the power generation facility in the Mtwara region.

The short-distance pipeline network covers all of Dar es Salaam. It is connected to each depot of an oil marketing company from Kurasini Oil Jetty (KOJ) which exists in the Dar es Salaam port. Some short distance pipeline existed at a local region other than Dar es Salaam. The short-distance pipeline is managed and operated by the oil marketing company which owns the oil terminal. Therefore, the investigation of the short-distance pipeline is conducted simultaneously with the investigation of the oil terminal.

As of March 2012, the following Oil Marketing Companies (OMCs) have an oil terminal in Dar es Salaam and local regions.

1) TIPER: Tanzanian and Italian Petroleum Refining Co Ltd
2) BPT: BP Tanzania Limited
3) GAPCO: Gulf Africa Petroleum Corporation Tanzania Limited
4) GAPOIL: GAPOIL Tanzania Limited (GAPOIL was owned by GAPCO)
5) ENGEN: Engen Petroleum Tanzania Limited
6) MGS: MGS International (T) Limited
7) ORYX: Oryx Oil Company Limited
8) TOTAL: Total Tanzania Limited
9) OILCOM: Oilcom Tanzania Limited
10) NATOIL: National Oil Tanzania Limited
11) CAMEL OIL: Camel Oil Tanzania Limited
12) GBP: GBP Tanzania Limited
13) LAKE OIL: Lake Oil Limited
14) WORLD OIL: World Oil Limited
15) AMAZON PETR: Amazon Petroleum Limited
16) HASS: Hass Petroleum Tanzania Limited
17) MCCL: MCC Limited Formerly called Malawi Cargo Centres Limited)
18) MOIL: Moil Limited
19) TAPCO: Tapco Tanzania Limited
20) TITO: Tiot Company Limited
21) CHEVRON: Chevron Tanzania Limited
22) MOUNT MERU: Mount Meru Petroleum Limited

The investigation results which provided from the oil marketing companies are described below.

(1) BPT

Dar es Salaam Depot

- Location:
  Plot No. 1, 1A, & 3 at the junction of Bandari road/Mafuta street, Kurasini Dar es Salaam

- Loading/Unloading volume for the year
  1) Unloading from ship: 259 m liters
  2) Loading; - Pipeline, 10 m liters
     - Trucks, 230 m liters
     - Railway, 19 m liters

- Pipeline data between TIPER manifold and BP/GAPCO manifold
  1) Pipe specification:
     Carbon Steel pipe, API 5L grade B, schedule 40,
     sizes 16”(HFO), 16”/12”(AGO), 12”(Jet A-1), 10” (ULP), 6” (LPG)
  2) Inlet/Outlet pressure:
     Design working pressure is 15bar.
  3) Length:
     70m long
  4) Type of product handled:
     HFO, AGO, JetA-1, ULP, LPG

5) Capacity (Design/Current Operation):
16” HFO (7.5 mt), 12” AGO (4.4 mt), 12”Jet A-1(4.1 mt),
10” ULP(2.7 mt), 6” LPG(0.8 mt)

6) Construction year:
Not sure but more than 40 yrs ago

- Pipeline data between BP/GAPCO manifold and Oil Terminal at Dar es Salaam

1) Pipe specification:
Carbon Steel pipe, API 5L grade B, schedule 30,
sizes 16”(HFO), 12”(AGO), 12”(Jet A-1), 10” (ULP), 6” (LPG)

2) Inlet/Outlet pressure:
Design working pressure is 15bar.

3) Length:
2.5km long

4) Type of product handled:
HFO, AGO, JetA-1, ULP, LPG

5) Capacity (Design/Current Operation):
16” HFO (266.8 mt), 12” AGO (157.1 mt), 12”Jet A-1(148.2 mt),
10” ULP(96.3 mt), 6” LPG(27.5 mt)

6) Construction year: 1996

- Pipeline of fire water between KOJ2 and Oil Terminal at Dar es Salaam

1) Pipe specification:
Carbon Steel pipe, API 5L grade B, Schedule 40 sizes 10”

2) Inlet/Outlet pressure:
Design working pressure is 15bar.

3) Length:
2.5 km long

4) Type of product handled:
Sea water

5) Capacity (Design/Current Operation):
127 m^3

6) Construction year:
1996 (using old product pipeline)

- Tank Storage Capacity

Table 6.14: Tank Storage Capacity in BPT Dar es Salaam Depot

Product type	Tank No	Tank safe capacity (MT)	Sizes	
			Dia (mm)	Height (mm)
LPG	21	302		
AVGAS	22	875	10,570	15,550
MSP	14	1,720	14,030	14,030
MSP	18	3,370	19,500	16,580
JETA-1	6A	4,072	24,000	12,000
JETA-1	13	1,972	20,000	8,990
JETA-1	17	3,712	19,500	16,580
JETA-1	23	6,216	27,500	14,000
AGO	7	4,316	23,990	11,750
AGO	12	2,730	20,000	12,550
AGO	16	9,022	29,260	16,530
AGO	24	4,322	24,000	12,000
HFO- 125	5	743	11,990	7,380
HFO-180	4	4,397	23,990	11,750
HFO-180	8	669	11,990	7,380
HFO-180	9	1,917	15,000	10,780
HFO-180	10	1,610	16,000	10,780
HFO-180	11	2,489	16,000	14,320

Source: BPT

- Future expansion plan:
  Cannot tell as BP has sold his shares to Puma Energy recently. The new investor has yet to come with his future development plans.

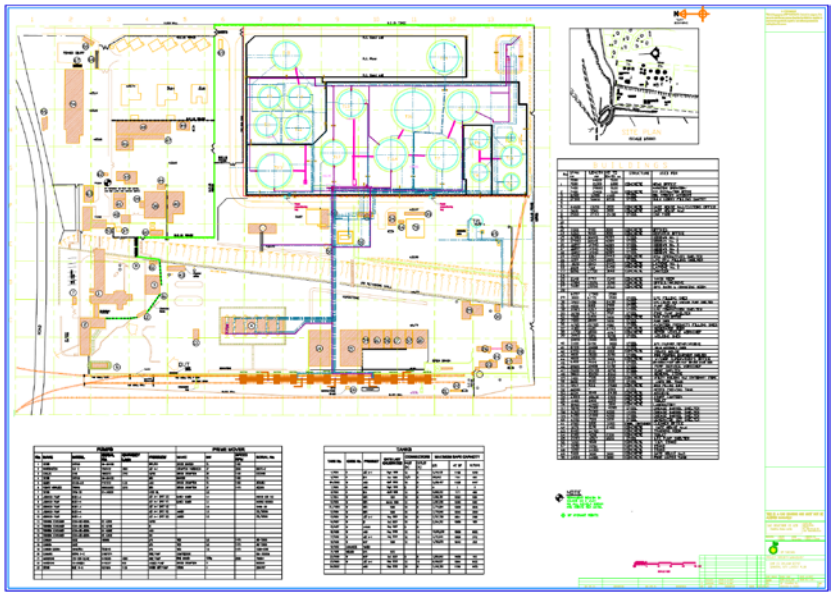
- Future plan of sales network:
  Cannot tell as BP has sold his shares to Puma Energy. The new investor has yet to come with his plans on Retail, Commercial and Aviation Business.

- Supply and demand plan of each product for future:

Type	Capacity
AVGAS	1,063 m^3
MSP	34,210 m^3
JET A1	79,830 m^3
AGO	101,968 m^3
FO	34,335 m^3

Some of volumes have been allocated as future demands for upcountry Depots (Aviation and Logistics).

- Layout



Source: BPT

Figure 6.15: Layout of BPT Dar es Salaam Depot

Mwanza Depot

- Location:
  IGOGO MWANZA SOUTH AREA

- Loading/Unloading volume for the year
  Railway wagons = 19,000 m^3 per year

- Tank Storage Capacity

Table 6.15: Tank Storage Capacity in BPT Mwanza Depot

Product type	Capacity (liters)	Tank type	Sizes	
			Dia (mm)	Height (mm)
IK	120,026	Vertical	4,500	7,200
MSP	119,920	Vertical	4,500	7,200
IK	90,280	Vertical	4,500	7,200
HFO	160,390	Vertical	6,000	5,400
IK	120,130	Vertical	4,500	7,200
MSP	54,555	Horizontal	2,700	9,000
IK	47,280	Horizontal	N/A	N/A
AGO	441,185	Vertical	5,860	7,270
HFO	215,380	Vertical	5,700	7,500
JET A1	406,490	Vertical	9,000	7,500
IDO	54,863	Horizontal	N/A	N/A
IDO	54,015	Horizontal	N/A	N/A
AGO	1,024,166	Vertical	10,000	13000

Source: BPT

- Future expansion plan:
  Cannot tell as BP has sold his shares to Puma Energy recently.
  The new investor has yet to come with his future development plans.

- Future plan of sales network:
  Cannot tell as BP has sold his shares to Puma Energy. The new investor has yet to come with his plans on Retail, Commercial and Aviation Business.

- Supply and demand plan of each product for future

Type	**Capacity**
MSP	1,260 m^3
AGO	1,260 m^3

- Layout

Source: BPT

Figure 6.16: Layout of BPT Mwanza Depot

Moshi Depot

- Location:
  Moshi depot is situated in Moshi Municipality at Viwanda road near Tanzania Breweries Limited Factory. (Situated near TBL)

- Loading/Unloading volume for the year
  12,000 m^3 per year by trucks

- Tank Storage Capacity

Table 6.16: Tank Storage Capacity in BPT Moshi Depot

Product type	Capacity	Tank type	Tank No.
GASOIL	500 m^3	Vertical	T1
GASOIL	500 m^3	Vertical	T2
GASOIL	500 m^3	Vertical	T3
UMSP	500 m^3	Vertical	T4
FO	92 m^3	Horizontal	T5
IK	92 m^3	Horizontal	T6
IDF	52 m^3	Horizontal	T7
LPG	78,945 Lts	Horizontal	T14
IK	53,422 Lts	Horizontal	T15
AGO	150 m^3	Horizontal	T4

Source: BPT

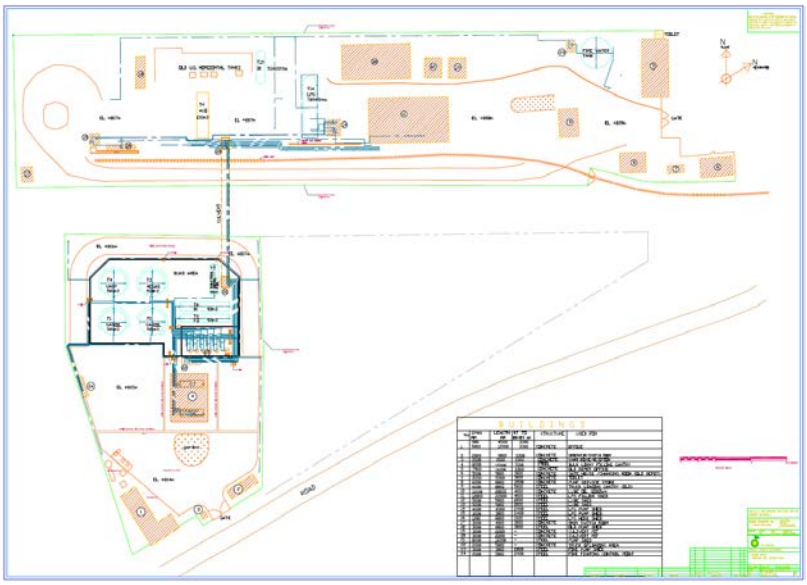
- Future expansion plan:
  Cannot tell as BP has sold his shares to Puma Energy recently.
  The new investor has yet to come with his future development plans.

- Future plan of sales network:
  Cannot tell as BP has sold his shares to Puma Energy. The new investor has yet to come with his plans on Retail, Commercial and Aviation Business.

- Supply and demand plan of each product for future

Type	Capacity
MSP	6,000 m^3
AGO	8,031 m^3
FO	330 m^3

- Layout



Source: BPT

Figure 6.17: Layout of BPT Moshi Depot

Geita (Mwanza) Depot

- Location:
  Geita depot is located within the Geita Gold mine 120 km south of Mwanza Moshi depot is situated in Moshi Municipality at Viwanda road near Tanzania.

- Loading/Unloading volume for the year
  Truck volumes per year- 107,061m^3

- Tank Storage Capacity

Table 6.17: Tank Storage Capacity in BPT Geita (Mwanza) Depot

Tank No.	Product type	Capacity (liters)	Tank type	Roof type	Sizes	
					Dia (mm)	Height (mm)
V1	AGO	4,200,000	Vertical	Fixed	20006	14,018
V2	HFO	4,200,000	Vertical	Fixed	20006	14,018
V2	AGO	1,000,000	Vertical	Fixed	N/A	13,900

Source: BPT

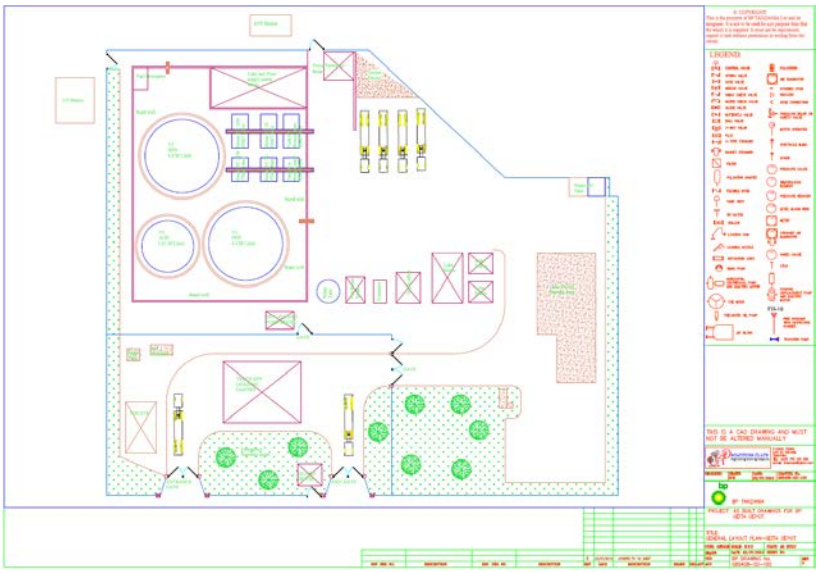
- Future expansion plan:
  Cannot tell as BP has sold his shares to Puma Energy recently.
  The new investor has yet to come with his future development plans.

- Future plan of sales network:
  Cannot tell as BP has sold his shares to Puma Energy. The new investor has yet to come with his plans on Retail, Commercial and Aviation Business.

- Supply and demand plan of each product for future

Type	Capacity
AGO	54,000 m^3
FO	300 m^3

- Layout



Source: BPT

Figure 6.18: Layout of BPT Geita (Mwanza) Depot

(2) GAPCO/GAPOIL

Dar es Salaam Depot

- Location:
  3/4 Mafuta Street – Kurasini

- Loading/Unloading volume for the year
  498,327 KL

- Pipeline data between TIPER manifold and BP/GAPCO manifold

  1) Pipe specification:
     DGO – 12" diameter, PMS – 10" diameter, IK/JET A1 – 12" diameter, LPG- 6" diameter and HFO- 16" diameter
  2) Inlet/Outlet pressure:
     Inlet 10 bar – Outlet 5 bar
  3) Length:
     2.2 km
  4) Type of product handled:
     DGO, PMS, IK/JETA1, HFO and LPG
  5) Construction year:
     1996/98
  6) Future expansion plan:
     No expansion plan

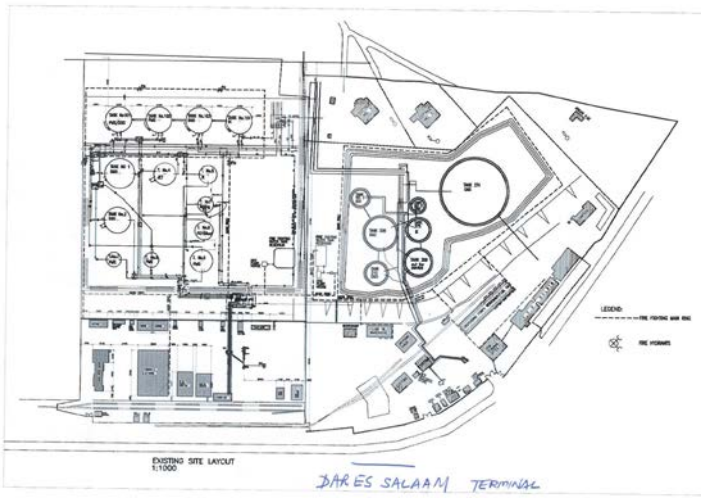
- Tank Storage Capacity

  1) DGO: 6 tanks (31 KT)
  2) PMS: 8 tanks (28 KT)
  3) IK/JET-A1: 4 tanks (7.5 KT)

- Future expansion plan:
  No expansion plan

- Future plan of sales network:
  No expansion plan

- Layout



Source: GAPCO/GAPOIL

Figure 6.19: Layout of GAPCO/GAPOIL Dar es Salaam Depot

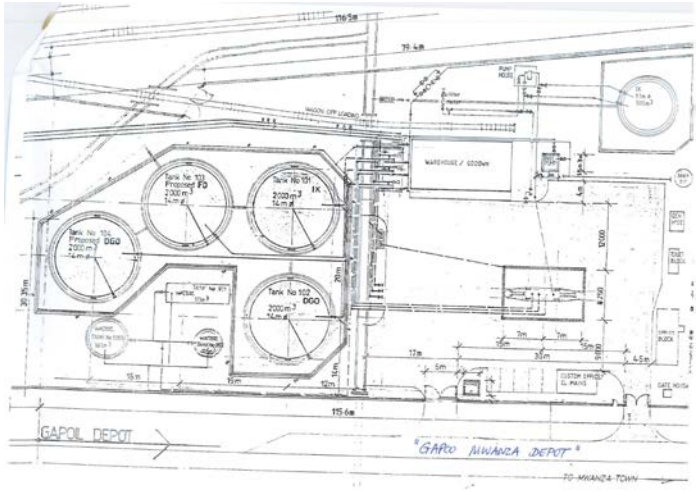
Mwanza Depot

- Location:
  Kenyatta Road/Mwanza South

- Loading/Unloading volume for the year
  29,287 KL

- Tank Storage Capacity
  1) DGO: 2 tanks (1.7 KT)
  2) PMS: 1 tanks (0.46 KT)
  3) IK: 2 tanks (0.13 KT)

- Layout



Source: GAPCO/GAPOIL

Figure 6.20: Layout of GAPCO/GAPOIL Mwanza Depot

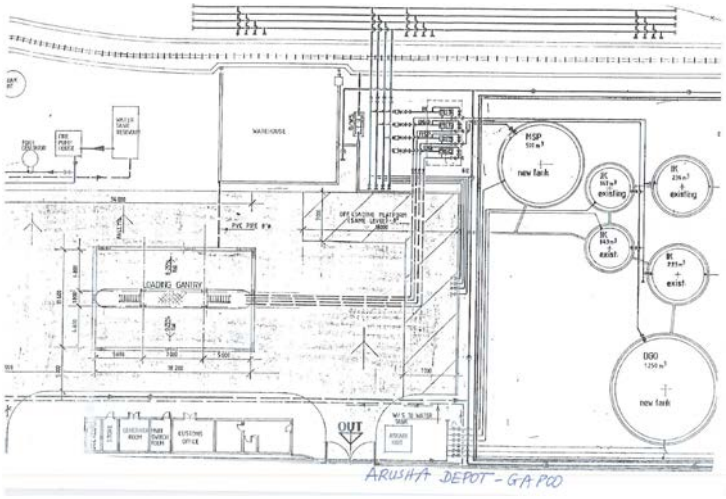
Arusha Depot

- Location:
  Esso Road/Unga Limited

- Loading/Unloading volume for the year
  29,14 KL

- Tank Storage Capacity
  1) DGO: 1 tanks (1.1 KT)
  2) PMS: 1 tanks (0.4 KT)
  3) IK: 3 tanks (0.8 KT)

- Layout



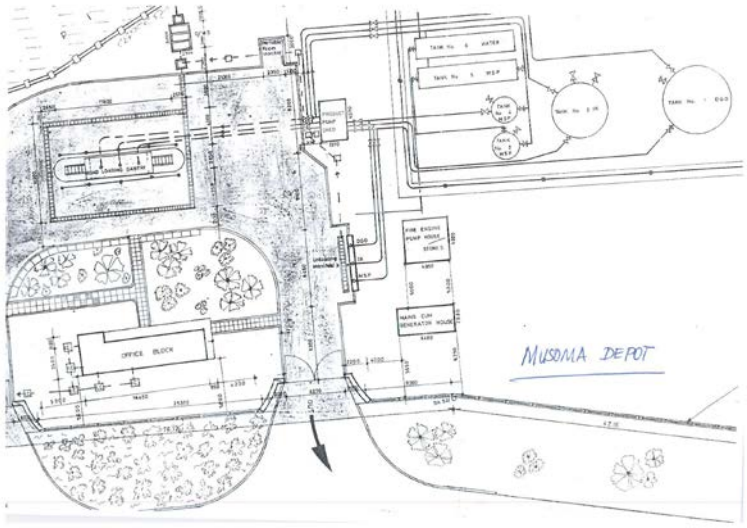
Source: GAPCO/GAPOIL

Figure 6.21: Layout of GAPCO/GAPOIL Arusha Depot

Musoma Depot

- Location:
  Mkendo Road

- Layout



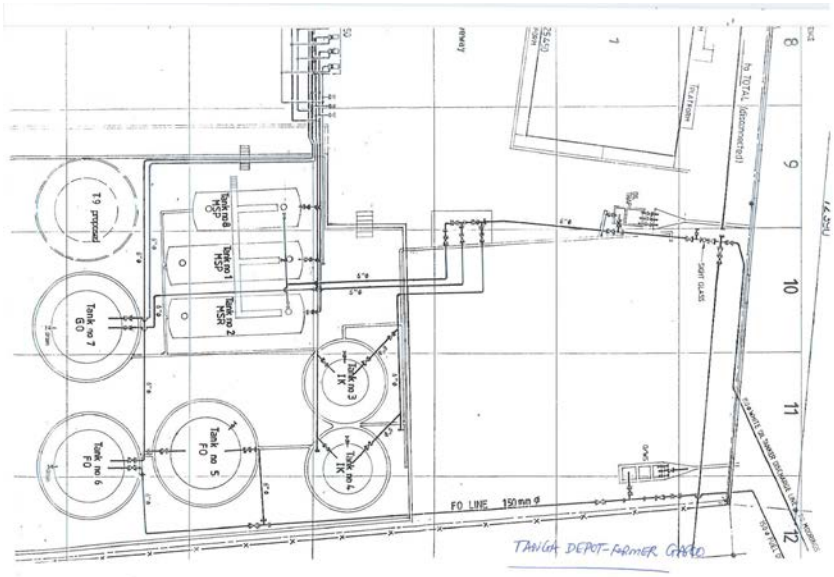
Source: GAPCO/GAPOIL

Figure 6.22: Layout of GAPCO/GAPOIL Musoma Depot

Tanga Depot

- Location:
  Chumbageni

- Layout



Source: GAPCO/GAPOIL

Figure 6.23: Layout of GAPCO/GAPOIL Tanga Depot

Bukoba Depot (Location information only)

- Location:
  Customs Road

Dodoma Depot (Location information only)

- Location:
  Mbugani Road

Kigoma Depot (Location information only)

- Location:
  Kibirizi

(3) NATOIL

Dar es Salaam Depot

- Location:
  Plot no. 115 & 315/2
  Kilwa Road Opposite SabaSaba Trade Fair
  Dar es Salaam

- Loading/Unloading volume for the year

  1) Loaded Volume for the Year by Trucks:
     AGO:= 49,808,874 Ltrs
     IK:= 29,547,285 Ltrs
     PMS:= 30,774,963 Ltrs

  2) Unloaded Volume for the Year by Pipeline:=
     AGO:= 53,964,282 Ltrs
     IK:= 31,017,906 Ltrs
     PMS:= 30,759,726 Ltrs

- Pipeline data between TIPER manifold and Oil Terminal

  1) Pipe specification:
     10’ or 250 mm diameter Seamless Pipe SCH. 40 Class B Type
     Note: Future Expansion for another 300 mm Diameter Pipeline from KOJ to Terminal expected to start by next year 2012.

  2) Inlet/Outlet pressure:
     15bar.

  3) Length:
     Approximately 3.5 km long

  4) Type of product handled:
     MSP,IK and AGO

  5) Construction year:
     1999

- Tank Storage Capacity

Table 6.18: Tank Storage Capacity in NATOIL Dar es Salaam Depot

TANK No.	PRODUCT TYPE	CAPACITY (Liters)	TANK TYPE
No.101	MOGAS	2,550,000	Vertical
No.102	MOGAS	500,000	Vertical
No.103	MOGAS	5,000,000	Vertical
No.201	GAS OIL	6,000,000	Vertical
No.202	GAS OIL	1,000,000	Vertical
No.203	GAS OIL	6,000,000	Vertical
No.301	KEROSENE	5,000,000	Vertical
No.302	KEROSENE	1,000,000	Vertical

Source: NATOIL

- Future expansion plan:
  Latest future expansion was in 2007 for the Tank No. 203.

- Future plan of sales network:
  Can Latest future plan of sales network is Mwendapole station along Morogoro Road in Kibaha Town.

- Supply and demand plan of each product for future

Type	Capacity
MSP	50,000,000 Liters
IK	30,000,000 Liters
AGO	40,000,000 Liters

(4) ENGEN

Dar es Salaam (Kurasini) Depot

- Loading/Unloading Type
  All products are received via pipeline and loaded on trucks and railway wagons.

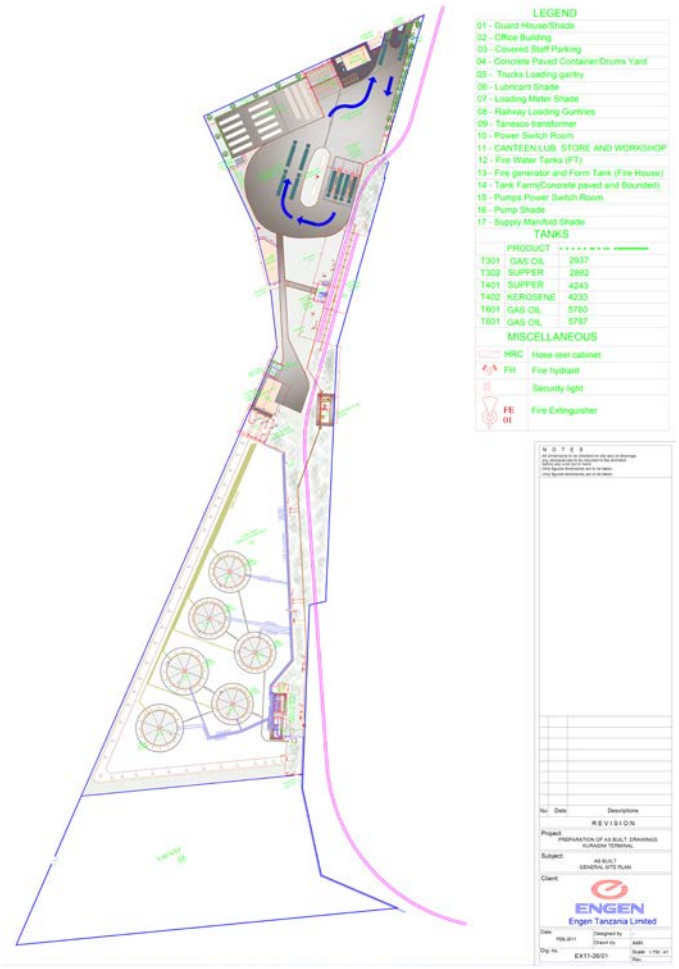
- Tank Storage Capacity

Table 6.19: Tank Storage Capacity in ENGEN Dar es Salaam (Kurasini) Depot

TANK No.	PRODUCT TYPE	CAPACITY (M^3)	TANK TYPE
T 301	GAS OIL	2,973	Vertical
T 302	MOGAS	2,882	Vertical
T 401	MOGAS	4,243	Vertical
T 402	KEROSENE	4,233	Vertical
T 601	GAS OIL	5,780	Vertical
T 602	GAS OIL	5,787	Vertical

Source: ENGEN

- Layout



Source: ENGEN

Figure 6.24: Layout of ENGEN Dar es Salaam (Kurasini) Depot

Kigoma Depot

- Loading/Unloading Type
  All products are received via trucks and railway wagons and loaded on trucks and barges.

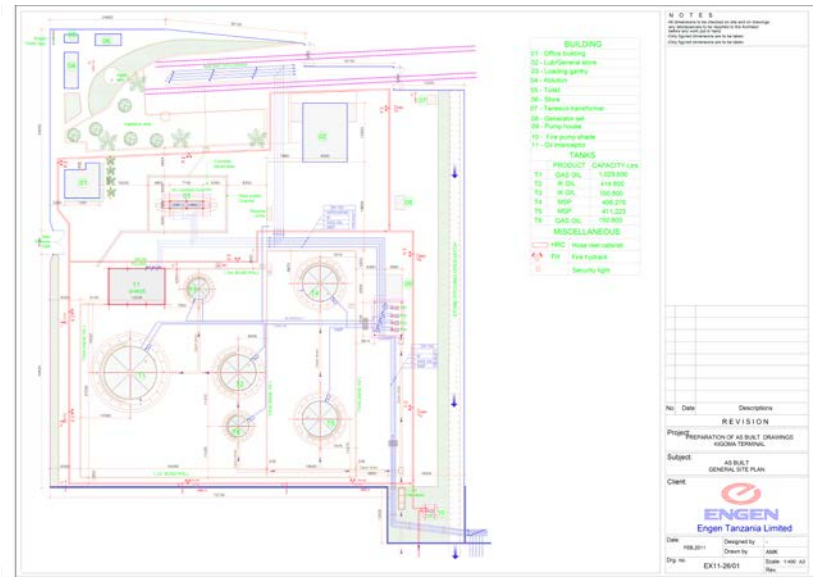
- Tank Storage Capacity

Table 6.20: Tank Storage Capacity in ENGEN Kigoma Depot

TANK No.	PRODUCT TYPE	CAPACITY (Liter)	TANK TYPE
No.1	GAS OIL	1,029,800	Vertical
No.2	KEROSENE	414,800	Vertical
No.3	KEROSENE	150,800	Vertical
No.4	MOGAS	408,276	Vertical
No.5	MOGAS	411,223	Vertical
No.6	GAS OIL	152,800	Vertical

Source: ENGEN

- Layout



Source: ENGEN

Figure 6.25: Layout of ENGEN Kigoma Depot

(5) HASS

Dar es Salaam Depot

- Location:
  PLOT 29& 31 VIJIBWENI INDUSTRIAL AREA,
  TEMEKE DISTRICT,
  DAR ES SALAAM.

- Loading/Unloading volume for the year
  122,892 m^3 (@2011)
  All products are received via pipeline and loaded on trucks.

- Pipeline data between TIPER manifold and BP/GAPCO manifold

  1) Pipe specification:
     10" Steel Pipe
  2) Inlet/Outlet pressure:
     9 bar or 130 PSI
  3) Length:
     3,414 m (2 pipes)
  4) Type of product handled:
     PMS, AGO and IK
  5) Capacity
     2 pipes @ 177,891 Liters
  6) Construction year:
     2009 – 2010
  7) Future expansion plan:
     No expansion plan

- Tank Storage Capacity
  1) Tank1 AGO: 5,127,239 Liters
  2) Tank2 AGO: 5,112,839 Liters
  3) Tank3 IK: 1,946,923 Liters
  4) Tank4 IK: 1,949,702 Liters
  5) Tank5 PMS: 5,126,126 Liters
  6) Tank6 PMS: 5,122,771 Liters

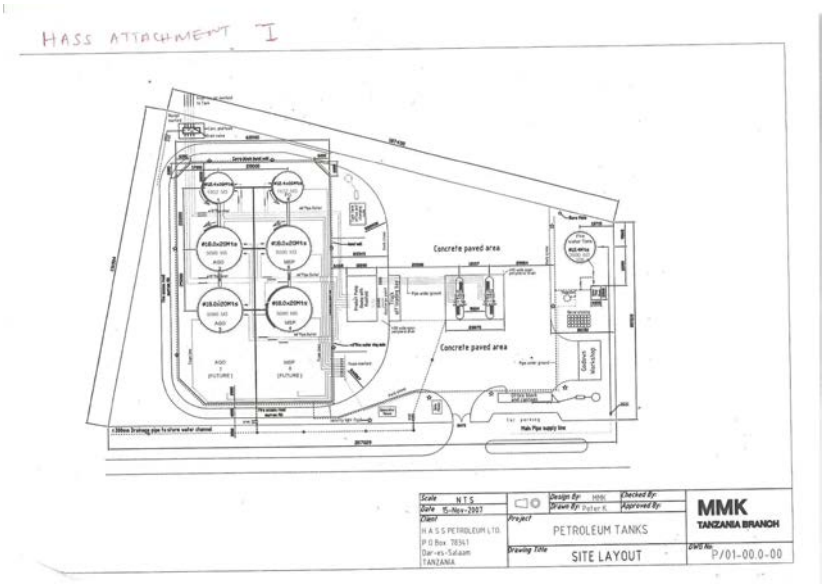
- Future expansion plan:
  Plans to construct two (2) tanks with a capacity of 5,000,000 liters each.

- Future plan of sales network:
  In 2012 it is planned to push all handling volumes through wholesale market. (i.e. Customers pick up bulk product from the Depot.)

- Supply and demand plan of each product for future

Type	**Capacity**
MSP	96 M Liters in 2012
IK	6 M Liters in 2012
AGO	156 M Liters in 2012

- Layout



Source: HASS

Figure 6.26: Layout of HASS Dar es Salaam Depot

(6) MGS

Dar es Salaam Depot

- Location:
  PLOT 310/3,
  KURASINI,
  DAR ES SALAAM.

- Loading/Unloading volume for the year
  346,783,047 Liters

- Pipeline data between TIPER manifold and BP/GAPCO manifold
  1) Pipe specification:
     NB 250 mm, API 5L GrB
  2) Inlet/Outlet pressure:
     Working Pressure 16 bar
  3) Length:
     2,960 m
  4) Type of product handled:
     White product
  5) Construction year:
     2006
  6) Future expansion plan:
     Add 2nd pipeline NB 300 mm by June 2012.

- Tank Storage Capacity
  10 no's x 4,000 m^3 each

- Future expansion plan:
  Additional 4,000 m^3 tanks

- Future plan of sales network:
  Expand to retail network by 12 station per calendar year.

Tanga Depot

- Location:
  PLOT 9 Kisisira Mombasa road,

- Loading/Unloading volume for the year
  14,000 m^3

- Tank Storage Capacity
  4 no's x 1,000 m^3 each

- Future expansion plan:
  Additional 8,000 MT of LPG

- Future plan of sales network:
  Expand to retail network by 12 station per calendar year.

(7) ORYX

Dar es Salaam Depot

- Location:
  East of Tanzania close to the Harbour

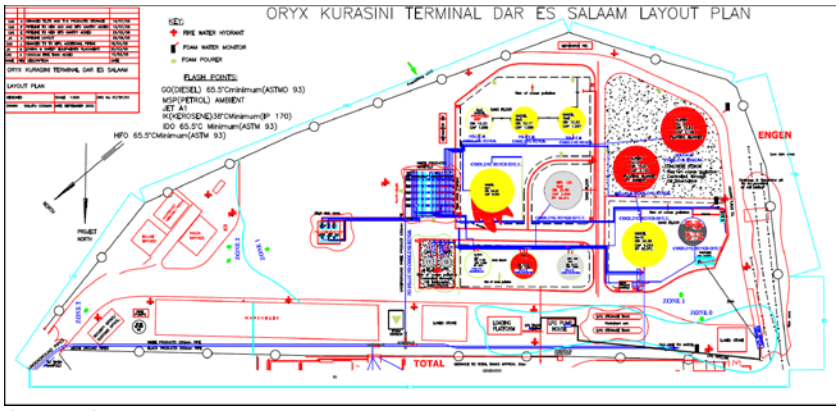
- Loading/Unloading volume for the year
  346,783,047 Liters

- Pipeline data between TIPER manifold and TOTAL/ORYX manifold

  1) Number of Pipeliens
     4 nos for Jet-A1, AGO, MSP and HFO
  2) Pipe specification:
     10 inch
  3) Inlet/Outlet pressure:
     10 bar
  4) Type of product handled:
     AGO-300 mt/hr
     Jet-A1-300 mt/hr
     MSP-250 mt/hr
  5) Construction year:
     Not known
  6) Future expansion plan:
     None

- Supply and demand plan of each product for future:
  Fuel : 119,165,434 Liters
  LPG: 12,918,894 Kgs

- Layout



Source: ORYX

Figure 6.27: Layout of ORYX Dar es Salaam Depot

Moshi Depot

- Location:
  570km (North of DSM)

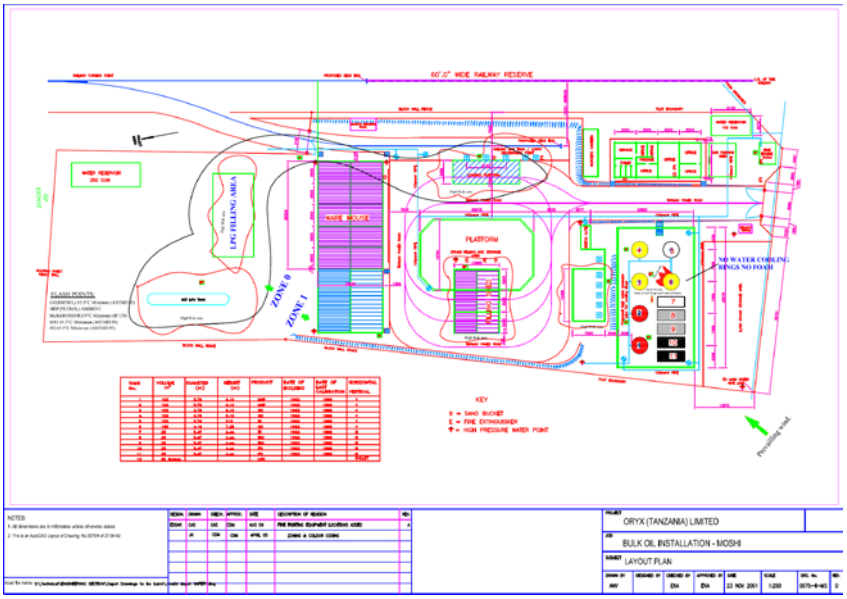
- Loading/Unloading volume for the year
  2,083,683 Liters

- Future expansion plan:
  None

- Future plan of sales network:
  Upgrading of Stations

- Supply and demand plan of each product for future:
  Fuel : 1,640,315 Liters
  LPG: 1,198,024 Kgs

- Layout



Source: ORYX

Figure 6.28: Layout of ORYX Moshi Depot

Mwanza Depot

- Location:
  1,200 km (North East of DSM)

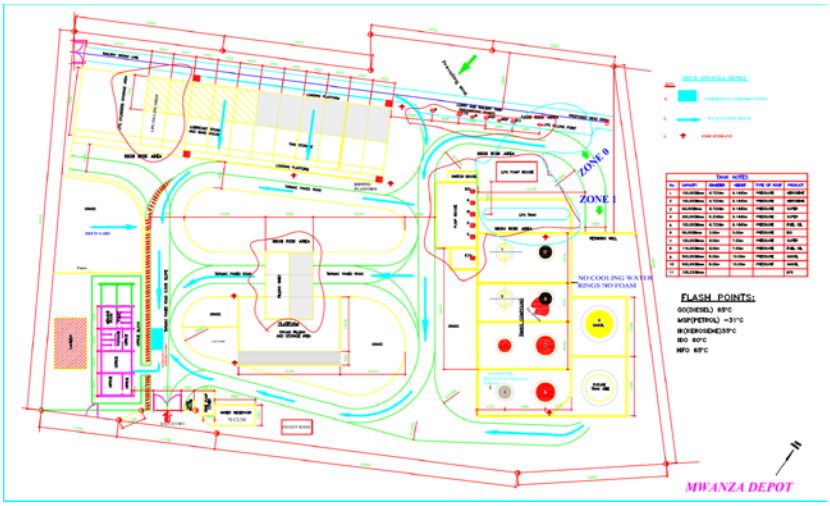
- Loading/Unloading volume for the year
  1,123,520 Liters

- Future expansion plan:
  None

- Future plan of sales network:
  Upgrading of Stations

- Supply and demand plan of each product for future:
  Fuel : 843,346 Liters
  LPG: 1,015,181 Kgs

- Layout



Source: ORYX

Figure 6.29: Layout of ORYX Mwanza Depot

Isaka (Shinyanga) Depot

- Location:
  1,040 km (North West of DSM)

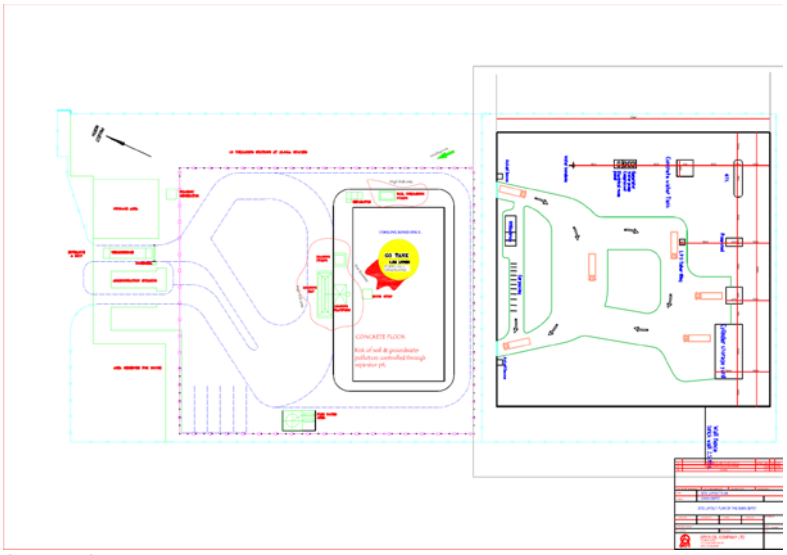
- Loading/Unloading volume for the year
  15,669,208 Liters

- Future expansion plan:
  None

- Future plan of sales network:
  Upgrading of Stations

- Supply and demand plan of each product for future:
  Fuel : 30,262,407 Liters

- Layout



Source: ORYX

Figure 6.30: Layout of ORYX Isaka (Shinyanga) Depot

Buzwagi Depot

- Location:
  1,132 km from DSM

- Loading/Unloading volume for the year
  2,233,484 Liters (Supply from DSM)

- Future expansion plan:
  None

- Future plan of sales network:
  Upgrading of Stations

Mwadui Depot

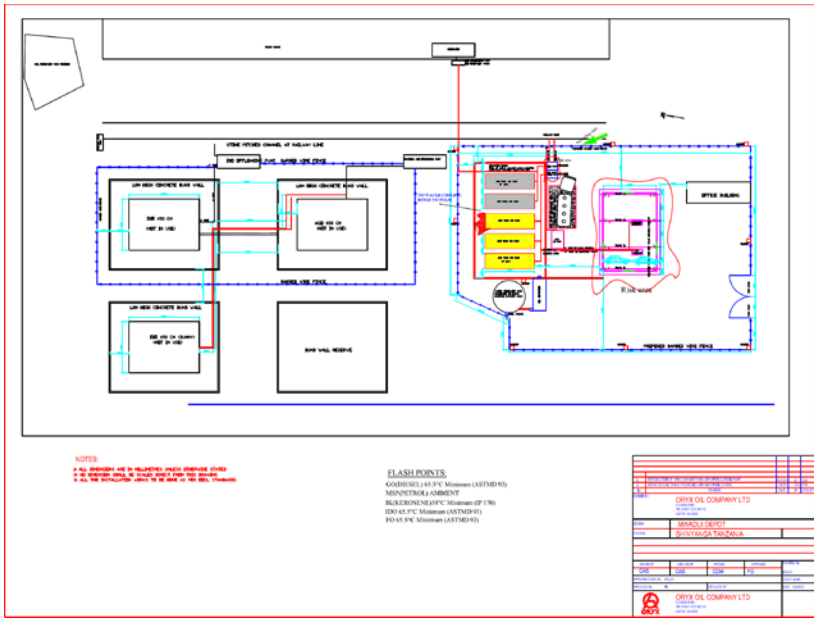
- Location:
  1,052 km from DSM

- Loading/Unloading volume for the year
  23,523,166 Liters (Supply from DSM)

- Future expansion plan:
  None

- Future plan of sales network:
  Upgrading of Stations

- Layout



Source: ORYX

Figure 6.31: Layout of ORYX Mwadui Depot

(8) WORLD OIL[1]

Kigamboni Depot

This depot has six tanks with storage capacities of 5.5 million litres each. (Total 33 million litres). The depot is connected to KOJ (Kurasini Oil Jet). It places world oil in a strategic and competitive advantage in the industry.

Chang'ombe Depot

This depot has seven tanks with total capacity of 1.8 million litres; it is situated within the City Centre and hence helps our small volume customers.

Kigoma Depot

Kigoma depot is used to serve our customers located in the lake region and nearby countries i.e. Burundi and Congo Customers. The capacity of the depot is 3.1 million litres.

6.2.2 Current Situation of TAZAMA Pipeline

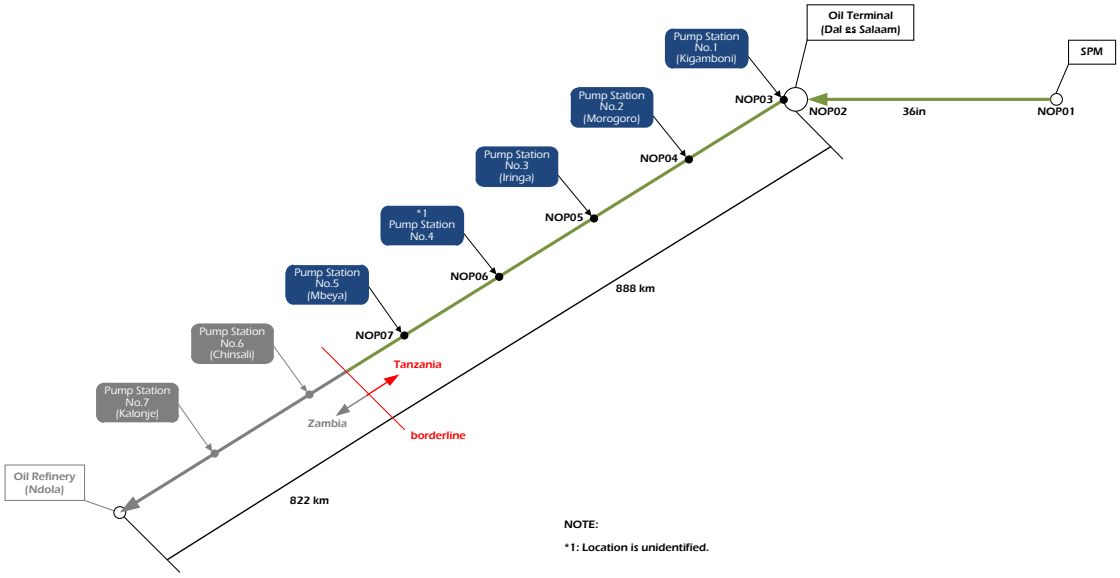
The TAZAMA Pipeline with a distance of 1,710 km of 8 inch and 769 km of 12 inch loops transports crude oil from the Single Point Mooring (SPM) at the outer anchorage of Dar es Salaam port in Tanzania through TIPER refinery that is not operational in Dar es Salaam to the Indeni Refinery Facility at Ndola in Zambia. The pipeline was designed for a throughput of 1.1 million metric tonnes per annum. Currently the optimum operating capacity is 700,000 metric tonnes per annum. The diameter of pipeline varies between 8 and 12 inches (200 and 300 mm).

[1] Source: WORD OIL Web Site" http://worldoil.co.tz/index.html "

Other facility information is as follows:

- Capacity of SPM which is owned by Tanzania Port Authority (TPA)
  - SPM has pumping rate of 5,000 cubic meters per hour. It allows ships with maximum size of 120,000 DWT.
- Tank Farm Storage Capacity
  - 6 Tanks with total operational capacity of 231,000 cubic meter or 190,000 metric tonnes.
- Number of Pumping Stations
  - 7 pumping stations, 5 in Tanzania and 2 in Zambia.
- Number of Pumping Station Unit/Station
  - 4 units per each pumping station with 450 hp capacity per each unit.
- Condition of the Facility
  - The facility is well maintained as the preventive maintenance plans are reviewed and updated every year.

The outline of the TAZAMA Pipeline is shown in the following figure.



Source: JICA Study Team

Figure 6.32: Outline of TAZAMA Pipeline

Current problems of the TAZAMA Pipeline are as follows:

- Pipeline from SPM to storage tank
  - The facility belongs to TPA and is used to offload crude oil tankers and pump to the storage tanks that it owned by the TAZAMA Pipeline through 36 inch pipeline which is badly corroded.
- Main engines of pump station
  - The main engines have deteriorated causing frequent minor breakdowns. Most of the spares are custom made and thus lead to higher maintenance costs.
- Pipeline condition
- Section 12/4 which stretches from Ilula to Iringa Pump Station (about 22 km length) has been out of operation due to its poor state. This section had the capacity restricted by isolation of only 150 cubic meters per hour resulting in reduction of company revenue.

Future development plans of the TAZAMA Pipeline are as follows:

- Replacement of SPM
  - TPA has already awarded tender to carry out the replacement of the SPM and 36 inch pipeline.
    The replacement plan of the SPM and 36 inch pipeline is shown in the following Figure 6.33.

Source: TPA

Figure 6.33: Replacement Plan of SPM and 36in Pipeline

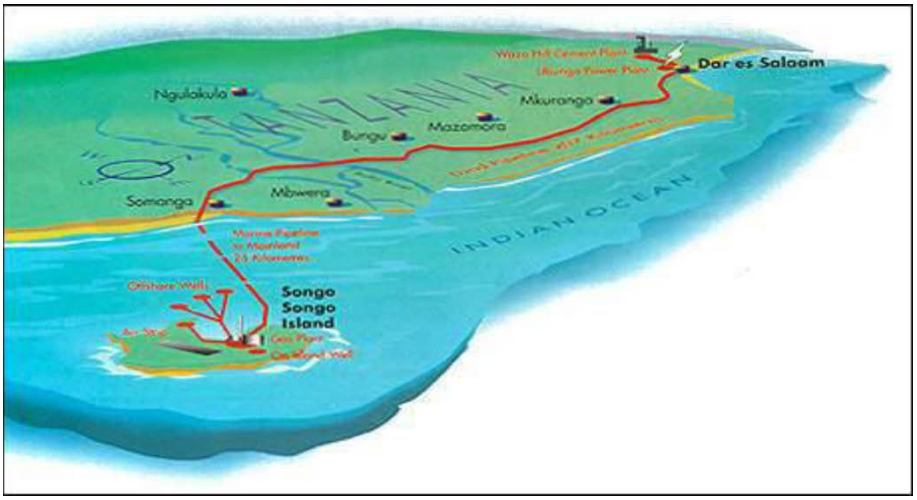
- Replacement of main engine
  - Replacement of the existing main engines starting with Kigamboni Pump Station to cut down on the maintenance costs and increase operational reliability.
- Pipeline repairs
  - The rehabilitation of section 12/4 in Iringa which involved pipeline replacement and sleeve repair works has now been completed and the pipeline is being commissioned. Future repair works are planned in future to eliminate all weak portions.

The pipeline data was analyzed based on the information which was provided during a limited investigation period. It was because of that the field survey period was not enough time to confirm the reply from TAZAMA Pipelines Limited and/or collect sufficient data. Therefore, it is difficult to perform the detail analysis of the future plan at the present stage. It is recommended that the unidentified data should be collected in the future investigation.

6.2.3 Current Situation of Songo-Songo Gas Pipeline

The Songo-Songo Gas Pipeline was constructed as a part of the Songo-Songo Gas-to-Electricity Project. It is managed by Tanzania Petroleum Development Corporation (TPDC) and operated by Songas Limited. With a distance of 232 km including a submarine part, it transports gas from the Songo-Songo gas plant at Songo-Songo Island to the power station at Ubanbo in Dar es Salaam.

The natural gas processed by the Songo-Songo gas plant is transported through 25 km of 12 inch submarine pipeline from the Songo-Songo gas plant to Somanga Funga, and from Somanga Funga through 207 km of 16 inch pipeline to the power station at Ubungo in Dar es Salaam. Natural gas has replaced liquid fuel as feedstock in the generation of up to 115 MW of electricity for the national grid. The gas pipeline for industrial use with a distance of 16 km of 8 inch pipeline has been extended northwards to provide natural gas to the Wazo Hill cement plant which has replaced fuel oil as feedstock in the manufacture of cement.



Source: TPDC

Figure 6.34: Map of Songo-Songo Gas Pipeline

Other facility and process information are as follows:

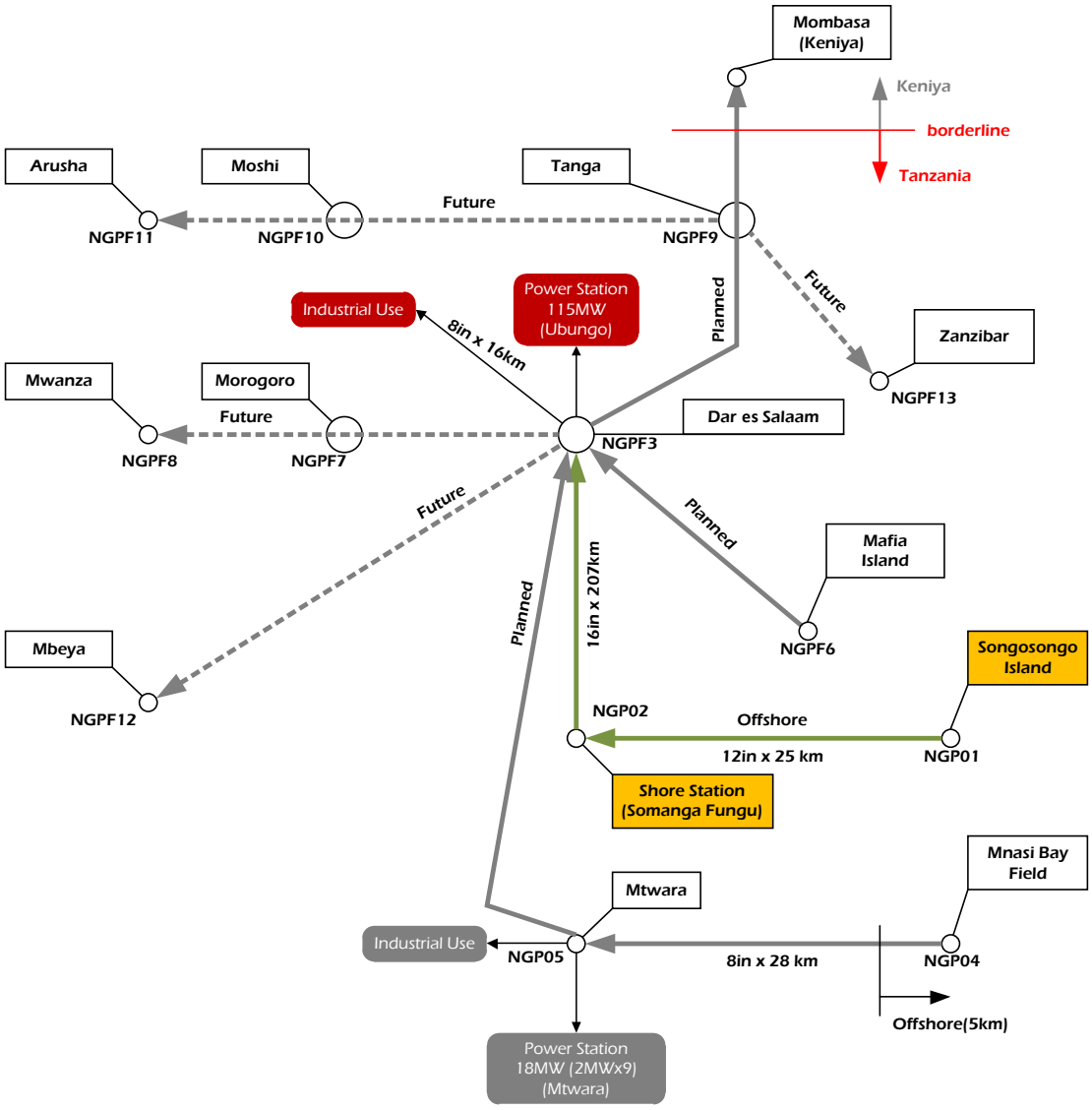
- Design capacity of the pipeline is 105 MMscfd.
- Operating Capacity
- Flow rate is 105 MMscfd.
- Discharge pressure of Songo-Songo Gas Plant is 85 bar (1,233 psi).
- Receiving pressure at Dar es Salaam is 55 bar (798 psi).
- Temperature (Ambient) is 25 deg.C (77 deg.F).
- Approximate Songo-Songo gas composition is shown in Table 6.21

Table 6.21: Approximate Songo-Songo Gas Composition

Methane	97.1860 mol %
Ethane	0.9797 mol %
Propane	0.2875 mol %
i-Butane	0.0637 mol %
n-Butane	0.0800 mol %
i-Pentane	0.0290 mol %
Neo-Pentane	0.0000 mol %
Hexane	0.1283 mol %
Nitrogen	0.7575 mol %
CO2	0.4641 mol %
Moisture	0.0010 mol %

Source: TPDC

The outline of the Songo-Songo gas pipeline is shown in Figure 6.35.



Source: JICA Study Team

Figure 6.35: Outline of Songo-Songo Gas Pipeline

Currently, the transportation volume of the Songo-Songo gas pipeline is approximately 38,325 MMscfd per year. The future plan is to increase the capacity of the Songo-Songo gas plant to around 210 MMscfd. Therefore, the pipeline capacity is expected to increase to twice the present volume.

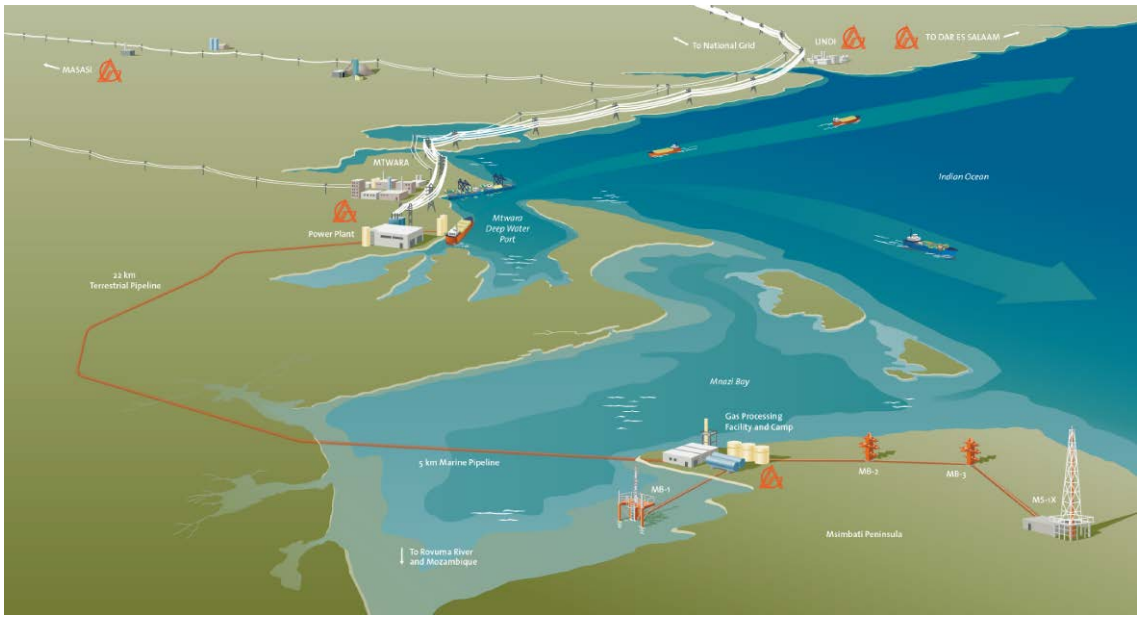
Because of the short investigation period, it is difficult to perform the detail analysis of the future plan at the present stage. It is recommended that unidentified data will be collected in the future investigation.

6.2.4 Current Situation of Manazi Bay Gas Pipeline

The Manazi Bay Gas Pipeline was constructed as a part of the Mtwara Energy Project. It is managed by Tanzania Petroleum Development Corporation (TPDC) and operated by Artumas

Group. It has a distance of 28 km including the submarine part and transports gas from Minasi Bay Field to the power generation facility in Mtwara.

The natural gas processed by the gas processing facility at Msimbati peninsula is transported through 5 km of 8 inch submarine pipeline from the gas processing facility at Msimbati peninsula to the riser site at Mtwara region, and from the riser site at Mtwara region through 22 km of 8 inch pipeline to the power generation facility in Mtwara. The natural gas is used to the gas-to-power generation facility located in Mtwara that it generates an electricity of 18 MW.



Source: Artumas Group

Figure 6.36: Map of Mnazi Bay Gas Pipeline

Other facility and process information are as follows:

- Design capacity of the pipeline is 70 MMscfd.
- Operating Capacity
- Flow Rate: 1.5 to 2.0 MMscfd
- Pressure: 80 bar (1,160 psi) at the gas processing facility
- Temperature: 25 deg.C (77 deg.F)
- Approximate Mnazi Bay gas composition is shown in Table 6.22.

Table 6.22: Approximate Mnazi Bay Gas Composition

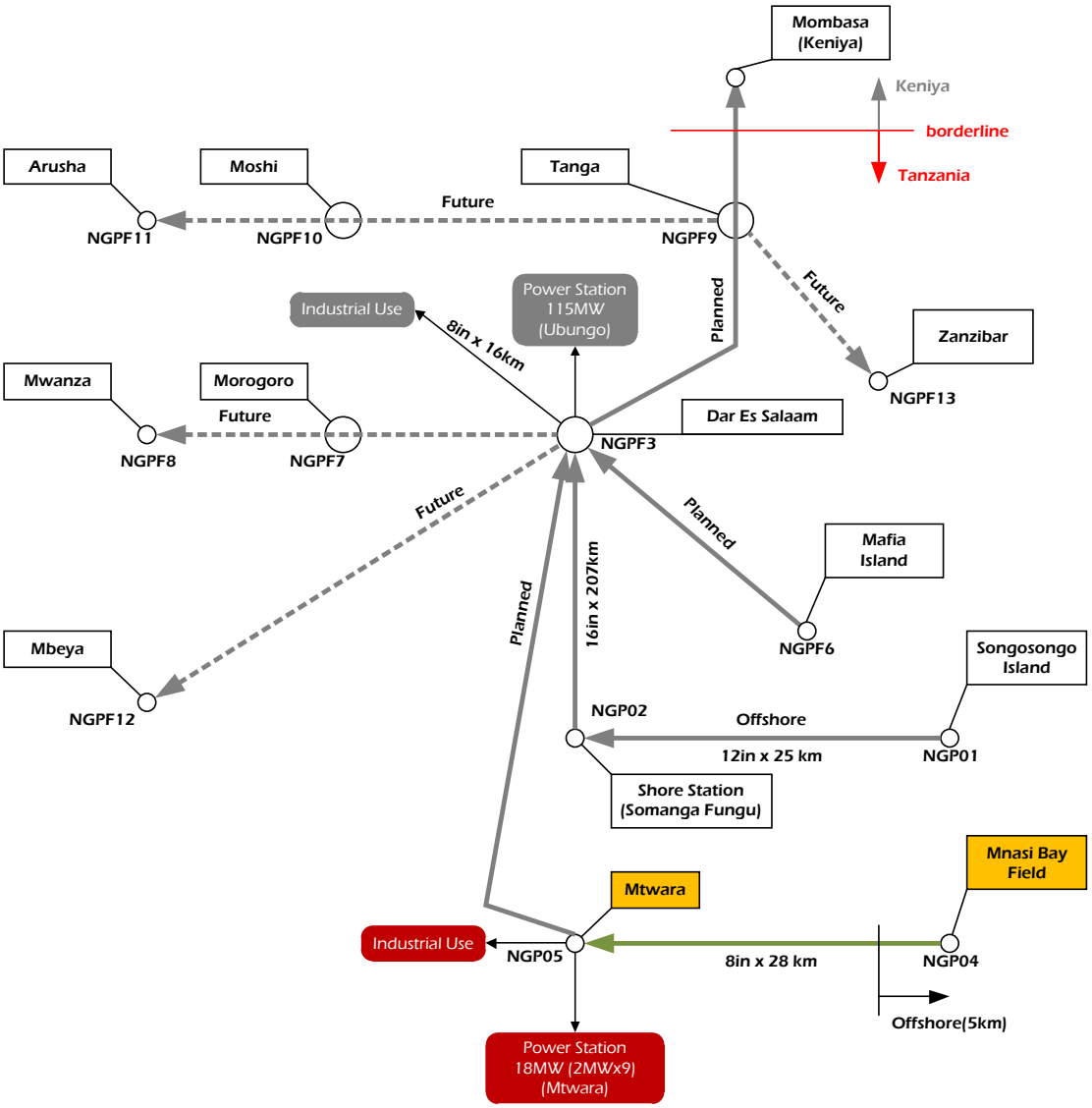
Chemical symbol	Mole %
N_2	0.23
CO_2	0.45
H_2S	0.00
C_1	97.83
C_2	1.22
C_3	0.01
i-C_4	0.06
n-C_4	0.07
i-C_5	0.02
n-C_5	0.01
C_6	0.01
C_7	0.08
C_8	0.01
C_9	0.00
C_{10}	0.00
C_{11}	0.00
C_{12+}	0.00
TOTAL	**1.00**

Source: TPDC

Source: TPDC

Figure 6.37: Route of Manazi Bay Gas Pipeline

The outline of the Manazi Bay Gas Pipeline is shown in Figure 6.38.



Source: JICA Study Team

Figure 6.38: Outline of Manazi Bay Gas Pipeline

Currently, the transportation volume of the Manazi Bay gas pipeline is approximately 550 MMscfd per year. The future plan is to increase the capacity of the gas handling volume to around 70 billion cf.

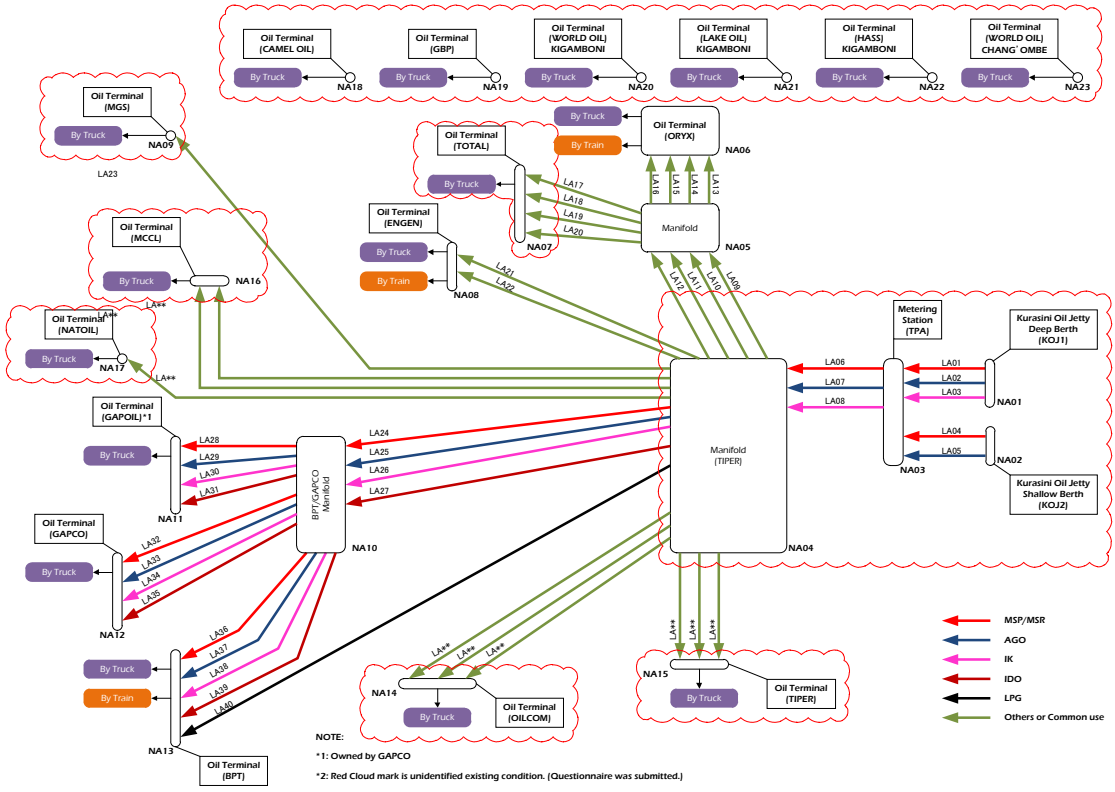
Therefore, the pipeline capacity is expected to largely increase from the present volume.

Because of the short investigation period, it is difficult to perform the detail analysis of the future plan at the present stage. It is recommended that unidentified data will be collected in the future investigation.

6.2.5 Current Situation of Short-Distance Pipeline

The short-distance pipeline (petroleum pipeline) network covers the whole of Dar es Salaam. It is connected to each depot of an oil marketing company from Kurasini Oil Jetty (KOJ) which exists in the Dar es Salaam port.

The Petroleum Pipeline Network Diagram at Dar es Salaam is shown in Figure 6.39.



Source: JICA Study Team

Figure 6.39: Petroleum Pipeline Network Diagram at Dar es Salaam

In spite of the limited investigation period, the questionnaire was submitted during the field survey by the JICA Study Team to each oil marketing company, reply was not obtained from most oil marketing companies.

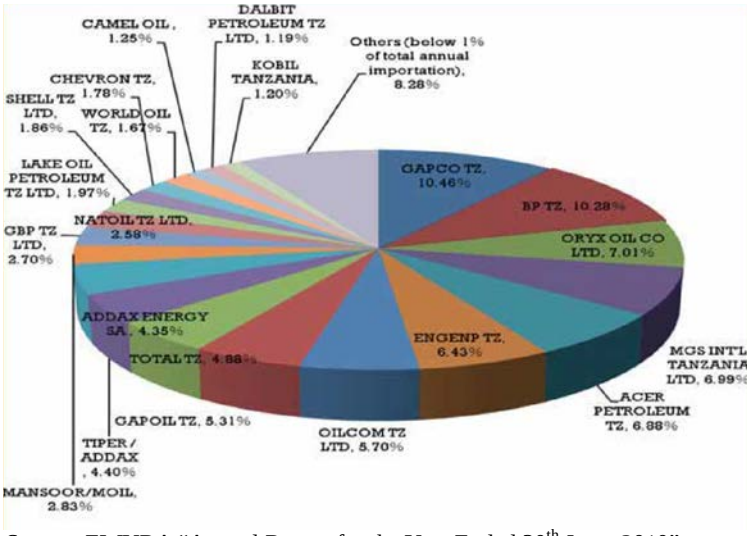
The short-distance pipeline is managed and operated by the oil marketing company which owns the oil terminal. Therefore, the investigation of the short-distance pipeline is conducted simultaneously with the investigation of the oil terminal. Therefore, the short-distance pipeline excluding Dar es Salaam area is described in section 6.2.5 Current Situation of Oil Terminals.

6.2.6 Current Situation of Oil Terminals

As of October 2011, twenty-one (21) oil marketing companies which are described above in section 6.2, have an oil terminal in Tanzania.

The oil terminal data was analyzed during the limited investigation period to collect the information and to receive the reply on the questionnaire from oil marketing companies. Therefore, this report is based on limited data collected in the field survey and unidentified data should be collected in the future investigation.

Market shares for oil marketing companies (OMCs) are summarized in Figure 6.40.



Source: EWURA "Annual Report for the Year Ended 30th June, 2010"

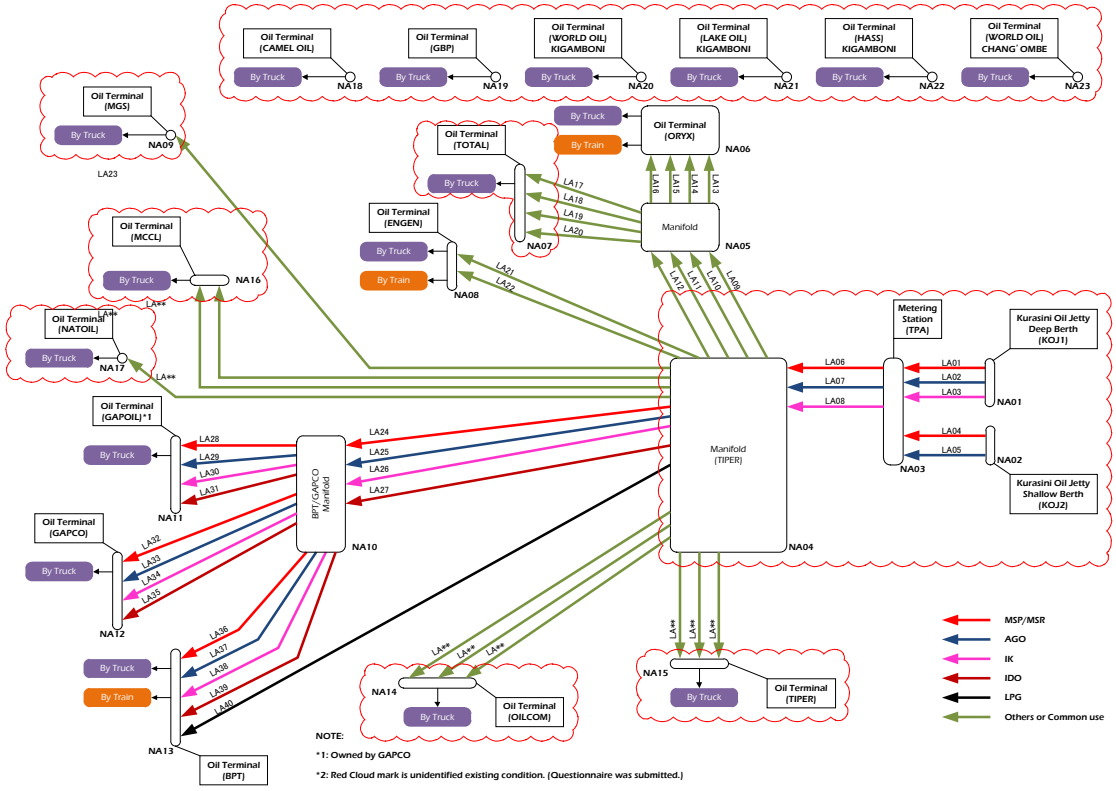
Figure 6.40: Market Shares (from July 2009 to June 2010)

As of October 2011, oil terminals owned by OMCs exist in the following fourteen (14) regions:

1) Dar es Salaam
2) Mwanza
3) Mtwara
4) Tanga
5) Musoma
6) Shinyanga
7) Kigoma
8) Arusha
9) Moshi
10) Mbeya
11) Tabora
12) Bukoba
13) Dodoma
14) Makambako

(1) Oil Terminal at Dar es Salaam

Currently, there are seventeen (17) OMCs with a total storage capacity of 431,146 metric tonnes. in Dar es Salaam. (This excludes MCCL oil terminal capacity because its capacity has not been identified.) The oil terminal diagram in Dar es Salaam is shown in Figure 6.41.



Source: JICA Study Team

Figure 6.41: Oil Terminal Diagram in Dar es Salaam

The total storage capacity in Dar es Salaam is shown in Table 6.23.

Table 6.23: Total Storage Capacity in Dar es Salaam

Unit (MT)

No.	COMPANY	AVGAS	LPG	MSP	JET A1	IK	AGO	IDO	FO	TOTAL
1	TIPER	-	960	12,100	4,400	4,400	42,100	3,360	24,500	**91,820**
2	BPT	1,005	302	2,486	9,388	3,183	14,949	1,105	9,449	**41,868**
3	ENGEN	-	-	5,058	-	3,302	7,356	-		**15,716**
4	GAPOIL	-	-	3,251	-	1,855	19,312	275	3,080	**27,773**
5	GAPCO	-	-	5,288	2,307	2,574	9,000	-	833	**20,002**
6	OIL COM	-	-	4,415	4,717	4,717	15,000	-	5,639	**34,488**
7	ORYX	-	1,050	5,080	0	804	9,246	245	4,800	**21,225**
8	NATOIL	-	-	2,208	-	4,717	5,833	-		**12,758**
9	TOTAL	-	-	6,442	2,296	-	7,646	-	6,698	**23,081**
10	MGS			8,830		6,289	13,333			**28,452**
11	CAMEL OIL			4,415		9,434	15,000			**28,849**
12	GBP			6,623		7,075	15,000			**28,698**
13	WORLD OIL - KIGAMBONI			7,358		3,931	8,333			**19,623**
14	LAKE OIL - KIGAMBONI			3,532		3,852	8,167			**15,551**
15	HASS - KIGAMBONI			7,358		3,931	8,333			**19,623**
16	WORLD OIL - CHANG'OMBE					786	833			**1,619**
17	MCCL	*1	*1	*1	*1	*1	*1	*1	*1	*1
	TOTAL	**1,005**	**2,312**	**84,444**	**23,108**	**60,850**	**199,442**	**4,985**	**55,000**	**431,146**

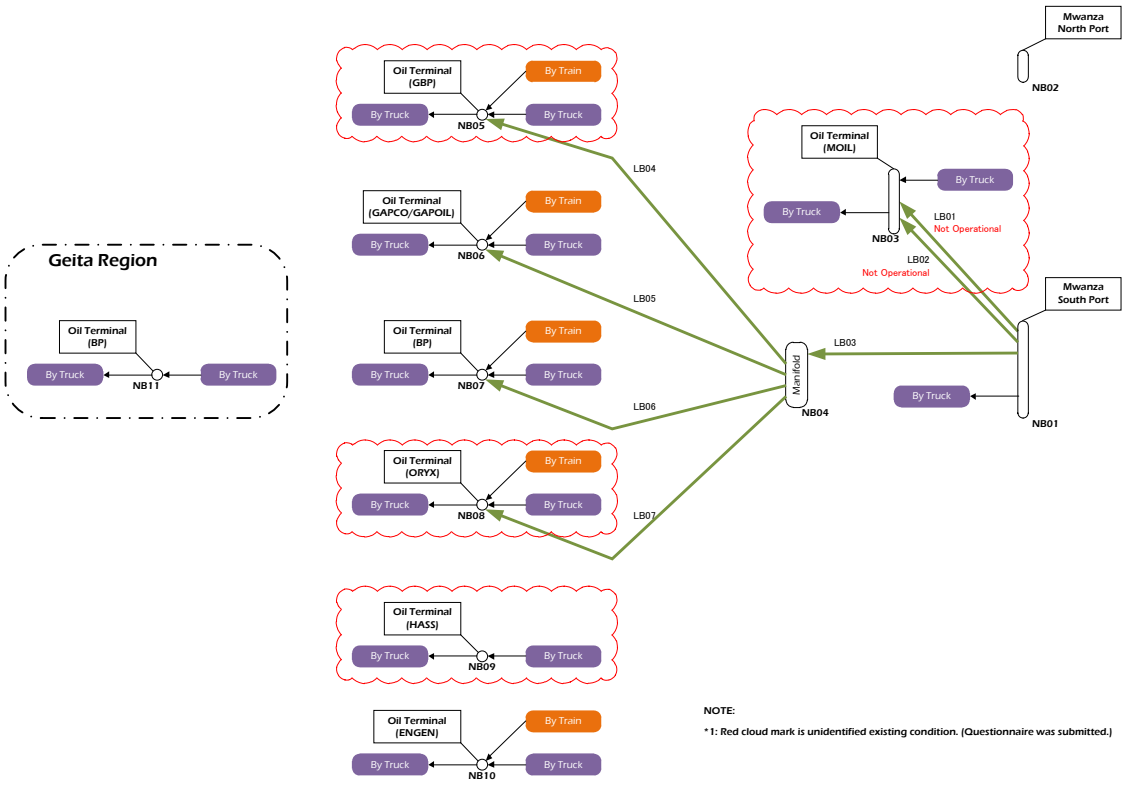
NOTE: as of December 2010

*1: Data is not available.

Source: JICA Study Team

(2) Oil Terminal at Mwanza

Currently, there are eight (8) OMCs with a total storage capacity of 18,305 metric tonnes (excluding GBP and HASS oil terminal capacities because they have not been identified.) in Mwanza. The oil terminal diagram in Mwanza is shown in Figure 6.42.



Source: JICA Study Team

Figure 6.42: Oil terminal Diagram in Mwanza

The total storage capacity in Mwanza is shown in Table 6.24.

The storage capacity data of ENGEN is that of former CHEVRON Oil Terminal.

Table 6.24: Total Storage Capacity in Mwanza

Unit (MT)

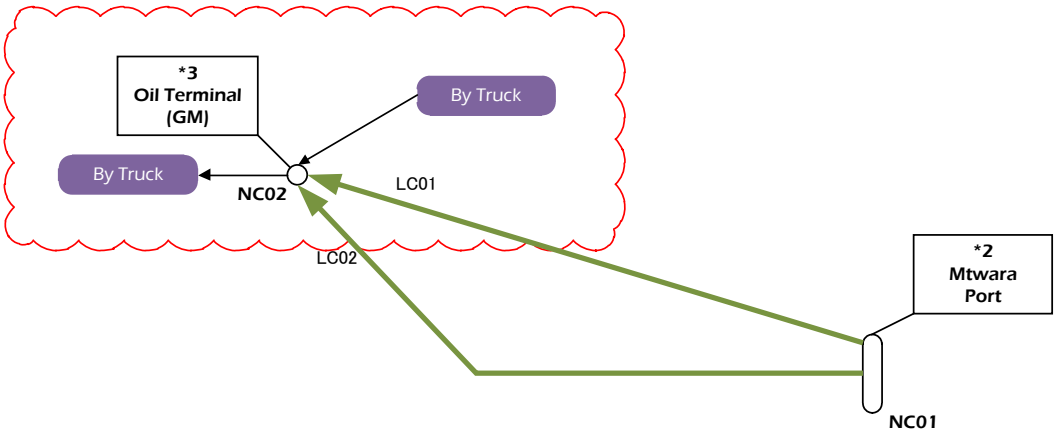
No.	COMPANY	AVGAS	LPG	MSP	JET A1	IK	AGO	IDO	FO	TOTAL
1	BPT	-	-	168	393	366	1,372	100	207	**2,606**
2-1	GAPCO	-	-	114	-	163	340	50		**667**
2-2	GAPOIL	-	-	400	-	1, 570	3,340	1,700		**5,440**
3	MOIL	-	-	87	-	62	105	-	-	**255**
4	ORYX	-	50	118	-	79	333	49		**629**
5	BPT - GEITA						3,650		3,947	**7,597**
6	GBP	*1	*1	*1	*1	*1	*1	*1	*1	*1
7	HASS	*1	*1	*1	*1	*1	*1	*1	*1	*1
8	ENGEN *2			202		79	830			**1,111**
	TOTAL	**-**	**50**	**1,089**	**393**	**749**	**9,970**	**1,899**	**4,154**	**18,305**

NOTE:
as of December 2010
*1: Data is not available.
*2: ENGEN is former CHEVRON.
Source: JICA Study Team

(3) Oil Terminal at Mtwara

Currently, there is (1) OMC with a total storage capacity of 3,800 metric tonnes in Mtwara. The oil terminal diagram in Mtwara is shown in Figure 6.43. Oil jetty is not available at Mtwara Port. The piping connection point is exists in Mtwara Port to connect the import/export line from tanker ship directly.

The oil terminal which BPT owned was sold off to GM (oil marketing company).



NOTE:

***1: Red cloud mark is unidentified existing condition. (Questionnaire was submitted.)**

***2: Oil jetty is not available at Mtwara Port. (Import/Export Lines are connected from tanker ship directly.)**

***3: BPT was sold the oil terminal in Mtwara to GM.**

Source: JICA Study Team

Figure 6.43: Oil Terminal Diagram in Mtwara

The total storage capacity in Mtwara is shown in Table 6.25. Storage capacity data of GM is to the use that of the former BPT Oil Terminal. It is not counted in storage capacity of the GAPCO oil terminal because it is not operational.

Table 6.25: Total Storage Capacity in Mtwara

Unit (MT)

No.	COMPANY	AVGAS	LPG	MSP	JET A1	IK	AGO	IDO	FO	TOTAL
1	GM *1	-	-	372	-	1,270	1,346	811		**3,800**
2	GAPCO *2			883			1,000	1,021		**2,904**
	TOTAL	**-**	**-**	**372**	**-**	**1,270**	**1,346**	**811**	**-**	**3,800**

NOTE: as of December 2010

*1: GM is former BPT.

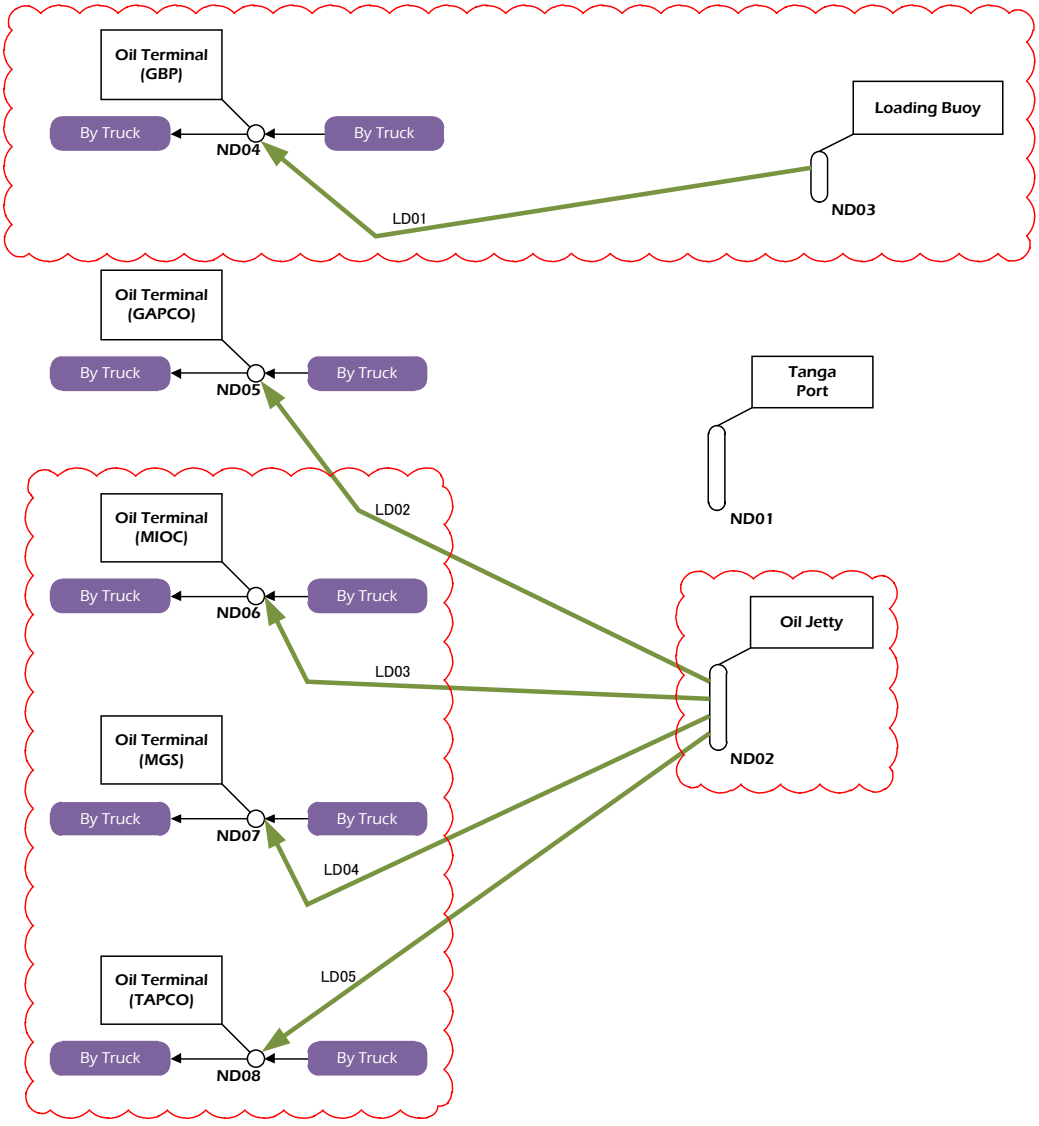
*2: it is not counted in storage capacity of the GAPCO oil terminal, because it is not operational.

Source: JICA Study Team

(4) Oil Terminal at Tanga

Currently, there are five (5) OMCs with a total storage capacity of 22,042 metric tonnes in Tanga. The oil terminal diagram in Tanga is shown in Figure 6.44.

TIOT was sold Oil terminal to MGS in Tanga.



Source: JICA Study Team

Figure 6.44: Oil Terminal Diagram in Tanga

The total storage capacity in Tanga is shown in Table 6.26. The storage capacity data of MGS is from that of the former TIOT Oil Terminal.

Table 6.26: Total Storage Capacity in Tanga

Unit (MT)

No.	COMPANY	AVGAS	LPG	MSP	JET A1	IK	AGO	IDO	FO	TOTAL
1	GAPCO	-	-	-	-	-	1,333	-	658	**1,991**
2	TAPCO	-	-	1,472		1,651	2,000			**5,123**
3	MGS *1	-	-	740		786	1,667	-	-	**3,193**
4	GBP	-	-	1,472	-	1,572	6,667	-	-	**9,711**
5	MIOC	-	-	-	-	983	1,042	-	-	**2,024**
	TOTAL		**-**	**3,684**	**-**	**4,992**	**12,708**	**-**	**658**	**22,042**

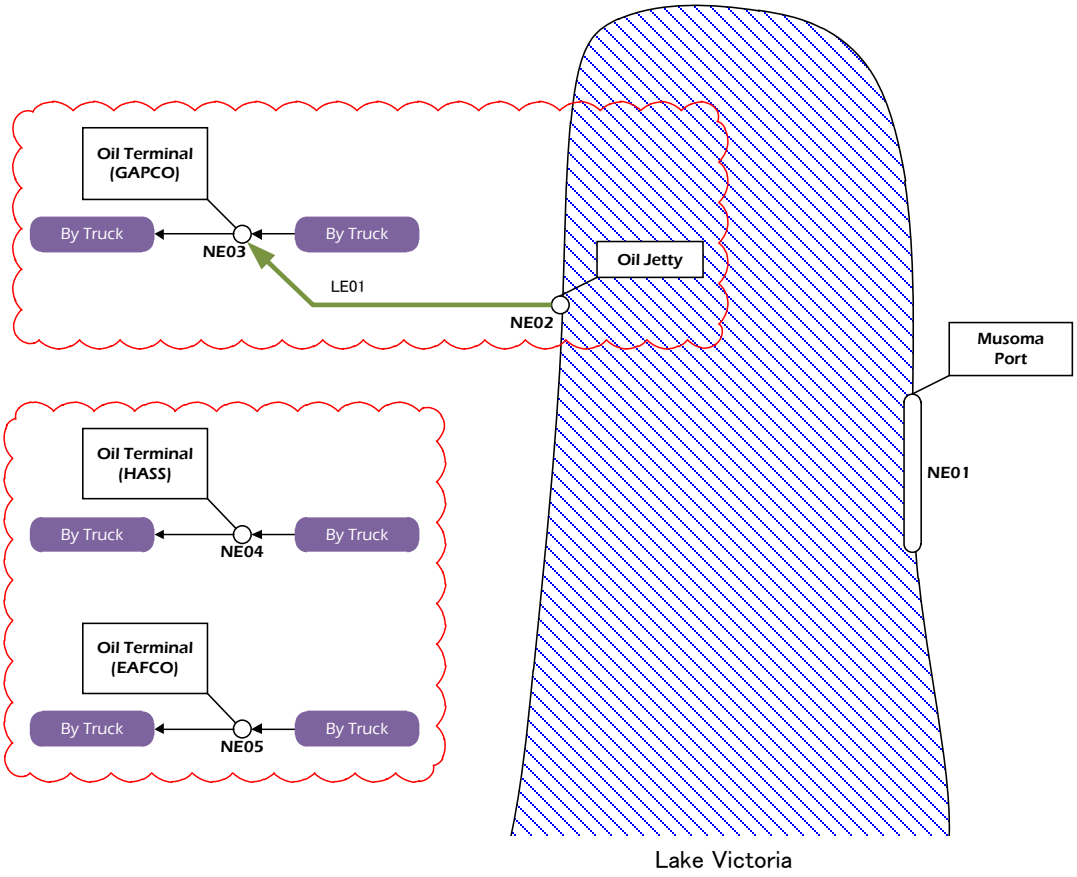
NOTE: as of December 2010

*1: MGS is former TIOT.

Source: JICA Study Team

(5) Oil Terminal at Musoma

Currently, there are three (3) OMCs with a total storage capacity of 1,790 metric tonnes (It excludes HASS oil terminal capacity because it has not been identified.) in Musoma. The oil terminal diagram in Musoma is shown in Figure 6.45.



NOTE:

*1: Red cloud mark is unidentified existing condition. (Questionnaire was submitted.)

Source: JICA Study Team

Figure 6.45: Oil Terminal Diagram in Musoma

The total storage capacity in Musoma is shown in Table 6.27.

Table 6.27: Total Storage Capacity in Musoma

Unit (MT)

No.	COMPANY	AVGAS	LPG	MSP	JET A1	IK	AGO	IDO	FO	TOTAL
1	GAPCO	-	-	50	-	200	340			**590**
2	HASS	*1	*1	*1	*1	*1	*1	*1	*1	*1
3	EAFCO	-	-	400	-	120	680	-	-	**1,200**
	TOTAL	**-**	**-**	**450**	**-**	**320**	**1,020**	**-**	**-**	**1,790**

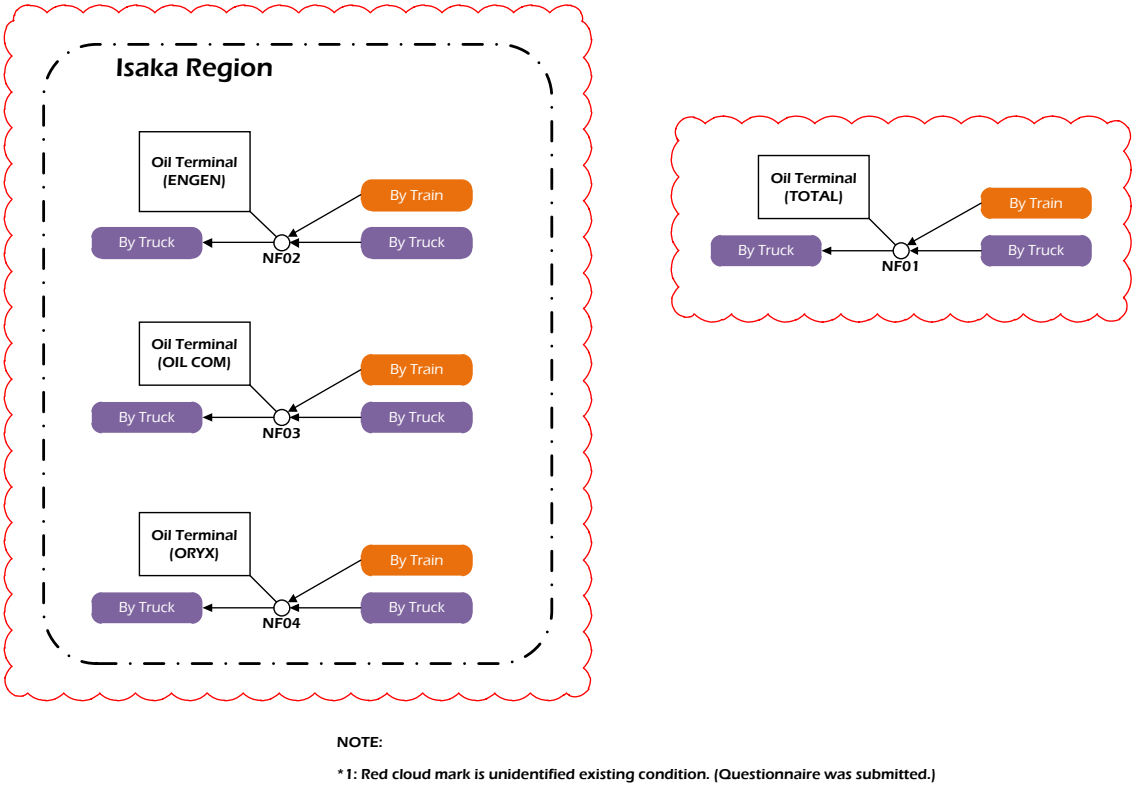
NOTE: as of December 2010

*1: Data is not available.

Source: JICA Study Team

(6) Oil Terminal at Shinyanga

Currently, there are four (4) OMCs with a total storage capacity of 9,291 metric tonnes in Shinyanga. The oil terminal diagram in Shinyanga is shown in Figure 6.46.



NOTE:

*1: Red cloud mark is unidentified existing condition. (Questionnaire was submitted.)

Source: JICA Study Team

Figure 6.46: Oil Terminal Diagram in Shinyanga

The total storage capacity in Sinyanga is shown in Table 6.28.

Table 6.28: Total Storage Capacity in Shinyanga

Unit (MT)

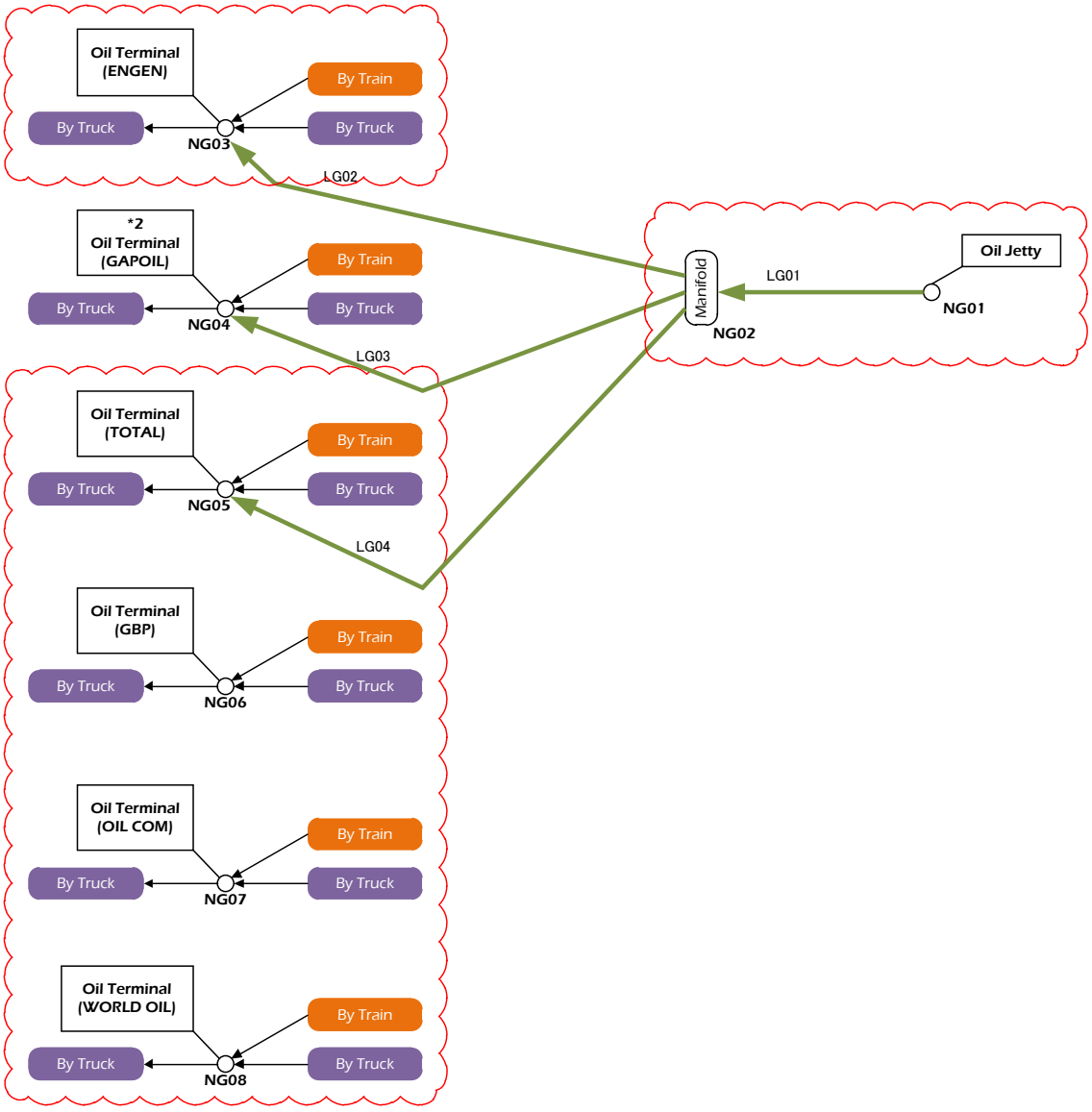
No.	COMPANY	AVGAS	LPG	MSP	JET A1	IK	AGO	IDO	FO	TOTAL
1	TOTAL	-	-	159	-	116	1,061			1,335
2	ENGEN (Isaka)	-	-	515	-	128	1,166			1,809
3	OILCOM (Isaka)	-	-	736		786	3,333			4,855
4	ORYX (Isaka)						1,291			1,291
	TOTAL	**-**	**-**	**1,410**	**-**	**1,030**	**6,851**	**-**	**-**	**9,291**

as of December 2010

Source: JICA Study Team

(7) Oil Terminal at Kigoma

Currently, there are six (6) OMCs with a total storage capacity of 9,660 metric tonnes (excluding GAPCO oil terminal capacity) in Kigoma. The oil terminal diagram in Kigoma is shown in Figure 6.47. GAPCO oil terminal in Kigoma is not in operational condition. Therefore, the data on this oil terminal has not been taken into consideration for this investigation.



NOTE:

*1: Red cloud mark is unidentified existing condition. (Questionnaire was submitted.)

*2: Not operational.

Source: JICA Study Team

Figure 6.47: Oil Terminal Diagram in Kigoma

The total storage capacity in Kigoma is shown in Table 6.29.

The capacity of GAPCO oil terminal is not considered in the total capacity figure in Kigoma because it is not in operational condition.

Table 6.29: Total Storage Capacity in Kigoma

Unit (MT)

No.	COMPANY	AVGAS	LPG	MSP	JET A1	IK	AGO	IDO	FO	TOTAL
1	ENGEN	-	-	1,024	-	314	458	-	141	1,937
2	TOTAL	-	-	1,177	637	-	638	-	-	2,452
3	GBP	-	-	736	-	393	1,250	-	-	2,379
4	OIL COM	-	-	567	385	252	596	128	-	1,927
5	WORLD OIL	-	-	302	-	322	342	-	-	966
-	GAPOIL *1	-	-	1,480	-	1,583	1,678	138	350	5,228
	TOTAL	**-**	**-**	**3,805**	**1,022**	**1,281**	**3,283**	**128**	**141**	**9,660**

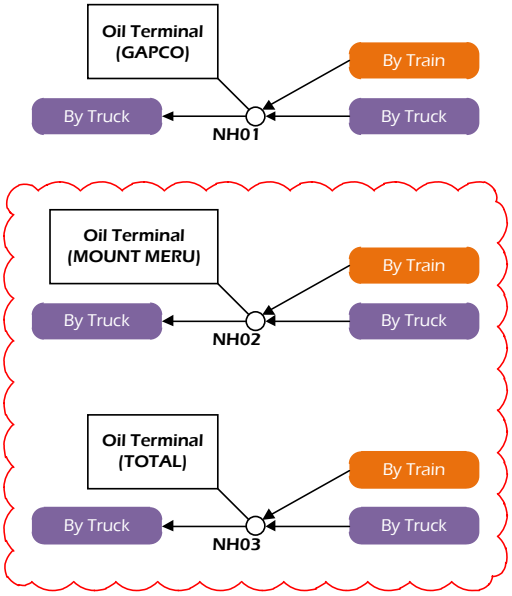
NOTE: as of December 2010

*1: Not operational condition. Therefore, this capacity is not considered to the total capacity in Kigoma.

Source: JICA Study Team

(8) Oil Terminal at Arusha

Currently, there are three (3) OMCs with a total storage capacity of 3,645 metric tonnes in Arusha. (This excludes MOUNT MERU oil terminal capacity because it has not been identified.) The oil terminal diagram in Arusha is shown in Figure 6.48.



NOTE:

*1: Red cloud mark is unidentified existing condition. (Questionnaire was submitted.)

Source: JICA Study Team

Figure 6.48: Oil Terminal Diagram in Arusha

The total storage capacity in Arusha is shown in Table 6.30.

Table 6.30: Total Storage Capacity in Arusha

Unit (MT)

No.	COMPANY	AVGAS	LPG	MSP	JET A1	IK	AGO	IDO	FO	TOTAL
1	GAPOIL	-	-	400	-	603	1,084	-	-	**2,087**
2	MOUNT MERU	*1	*1	*1	*1	*1	*1	*1	*1	*1
3	TOTAL	-	-	320	-	169	872	79	118	**1,558**
	TOTAL	**-**	**-**	**720**	**-**	**772**	**1,956**	**79**	**118**	**3,645**

NOTE: as of December 2010

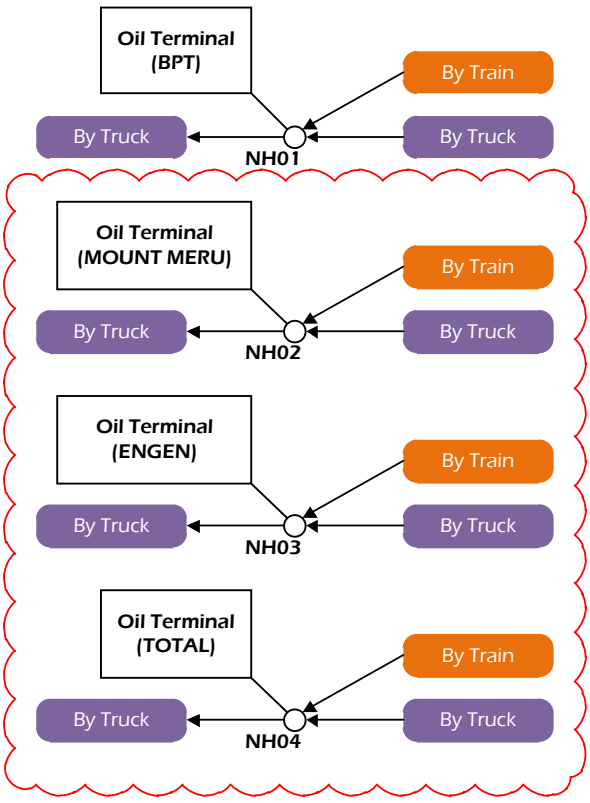
*1: Data is not available.

Source: JICA Study Team

(9) Oil Terminal at Moshi

Currently, there are four (4) OMCs with a total storage capacity of 3,296 metric tonnes in Moshi. The oil terminal diagram in Moshi is shown in Figure 6.49.

CHEVRON sold its oil terminal in Moshi to ENGEN.



NOTE:

1: Red cloud mark is unidentified existing condition. (Questionnaire was submitted.)

Source: JICA Study Team

Figure 6.49: Oil Terminal Diagram in Moshi

The total storage capacity in Moshi is shown in Table 6.31.

Table 6.31: Total Storage Capacity in Moshi

Unit (MT)

No.	COMPANY	AVGAS	LPG	MSP	JET A1	IK	AGO	IDO	FO	TOTAL
	BPT	-	-	736	-	71	833	-	169	1,809
	ORYX	-	50	151	-	80	252	39	67	640
	ENGEN *1			74		79	167			319
	BPT/TOTAL	24			504					527
	TOTAL	**24**	**50**	**961**	**504**	**229**	**1,252**	**39**	**236**	**3,296**

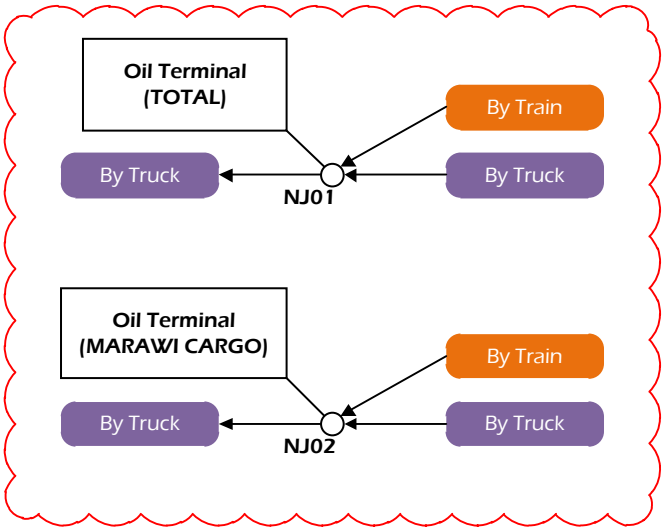
NOTE: as of December 2010

*1: ENGEN is former CHEVRON.

Source: JICA Study Team

(10) Oil Terminal at Mbeya

Currently, there are two (2) OMCs with a total storage capacity of 6,336 metric tonnes in Mbeya. The oil terminal diagram in Mbeya is shown in Figure 6.50.



NOTE:

***1: Red cloud mark is unidentified existing condition. (Questionnaire was submitted.)**

Source: JICA Study Team

Figure 6.50: Oil Terminal Diagram in Mbeya

The total storage capacity in Mbeya is shown in Table 6.32.

Table 6.32: Total Storage Capacity in Mbeya

Unit (MT)

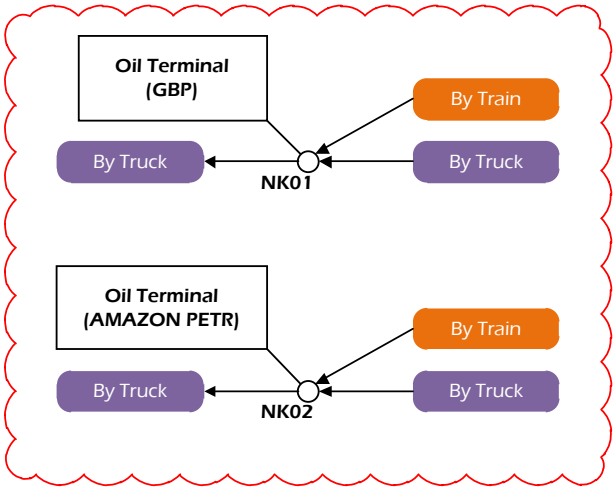
No.	COMPANY	AVGAS	LPG	MSP	JET A1	IK	AGO	IDO	FO	TOTAL
1	TOTAL	-	-	684	-	432	1,883	-	-	3,000
2	MALAWI C.	-	-	1,339	-	308	1,689	-	-	3,336
	TOTAL	**-**	**-**	**2,023**	**-**	**740**	**3,572**	**-**		**6,336**

as of December 2010

Source: JICA Study Team

(11) Oil Terminal at Tabora

Currently, there are two (2) OMCs with a total storage capacity of 534 metric tonnes in Tabora. (This excludes GBP oil terminal storage capacity because it has not been identified.) The oil terminal diagram in Tabora is shown in Figure 6.51.



NOTE:

1: Red cloud mark is unidentified existing condition. (Questionnaire was submitted.)

Source: JICA Study Team

Figure 6.51: Oil Terminal Diagram in Tabora

The total storage capacity in Tabora is shown in Table 6.33.

Table 6.33: Total Storage Capacity in Tabora

Unit (MT)

No.	COMPANY	AVGAS	LPG	MSP	JET A1	IK	AGO	IDO	FO	TOTAL
1	GBP	*1	*1	*1	*1	*1	*1	*1	*1	*1
2	AMAZON PETR	-	-	88	-	148	298	-		534
	TOTAL	**-**	**-**	**88**	**-**	**148**	**298**			**534**

NOTE: as of December 2010

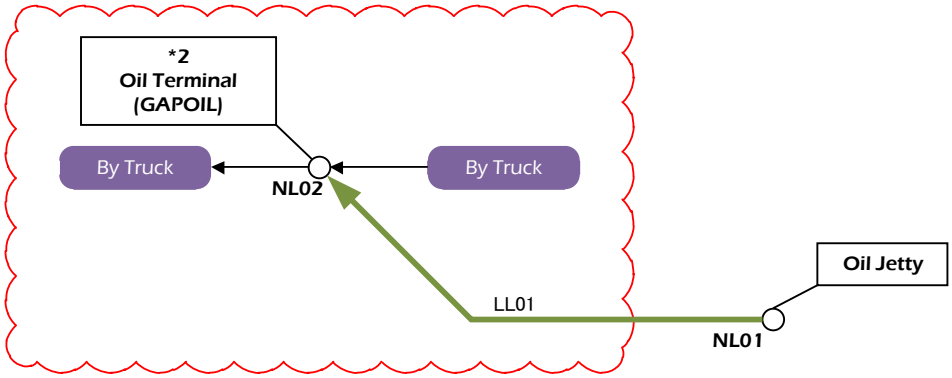
*1: Data is not available.

Source: JICA Study Team

(12) Oil Terminal at Bukoba

Currently, there is one (1) OMC which is owned by GAPCO in Bukoba. However, the GAPCO oil terminal in Bukoba is not in operational condition. Therefore, the data on this oil terminal is not taken into consideration for this investigation.

The oil terminal diagram in Bukoba is shown in Figure 6.52.



NOTE:

1: Red cloud mark is unidentified existing condition. (Questionnaire was submitted.)

2: Not operational.

Source: JICA Study Team

Figure 6.52: Oil Terminal Diagram in Bukoba

The total storage capacity in Bukoba is shown in Table 6.34.

The capacity of the GAPCO oil terminal is not considered as part of the total capacity figure in Bukoba because it is not in operational condition. Therefore, there will be no storage capability of petroleum products in Bukoba.

Table 6.34: Total Storage Capacity in Bukoba

Unit (MT)

No.	COMPANY	AVGAS	LPG	MSP	JET A1	IK	AGO	IDO	FO	TOTAL
1	GAPOIL *1	-	-	129	-	208	45	-	-	382
	TOTAL	-	-	0	-	0	0	-	-	0

NOTE: as of December 2010

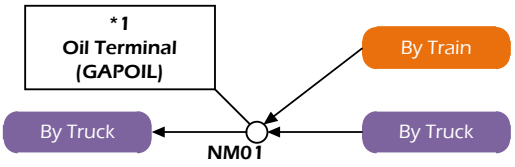
*1: Not operational condition. Therefore, this capacity is not considered to the total capacity in Bukoba.

Source: JICA Study Team

(13) Oil Terminal at Dodoma

Currently, there is one (1) OMC which is owned by GAPCO in Dodoma. However, the GAPCO oil terminal in Dodoma is not in operational condition. Therefore, the data on this oil terminal is not taken into consideration for this investigation.

The oil terminal diagram in Dodoma is shown in Figure 6.53.



NOTE:

1: Not operational.

Source: JICA Study Team

Figure 6.53: Oil Terminal Diagram in Dodoma

The total storage capacity in Dodoma is shown in Table 6.35.

The capacity of GAPCO oil terminal is not considered as part of the total capacity figure in Dodoma because it is not in operational condition. Therefore, there will be no storage capability of petroleum products in Dodoma.

Table 6.35: Total Storage Capacity in Dodoma

Unit (MT)

No.	COMPANY	AVGAS	LPG	MSP	JET A1	IK	AGO	IDO	FO	TOTAL
1	GAPOIL *1	-	-	62	-	215	280	-	-	557
	TOTAL	-	-	0	-	0	0	-	-	0

NOTE: as of December 2010

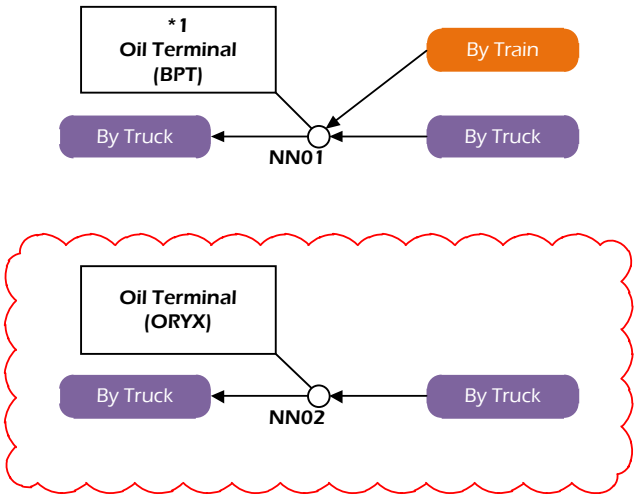
*1: Not operational condition. Therefore, this capacity is not considered to the total capacity in Dodoma.

Source: JICA Study Team

(14) Oil Terminal at Makambako

Currently, there are two (2) OMCs in Makambako. However, the BPT oil terminal in Makambako is not in operational condition. Therefore, the data on this oil terminal is not taken into consideration for this investigation.

The oil terminal diagram in Makambako is shown in Figure 6.54.



NOTE:

1: Red cloud mark is unidentified existing condition. (Questionnaire was submitted.)

2: Not operational.

Source: JICA Study Team

Figure 6.54: Oil Terminal Diagram in Makambako

The total storage capacity in Makambako is shown in Table 6.36.

The capacity of the BPT oil terminal is not considered as part of the total capacity figure in Makambako because it is not in operational condition. The storage capacity of ORYX oil terminal has also not been identified.

Therefore, there will be no storage capability of petroleum products in Makambako in this stage. It is planned that unidentified data will be collected in the next investigation.

Table 6.36: Total Storage Capacity in Makambako

Unit (MT)

No.	COMPANY	AVGAS	LPG	MSP	JET A1	IK	AGO	IDO	FO	TOTAL
1	ORYX	*1	*1	*1	*1	*1	*1	*1	*1	*1
-	BPT *2	-	-	317	-	200	815	-	-	1,332
	TOTAL	-	-	0	-	0	0	-	-	0

NOTE: as of December 2010

*1: Data is not available.

*2: Not operational condition. Therefore, this capacity is not considered to the total capacity in Makambako

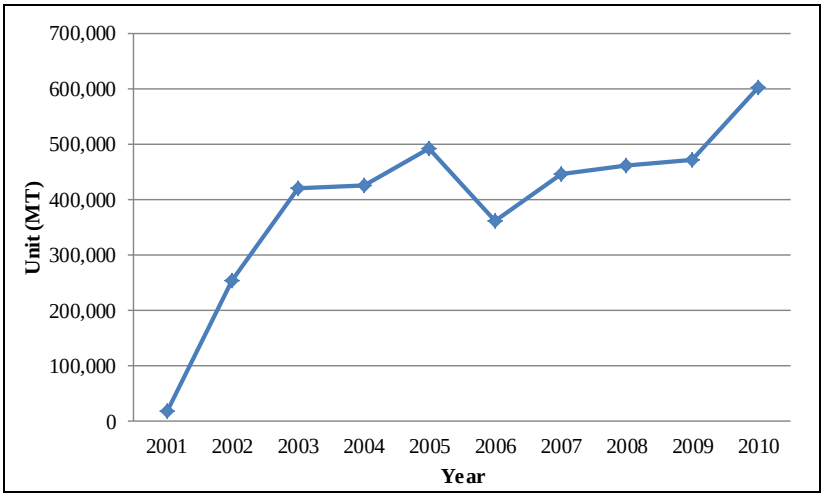
Source: JICA Study Team

6.2.7 Energy Supply and Demand

(1) Crude Oil

The current transportation volume of the TAZAMA Pipeline which handles crude oil from Dar es Salaam to Zambia has increased by 27% from last year.

The trend in transportation volume is shown in the following Figure 6.55.



Source: TAZAMA Pipeline Limited

Figure 6.55: Trend in Transportation Volume

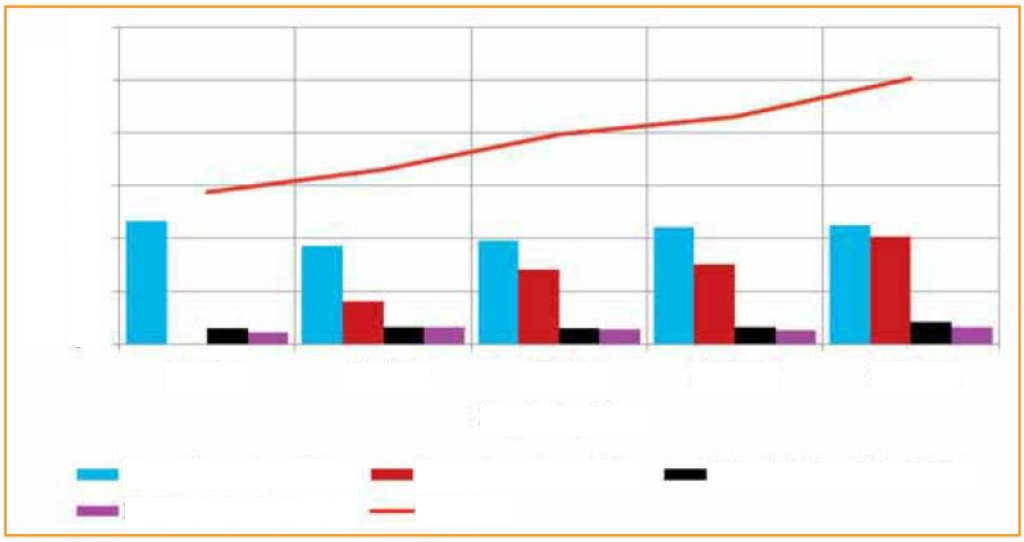
A future expansion plan will be analyzed based on the 2nd investigation results and the result of demand forecast.

(2) Natural Gas

Natural gas consumption has grown rapidly due to population growth and the increase in economic activities in recent years.

Depending on the electricity demand growth in the power generating plant, the increase in natural gas utilization grew linearly and substantially by about 16.52% per annum.

Annual natural gas sales trend is shown in Figure 6.56.



PG: Protected Gas (dedicated to the initial 110 MW capacity owned and operated by Songas, the first two kilns of Twiga Cement Factory in Dar es Salaam, and 6MW of Somanga Fungu power plant) kept stable at around 11 BCF per annum.
AG: Additional gas sales to electric power generation plants.
Source: EWURA, "Annual Report for the Year Ended 30th June, 2010"

Figure 6.56: Annual Natural Gas Sales Trend

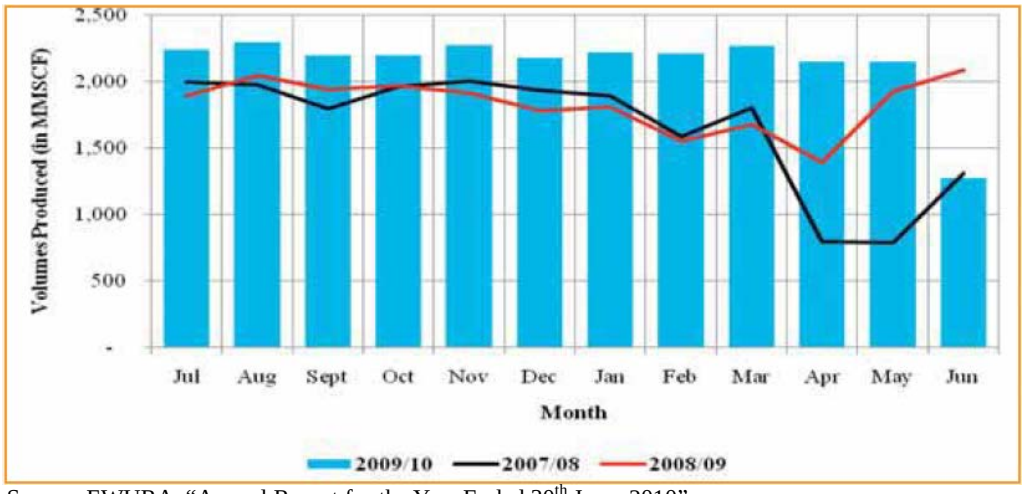
The following excerpt is taken from the report of "Annual Report for the Year Ended 30th June, 2010" prepared by EWURA.

"According to the McDaniel & Associates Report dated 31st December, 2008, proven and probable reserves in the Songo-Songo gas field (the main and north structures) are estimated at 828.8 billion standard cubic feet (BCF), while proven, the probable and possible reserves stand at 1.562 trillion standard cubic feet (TCF).

According to Rose & Associates Report dated 2008, the proved and probable gas reserves are estimated at 2.015 TCF, while the proved, the probable and possible gas reserves in the Mnazi Bay vicinities are estimated at 4.055 TCF.

The natural gas production from the Songo-Songo gas field met 75 percent of Dar es Salaam market, which is estimated at 120 million standard cubic feet per day (MMSCFD). On average, the critical gas processing facility was 109.5% available at 76.65 MMSCFD after the capacity of the common processing facility for Songas and PanAfrican Energy on Songo-Songo Island was re-rated by Lloyds Register from the operating capacity of 70 MMSCFD to the maximum of 90 MMSCFD. The peak gas demand of 90.07 MMSCFD was recorded on 24 June 2010."

Monthly natural gas production from Songo-Songo gas reservoir is shown in Figure 6.57.



Source: EWURA, "Annual Report for the Year Ended 30th June, 2010"

Figure 6.57: Monthly Natural Gas Production from Songo-Songo Gas Reservoir

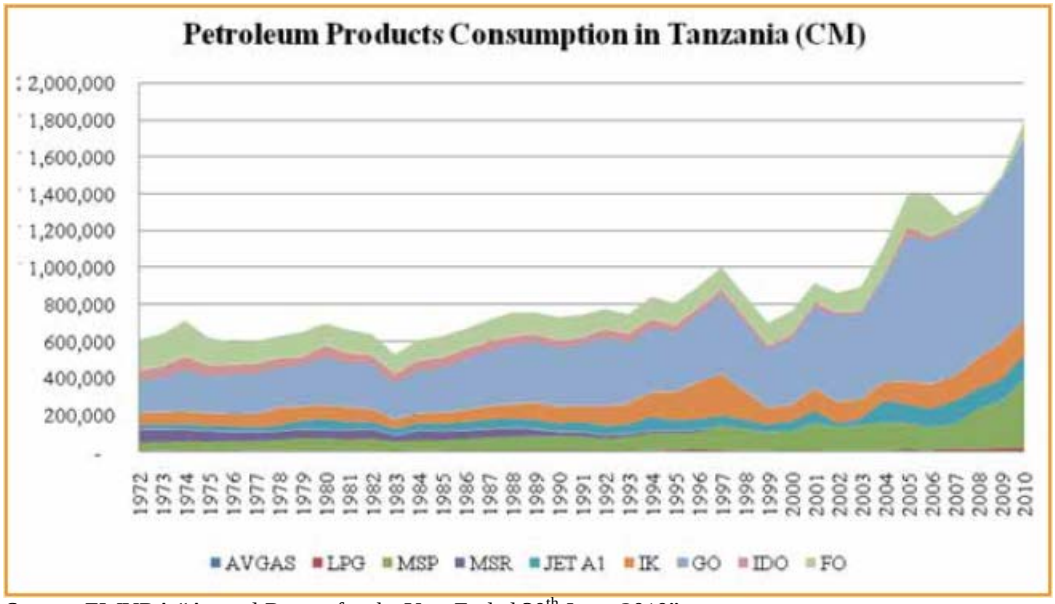
Monthly natural gas production from Minazi bay reservoir is shown in Figure 6.58.

Source: EWURA "Annual Report for the Year Ended 30th June, 2010"

Figure 6.58: Monthly Natural Gas Production from Mnazi Bay Gas Reservoir

(3) Petroleum Product

Consumption of petroleum products has grown rapidly due to population growth and the increase in economic activities over the last ten years. It is as shown in Figure 6.59.

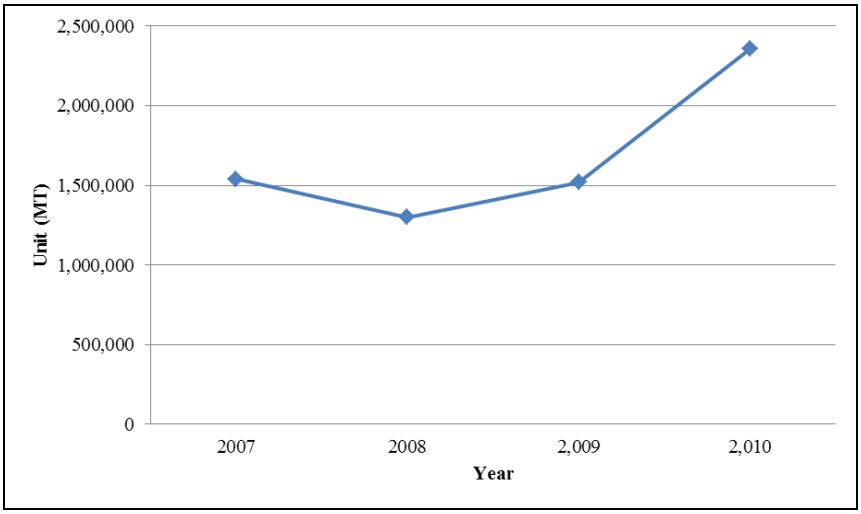


Source: EWURA "Annual Report for the Year Ended 30th June, 2010"

Figure 6.59: Petroleum Production Consumption in Tanzania

The trend in quantities of imported petroleum is shown in Figure 6.60.

In 2010, a total of about 1,557,898,439 liters of petroleum products were imported for the local market, and 797,914,676 liters were imported for transit to neighboring countries.



Source: EWURA

Figure 6.60: Imported Petroleum Quantities

More than approximately 95% of petroleum product imports to Tanzania are unloaded at the Kurasini Oil Jetty (KOJ) at the port of Dar es Salaam. The remaining 5% of petroleum product was imported through Tanga and Lake Victoria ports and, by road tankers, through the Sirari border with Kenya.

The breakdown of the imported petroleum quantities in Tanzania for each entry point is shown in Table 6.37.

Table 6.37: Imported Petroleum Quantities in Tanzania

Region	2009 (MT)	2010 (MT)	Year-on-Year
Dar es Salaam	1,456,981	2,278,793	+56%
Tanga	16	7,971	+49,719%
Mwanza	5,622	12,103	+115%
Musoma	10,222	6,870	−33%
Sirari	47,357	50,074	+6%
Total	1,520,198	2,355,813	+55%

Source: EWURA

6.2.8 Current Development Plan

(1) Crude Oil Pipeline and Related Facility

The Oil Refinery and Refinery Product Pipeline Project plans to install the following:

- Oil refinery (200,000 barrels a day refinery) in Dar es Salaam
- Dar es Salaam – Mwanza Petroleum Product Pipeline
- Dar es Salaam – Kigoma Petroleum Product Pipeline

The construction project of an oil refinery (200,000 barrels a day refinery) in Dar es Salaam and a pipeline with a distance of 1,500 km for transporting refinery products from Dar es Salaam to Mwanza and Kigoma was to be undertaken by Noor Oil and Industrial Technology Ltd (NOIT) with a consortium of Russian and German firms.

Its advantages are linked to the huge net proceeds from the storage and transport of petroleum products to Mwanza, Kigoma and neighbouring 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 caused by excessive use of surface transport to deliver products to destinations.

The new oil refinery can supply to the inland service in Tanzania and its neighbours with petroleum products in addition to some for the export market.

Landlocked Uganda currently depends on the Kenyan port of Mombasa for the bulk of its imports and exports.

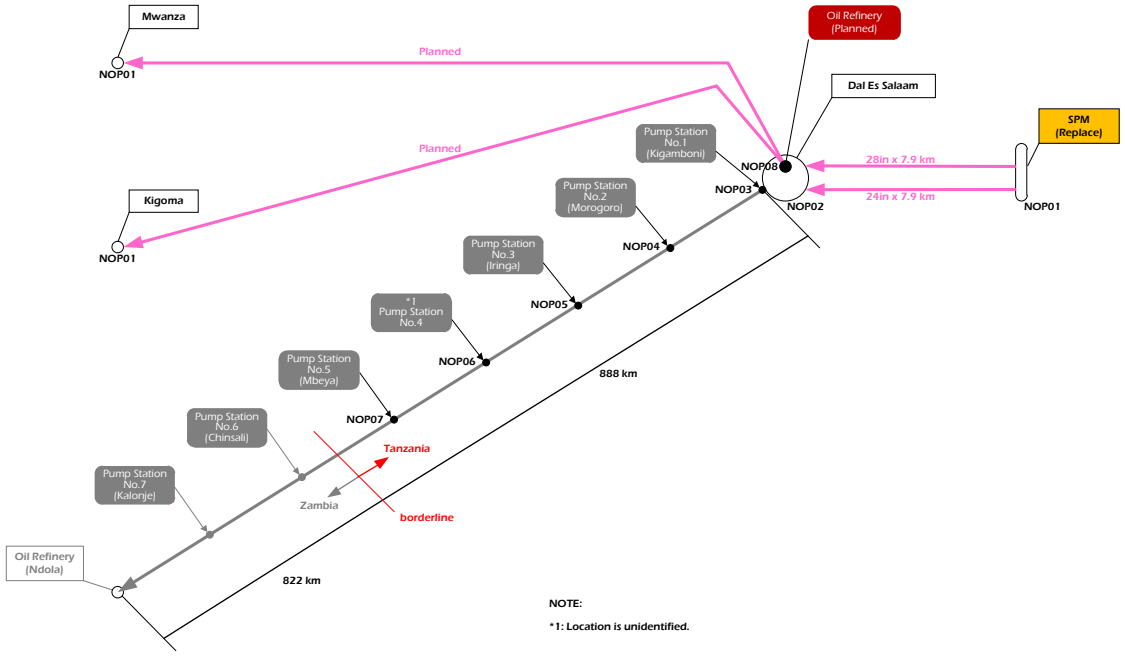
NOIT had approached the government to discuss the possibilities of extending the pipeline from Mwanza to Uganda's oil region, along the western border with Congo.

The Replacement SPM and Pipeline Project is planned to replace and to install the following:

- Replacement of SPM in Dar es Salaam port
- Installation of 28 inch crude pipeline from SPM to Dar es Salaam port
- Installation of 24 inch petroleum product pipeline from SPM to Dar es Salaam port

The replacement of Single Point Mooring (SPM) and pipelines in Dar es Salaam port in Tanzania is planned by Leighton Offshore. This project includes installation of two (2) pipelines: a 28 inch crude oil pipeline and a 24 inch petroleum product pipeline. Both pipeline lengths are 7.9 km (3.6 km offshore and 4.3 km onshore).

The development plan of crude oil pipeline is shown in Figure 6.61.



Source: JICA Study Team

Figure 6.61: Development Plan of Crude Oil Pipeline

(2) Natural Gas Pipeline Project

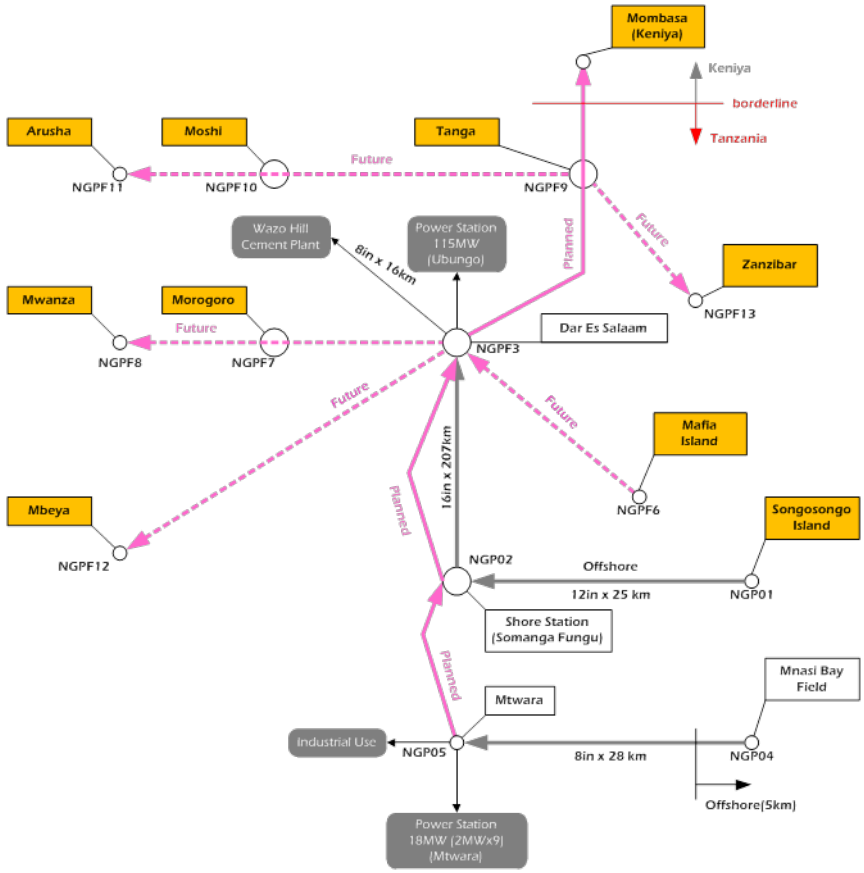
Construction of a natural gas pipeline from Mnazi Bay in the Mtwara Region and Songo-Songo in Kilwa to Dar es Salaam is planned. This project is carried out by a loan agreement for more than USD 1 billion with the Chinese government.

Tanzania is planning to construct and own the natural gas pipeline by 100%. The pipeline will connect Mnazi Bay with Songo-Songo, Kiliwani and Nyuni, Mkuranga and deep sea gas reserves on the coastal area.

The development plan of the natural gas pipeline currently being planned is described below.

- Planned Pipeline
  - 24–30 inch Songo-Songo–Dar es Salaam Gas Pipeline
  - Dar es Salaam–Mombasa (in Kenya) Gas Pipeline
  - Mtwara–Dar es Salaam Gas Pipeline
  - Mnazi Bay–Somanga Fungu Gas Pipeline
- Future Pipeline
  - Dar es Salaam–Mwanza Gas Pipeline
  - Dar es Salaam–Mbeya Gas Pipeline
  - Tanga–Zanzibar Gas Pipeline
  - Tanga–Moshi–Arusha Gas Pipeline

The development plan of the natural gas pipeline is shown in Figure 6.62.



Source: JICA Study Team

Figure 6.62: Development Plan of Natural Gas Pipeline

(3) Oil Terminals

The oil marketing companies will each have an extended plan for an oil terminal. However, the plan is not clear in the present stage.

It will be determined by the management policy of each company. Therefore, it is difficult to collect information on the long term scheme from the oil marketing companies.

This, this study will use the trend of handing volume.

In this study, analysis will be performed based on prediction of the transition tendency of the transfer volumes and the rate of GDP growth.

6.3 Cross-Border Operations and Facilities

Since 2004, the Tanzania Revenue Authority has been in the process to modernize the Customs and Excise Department through the implementation of various initiatives incorporated into the TRA Corporate Plan with the vision of transforming its operation into a modernized customs administration by 2013. The Customs reform initiatives incorporated into both TRA Corporate Plans are in line with the Government's broad social and economic policies, World Trade Organization (WTO) initiatives on trade facilitation and the World Customs Organization (WCO) Framework of Standards.

6.3.1 The Customs Modernization

The customs modernization efforts since 2004 include the following:

- **Implementation of EAC Customs Union:** Customs operations are administered under the provisions of the EAC Customs Management Act (2004), Common External Tariff and other EAC Customs Protocols.

- **Automation of declaration processes:** ASYCUDA++ system has been implemented to enable clearing agents to lodge documents from their offices. Additional system of ASY-SCAN enabled the agent to lodge declarations with scanned documents attached electronically. Central Data Processing Office has been established in the headquarters of the customs and the ASYCUDA++ system has been implemented in 28 major customs stations. (These include; DSM Customs Service Centre, DSM Wharf, JNIA, Holili, Moshi, Arusha, Mwanza, Tunduma, Kasumulu, Mtwara, Kigoma, Tanga, Horohoro, Isaka, Namanga, KIA, Sirari, Zanzibar, Bukoba, Mutukula, Rusumo, Kabanga, Pemba, Misugusugu, Makambako, Iringa, MCCL-Mbeya branch, and Mtambaswala.) By this central processing system, it became possible to provide a uniform treatment of Valuation and Classification across the country since February 2010.

- **Database and System development**: Several database systems have been developed and implemented such as the Pre-arrival Documentation System, Valuation and Classification System with Transaction Price Database and Computerized Risk Management System (CRMS). These systems promote trade compliance through fair, equitable and transparent application of customs values by eliminating double standards in valuation of imported/exported goods by using real time and on-line database.

- **New Valuation method:** In line with the Valuation Database System, TRA has adopted the application of a variant method of valuation of used motor vehicles which applies a depreciation-based method to arrive at customs values for tax purposes. This technique has been used successfully in customs administrations of the Kenya Revenue Authority. TRA decided to adopt a similar model and the new process started in June, 2011. This method facilitated the reduction in time taken to clear motor vehicles by eliminating several processes between the taxpayers and customs officers.

- **Implementation of One Stop Border Post (OSBP):**
  - Under the project of East Africa Trade and Transport Facilitation (EATTF), a feasibility study on the construction of several border sites has been conducted. Under JICA support, the construction of OSBP at Rusumo and Namanga has been in progress. A feasibility study was conducted on both stations, and the design for office construction at Rusumo was prepared and approved by both governments of Tanzania and Rwanda.
  - The construction of OSBP at Namanga has yet to be started even though the design and training of a computer system to be installed has been completed in Kenya. The Government compensation to the local residents to relocate has not been paid yet. These preparations and construction is under TANROAD under the Ministry of Works.
  - The JICA project for capacity development of EAC customs prepared Real Time Monitoring System and is being tested at Namanga. The system is ready to be rolled out to all other border stations.

- The Trade-Mark East Africa has shown interest to finance the development of OSBP at Kabanga and Tunduma. Feasibility study at Tunduma has completed. The Joint Consultative meeting between Tanzania and Zambia was held in Dar es Salaam and the dialogue is continuing.

- **Scanners**
  - Two Container Scanners were introduced for customs operations at Dar es Salaam and Zanzibar ports in 2010. Eleven officers trained on Image analysis and scanning management system while 4 officers attended training on scanner maintenance in July 2010.
  - For airport inspection, 4 pallet scanners have been procured for screening cargo of arrival passengers in 2011. Two machines are allocated at JNIA, one each at KIA and Zanzibar Airport.

- **Authorized Economic Operator (AEO) implementation:** Based on the WCO safe programme, AEO concept is introduced with implementation of Compliant Traders Scheme and 54 traders are selected.

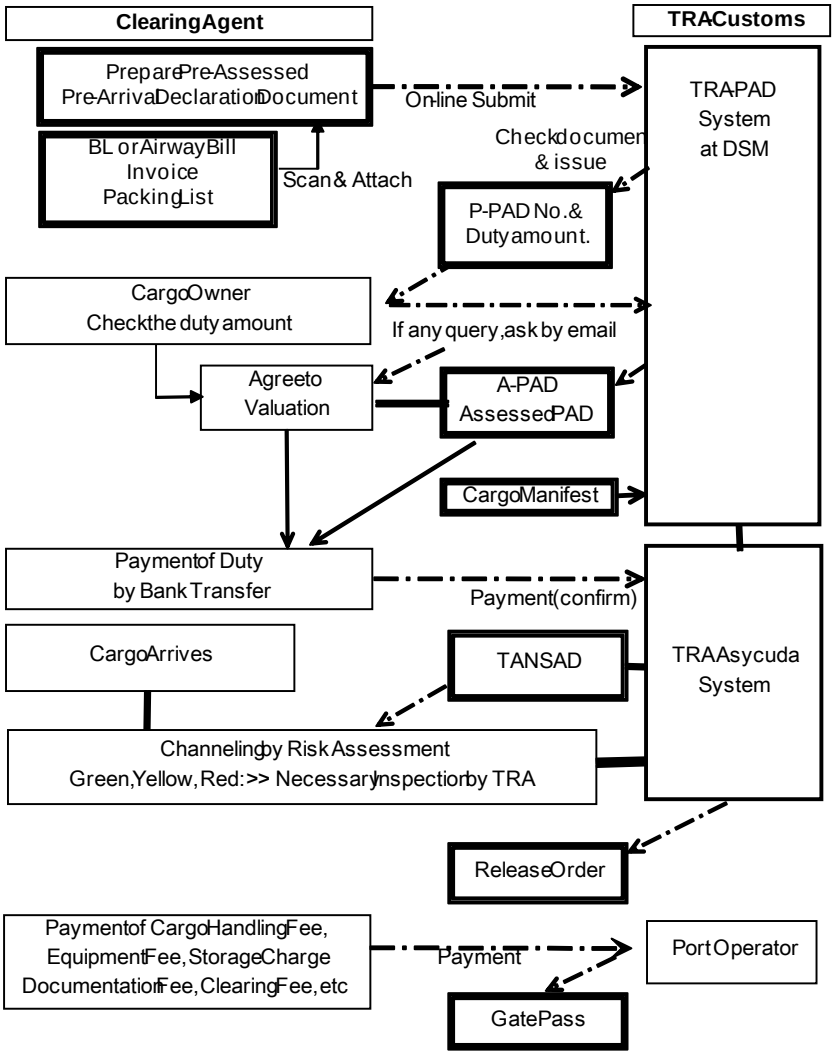
The Customs Modernization has been continuing with Human Resource Capacity Enhancement and Organization Development including strengthening enforcement capacity and increasing relationship with stakeholders.

6.3.2 Customs Procedure in Tanzania

Customs procedure is centralized with ASYCUDA++ system introduced in May 2005 at JNIA, DSM Port and other 18 Customs offices. A document transfer system called ASYSCAN was also introduced in 2009 for facilitating document verification, revenue accounting, manifest and cargo control, risk based selectivity, warehousing and transit control management.

ASYCUDA++ is based on wide area network communication, with computerized system linked to a single server at Customs Headquarters in Dar es Salaam. Declarants prepare and assess declarations directly in ASYCUDA++ through direct trader input facility.

The following describes the flow of the declaration process with Pre-Arrival documentation until the release of cargo. Based on the documents of B/L, Invoice and Packing List, a clearing agent prepares the Pre-assessed Pre-Arrival Document (P-PAD). Using internet connection, P-PAD is sent to the TRA-PAD system and is checked. Then the system responds with a P-PAD number with duty amount to be paid. If the cargo owner does not agree to the indicated amount, he can make inquiry by e-mail to the customs. After the duty amount is agreed and paid, Assessed-PAD is issued. The Asycuda system will issue Tanzania Single Administration Document (TANSAD) for assessing the risk premium of cargo, and return the result of selectivity by red (cargo inspection), yellow (document check), blue (transit) or green (immediate release). If it is channeled red, the agent has to prepare for physical examination. After clearing the examination, a Release Order will be issued. In parallel with the customs procedure, port procedures should take place. After the required documentation for the port and payment of fees and charges are completed, a Gate Pass will be issued.



Source: JICA Study Team
Note: All declarations should be lodged by P-PAD electronically.
TANSAD is automatically produced by Asycuda++ system using information of A-PAD.

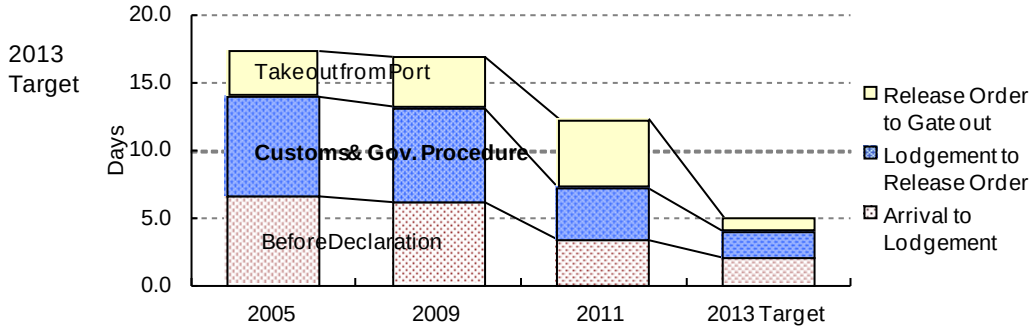
Figure 6.63: Customs Procedure Flow (Import)

6.3.3 Customs Processing Time

Tanzania customs has been making effort by reviewing its performance regularly in recent years. The Time Release Study is one of them and the result is published in the report. Based on the report and related information from officers involved, the following facts were identified.

Cargo arrival to removal at the Port of DSM was more than 15 days until 2009, but improved to 12 days in 2011. As shown in the figure below the dwell time of cargo in the port can be divided into three parts based on the responsibility of processing documents and arrangements. The first section is from arrival to lodgment of declaration, which took more than 6 days before and now reduced to 3 days. The second section is from declaration to Release Order, which also took 6 days before and has improved to 4 days. The third section is Release Order to Gate out, which seems to have been increased from 3 days to 5 days in the past 2 years. The first section is dependent on the pre-arrival work of a Clearing Agent. The second section is mainly the work of customs administration including other related government organizations, and the last section is related to the port infrastructure and cargo owners' arrangement to remove cargo.

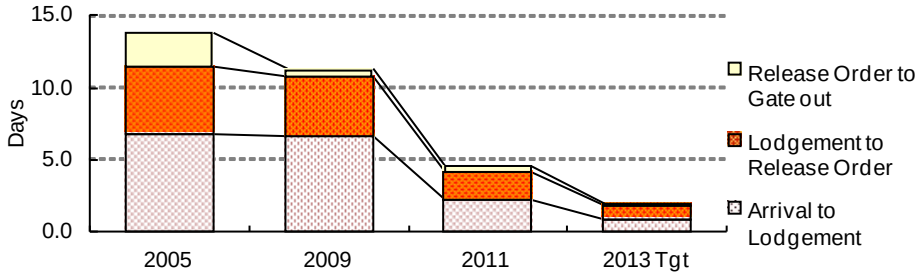
For customs declaration documents, pre-arrival lodgment system and cargo manifest reported into ASYCUDA++ system before vessel arrival increased from 36% in 2009 to 89% in 2011. These improvements has contributed to the reduction of processing time of both section 1 and 2. The target of cargo clearance time is set to 5 days from the current 12 days at Dar es Salaam port.



Source: Data from TRA officers and Tanzania Time Release Study, 2009

Figure 6.64: DSM Port Cargo Clearance Days

At the Julius Nyerere International Airport (JNIA), the cargo clearance time was more than 10 days in 2009 because of long preparation time of clearing agents taking more than 6 days. It is now reduced to 2 days for both sections. As a result, the total time taken for gate out is now less than 5 days. The target for the year 2013 sets the dwell time of cargo to 2 days, which is the same as the dwell time of KIA and Mwanza International Airport now.

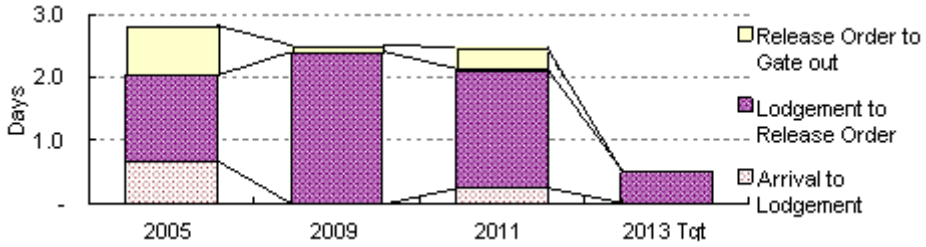


Source: Data from TRA officers and Tanzania Time Release Study, 2009

Figure 6.65: JNIA (Airport) Cargo Clearance Days

Across land border stations, cargo clearance time was 2.5 days in the quarter ending June 2011, a deterioration from 2 days reported by TRS baseline in 2009. The figure below shows the trend on cargo clearance time. The target is to reduce the time from 2 days to half a day with the operation of OSBP across land border stations by June 2013. The survey in 2009 indicates some irregular composition of three sections. The second section may include preparation time of declaration, because in many cases, agents prepare the declaration document after cargo arrival because pre-lodgment had not started.

The reason for the long time required for cargo documentation at the land border is a result of slow internet connection and slow delivery of cargo information by the consignee. Drivers usually carry documents and hand over to the branch offices of agents upon arrival at the border. Agents start input of data to be sent to central office of customs at DSM. There are still many owners who provide cargo information only when the truck departs.



Source: Data from TRA officers and Tanzania Time Release Study, 2009

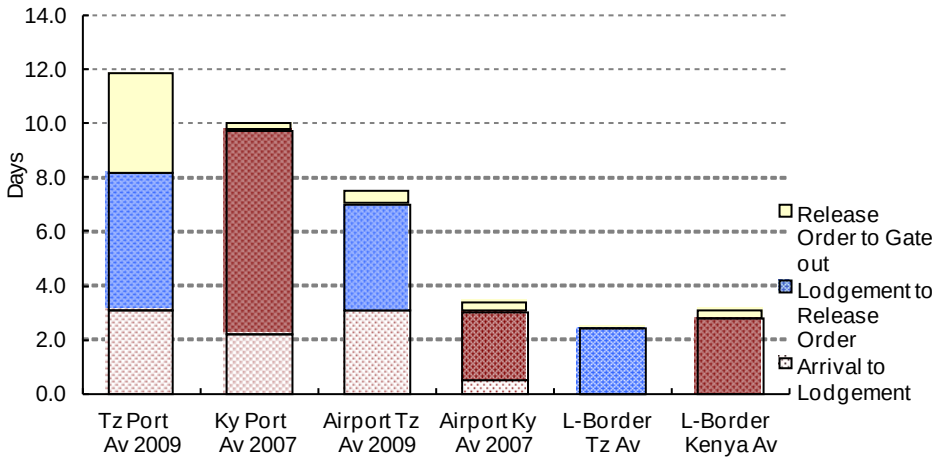
Figure 6.66: Land Border Cargo Clearance Days

Performance compared with the Kenya Revenue Authority is exhibited in the figure below.

Even though total dwell time at DSM port is longer than that of Mombasa port, the time for Release Order is faster than Kenya. It takes 10 days from arrival to Release Order of the customs. (Section 1 and 2) Port procedure and cargo handling to gate out took time for 4 days at DSM whereas it is less than half a day at Mombasa port.

Airports in Kenya is taking less than 4 days which is half of the JNIA at Tanzania. However, for air cargo, 4 days of processing time is still long. Now TRA set the target to reduce it to 2 days.

For land border, it takes more than 2 days in both Kenya and Tanzania. Both countries are making efforts including OSBP so that process time will be reduced to half a day.



Source: Data from TRA Tanzania Time Release Study, 2009

Figure 6.67: Comparison of Cargo Clearance Time
(Tanzania Average in 2009 and Kenya Average in 2007)

6.3.4 Transit Cargo to Neighbouring Countries

There were 118,000 declarations for transit cargo last year which accounts to approximately 30% of all transactions. The processing record of transit by borders is shown in the table below. More than 50% of declarations are processed at Tunduma, a border with Zambia. According to the interview at Tunduma border station, 95% of cargo are sea-born transit from DSM port, and include cargos onward to DRC. Transit cargo from Zambia is mostly copper related products such as wires and plates.

The daily average of declarations is now reaching 200. In addition to this increase in number, lack of space makes border areas very crowded. The bilateral agreement between Tanzania and Zambia requires the processing of documents for both countries before crossing the border. Therefore, cargos from Tanzania stay before the border at Tunduma and wait for the processing by both Tanzania and Zambia. Documents are carried to the Zambian agents entering data into the Zambian system newly and cargo owner in Zambia has to pay for import duty. For all of these procedures it takes 3 to 5 days. After clearing both customs, cargo may cross the border.

Table 6.38: Transit Transactions at Land Border Stations (Year 2010–2011)

Station	Number of Transactions	Ratio (%)
Tunduma (Zambia)	61,429	52
Rusumo (Rwanda)	21,315	18
Kabanga (Brundi)	17,207	15
Kasumulu (Malawi)	12,827	11
Mutukula (Uganda)	2,395	2
Kigoma Port (DRC)	1,821	2
Mwanza Port (Uganda)	372	0.3
Isaka (ICD)	223	0.2
Zanzibar Longroom	198	0.2
DSM Wharf	117	0.10
Namanga (Kenya)	49	0.04
Kigoma (DRC)	10	0.01
Horohoro (Kenya)	9	0.01
Mtwara Port	8	0.01
DSM Airport (JNIA)	6	0.01
Zanzibar Port	5	0.00
Bukoba Lake Port	5	0.00
Tazara Mbeya Station	2	0.00
Holili (Kenya)	1	0.00
Mtambaswala	1	0.00
Total	118,000	100

Source: TRA

There are some reported pilferage cases but the number is less than 10 last year. The ratio of missing cargo is less than 0.01%. There are specific areas where lorries were robbed together with drivers in the suburb of DSM between Cherinze and Dumira. The robbery is prone to happen at night where roads are not paved.

The amount of bond for transit cargo is the same as import duty. If the cargo is lost, the bond will be confiscated and additional 50% is charged as penalty. Therefore the consignee has to pay 150% of duty in total. Customs has a checkpoint and stipulate the time-frame that a vehicle should arrive at each checking station.

Transit cargos are now checked for their movements at several points with signatures of customs officers on the movement sheets. Some trucking companies installed a satellite tracking system so that drivers will not steel diesel or waste time on the way, and for identification in times of accidents. The government is preparing a tracking system for the purpose of security. TRA is including both OSBP at border stations and cargo tracking system in the Customs Modernization Programme and preparing for implementation.

6.3.5 Customs Projects for Modernization Supported by External Funds

There are several projects currently running under the customs modernization programme. The title of the projects and their supporting agencies or source of funding are as follows:

1. Electronic Cargo Tracking system funded by Basket Funds.
2. Revenue Authorities Digital Data Exchange (RADDEX) funded by USAID & EAC Secretariat.
3. Cargo and Risk Management Systems funded by KOICA
4. New Customs Automated System funded by ICF/TRA.
5. One Stop Border Post (OSBP) development project funded by World Bank, JICA, Trade Mark East Africa.
6. Authorized Economic Operators Programme (AEO) funded by SIDA & WCO.

There are some project schemes now seeking financial support such as:

1. Time Release Study on Southern Corridor with its Future Plan similar to the pilot study currently conducted.
2. Enhance capacity on data analysis for Customs data to facilitate Decision Making Process on areas of Risk Management, Trade Facilitation. The details need to be discussed.

Chapter 7 Institutional Matters

7.1 Related Laws and Regulations

For the transport sector, the Surface and Marine Transport Regulatory Authority (SUMATRA), a multi-sectoral regulatory authority established by the Act of Parliament No. 9 of 2001, regulates rail, road and maritime transport services. One of the duties of SUMATRA is to promote availability of regulated services to all consumers including low income, rural and disadvantaged consumers. SUMATRA basically regulates all transport sectors except aviation.

7.1.1 Ports and Shipping Services

For the port and shipping sectors, SUMATRA provides the regulatory services, as in; developing rules and standards to regulate ports and shipping business; promoting port/shipping services, as well as intermodal transport with landlocked countries; issuing Shipping Agency Licenses to local shipping agents; ensuring service providers file their tariffs in accordance with established procedures, holding consultations with stakeholders in the industry; enforcing compliance of good conduct and practices by port and shipping service providers; promoting improved utilization of inland waterways shipping and intermodal transportation system; enhancing the competition of domestic inland transportation; and regulating services of shipping agents, shipping lines, port operators, clearing and forwarding agents and cargo consolidators. Regulations relating to ports and shipping are as follows.

- Port Terminal Operators Regulations
- Shipping Agency Regulations
- Cargo Consolidation Regulations
- Ports Performance Indicators and Benchmarks
- Maritime Safety and Security
- The Merchant Shipping (Fees) Regulations, 2005
- Medical Examinations Regulations 2004
- Ship and Port Facility Security Regulations 2004
- Small Ships Local Cargo Ship Safety Small Ship Safety Surveys and Inspections for Vessels Engaged on Local and Coastal Voyages Inland Waters Regulations 2004
- Training Certification and Manning Regulations 2004

7.1.2 Railway

For the railway sector, SUMATRA also provides the regulatory services, as in; recommending railway rules and regulations; monitoring and preventing abuse of monopoly position in the railway transport sector; coordinating issuance of licenses to railway operators; monitoring rail transport service standards; initiating rail transport service standards; initiating and conducting investigations in relation to the quality of service provided by rail transport operators; laying down standards and codes of conduct in respect of rail transport operators and customers; enforcing railway safety; investigating accidents and incidents prejudicial to rail safety; approving new rail infrastructure, safety systems and unusual safety related features of rolling stock; ascertaining the safety competence of the holders of railway operator license; and promoting intermodal cooperation in railway transport. Regulations relating to railway are as follows.

- The Railways (Accident Investigation and Reporting) Regulations
- The Railways (Licensing of Railway Operators) Regulations
- The Railways (Safety Plan) Regulations

- The Railways (Handling and Transportation of Dangerous Goods and Substances) – Draft
- The Railways (Automatic Brake, Passenger Communication Unit and Automatic Coupler) – Draft
- The Railways (Training , Competence and Medical Fitness of Safety Critical Workers) – Draft
- The Railways (Function and Duties of Chief Inspector of Railway Safety and Related Matters) Regulations , 2009 – (Draft)
- The Railways(Level Crossing) Regulations ,2009 (Draft)

7.1.3 Road

For the road sector, SUMATRA provides the regulatory services such as; registering and licensing commercial vehicles; determining and/or monitoring national and international yardsticks/benchmarks which can be used in determining the reasonableness of charges/rates/ tariffs charged by the providers of road transport services; formulating and reviewing codes of conduct for the providers and users of the road sector services; overseeing investigation in road transport accidents in collaboration with other stakeholders; liaising with Police, Ministry of Public Safety and Security and Ministry of Infrastructure Development on issues affecting road transport; developing rules and regulations in Road Transport; and regulating tariff and charges. Regulations relating to road are as follows.

- Passenger Vehicle – Technical Safety and Quality of Service Standard Rules 2008 (*NEW*)
- The Transport (Road Passenger) Licensing Regulation 2007
- Bajaj (Motorcycles and Tricycles) Regulations
- Amendment of the Transport Licensing Act

7.1.4 Air

The Tanzania Airports Authority (TAA) oversees air transport in Tanzania. Its mission is to provide high quality airport services and facilities to international and domestic air transport system in a most cost-effective manner and its vision is to become a model for provision of airport facilities and services in East Africa. Regulations relating to air transport are as follows.

- Tanzania Civil Aviation Authority Act 2003
- The Air Tanzania Corporation (Re-Organization and Vesting of assets and Liabilities) Act, 2002
- The Civil Aviation Act 1977 revised 2002

7.2 Policy Framework on Freight Transport and Trade Facilitation System

7.2.1 National Investment Promotion Policy in Economic Development in Tanzania

(1) Past Economic Policies

In the economic reforms initiated in 1986, the first Investment Code was put into effect in June 1990, with a view to accelerating the trade liberalization. Also, private investment is allowed in allocated areas. Some of the problems addressed in implementing the 1990 Investment Policy & the Act as per studies carried out were; restrictive investment environment; lack of coordination between sectoral and investment policies; existence of several laws and regulations that conflicted with the investment code; existence of a non-commercialized society; and Existence

of a non-facilitative civil service. Also, corrective measures were taken to further improve the investment climate in Tanzania, in which new frameworks have been introduced such as the New Investment Policy 1996 and the new investment code 1997. Also Tanzania Investment Centre (TIC) One Stop Shop has been established for investors, and there has been efforts to harmonized key legislation, remove restrictions on investment areas, and enhance economic and social reforms.

(2) Tanzania Economic Reforms

The Government has implemented reforms aimed at transforming its large State-owned sector and central planning-based economy to a market- and private sector-based economy. Major legislations which were put into effect from 1990 to 2002 are as follows.

- The Export Processing Zones Act No. 11 of 2002
- The Privatization Trust Act No. 7 of 1997
- The Tanzania Investment Act No. 26 of 1997

(3) Investment Relating Regulation System in Tanzania

a) Tanzania Investment Act, 1997

This Act was passed in 1997 pursuant to the promulgation of the National Investment Promotion Policy 1996 discussed in 7.2.1. (1), and the Tanzania Investment Centre (TIC) was established based on this Act. This Act offers a wide range of incentives to investors under the umbrella of the Centre, provided the investment capital is not below USD 300,000.00 and USD 100,000.00 for foreign and local investors respectively. The incentives include benefits under the Income Tax Act, Customs Tariff Act and the Value Added Tax Act. Non-fiscal incentives are also provided by the Act.

b) National Trade Policy, 2003

The Policy emphasizes the role of the government as implementer of trade policy and that of the private sector as the engine of growth and partners in the formulation and implementation process. It sets new and modern rules on how to increase international competitiveness, establishes how these rules are made and implemented, elevates the role of the private sector and creates opportunities for its development. On infrastructure development, the Policy advocates for several strategies, one of which is “modernization and expansion of the transportation infrastructure based on increasing recourse to private sector resources through Build, Own, Operate and Transfer (BOOT) and Build, Operate and Transfer (BOT) schemes.”

c) Establishing TIC

The Tanzania Investment Centre (TIC) established in 1997 has the objectives of: 1) being “The Primary Agency of the Government to coordinate, encourage, promote and facilitate investment,” 2) serving as a “One-Stop Facilitative Centre” with officers from Ministry of Trade & Industry, Business Registration & Licensing Authority (BRELA), Lands, Immigration, Labour and TRA stationed at the TIC, 3) visiting investment projects on a regular basis to follow up on implementation and obtain feedback to resolve any business problems, 4) facilitating investors to acquire land by offering them land derivative titles on behalf of the Government, 5) providing necessary information with regard to investment in Tanzania to foreign and local investors, 6) providing information on investment opportunities and fund for investment as well as establishment of joint venture companies in Tanzania, and 7) providing investors with services that aim at assisting both new and old investors with regulatory problems and the identification of new markets or opportunities for the expansion of business.

7.2.2 Regulatory Framework for Partnerships between Public and Private Sectors in East African Regional Agreement

(1) Treaty for the Establishment of the East African Community (EAC)

For EAC, both the Treaty and the Protocol guarantee investors a bigger market for the products and services they produce. The Partner States shall endeavour to adopt programmes that would strengthen and promote the role of the private sector as an effective force for the development of their respective economies. Besides the promotion of the private sector, the Treaty also advocates for cooperation among the Partner States in infrastructure and services provision. In order to promote the achievement of the objectives of the Community as set out in Article 5 of this Treaty, the Partner States undertake evolvement of coordinated, harmonized and complementary transport and communication policies. Partner States shall coordinate activities with respect to the construction of trunk roads connecting the Partner States to common standards of design and maintenance of existing road networks, as such standards will enable carriers of other Partner States to operate to and from their territories efficiently. (Article 90). The Partner States shall harmonize their inland waterway transport policies and shall adopt, harmonize and simplify rules, regulations and administrative procedures governing waterways transport on their common navigable inland waterways. (Article 94). The EAC has embarked on several programmes directed at actualizing the latter as well as the spirit of these Articles for general betterment of the Partner States and for promotion of private investment in the respective States.

(2) Protocol on the Establishment of the East African Community Common Market

This protocol regulates investment activities in that; it enumerates the principles of the Common Market to which Partner States are bound; the Partner States are supposed to observe the principle of non-discrimination of nationals of other Partner States on grounds of nationality; treatment to nationals of other Partner States should not be less favourable than the treatment accorded to third parties; Removal of restrictions is required on the right of establishment and residence of nationals of other Partner States in their territory in accordance with the provisions of the Protocol; and it also requires removal of the measures that restrict movement of services and service suppliers; harmonize standards to ensure acceptability of services traded.

(3) SADC Protocol on Transport Communications and Meteorology

The SADC Protocol on Transport Communications and Meteorology is another Regional Agreement promoting inter-regional investments in transport infrastructure and it stipulates that; the Agreement commits the Tanzanian Government to cooperate with other Member States of SADC in the provision of inter alia, road, railway and maritime infrastructure and services through the involvement of both public and private sectors; Member States shall cooperate in providing, operating and maintaining transport infrastructure which supports the provision of integrated transport services; and infrastructure should be progressively self-sustaining with funding based on a user pays principle and that Member States shall promote private sector involvement in railway investment with a view to improve railway network and services standards while lowering unit costs for services.

7.2.3 Investment Promotion Policies in Tanzania

(1) Outline of EPZ

The Export Processing Zones (EPZ) Act was established in April 2002, followed by an effective implementation in March 2003. In February 2006, the Act was amended to strengthen supervision of the programme and to improve the incentive package. The objectives of establishing EPZ are: 1) attracting and promoting investment for export-led industrialization, 2)

increasing foreign exchange earnings, 3) creating and increasing employment opportunities, 4) attracting and encouraging transfer of new technology, and 5) promoting the processing of local raw materials for export (adding values).

The EPZ Council, composed of 7 Ministers, Attorney General, Governor of the Central Bank, Chairman of TPSF, Executive Secretary of the TNBC and Secretary General of TUCTA, approves EPZ plans and programmes and gives general policy directions. The Minister responsible for industry is the Chairman of the Council and has authority and power to declare EPZs. The Export Processing Zones Authority (EPZA) is responsible for EPZ programme design, management and investor facilitation.

EPZ investments are classified into two types, 'Industrial Parks' and 'Stand Alones (single factory units),' which involve 'EPZ Developers' (investors in construction of EPZ factory buildings and warehouses for lease or hire/rent), 'EPZ Operators' (undertakers of EPZ manufacturing operations), and 'EPZ Service Providers' (providers of EPZ utility services) as key players. The relevant incentives for these players can be classified as follows.

a) Fiscal Incentives
   - Exemption from corporate tax for ten (10) years
   - Exemption from withholding tax on rent, dividends and interests for 10 years
   - Remission of custom duty, VAT and other taxes on raw materials and goods of capital nature related to production in EPZs.
   - Exemption from taxes and levies imposed by Local Government Authorities on products produced in EPZs
   - Exemption from VAT on utility and wharfage charges

b) Non-Fiscal Incentives
   - Exemption from pre-shipment or destination inspection requirements
   - Unconditional transferability of profits, dividends, loyalties, etc.
   - Lower port charges compared to other cargo box rate (transit cargo)
   - Access to the export credit guarantee scheme
   - Allowance to sell 20% of goods to the domestic market

c) Procedural Incentives
   - One-Stop-Service Centre by EPZA for set-up, facilitation and aftercare service
   - Operation is under one license issued by the EPZ Authority
   - Rapid project approval
   - On-site customs inspection in the Export Processing Zones
   - Heavily composed EPZ Council to avoid bureaucracy in decision-making

(2) Outline of SEZ Act

SEZ aimed at fast-tracking economic growth and poverty reduction. It combines both export-oriented investments and investments targeting the domestic market. The SEZ Act was passed in February 2006. SEZ specifically includes:

- Export Processing Zones,
- Free Ports,
- Free Trade Zones, Industrial Parks,
- Regional Headquarters,
- Science and Technology Parks,
- ICT Parks,

- Agricultural Free Zones, and
- Tourism Development Zones and Business Incubation.

(3) Investment Promotion in the Policies Transport Related Regulations

a) The National Transport Policy (NTP) 2003

The National Transport Policy (NTP) 2003 was a key promotional document to potential investors in the transport sector. NTP acknowledges the weaknesses in the development and management of the transport sector. These include inadequate formalized coordination and consultation among principal actors and insufficient dialogue between the public and private sectors. It is a basis of an institutional framework which ensures that appropriate mechanisms exist to effectively promote intermodal coordination and communication between the user, the operator, the regulatory agency and the Government on all transport questions and issues.

NTP has several policy statements which encourage the participation of the private sector in the provision of infrastructure and services in the road, railway and maritime transport sub-sectors. It underlines the need for private sector participation including the planning and rehabilitation of the roads that pass through local communities. The role of railway transport for efficient inter-modal transit cannot be over emphasized. NTP also underlines the need for further development of modal and inter-modal interface facilities and institutions. For this to happen, involvement of the private sector in infrastructure development and operation of railways is considered necessary. In addition, NTP recognizes the need for further restructuring of ports for increased infrastructure, safety, security and operations' efficiency. Private sector involvement in the enhancement of infrastructure, services in port development, operations and in shipping services is underlined.

b) The National Investment Promotion Policy (NIPP) 1996

NIPP is another important promotional document for investment in Tanzania, prepared; to encourage participation by private and public sectors and foreign investment in the transport sector, as well as regional cooperation and investments in transport services and facilities; to encourage investments in inland water and maritime transport facilities; and to promote an integrated and linked national, regional and international road, railway and air transport networks in order to enjoy not only the benefits of economies of scale, but also to maintain international standards and levels. In order to achieve these objectives, the NIPP offers, among others, the following investment policy strategies.

- It commits the Government as a promoter and facilitator of both local and foreign investments.
- It establishes the Tanzania Investment Centre (TIC) as the focal point of the promotion, coordination, and monitoring of local and foreign investments.
- It invests in TIC with the obligation to provide the investors with services that aim at assisting both new and old investors with regulatory problems and the identification of new markets or opportunities for the expansion of business.
- The investment incentives are categorized into fiscal and non-fiscal.

c) National Road Safety Policy (NRSP) 2009

The National Road Safety Policy provides the basis for attaining the vision of a safe traffic environment for potential investors. The underlying theme of the Policy is that, all concerned actors in society, including investors in this case, should work in harmony by cooperating and sharing knowledge, expertise and resources to reduce road crashes. NRSP, like the preceding Policies, attaches significant importance to multimodal transport and the participation of the private sector in road safety issues.

7.2.4 Necessity of Public Private Partnership (PPP) for the Economic Development

PPP Policy defines the reason why it is necessary for Tanzania to have PPP. According to PPP Policy, the Government of Tanzania recognizes the role of private sector in bringing about socio-economic development through investments. PPP framework provides avenues for attracting investments. The PPP Policy acknowledges that PPP have been identified as viable means to effectively address constraints of financing, managing and maintaining public goods and services. Moreover, PPP can enable the Government to fulfil its responsibilities in efficient delivery of socioeconomic goods and services by ensuring efficiency, effectiveness, accountability, quality and outreach of services.

7.3 PPP

7.3.1 PPP Policies in Tanzania

(1) National Public Private Partnership (PPP) Policy

National Public Private Partnership (PPP) Policy was put into effect in 2009. The Government of Tanzania recognizes the role of private sector in bringing about socio-economic development through investment. The Public Private Partnership framework provides avenues for attracting investments.

(2) Benefits of PPP

The following benefits are expected as a result of the PPP policy.

- Facilitating creative and innovative approaches in stimulating the private sector
- Enhancing the government's capacity to develop integrated PPP solutions
- Reducing fiscal burden of implementation and simplifying licensing procedures
- Accessing technical and managerial expertise as well as financial resources
- Facilitating large-scale capital injections
- Improving response to consumer needs
- Fostering economic growth by developing new investment opportunities
- Ensuring fulfilment of the best interest of the public and private sector

7.3.2 Problems which Tanzania Faced in Implementing PPP Policies

(1) Challenges Facing PPPs in Tanzania

Tanzania has faced various problems in implementing PPP projects, such as; the lack of comprehensive policy, legal and institutional frameworks that provide clear guidelines and procedures for development and implementation of PPPs; shortage in analytical capacity to assess investment proposals; absence of long-term financing instruments; insufficient capacity in negotiations, procurement, implementation and management of PPPs; lack of appropriate risk sharing mechanisms; and insufficient of public awareness on the benefits of PPPs.

(2) Lessons from Failure of Railway PPP Project with RITES

PPP project between TRL and RITES, can be a good example of such challenges. The contract negotiation initiated in 2002, and the operation was commenced in 2007. However, the delay of the negotiation and the optimistic business forecast led to serious deterioration of the railway assets which affected the railway staff morale. The agreement was terminated and the project halted. This project indicates various problems which Tanzania faces in implementing infrastructure-related PPP projects. This research can be utilized for improving Tanzania's

future PPP policies by analyzing why the project failed. In the Study Team's view, the sources of this failure can be summarized as follows.

1. Contract negotiation was delayed

One of the bidders launched a legal challenge in a local court and even though the case was eventually dismissed, close to one year was lost. The preferred bidder selected GAPCO as a local partner, but the same was not acceptable to IFC, a potential lender to the Concessionaire. That led to a contentious and time-consuming process. Firstly, railway concessioning is a complex process and delays are common. It would have been prudent to plan for the possibility of delay in the concession becoming operational.

2. No maintenance was done, which led to deterioration of the railway assets

No budgetary allocation for support to TRC for the deteriorating railway assets. IDA funds for rehabilitation was not used timely even before the award of the concession. And there were not enough funds to avoid adding to the backlog of maintenance during the concessioning process from the government.

3. The business plan was too optimistic

The key assumptions of traffic growth, cost reduction, and adequate surplus generation did not materialize. Traffic forecast was too optimistic, and the project underestimated the risks for the railway due to concessioning delay. To deal with it, contingency plan should have been considered in case of slippage from the concessioning timeframe. In addition, adequate traffic marketing strategy did not work, in that; TRC carried much small (wagon load) traffic servicing many small customers but did not have many large-volume customers; and TRL did not create large-volume customers such as mines in the North West of Tanzania and in the neighbouring countries of Rwanda, Burundi and DRC. Also, appropriate legal framework to support the railway from competition with other modes of transport was not available.

4. The retrenchment plan was not appropriate

Retrenchment of surplus staff should have been done as early as possible to save on operating costs. The concession kept the large number of personnel subject to retrenchment and transfer to the Concessionaire, which resulted in significant cost and affecting project management. The government eventually paid close to USD 56 million to retrench about 3,500 staff (almost USD 16,000 per person). It was rather high comparing with other similar projects. Most staff remained uncertain about the terms of retrenchment and that adversely affected their morale and productivity. Inadequate retrenchment plan also created social concern, and a large amount of funding was needed to compensate it.

5. The project was not profitable

In Africa, where infrastructure is in very poor condition and heavy investment is required to restore the infrastructure to standard condition, the burden on the concessionaire becomes too heavy. The railway infrastructure is often in poor state and in need of substantial investment. The response has been very limited and not from the best players. It would be better if the governments commit to offer the railways in good condition without any backlog of maintenance. There was a clear need for huge funds to liquidate the backlog of maintenance and rehabilitation of railway infrastructure. As per the railway records, more than 2,000 km were estimated to be in need of rehabilitation in 2002 and the funds needed for rehabilitation would have amounted to USD 400 million.

7.3.3 PPP Policy

PPP policy is comprised of the following.

Chapter 1: INTRODUCTION
- Status of Public-Private Partnerships in Tanzania
- Challenges Facing PPPs in Tanzania
- Rationale, Benefits and Scope

Chapter 2: VISION, MISSION, GOAL AND OBJECTIVES
- What are the objectives and goals of PPP
- Vision and mission of PPP

Chapter 3: POLICY ISSUES, OBJECTIVES AND STATEMENTS

7.3.4 PPP Act

(1) PPP Act Outline

The PPP Act came into effect in 2009. The act aims to define guidelines for the procedures for the government authorities to implement PPP projects. It stipulates the roles and responsibilities of the relevant organizations, such as contracting authorities, coordination Unit, Finance Unit, Committee of Experts, Finance Minister, Attorney General and Contract Negotiation Team. PPP Act is comprised of the following.

PART I: PRELIMINARY PROVISIONS
- Definition of PPP-related words
- Role of private sector in the preliminary stage
- Unsolicited proposal by the private sector

PART II: IDENTIFICATION OF PROJECTS
- Feasibility study by public sector
- Preliminary study by private sector

PART III: RECOMMENDATION OF PROJECTS BY COORDINATION UNIT
- Consideration by committee
- Recommendation by the Coordination Unit
- Projects to be kept in a register

PART IV: APPROVAL OF PROJECTS BY THE FINANCE UNIT
- Consideration by Finance Committee
- Consideration by the Finance Unit
- Approval by the Minister responsible for finance
- Funds for implementation of project

PART V: PROCUREMENT BY CONTRACTING AUTHORITY
- Advertisement for the tender
- Procurement of unsolicited proposals

PART VI: NEGOTIATIONS, AGREEMENT AND AWARD
- Agreement
- Negotiating Team
- Drafting of agreement

- Approval and finalization of contract
- Implementation of projects
- Supervision of the project by accounting officer
- Audit

PART VII: TERMINATION OF PROJECTS
- Termination of the project
- Compensation and remedy for the private sector

PART VIII: GENERAL PROVISIONS

(2) Business Flow of Approval Procedure and Verification

Table 7.1: Flow of Approval Procedure and Verification according to the PPP Act

No.	JOB
1	A private sector submits Unsolicited Proposal
2	A public sector shall select or identify specific project or projects
3	A private sector submits preliminary study to contracting authority
4	CU(Coordination Unit)とFU(Finance Unit) approves preliminary study and make recommendation
5	A private sector makes project concept before conducting preliminary study, and submits it to contracting authority
6	Contracting authority approves project concept after evaluating it with the stipulated criteria
7	A private sector finalizes feasibility study and submits it to contracting authority
8	Contracting authority establishes committee of experts after receiving feasibility study and receives their recommendation
9	Contracting authority consults with regulatory authorities relevant to the project and receives their recommendation
10	Contracting authority makes its final conclusion whether implementing the project or not
11	Contracting authority submits project application to Coordination Unit after the ministry responsible for the authority approves the feasibility study
12	Coordination Unit asks the committee of exports for verifying the application within 30 days
13	Coordination Unit submits their recommendation to Finance Unit upon consultation with the committee of experts
14	Finance Units establishes committee of finance experts
15	Finance makes its decision whether or not implement the project after receiving recommendation from committee of finance experts
16	Finance minister makes final decision of the project and initiate funding process
17	Contracting authority advertise for tenders for the project
18	Contracting makes selection of the successful tender
19	Contracting authority initiates contract negotiation with private sector
20	Contracting authority forms negotiation team
21	Contracting authority submits draft of contact to Finance Unit and Finance minister for approval
22	After receiving recommendation from the attorney general, contracting authority makes final draft of the contract
23	Contracting authority notify the final draft of the contact to private sector, and accounting officer signs the agreement
24	Contracting authority shall ensure that the agreement is properly implemented, managed, enforced, monitored
25	The accounting officer review the implementation of, and performance of the project under the agreement, and prepares reports over the project.

(3) Roles and Functions of Organizations Involved

The PPP Act stipulates the roles and functions of each organization as follows.

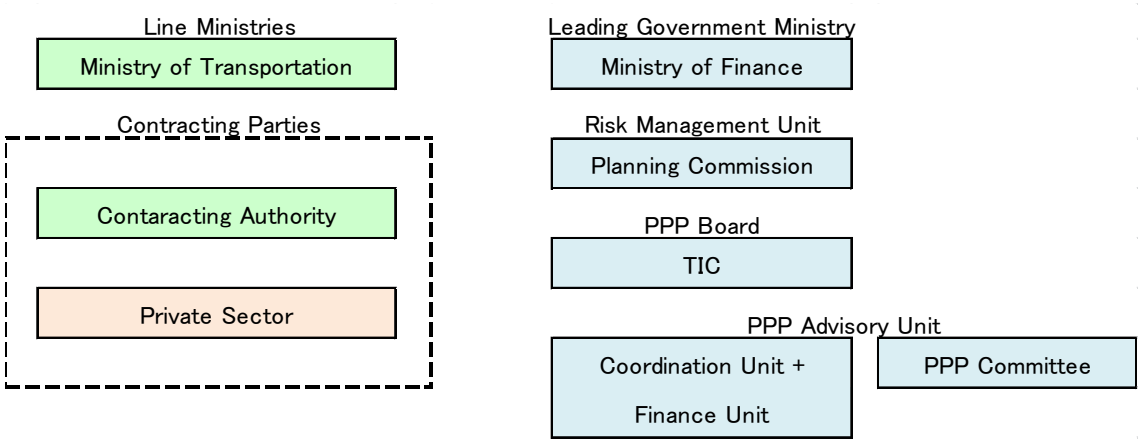


Figure 7.1: PPP Institutions in Tanzania

(4) The Criteria of Evaluation and Approval

Coordination Unit and Finance units evaluate the preliminary Feasibility study with the following criteria.

- The project is in line with government priorities as per national development plan
- The project complies with the value for money requirement
- The project complies with affordability requirement
- The project presents new and cost-effective methods of service delivery
- The project will address acute social needs sustainably
- The private sector participation in the project will result in net benefits and savings as compared to public procurement
- The project adheres to the Act and other relevant laws
- The project includes adequate risk analysis and sharing
- It complies with other conditions relevant to public private partnership.

(5) Roles of Committee of Finance Experts

A committee of finance experts evaluates the project with the criteria below.

- Affordability of the project
- Value for money
- Risk sharing
- Government development priorities
- Commercial viability

7.3.5 How Tanzania Will Respond to Future Railway PPP Projects

In order to make use of the past experiences, following points need to be considered.

1. In case negotiation of the contract delays, can Tanzania adequately respond to the existing business?
   - The negotiation with RITES was initiated in 2002 and operation commenced in 2007, but the agreement and the project were terminated in 2009.

- When the PPP project with RITES was in progress, the PPP Act did not exist, so obviously the Act was not applied. If another railway PPP project is implemented, the guidelines in the Act will be applied so the situation is anticipated to improve.
- However, the guidelines require more time for its approval process, such as several series of verifying by coordination unit, finance unit, committee of experts, Minister of Finance and Attorney General. Therefore it will take some time until a project is finalized. In such case, interim management contract will be applied to handle existing business.
- As described in the approval process in Chart 7.1, there are many check points, so sometimes it will take more time than before. Whether the guidelines would work appropriately in the circumstances, which might change from moment to moment, is a concern.
- No budgetary allocation for support to TRC was taken in the RITES project, which led to deterioration of the railway asset. However, if the interim management contract is implemented, it would avoid the problems from before.
- The function of PPP units will be able to respond to various problems which future projects in Tanzania will face.
- However, simply having a PPP unit is not sufficient. It is important that a PPP unit have broad knowledge, know-how and ability of coordination with the relevant government authorities.

2. Will it be able to make proper business forecasts?
   - The government office which has administered the targeted business so far has most knowledge and information about business plans, market trend predictions and marketing strategies.
   - However, the organization in charge of the project tends to make the business plan in their favour with unrealistic figures.
   - For the tendency mentioned above, a Coordination Unit and expert Committee in the PPP ACT can work as a watchdog function
   - In business plan development, it is expected that Coordination Unit serves the function, while it may take some time until the unit starts functioning efficiently.

3. Can Tanzania offer feasible PPP projects?
   - This is the most focal point.
   - Yes, it is possible depending on determination of the government, though a large amount of expenses for the track rehabilitation and repair of facilities is necessary for the project enforcement.
   - In the country where industry developed at a constant level, the privatization of the railway business basically can be managed within the railroad section. On the other hand, railway business is more likely to fail in a country like Tanzania where the circumstances are different.
   - In Tanzania, a PPP in the railway business does not merely make the business plan only for railway. Instead it should be examined based on the national industrial development plan.

7.3.6 Concluding Remarks and A Proposal

(1) Coordinated Movement with the National Industrial Development Plan

Tanzania should propose and implement PPP projects based on the transportation infrastructure development programme that is harmonized among each of the ministries and government offices with the leadership of the Planning Commission of the President Office.

(2) Improvement of the Regulatory Framework for PPP Investment Promotion

With a view to further encouraging the PPP investment promotion, the Study Team propose; the establishment of a PPP unit (experts unit to enforce and supervise PPP projects); improvement of the PPP guidelines that the PPP Act stipulates; setting a legal framework supporting the competitiveness with other transportation means; and an incentive system affects profitability of the business.

(3) The Improvement of Investment Promotion System for Public Private Partnership

As for the investment promotion system, it is suggested that; incentives should be provided to PPP investments other than the taxation system (such as reduced gasoline prices, the supply of parts); and the investment promotion system itself should be improved for the investment promotion programmes such as TIC, EPZ and SEZ.

(4) The Coordinated Movement with the Local Agreement

Also it should be ensured that the policies are well coordinated with the regional arrangements, through; securing consistency with investment promotion regulations of the Common Market which EAC stipulates as well as domestic regulations; and identifying and revising domestic regulations that are against the purpose of Common Market.

7.4 Fiscal Measures

7.4.1 Overview of the Fiscal Resource Allocation for Transport Sector

To understand the fiscal environment for the transport sector in Tanzania, several different frameworks for allocating fiscal resources need to be reviewed. In this section, such frameworks will be examined, starting with the wider framework for the national development plan (Tanzania Development Vision 2025) down to the sector-specific investment plan (TSIP) as well as annual budgets. In that process, the interrelation/interaction among these different frameworks will also be reviewed.

(1) Tanzania Development Vision 2025 (TDV2025)

As a new national vision, Tanzania Development Vision 2025 (TDV2025) was announced in 1999. The basic idea is that by 2025 Tanzania should have gone through an unprecedented economic transformation and development to achieve middle income status (with a per capita income of USD 3,000 in nominal terms), characterized by high levels of industrialization, competitiveness, quality livelihood, rule of law, and having in place an educated and pro-learning society. One of the core focuses of TDV2025, in relation to the transport sector development, is to achieve a ‘strong and competitive economy,’ which is characterized by:

- Diversified and semi-industrialized economy;
- Macroeconomic stability, with an annual growth rate of 8% or more;
- Adequate level of physical infrastructure; and
- Active/competitive player in regional/world markets.

While TDV2025 was originally designed to be operationalized through a series of five-year development plans, the announcement was not followed by an initial five-year plan. Instead, short-to-medium term Poverty Reduction Strategy (PRS, 2000–2003) was adopted to mitigate the negative impact of the reforms on the country's poor, which was followed by the first five-year National Strategy for Growth and Reduction of Poverty (MKUKUTA, 2005–2010) as detailed below.

(2) Mkakati wa Kukuza Uchumi na Kupunguza Umaskini Tanzania, or the 'National Strategy for Growth and Reduction of Poverty' (MKUKUTA)

MKUKUTA, an overarching framework for development and poverty reduction in Tanzania, has been designed based on the TDV2025 and committed to the achievement of the Millennium Development Goals (MDGs). It focuses on growth and governance, and has mainstreamed cross-cutting issues (gender, environment, HIV/AIDs, disability, children, youth, elderly, employment and settlements). To meet the resource requirements, the national budget has been aligned to MKUKUTA with direct links to the public expenditure review.

The basic idea is achieving higher incomes thus reducing poverty through balanced growth, by allowing higher household incomes to improve human capabilities through better education, health, nutrition and shelter. In other words, a cycle in which human capability leads to long-term growth, and the growth enables the government to collect revenue for provision of services. Also, governance provides conditions for growth, well-being and poverty reduction.

The performance/achievement of MKUKUTA has been monitored through the Monitoring Master Plan (MMP), which specifies the indicators such as follows, as far as the transport sector is concerned:

- Percentage of the road network in good and fair condition. (e.g. Based on the data on network length, type of road, and surface condition, the road conditions are categorizes into good, fair and poor);
- Percentage of the total rural population living within 2 km of an all-season passable road.

The first MKUKUTA, covering the period of 2005/06–2009/10, has been rolled over for another five years as MKUKUTA II (2010/11–2015/16). With spending plans for MKUKUTA II included in the budget for FY2010/11, its implementation is underway. This second round particularly focuses on scaling up the role and participation of the private sector in economic growth and employment, through improving the business climate, and investing in people and infrastructure development. Specifically, it refers to the 'appropriate prioritization and coordination of policies' and emphasizes the importance of harnessing PPP potentials.

(3) Medium Term Expenditure Framework (MTEF)

Under the above mentioned visions and strategies, more detailed plans for public expenditures are organized around the Medium Term Expenditure Framework (MTEF). It is formulated within the context of the national macro-economic framework in the medium term in line with, and as a basis of macroeconomic performances such as economic growth, inflation, domestic revenue, exchange rate, etc. In that process, it takes into account the consistency with the implementation of MKUKUTA, particularly in the context of resource allocation among different sectors. In that sense, MTEF can be regarded as a framework to bridge the idea of TDV2025/MKUKUTA and the actual budgeting. At the sector level, priority areas for expenditure are identified within the framework through the systematic process for the preparation of the Medium Term Plan and Budget Framework as described in the annual budget guidelines from the Ministry of Finance (MOF).

As pointed out by IMF, MTEF has several weaknesses that make it difficult to realize its full benefits. Currently, the structure for discussing the MTEF within the government and with donors (with targets for revenues, expenditures, and the deficit) does not allow MTEF to help position the annual budget in terms of the medium-term perspective, due to the insufficient alignment with the annual budgeting process. It is also pointed out that a lack of focus on expenditure ceilings in MTEF and limited political ownership make it difficult to ensure that medium-term planning and annual budgeting assume consistent resource constraints.

(4) National Transport Policy 2003 (NTP2003)

GOT has announced the National Transport Policy 2003 (NTP2003), with a mission to "develop safe, reliable, effective, efficient and fully integrated transport infrastructure and operations which will best meet the needs of travel and transport at improving levels of service at lower costs in a manner, which supports government strategies for, socio-economic development whilst being economically and environmentally sustainable." It also identifies the need for; 1) institutional reforms, 2) strategic planning framework, 3) formal coordination/consultations through sectoral technical consultative meetings and annual national consultative technical meetings, 4) computer-based transport database, and 5) more systematic coordination of transport planning and operations on the back of regional cooperation. As a general guideline for the direction of sector development, NTP2003 does not refer to the specifics on the fiscal side, but at least provides the idea behind the allocation of fiscal resources. GOT is currently updating NTP2003 for better aligning with MKUKUTA II as well as with EAC and SADC regional strategies, and also taking into consideration the Five Year Development Plan (FYDP) mentioned below.

(5) Transport Sector Investment Program (TSIP)

There is also a sector-specific investment planning framework, TSIP (Transport Sector Investment Program), which was adopted by GOT in 2007 for two consecutive five-year segments beginning in FY2007/8 and ending in FY2016/17. In other words, this started as an implementation plan for MKUKUTA/NTP2003, and is structured to align and integrate different sub-sectors (such as roads, railways, ports and airports) on the usage side, and to specify the funding sources (such as government budget, donors, private investors, etc.) on the financing side. Toward the end of the initial five years, the part for the second half is being prepared.

However, the budget execution rate under TSIP for the first five years will be significantly low, and a large volume of unfinished projects will be carried over to the next five years, according to the rapid budget analysis conducted by the team led by Dr. Ozeki[1]. The team also points out that the limited physical execution ratios were accompanied by relatively high financial execution ratios, which implies an increase in the construction costs and other costs resulting from management inefficiencies. To make up for this financing gap, GOT is aggressively pursuing PPP arrangements, particularly in the non-road subsectors to complement public investments.

(6) Short Transport Sector Investment Program (STSIP)

To bridge the annual budget with TSIP and MTEF, Short Transport Sector Investment Program (STSIP) was developed for FY2009/10–2011/12, and has been rolled over to another round (FY2011/12–2013/14), back to back. In other words, STSIP has been expected to address the widening gap between TSIP and the diverging annual breakdown for MTEF, to be more realistic with what are proposed through TSIP. While STSIP points out GOT and donors as the

[1] 'Rapid Budget Analysis – Transport Sector' (draft as of November 14, 2011) prepared by a team consisting of Yuzuru Ozeki (lead), JICA, Maria Iarrera, European Commission, and Prosper Charle, African Development Bank.

most likely sources for bridging the funding gap, it also recommends encouraging long-term private investments, as well as the additional efforts toward cost recovery (e.g. increase in fuel levy for the road maintenance).

For the ***road sector***, the Road Fund allocation is expected to increase going forward, given the growing vehicle uses. But this will not be enough to bridge the funding gap for the development side. STSIP therefore recommends relying on GOT and donors as the prime funding sources, while also seeking guarantees from the donor communities when inviting the private sector, as in the PPP for toll roads. Also for the ***railway sector***, STSIP assumes GOT and donors as the most likely funding sources, while it does not rule out the private sector as a potential funding source over the long-term. As for the ***airport sector***, STSIP identifies the greater role of its own revenue sources such as landing/parking charges, rental charges, concession fees, passenger service charges, advertisements, and car parking, although they are not enough to fill the funding gap immediately.

(7) Five Year Development Plan (FYDP)

Lastly, there is a new framework that started, which is the Five Year Development Plan (FYDP). After running MUKUKUTA under TDV2025, a coherent framework for coordinating the use of resources towards strategic areas for socio-economic development was sought. To be able to achieve the target of a middle-income economy by 2025, GOT identified the necessity to shift from needs-based planning (which is restricted by the availability of financial resources) to an opportunity-based one, focusing on the country's comparative advantages. This approach emphasizes leveraging on increasingly integrating regional markets (in light of the geographical advantage as a gateway to servicing landlocked neighbouring countries), as well as on natural resource endowments. By implementing this strategy, GDP is expected to grow between 8 and 10% until 2025, which is quite optimistic in the Study Team's view.

This first FYDP (2011/12–2015/16) has been designed as the initial set of medium-term planning tool required to operationalize the long-term plan, which addresses the following implementation bottlenecks identified through reviewing TDV2025:

i. Misalignment and failure to articulate a manageable number of operational priorities;
ii. Prioritizing short-term operational needs over long-term projects, due to the lack of guiding plans;
iii. Lack of comprehensive and complementary perspective in project identification;
iv. Lack of a clear financing strategy, leading to overdependence on donations and under-funding;
v. Weak institutional framework for the implementation of national plans; and
vi. Weak monitoring and evaluation framework to check consistency and coherence.

The main objectives of this plan are to improve the physical infrastructural networks and human capital in order to hasten investment for the transformation of the country's production and trade supply structures (agriculture, manufacturing and services), and foster Tanzania's competitiveness through: 1) improving implementation through detailed, prioritized, and sequenced interventions, 2) improving synergistic and complementary growth, and 3) streamlining the institutional framework for effective implementation.

While FYDP is not a total replacement for MTEF as a multi-year budgeting tool, it is expected to play a greater role as a comprehensive framework or guideline for fiscal resource allocation on a medium-term basis. Technically, FYDP has been formulated under the Planning Commission (P/C) under the President's Office, through prioritizing the investment projects proposed by line ministries, while the final budget allocations are under the control of MOFEA.

The selected projects from P/C are reviewed by MOFEA, and the finalized budget bill is sent to the Cabinet Office for approval.

In relation to the transport sector, the plan seeks a more multimodal approach through greater investments in the railway sector. As shown in Table 7.2, it is expected that the share of the railway investment in the overall transport sector is expected to grow from around 10% in FY2011/12 to more than 40% in FY2015/16. As seen in the blank cells for financing breakdown (with an exception of the road sector), however, financing for these investments over the next five years is yet to be specified. In this regard, FYDP is an "opportunity-based" plan as explained earlier, with insufficient financial justification. In other words, the framework itself allows the maximum flexibility to alter the 'activities' in adjusting to the actual annual budgets, as long as such adjustments are in line with the 'goals' and 'objectives' fixed for the whole five years.

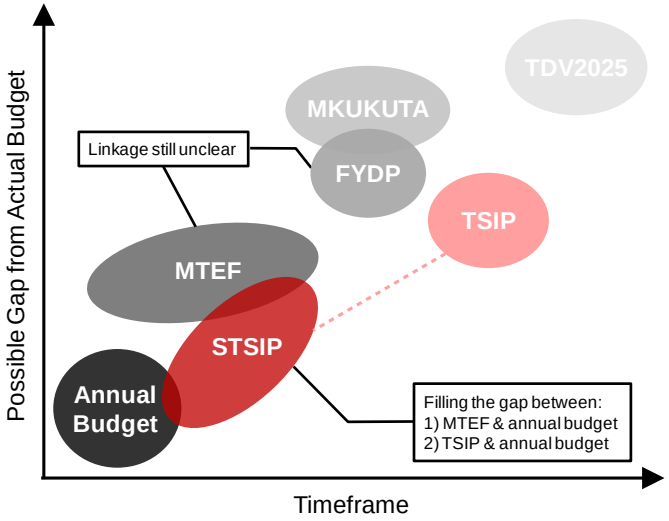
Table 7.2: Transport-Sector-Related Investment Plans in the FYDP (2011/12–15/16)

(Unit: Tsh mn)

	Total Cost				2011/12	2012/13	2013/14	2014/15	2015/16
	Total	GOT	DPs	PPP					
Road	6,236,257	4,421,890	1,700,005		1,855,095	1,958,416	1,230,896	687,302	504,548
Railway	2,097,359				252,535	272,065	280,385	644,615	647,760
Marine	716,000				95,712	104,724	123,862	163,284	228,418
Air	1,027,329				117,000	208,000	208,000	307,000	187,329
Transport Sector Total (A)	10,076,945	4,421,890	1,700,005		2,320,342	2,543,205	1,843,143	1,802,201	1,568,055
Priority Areas Total (B)	37,152,488	6,915,787	3,589,878	1,677,050	7,497,008	9,189,888	8,138,173	7,865,877	5,040,287
(A) / (B) (%)	27.1%	63.9%	47.4%	0.0%	31.0%	27.7%	22.6%	22.9%	31.1%

After all, these development frameworks have been introduced to complement each other, generally to fill the gap between longer-term frameworks and shorter-term ones (as in MTEF to materialize the concept of TDV2025/MKUKUTA into annual budgeting, or STSIP to bridge between TSIP and annual budgeting), as well as those between economy-wide frameworks and sector-specific ones (again STSIP, filling the gap between MTEF and annual budget).

However, the linkage is not clear enough between some of them, and the numbers under different frameworks, in and of themselves, are not always consistent with each other. Figure 7.2 below illustrates such relationships between different frameworks using a combined perspective of 'timeframe' and the 'possible gap from the actual annual budget'. Generally the plans with longer timeframes tend to divert from the annual budget particularly due to the lack of financial justifications. Among others, functional division between MTEF and FYDP is not yet clear, due particularly to the lack of consistency on the funding side. In that sense, FYDP is more of a "wish list" by GOT, while a bridging mechanism will be required to trickle the idea down to MTEF and further to annual budgeting.



Note:
1) Timeframe varies from 1 to 30 years.
2) Transport-sector-related frameworks are shown in red tones.
Source: JICA Study Team, based on various sources.

Figure 7.2: Relation between Different Development Planning Frameworks in Tanzania

7.4.2 Overview of the Fiscal Resource Allocation for Transport Sector

To have a bird's eye view on the current status and the future prospect of the fiscal resource allocations to the transport sector, a study conducted on the "Public Expenditure Review for the Transport Sector (PERTS) 2007/08–2008/09" (August 2010) provides a useful perspective. Taking advantage of this survey result, a visualization of the fiscal landscape of the transport sector was undertaken.

The PERTS evaluates the public expenditure performances for subsectors through the criteria to see whether; 1) GOT strategic objectives receive due consideration in budget deliberation, 2) expenditures correspond to budget, 3) expenditures deliver value for money (VFM), 4) relevant institutions are economically viable, 5) institutional reforms are applied without delay, 6) budget is reliable for stakeholders, 7) budget is well adjusted later on. The original scoring ("No, or only to a small degree" = lowest, "To some degree" = middle and "Yes, or to a pronounced degree" = highest) was converted into five levels (as shown in Table 7.3), considering the scores in between. Also, the seven criteria were categorized into two aspects of efficiency; "budgeting efficiency" and "operational efficiency." The former includes the criteria regarding how efficiently the budget is formulated and adjusted, whereas the latter focuses on the operational efficiency of the entities that actually spend the allocated fiscal resources.

Table 7.3: Modified Scoring for the Public Expenditure Performances by Sub Sector

	National Road		Local Road		Railway		Port	Airport
	Maint	Dev	Maint	Dev	TRA/RAHCO	TAZARA	TPA	TAA
1) GOT strategic objectives receive due consideration in budget deliberation	3	4	3	3	1	1	4	4
2) Expenditures correspond to budget	4	2	4	2	2	2	3	3
3) Expenditures deliver VFM	4	4	3	4	1	1	4	4
4) Institutions economically viable	4	2	4	3	1	2	5	5
5) Institutional reforms w/o delay	5	3			2	1	3	3
6) Reliable budget for stakeholders	4	2	4	4	1	3	5	5
7) Budget well adjusted	4	3	4	3	1	1	3	3
Budgeting Efficiency (1+2+6+7)	15	11	15	12	5	7	15	15
Operational Efficiency (3+4+5)	13	9	7	7	4	4	12	12

Note:
1. Original survey result has been converted into scores, where "No, or only to a small degree" and "Yes, or to a pronounced degree" are given the lowest (=1) and the highest (=5) scores respectively.
2. "Maint" = maintenance, "Dev" = development

Source: JICA Study Team, based on "Final Report: Public Expenditure Review for the Transport Sector 2007/08-2008/09" (August 2010).

A close look at the modified score provides some implications which confirm the Study Team's general perceptions on the performance of each sub sector.

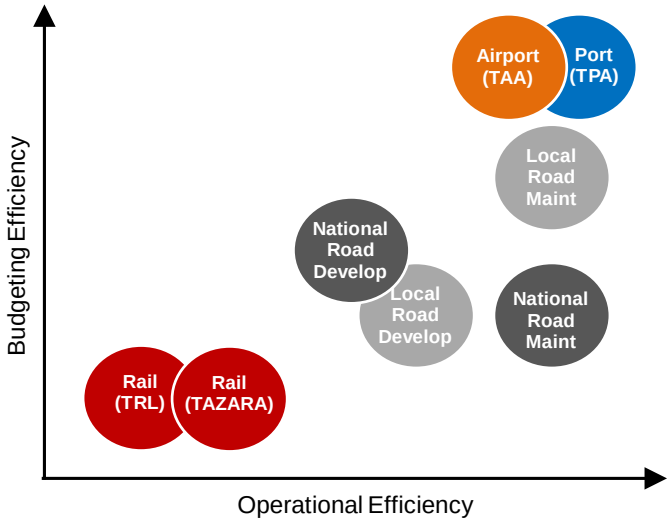
- ***Road*** sub sector represents a relatively high score, particularly in the budgetary efficiency on the maintenance side (both for national and local roads), thanks to the stability provided by the Road Fund, as well as the relatively high productivity on maintenance works. For operational efficiency, local road lags behind national road, the low score reflecting its lack of score itself for the capability of institutional reforms for the local road. On the development side, both budgeting and operational efficiencies lag behind the maintenance side, reflecting the relative difficulty in obtaining financial resources for donor-funded projects in the face of still-swelling back logs.

- ***Railway*** sub sector ranks the lowest both in terms of budgeting and operational efficiencies, reflecting the budget shortage even for rehabilitation and maintenance works, inefficient management due to the collapse of the concessionary agreement (in the case of TRL/RAHCO) and two country ownership (in the case of TAZARA). Unrealistically optimistic plans have also negatively affected the reliability of their budgets. If the standard gauge were to be applied for the railway tracks as discussed under the regional framework such as East African Community (EAC), the Study Team is concerned that the financial requirement will far exceed not only the fiscal capacity of GOT but also availability of other funding sources such as donor support and private sector investments. The situation is more serious for TRL/RAHCO than TAZARA, which has infrastructure that has deteriorated more. Also from the management point of view, comprehensive institutional reform is becoming more necessary, with a view to rebalancing the investment burden among the stakeholders.

- ***Port and Airport*** sub sectors, status quo seems to be rather stable, with some revenue generating capability and funding sources. Particularly in the case of the port sector, TPA's management efforts to ensure financial viability has contributed (as in its plan to expand its landlord role), which is further extended to the investments through its own revenue/financing sources. This relatively robust financial condition of port and aviation sectors seems to be sustained as long as their management autonomies are ensured. At the same time however, there is a need to keep an eye out for the possibility

of investment demands beyond their financing capacity (as those for the port of Dar es Salaam under the Port Master Plan).

To summarize these observations, Figure 7.3 illustrates the combination between budgeting and operational efficiencies as of now. It can be characterized by relatively high efficiencies in the port and aviation sectors with its own sources of revenue generation, and extremely poor situation for railway sector on the other extreme. Road sector comes in between, with the maintenance side more robust in terms of budgeting efficiency on the back of the Road Fund.



Source: JICA Study Team, based on "Final Report: Public Expenditure Review for the Transport Sector 2007/08-2008/09" (August 2010).

Figure 7.3: Public Expenditure Performances in Terms of Budgeting/Operational Efficiencies

Also Table 7.4 (rearranged from the information in PERTS) summarizes the funding capacity of each subsector by funding type (funding through the government budget, donor funding, and private sector funding). The ***road*** sector generally has robust budget funding, especially on the maintenance side thanks to the Road Fund, while there is almost no private sector funding at this moment. There is a prospect of utilizing PPP, however, for the national road development, going forward. The two ***railway*** companies have suffered from very poor funding from all sources, due to the impaired concessions which not only cut off the public funding sources but also weakened the private funding sources. Unless the current concession structures are reorganized substantially, it will be difficult to break out of the present deadlock in their financial position. For the ***port and airport*** sectors, on the other hand, the challenges are relatively straightforward: 1) maintain the current financial position which is relatively strong, and 2) further develop the framework for involving the private sector, while additional budget and donor funding should provide better grounds for private sector participation.

Table 7.4: Funding Capacity by Sub Sector

	National Road		Local Road		Railway		Port	Airport
	Maint	Dev	Maint	Dev	TRA/RAHCO	TAZARA	TPA	TAA
General Situation	Strong but under stress	Declining	Improving	Improving	Poor & degrading	Poor but stable	Strong & stable	Strong & improving
Budget Funding	Large & stable (RF)	Large (GOT)	Large & stable (RF)	Some (RF & GOT)	Almost none	Almost none	Almost none	Large (Dev) Some (Rec)
Donor Funding		Large but below target		Small & below target	Small & declining		Some Dev	Large dev but below target
Private Sector Funding								
Current: Own	None	None	None	None	Below target	Below target	Large	Large
Private	None	None	None	None	None	Below target	Large	Some
Potential: Own	Little	Little	Little	Little	Pending	Pending	Some	Large
Private	Little	Some (PPP)	Little	Little	Pending	Pending	Some	Large

Note: "RF" = Road Fund, "Maint" = maintenance, "Dev" = development, "Rec" = recurrent
Source: JICA Study Team, based on "Final Report: Public Expenditure Review for the Transport Sector 2007/08-2008/09" (August 2010).

7.4.3 Key Factors for Improvements

(1) Further Alignment between Different Planning Frameworks

As reviewed above, 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 sub sectors (as in the resource shift toward the railway sector from other sub sectors), it will become important to ensure consistency between different plans. To make this happen more smoothly, it may be suggested that each of the frameworks be assigned clearer definition of its relevancy to the budgeting process, with a view to avoiding the discrepancy between longer-term plans with goals that are too aggressive and annual budgeting under tight fiscal constraints. As sought in FYDP, it will also be necessary that each and every one of the frameworks be given the flexibility to adjust in line with the ongoing changes in other frameworks.

(2) Additional Efforts toward Cost Recovery

As a part of reviewing the revenue sources, income generation capacity in each sub sector also needs to be further examined and maximized.

For the ***road*** sector, the maintenance side 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 is enough to cover the development side. As proposed in FYDP, tapping into the fees related to road licenses, goods/motor vehicle licenses and vehicle inspection fees (collected through vehicle insurance agencies), can be a part of the development funding sources, but this is likely to be limited in its contribution.

By the same token, establishment of the '***Railway*** Fund' is currently under consideration, the proposal for which MOT has already requested to RAHCO. The proposal is expected to include fuel levy and some form of transfers from GOT and TPA as financing sources, to cover maintenance of railway tracks and rolling stocks. Evaluation of the proposal shall be included in the rest of this study once it becomes available. While it is reasonable to tap into the available sources from the beneficiaries as a part of the longer-term strategy, immediate and desperate needs for maintenance (particularly those on old tracks and spare parts for locomotives) have to be, and actually are in the process of being met by more urgent support from the donor community.

Port and aviation sectors seem more self-sustaining on the back of relatively stable and commercial- based revenue sources, but sources are not unlimited. On airports, for example, user charges and revenues from tenants can support the operations, but only for a limited number of them (out of total 58 airports) such as Dar es Salaam, Kilimanjaro and Mwanza,

which can enjoy the number of passengers beyond the break-even point. This limitation requires greater focus on strategic locations, which are profitable enough to be able to support the local airports.

(3) Improving Efficiency in Budget Execution

As reviewed in the evaluation of operational efficiencies, the rise in construction costs needs to be addressed through 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 maintenance of infrastructure on the recurrent side, and setting aside a minimum threshold for expenditures on the development side.

(4) Expanding the Revenue Sources

In order to increase the tax revenue, it will be necessary to: 1) cover the activities which are currently not fully captured, such as those in the informal sector, as well as in the natural resource sectors, 2) remove unnecessary tax exemptions if any, 3) monitor the application of tax exemptions more closely, and 4) improve the tax collection efficiency through minimizing loopholes and evasions. On the non-tax side of the revenue, royalties from natural resources, sale of shares or privatization proceeds of state enterprises, could be the candidates on the medium to long-term.

(5) Expanding the Financing Sources

In the context of declining availability in donor funds, especially on the General Budget Support front, GOT will be required to devise alternative funding sources. In addition to developing additional revenue sources mentioned above, additional financing sources have to be sought to enhance the overall fiscal capacity.

On the domestic borrowing side, a 3.5 percentage point rise in the domestic savings is expected in the current FYDP (2011/12–2015/16), creating greater capacity in the domestic credit for the next five years. For the road sector financing, this could be supported by the Road Fund as collateral for domestic borrowings from financial institutions. As for external borrowing, the current market condition is not very favourable due to the global credit contraction, but is expected to turn around in a longer timeframe. Prior to the global financial in 2008, there were active discussions in Tanzania about the infrastructure bond focusing on the transport sector. GOT will need to be prepared to take advantage of the recovery in the market momentum.

Under the current difficulty in the credit market as well as the donor financing, Public Private Partnership (PPP) is expected as an alternative financing measure, as detailed in the previous section. The process has just recently started, as GOT issued the National Public-Private Partnership Policy in November 2009 and the Public-Private Partnership Act No.19 was enacted in August 2010. While the introduction of this policy framework is in line with MTEF (2011/12–2013/14), the use of PPP at this point is constrained to the operation of relatively small existing projects (rather than brand new investments), due to the limited amount of domestic investment money and the poor appetite from the investors abroad. As a longer-term objective, a step-by-step strategy for expanding the investor base needs to be sought.

7.5 Environmental and Social Considerations

7.5.1 Environmental Legal Framework and Administration

(1) Introduction

This comprehensive transport and trade system development study consists of the following two parts: (i) Master Plan development study and (ii) Pre-Feasibility studies. 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. It should be noted that SEA Law (CAP.191, 2008), to be described later, requires that all master plan development studies conducted in Tanzania shall obtain approval from the Vice President's Office regarding appropriate SEA study and its examination process.

(2) Environmental Organization

The highest-level organizations of environmental administration in Tanzania are the Minister of State Responsible for Environment and the National Environmental Advisory Committee, both belonging to the Vice President's Office. 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. 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) 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 (National Environmental Advisory Committee), 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

This Division 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 strategic environmental assessment (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 (EIA), and, in that regard, shall facilitate public participation process within environmental decision making, exercise general supervision and coordination for all environmental issues.

7.5.2 Environmental Laws

(1) 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.

Recently, 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 the Vice President's Office. Several important environmental codes are described in this section.

(2) 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 EIA are described in Part VI. Also, general descriptions about SEA are provided in Part VII.

(3) 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.

(4) 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.

(5) 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 master plan development studies shall conduct SEA and obtain the approval from the Vice President's Office. The process of the environmental screening is specified in Part III while ToR development process with NEMC is described in Part IV. 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 stakeholder 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.

7.5.3 Environmental License

(1) Introduction

As mentioned earlier, a comprehensive transport and trade system development master plan 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) need IEE and/or EIA, depending on the magnitude of potential negative impacts to be caused by those

implementations. Application procedures of both EIA/IEE and SEA are described separately in the following sections.

(2) Environmental License (EIA)

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.

Figure 7.4 and 7.5 show the schematic diagram of the entire environmental license approval system in Tanzania.

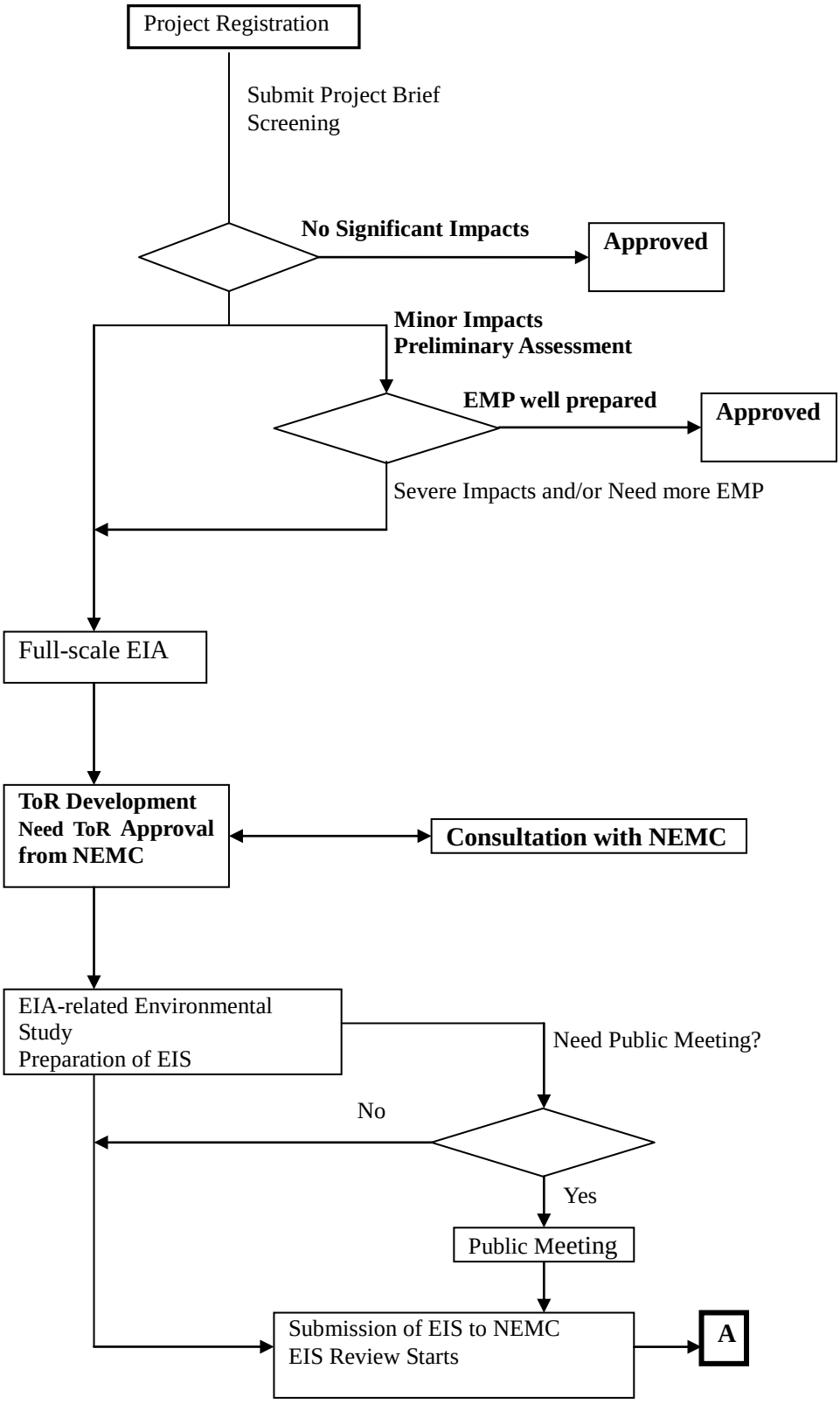


Figure 7.4: Environmental License Approval Process in Tanzania

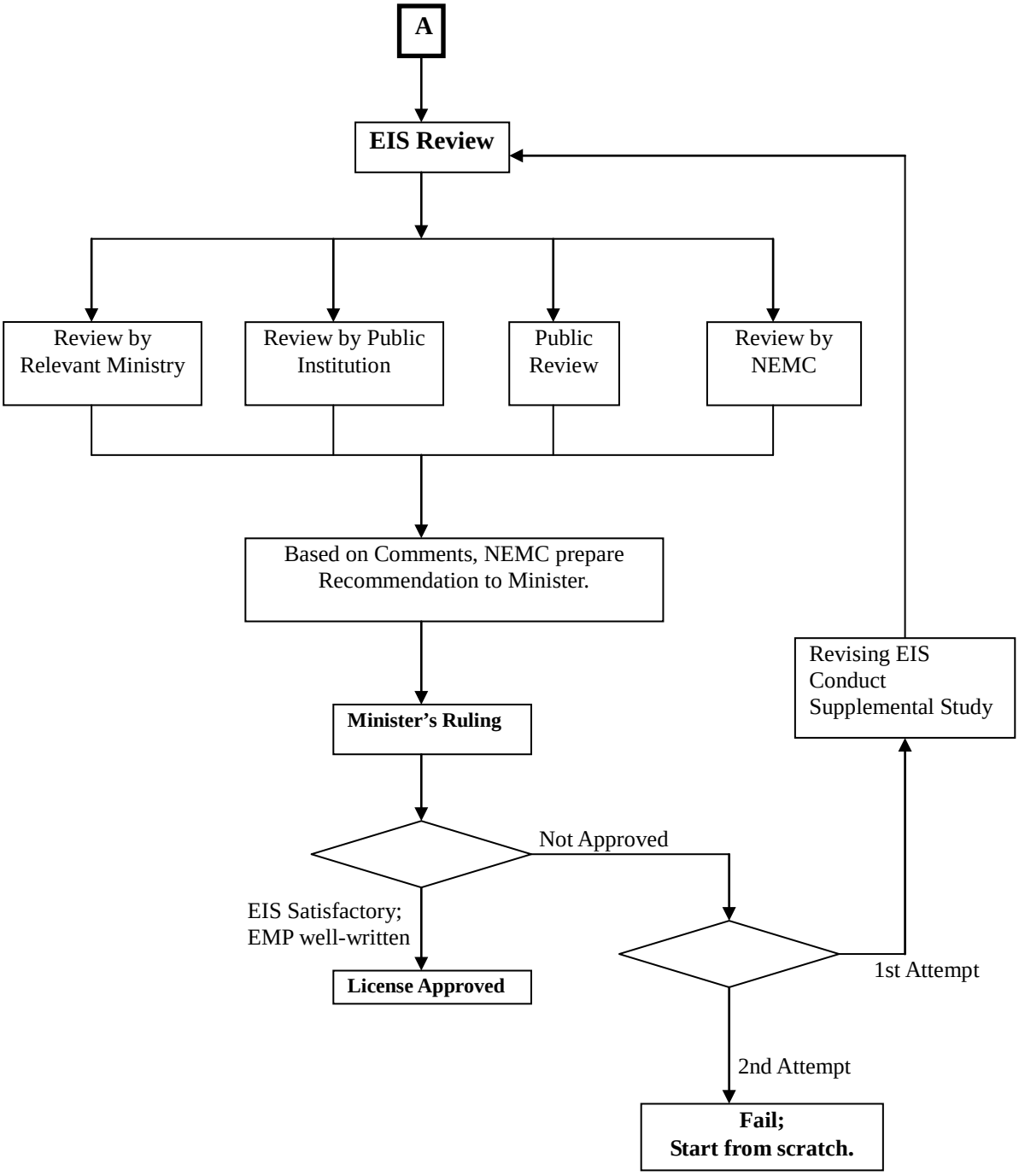


Figure 7.5: Environmental License Approval Process in Tanzania (Continued)

(3) Environmental License (SEA)

Strategic Environmental Assessment (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.

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 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 7.6 shows the schematic diagram of the entire SEA approval system in Tanzania.

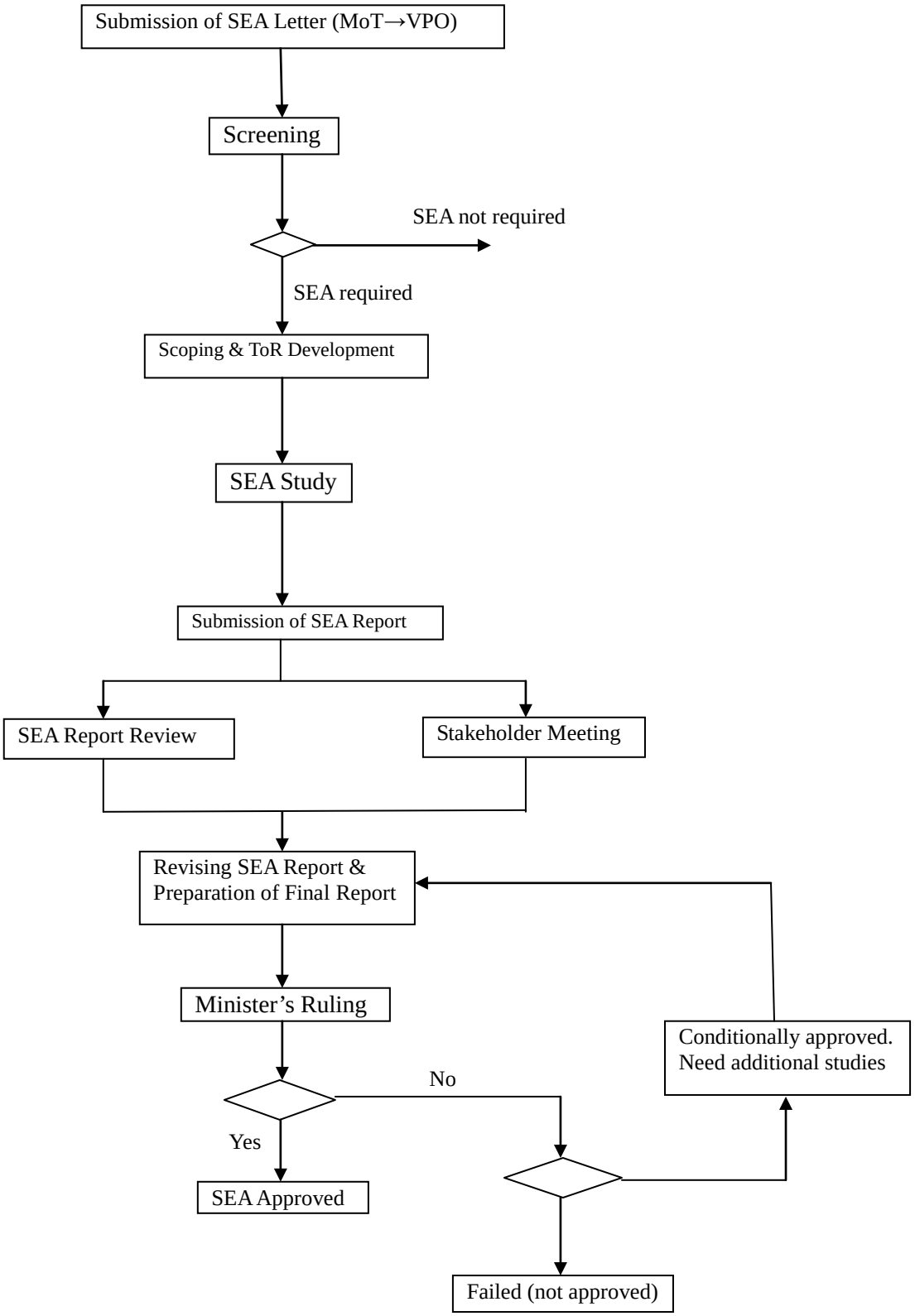


Figure 7.6: SEA Approval Process in Tanzania

Chapter 8 Estimation of Transport Demand

8.1 Forecasting Methodology and Data Collection

8.1.1 Purpose of Transport Demand Forecast

The purpose of transport demand forecasting and issues to be discussed are as follows:

Estimation of future freight origin and destination matrix by type of commodity

An origin-destination (OD) matrix representing the movement of freight imported to and exported from Tanzania and neighbouring countries was estimated by type of commodity. OD matrices was expressed with specified zones consisting of (i) regions inside Tanzania for domestic area coverage, (ii) seven zones for neighbouring countries, and (iii) integrated areas for other countries. Three different units (currency, weight, and twenty-foot equivalent units) were used for OD matrix estimation.

Assessment of function expected based on the estimated freight movement

In order to forecast transport along each corridor, the OD matrices estimated above were broken down into the corridors considering the service level of each corridor and the principal characteristics of each commodity. If there was more than one feasible corridor for the transport of a commodity, the amount of transport by commodity was estimated with a model estimating the possibility of selecting a corridor based on the level of service, which will be determined based on a stated preference survey of transport operators.

Analysis of the balance between transport demand and the supply of infrastructure proposed in the Master Plan

The supply of infrastructure based on projects proposed in the Master Plan was analyzed by comparing it with the demand for freight movement along each corridor. Total transport system costs was assessed with indicators such as transport cost (i.e., the sum of time and expenses required for transporting commodities along all corridors). The benefits of the Master Plan were calculated from the difference in transport costs between the cases with and without the Master Plan.

8.1.2 Development of the Existing Origin-Destination Matrix

An OD matrix was developed based on the format displayed in Figure 8.1. As shown in the figure, this matrix consists of four parts: (i) interregional freight (domestic movement inside Tanzania), (ii) export trade from Tanzania, (iii) import trade to Tanzania, and trade between the rest of the countries and areas. Part (iv) includes trade between the neighbouring countries and between the neighbouring countries and the rest of the world. Some trade, for example exports from Burundi to the Middle East, could be transported along corridors inside Tanzania. This type of trade was estimated, while the trade between countries in the rest of the world that has no possibility to be transported inside Tanzania was not estimated.

In order to develop the existing OD matrix representing freight movement between two countries, statistical data on the amount of trade by commodity type was obtained from the UN COMTRADE database (http://comtrade.un.org/). After compiling this data in the format of an OD matrix between two countries, the part that represents imports to and exports from Tanzania was distributed to regions for analysis of domestic traffic, while the part for the rest of the world was aggregated into areas such as Asia, the Middle East, and Europe. This distribution was done by considering regional ratios of variables such as population and gross regional domestic product (GRDP).

		Domestic					Neighbouring Countries					Other Area				
		Arusha	DES	Dodoma	…	Tanga	Burundi	DRC	Kenya	…	Zambia	Other Africa	Asia	Middle East	Europe	Others
National	Arusha	Domestic Freight inside Tanzania					Export from Tanzania									
	DES															
	Dodoma															
	…															
	Tanga															
Neighbouring Countries	Burundi	Import to Tanzania					Possibly Transit									
	DRC															
	Kenya															
	…															
	Zambia															
Other Area	Other Africa															
	Asia															
	Middle East															
	Europe															
	Others															

Figure 8.1: Format of the Origin–Destination Matrix

On the other hand, domestic movement inside Tanzania should include not only international trade between two countries but also the movement between regions of goods that are produced, transported, and consumed in Tanzania. This was established by estimating the amount of goods by type of commodity in terms of production and consumption in each region, and a "self-contained ratio". It was assumed that the production surplus of regions is transported to regions with production deficits, and this comprises domestic freight inside Tanzania and is added as a component of the interregional freight part of the matrix.

The following statistical data was required for this analysis:

- Population by region;
- Number of workers and employees by region;
- Regional economic indicator (GRDP);
- Amount of and/or cultivated area for major agricultural products by region; and
- Amount of industrial product by region.

8.1.3 Network Database Development

The information provided from the network database for this project is the value of time savings calculated by using a linear combination of travel time and cost, termed the "generalized cost" for a specific route or corridor. When production and consumption areas are determined, the network database provides the minimized-cost route or corridor from origin to destination by calculating the sum of travel time and cost on the route.

The network database was developed using a geographical information system (GIS). Most GIS systems are originally developed for point, line, and polygon processing. The transport network can be expressed with a set of lines and transport terminals such as ports, stations, and export processing zones (EPZs) expressed with a set of points in the GIS.

Details follow:

- Two layers, a line layer for the network and a polygon layer for the regions, were developed.
- The polygon layer consists of region, country, and areas, and regional statistics are kept in the polygon layer.
- The network layer includes road, railway, waterway, airline, pipeline, and foreign sea routes.
- The network is composed with a line and node; a line connects two nodes and information is kept on each link so that the data can be transformed into the format of the System for Traffic Demand Analysis (STRADA) network data that was used for searching a minimized cost route.

For the development of network database, the following data was collected:

- Road inventory (e.g., road name, length, pavement, carriageway width);
- Railway (e.g., name of line, location of stations, distance, operating hours, service data);
- Maritime and inland waterway (e.g., route, frequency and operating time, tariff, handling capacity, transportation performance);
- Pipeline (e.g., route, capacity, transportation performance).

8.1.4 Corridor Choice Model

Generally, bulk cargo such as mineral products is transported by railway or inland waterway, and commodities requiring frequent and short distance transport are carried by land transport (e.g., by truck). Thus, it is necessary to analyze the preference and choice of transport mode by transport-related and logistics companies. In order to collect the data used for this analysis, an interview survey was conducted with major shipping companies and freight companies selected in Tanzania and neighbouring countries. The interview was designed to collect the following information:

- Company profile (e.g., company name, major products, number of employees);
- Major product and material (e.g., type of products, amount of products, major destinations of products and major origin of materials);
- Transportation (e.g., annual transport volume of products and materials, transport route, transport time and cost by route);
- Preference of route choice (e.g., reasons for route choice, alternative route choice in different conditions of transport time and cost).

Figure 8.2 shows possible chains of mode choice between origins and destinations inside Tanzania, which is the basis of analysis for formulating the corridor choice model.

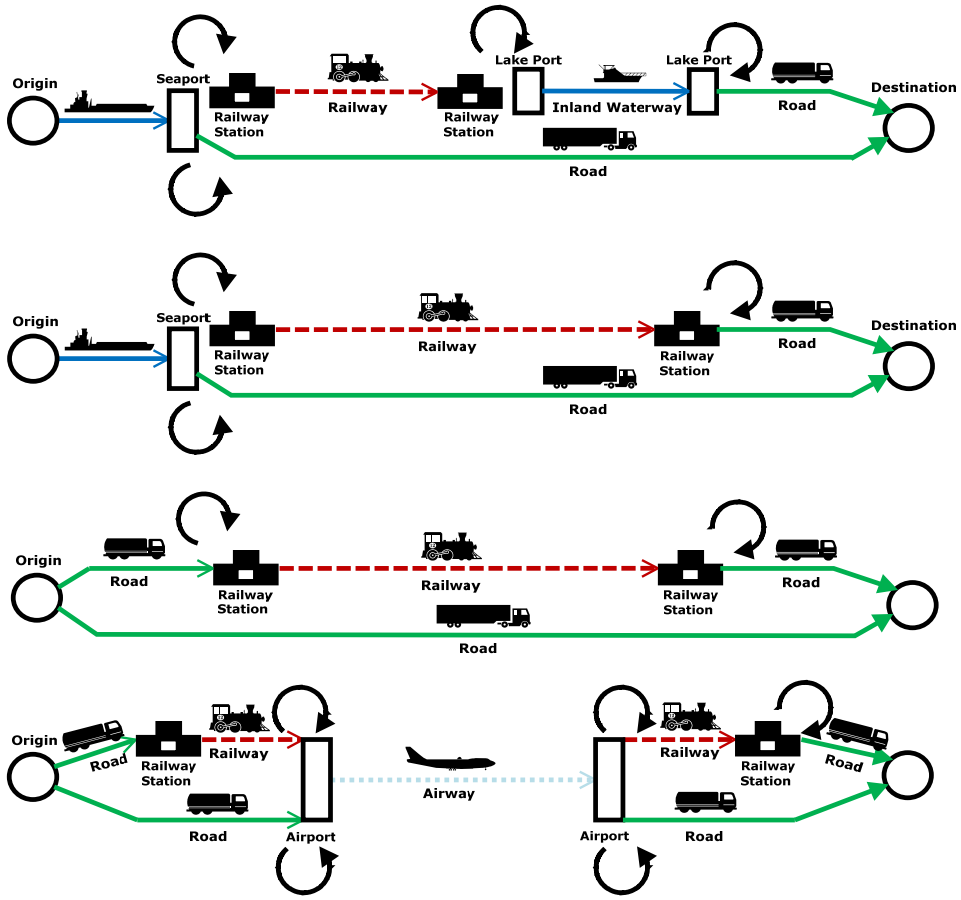


Figure 8.2: Candidate Modal Chains

For forecasting future corridor choice, the following model was examined to analyze the relationship between the current trend of route choice and transport cost.

$$R_{ij}^{k} = \frac{e^{a_0 + a_1 \cdot t_{ij}^{k} + a_2 \cdot c_{ij}^{k} + a_3 \cdot \delta_1^{K} + a_4 \cdot \delta_2^{k} + \cdots}}{\sum_{l} e^{a_0 + a_1 \cdot t_{ij}^{l} + a_2 \cdot c_{ij}^{l} + a_3 \cdot \delta_{i1}^{l} + a \cdot \delta_{i2}^{l} + \cdots}}$$

Where R_{ij}^{k} : choice probability of corridor k for zones between i and j;

t_{ij}^{k}, c_{ij}^{k} : travel time and travel cost on corridor k for zones between i and j;

$\delta_1^{k}, \delta_2^{k}, \cdots$: other factors for the selection of corridor k;

$a_0, a_1, a_2, \cdots$: parametres; and

l : candidate corridors.

8.1.5 Calibration of Models

The existing OD matrix was elaborated through the process described above. The development process includes some assumptions and parameters obtained with the analysis based on the data collected. Therefore, the process and output, an OD matrix, were examined to gauge the accuracy of the forecast, and if the accuracy was insufficient, the process and parameters were determined again.

There are three steps involved in the calibration. First, the estimated OD matrix was compared with the surveyed OD matrix obtained by OD interview surveys. Second, the estimated freight volume at intermodal stations such as railway stations, seaports, and logistics terminals was checked by comparing it with the amount of freight actually carried by each mode at the stations after selecting a corridor for distribution of some commodity. This was carried out in order to check the total amount of the commodity included in the OD matrix. The third step is that the vehicle traffic volume by transport mode on each link in the road network was examined by comparing it with the traffic volume counted in the transport surveys.

The following information was required for this calibration:

- Results of the OD interview surveys (amount of freight by type of commodity for origin and destination pairs);
- Performance statistics by type of mode (amount of freight between stations by railway mode and type of commodity, amount of freight between ports by inland waterway and type of commodity); and
- Performance statistics at transport terminals (amount of freight performed by type of commodity at port, customs, and logistics terminal).

8.1.6 Transport Demand Forecasting

Figure 8.3 presents the procedure for transport demand forecasting. In the beginning of the procedure, a model forecasting the production and attraction of freight volume by zone, which is the sum of elements in the OD matrix, was estimated by analyzing the relationship between national and regional economic statistics and the volume of national imports, exports, regional production, and consumption. The future national and regional economic and regional development situation was projected by reviewing the national economic plan and development projects, and then was used as input to the model for estimation of future OD matrices.

The future network was developed by improving and/or adding future projects on the existing network data. The following sector projects were considered to be included in this improvement.

- New construction and improvement of road sections;
- Improvement of operational service level of existing railway lines;
- Improvement of handling capacity at existing seaports and lake ports;
- Construction of new international seaports; and
- Improvement of service levels for customs clearance at borders.

Based on the future network, the performance of each corridor was analyzed in terms of transport time and cost. The probability was then calculated by inputting the transport time and cost by corridor into the model as described in the previous section and the transport flow was distributed to the corridors according to the probability, so that the OD matrix by corridor and the transport volume by type of transport mode was specified.

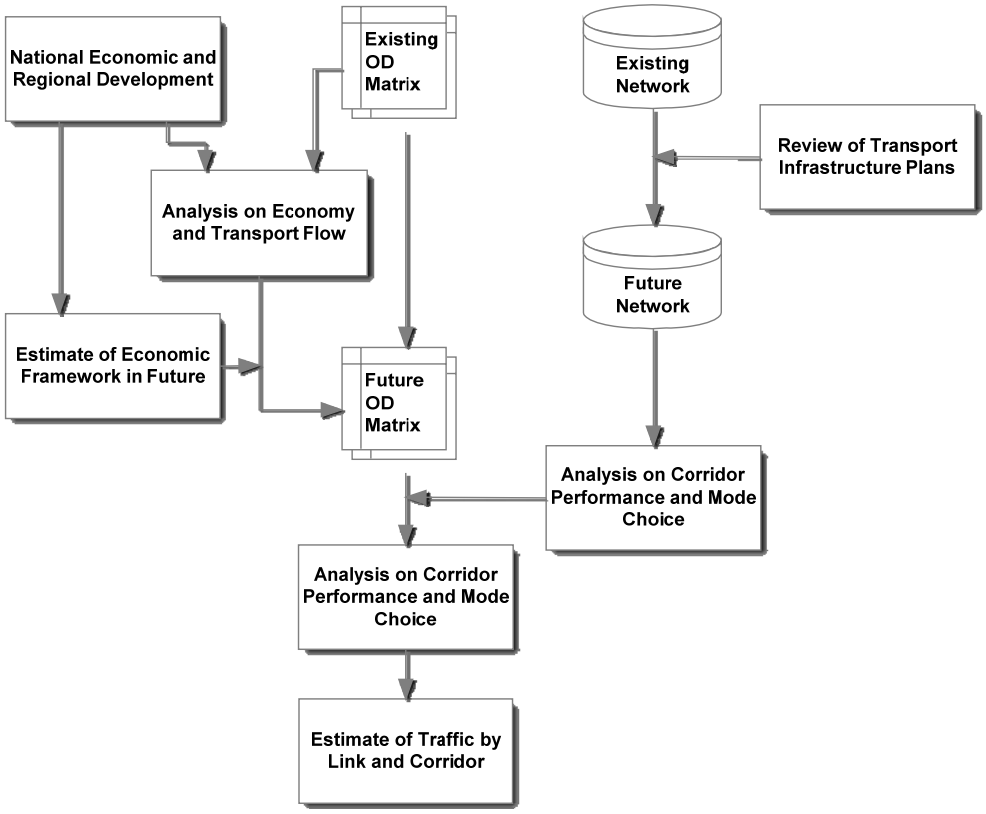


Figure 8.3: Transport Demand Forecasting Procedure

8.2 Field Surveys

In order to clarify commodity and passenger movements in and through Tanzania, a roadside traffic survey was conducted at specific locations in and around Tanzania as a part of the study. The roadside traffic survey consisted of: (i) an origin and destination survey (OD survey) for freight; (ii) a passenger OD survey; and (iii) a traffic count survey. The surveys were implemented by a subcontractor contracted by the JICA Study Team. The survey results were compiled and verified by the JICA Study Team. After verification, the final data files were used to build origin and destination tables. A summary of the surveys and verification follows.

8.2.1 Summary of Field Surveys

The field surveys were conducted from the mid-September to mid-October 2011 after preparation of survey sheets, training of surveyors, and implementation of a pilot survey with the JICA Study Team. The three categories of surveys are summarized below.

(1) Origin and Destination Survey for Freight

Directed at truck drivers passing through survey locations, the freight OD survey was conducted mainly to obtain information on the origins and destinations of truck trips to transport commodities. Surveyors interviewed truck drivers and filled out interview sheets at each survey location. The survey results were processed to develop a database that was used to estimate the origins and destinations of freight movements by commodity.

Considering the large number of survey locations and the limited duration of the survey, the survey period at most was set as one day (i.e., the 16 hours with the highest traffic volume per

day[1]). The target sample size was set as 20 or above per hour at high traffic locations with 25 freight vehicles or more per hour; it was set as 80% of the total freight vehicles or above at locations with lower traffic volumes.

Major data items surveyed included: (i) vehicle type; (ii) vehicle registration number; (iii) trip origin and destination; (iv) category of commodity; (v) cargo weight; (vi) vehicle tare weight; and (vii) transport time by the vehicle. Additional questions regarding the time taken for each stage of the trip including port procedure, highway, checkpoints (police and weighbridge), and border crossing were asked of 20% of interviewees. In addition, truck drivers crossing borders or using inland clearance/container depots (ICDs), or export processing zones (EPZs)/special economic zones (SEZs) were asked how many documents and how much time were usually required to pass through the survey location.

Table 8.1 and Figure 8.4 show the final survey locations. Appendix 3 shows the survey sheets used for the interviews, as well as the instruments for the passenger and freight origin and destination surveys.

(2) Passenger Origin and Destination Survey

Although the main subject of the study is freight transport, a passenger origin and destination survey was also conducted in order to identify the relative portions of freight and passenger flows within overall transport movement in and through Tanzania.

The passenger OD survey was conducted at the survey locations at which both freight and passenger vehicles pass. For example, referring to Table 8.1, at the crossing points in 21 regions on trunk and/or regional roads and at border points with neighbouring countries crossed by trunk and/or regional roads, both truck drivers and drivers and/or passengers of passenger vehicles (e.g., buses and sedans) were interviewed for both the freight and passenger OD surveys. In the case of railway stations and lake ports, where interviews of truck drivers were conducted at the gates of the freight yards, passengers walking from/to the railway station or lake port were interviewed.

The survey period at each location for the passenger OD survey was the same as that for the origin and destination survey for freight. However, the target sampling size was set lower than that of survey for freight because the major target of the overall study is freight transport. Specifically, target sample size for the passenger survey was set at 10 passenger vehicles interviewed or above per hour at high traffic locations with 12 passenger vehicles or above per hour, while at locations with lower traffic 80% or above of the passenger vehicles were interviewed (in addition to freight vehicles). The driver or only one passenger was interviewed in each bus or other passenger vehicle surveyed.[2]

Major data items surveyed include: (i) vehicle type; (ii) passenger characteristics (e.g., gender, age); (iii) trip origin and destination; (iv) physical address of the interviewee; and (v) number of passengers in the vehicle. Additional survey items at railway stations and lake ports include the origin/destination and transit points of the subject transport mode, and transport modes used from/to the origin/destination of the subject transport mode. For example, in the case of an interview at a railway station, origin/destination and transit stations and transport mode used from/to the destination/origin station (e.g., bus, private car, or walking) were asked of the interviewees.

[1] At some locations where there is traffic for less than 16 hours per day (e.g., at some border posts and the freight yards of some railway stations, ports, and ICDs), the survey was conducted only during the operating hours.
[2] Because the area of each origin/destination zone is large, the origin and destination of all passengers on the same passenger vehicle were regarded as the same.

(3) Traffic Count Survey

The traffic count survey was conducted in order to specify the total number of freight and passenger vehicles at the locations where the freight and passenger OD surveys were conducted. The survey period was set as one to three days depending on the location. The vehicle types were categorized as follows: (i) car; (ii) utility vehicle (bus/van); (iii) bus (26 seats); (iv) bus (26 seats or above); (v) light truck (2 axles); (vi) medium truck (3 axles); (vii) heavy truck (4 axles); (viii) heavy truck (5 axles); (ix) heavy truck (6 axles); (x) heavy truck (7 axles or above); (xi) motorcycle/bicycle; and (xii) animal-drawn or hand cart, or other vehicle type.

8.2.2 Results of Field Surveys

By the end of October 2011, the field surveys at all survey locations had been completed. Then, the interview results on the survey sheets were captured in Excel data files, and these were compiled and verified. Table 8.1 summarizes the implementation of the field survey.

Table 8.1: Summary of the Implementation of the Field Survey

			Freight OD		Passenger OD	
Location Category (Survey Category)	**Location Number**	**Location Name**	**Date of Survey**	**Sample Size**	**Date of Survey**	**Sample Size**
Border points with neighbouring countries crossed by trunk and/or regional roads (Freight and Passenger OD Survey/Traffic Count)	B-1	Sirari/Isebania	26-Sep	43	26-Sep	3
	B-2	Namanga	23-Sep	66	23-Sep	12
	B-3	Tarakea	3 & 4-Oct	21	4-Oct	1
	B-4	Holili	6,7 & 9-Oct	38	6-Oct	7
	B-5	Horohoro	15-Oct	18		
	B-6	Umoja Bridge	25-Sep	7	25-Sep	7
	B-7	Kasumulu	10-Oct	26	10-Oct	1
	B-8	Tunduma	2 & 3-Oct	96		
	B-9	Rusumo	12-Oct	76	12-Oct	2
	B-10	Mutukula	8-Oct	13		
Crossing points in 21 regions on trunk and/or regional roads (Freight and Passenger OD Survey/Traffic Count)	C-1	Rubana	28 & 29-Sep	107	28-Sep	4
	C-2	Katoro	4-Oct	47	4-Oct	28
	C-3	Kahama	14-Oct	48	14-Oct	13
	C-4	Tinde	16-Oct	90	16-Oct	14
	C-5	Mwandinga	27-Sep	46	27-Sep	14
	C-6	Ushokola	30-Sep & 1-Oct	24	30-Sep & 1-Oct	10
	C-7	Lwanzali	4 & 5-Oct	7	4 & 5-Oct	18
	C-8	Cheyo	6, 7 & 9-Oct	51	6-Oct	8
	C-9	Shingida	9 & 10-Oct	136	9-Oct	19
	C-10	Kikuyu	12-Oct	27	12-Oct	16
	C-11	Gairo	15 & 16-Oct	158	15 & 17-Oct	33
	C-12	Mikese	12, 16 & 19-Oct	81	12-Oct	26
	C-13	Uyole	30-Sep & 1-Oct	60	30-Sep	4
	C-14	Songea	5-Oct	3	5-Oct	7
	C-15	Mletele	5 & 6-Oct	18		
	C-16	Ruvuma	5 & 6-Oct	46	5-Oct	4
	C-17	Igumbilo	13, 14, 15 & 16-Oct	395	13, 14, 15 & 16-Oct	43
	C-18	Mtwara Yatch Club	23 & 24-Sep	53	23 & 24-Sep	69
	C-19	Mingoyo-Lindi	27-Sep	59	27-Sep	52
	C-20	Kilombero	18-Oct	3		
	C-21	Msata	3-Oct	85	3-Oct	55
	C-22	Minjingu	25-Sep	68	25-Sep	27
	C-23	USA River/Kikatiti	28-Sep	93	28-Sep	40

Location Category (Survey Category)	Location Number	Location Name	Freight OD		Passenger OD	
			Date of Survey	Sample Size	Date of Survey	Sample Size
	C-24	Himo	30-Sep	95	30-Sep	95
	C-25	Hedaru	9, 10, 11 & 13-Oct	271		
	C-26	Mutukula	8-Oct	18	8-Oct	13
Railway stations/yards in Tanzania (TRL) (Freight and Passenger OD Survey/Traffic Count)	R-1	Dar es Salaam (TRL)			7 & 8-Oct	110
	R-2	Morogoro (TRL)			18-Oct	66
	R-3	Kaliua (TRL)			30-Sep	25
	R-4	Mpanda (TRL)	24 & 25-Sep	10	25-Sep	27
	R-5	Kilosa (TRL)			19-Oct	18
	R-6	Dodoma (TRL)			12-Oct	24
	R-7	Tabora (TRL)			3-Oct	58
Railway stations/yards in Tanzania (TAZARA) (Freight and Passenger OD Survey/Traffic Count)	R-8	Mbeya (TAZARA)			1-Oct	10
	R-9	Makambako (TAZARA)	11 & 12-Oct	13		
Lake Ports (Freight and Passenger OD Survey/Traffic Count)	L-1	Kyela (New Kiwira)			11-Oct	40
	L-2	Kasanga	29 & 30-Oct	4	30-Oct	12
	L-3	Kigoma	26 & 27-Oct	10	28-Sep	26
	L-4	Bukoba			7-Oct	90
	L-5	Mwanza			1 & 2-Oct	62
Seaport Gates (Freight OD Survey/ Traffic Count)	S-1	Dar es Salaam	10, 11, 12 & 17-Oct	186	–	–
	S-2	Tanga	17 & 18-Oct	50	–	–
Inland Container and Freight Ports (Freight OD Survey/ Traffic Count)	I-1	MOFED	15-Oct	40	–	–
	I-2	AICD	19-Oct	10	–	–
	I-3	DICD	8-Oct	32	–	–
	I-4	AMI	6-Oct	49	–	–
	I-5	AZAM	19-Oct	17	–	–
	I-6	MCCL	19-Oct	6	–	–
	D-1	Mbeya	30-Sep & 1-Oct	5	–	–
	D-2	Isaka	19-Oct	23	–	–
International Airports (Freight OD Survey/ Traffic Count)	A-1	Dar es Salaam	17-Oct	45	–	–
	A-2	Kilimanjaro	29-Sep	3	–	–
	A-3	Mwanza	29 & 30-Sep	3	–	–
EPZs and SEZs (Freight OD Survey/ Traffic Count)	E-1	BWM-SEZ	7-Oct	5	–	–
	E-2	Millennium Business Park	6-Oct	29	–	–
	E-3	Hifadhi EPZ	6-Oct	16	–	–
	E-4	Kisongo	26-Sep	62	–	–
Total	–	**67 locations**	–	**3111**	–	**1213**

Abbreviations: DSM = Dar es Salaam, EPZ = export processing zone, OD = origin-destination, SEZ = special economic zone, TAZARA = Tanzania Zambia Railway Authority, TRL = Tanzania Railways Limited
Source: JICA Study Team

Figure 8.4: Survey Locations –
Border Points, Regional Crossing Points, and Lake Ports

Two steps were required to verify the survey results. First, the subcontractor checked survey sheets and made modifications in columns with obvious mistakes in which the appropriate responses were clear.[3] Second, JICA Study Team checked the all survey sheets by themselves, added missing information which were shown on the survey sheets but not reflected to the Excel data files by the subcontractor, and modified mistakes of data capturing by the subcontractor. The samples whose data on the original survey sheet was recognized inadequate were eliminated as invalid samples by JICA Study Team. The number of valid samples verified by the process above is 2930.

8.2.3 Estimation of Existing Origin-Destination Matrix in Tanzania

The valid samples described in Subsection 8.2.2 were complied as a dataset for estimation of the origin and destination (OD) matrix in Tanzania.

[3] These modifications by the subcontractor focused on the transport time at each stage of travel. For example, if the total transport time was not recorded appropriately, but if the appropriate answer was obvious from the time taken at each stage of travel, the subcontractor calculated the sum of the time taken for each stage of travel and recorded the calculation result.

In order to estimate the OD matrix for road transport, at first the data from the crossing points in 21 regions and border points was extended based on the traffic volume at the survey location by vehicle category. Next, base OD tables by commodity were compiled. The final OD matrix was estimated through a calibration process using the base tables.

The data from railway stations, lake ports, seaports, and airports was extended based on the cargo handling or cargo transport volume of each transport mode at each survey location. The final OD was again estimated through a calibration process using the base tables.

8.3 Findings on Existing Transport Demand

8.3.1 International Trade

(1) Amount of Trade by Tanzania and Neighbouring Countries

Table 8.2 shows the past trends of Tanzania's foreign trade and that of its neighbouring countries (Burundi, the Democratic Republic of the Congo/DRC, Kenya, Malawi, Mozambique, Rwanda, Uganda, and Zambia) calculated based on the statistics obtained from was obtained from the UN COMTRADE database (http://comtrade.un.org/). Figure 8.5 presents an image of the trading volume of each country and its growth from 2001 to 2010.

As illustrated in Figure 8.5, Kenya has the largest volume with USD 12.1 million in total goods trade, followed by Zambia with USD 12.5 million and Tanzania with USD 12.1M. Zambia has a surplus of exports over imports, while the rest of the countries have a surplus of imports over exports. The highest growth rate for imports was that of Burundi at 6.0 from 2001 to 2010, which is an equivalent average annual growth rate (AAGR) of 22.0%, while the highest growth for exports was that of Zambia at 7.3, or an AAGR of 24.7%. The growth rate of both imports and exports for the rest of the countries in the table exhibit a similar trend.

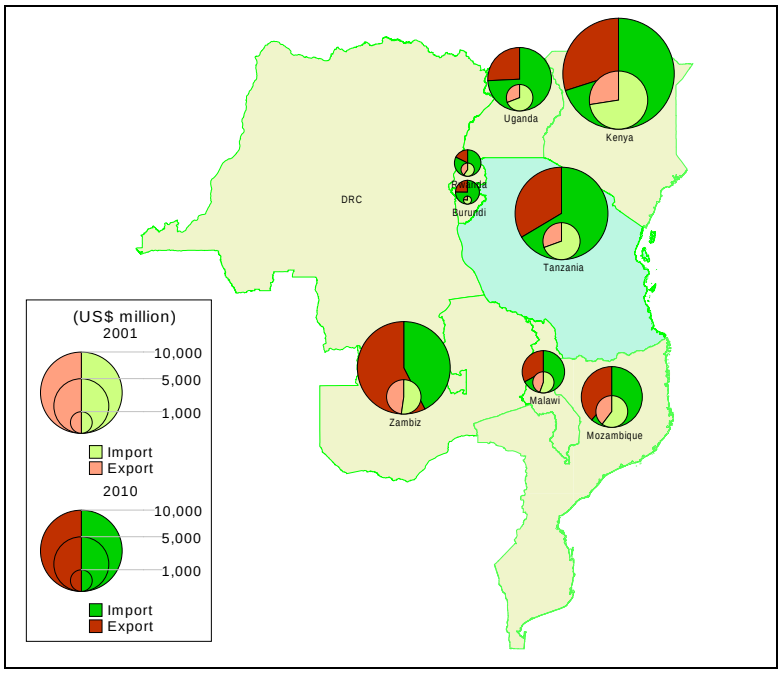


Figure 8.5: Growth in Trade Volume of Tanzania and Neighbouring Countries from 2001 to 2010 (USD Million)

Table 8.2: Import/Export Trends of Tanzania and Neighbouring Countries (2001–2010)

Unit: USD million

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Import										
Burundi	138.9	128.8	144.7	172.7	258.2	433.6	423.0	315.2	344.8	832.5
Kenya	4,008.0	3,074.6	3,475.0	4,563.5	5,846.2	7,232.9	8,989.3	11,127.8	10,202.0	12,092.9
Malawi	561.6	695.0	785.4	928.7	1,165.2	1,206.7	1,377.8	2,203.7	2,021.7	2,173.0
Mozambique	1,063.1	1,543.0	1,753.0	2,034.7	2,408.2	2,869.3	3,049.7	4,007.8	3,764.2	3,564.2
Rwanda	278.7	252.8	261.7	310.1	411.7	487.9	679.1	1,035.6	1,112.0	-
Uganda	1,005.5	1,073.8	1,375.1	1,720.2	2,054.1	2,557.3	3,493.4	4,525.9	4,247.4	4,664.3
Tanzania	1,728.5	1,691.2	2,164.3	2,556.4	3,246.8	4,526.7	5,919.0	8,087.7	6,530.8	8,012.9
Zambia	1,081.8	1,102.5	1,573.8	2,152.1	2,558.0	3,074.3	4,007.0	5,060.5	3,792.6	5,320.8
Export										
Burundi	42.2	26.6	65.9	82.7	113.8	228.5	156.2	141.8	112.9	275.5
Kenya	1,520.2	1,400.4	2,551.1	2,683.2	3,419.9	3,501.7	4,080.8	5,000.9	4,463.4	5,169.1
Malawi	449.4	377.5	502.4	458.7	495.5	666.2	868.6	879.0	1,187.9	1,066.2
Mozambique	703.1	809.8	1,043.9	1,503.8	1,745.3	2,381.1	2,412.1	2,653.3	2,147.2	2,243.1
Rwanda	186.7	54.1	51.3	99.5	149.1	140.7	182.8	250.2	260.7	237.8
Uganda	450.5	467.4	531.6	653.5	812.8	962.2	1,336.7	1,724.3	1,567.6	1,618.6
Tanzania	762.9	901.4	1,132.0	1,473.1	1,671.8	1,864.7	2,139.3	3,121.1	2,982.4	4,050.5
Zambia	987.4	956.3	980.4	1,575.6	1,809.8	3,770.4	4,617.5	5,098.7	4,312.1	7,200.3
Total										
Burundi	181.1	155.4	210.6	255.5	371.9	662.2	579.2	456.9	457.7	1,108.1
Kenya	5,528.2	4,475.0	6,026.1	7,246.7	9,266.1	10,734.6	13,070.1	16,128.8	14,665.4	17,262.0
Malawi	1,011.0	1,072.5	1,287.8	1,387.4	1,660.7	1,872.9	2,246.4	3,082.7	3,209.6	3,239.2
Mozambique	1,766.2	2,352.8	2,796.9	3,538.5	4,153.5	5,250.5	5,461.8	6,661.0	5,911.4	5,807.3
Rwanda	465.4	306.9	312.9	409.7	560.8	628.6	861.9	1,285.8	1,372.7	–
Uganda	1,456.0	1,541.1	1,906.7	2,373.8	2,866.9	3,519.5	4,830.0	6,250.2	5,815.0	6,282.9
Tanzania	2,491.4	2,592.6	3,296.3	4,029.6	4,918.6	6,391.4	8,058.4	11,208.8	9,513.2	12,063.4
Zambia	2,069.3	2,058.8	2,554.3	3,727.7	4,367.8	6,844.6	8,624.4	10,159.2	8,104.7	12,521.1

Source: JICA Study Team

(2) Change in Type of Commodity Traded by Tanzania

Tables 8.3 and 8.4 indicate the changing trends of Tanzania's imports and exports by type of commodity; Figure 8.6 graphically shows their shares. Mineral fuel is the most imported commodity with imports reaching 3.6 million tonnes in 2010, followed by vegetable products at 1.5 million tonnes. The share of mineral fuel in total imports increased from 31% in 2001 to 47% in 2010, while the share of vegetable products decreased from 32% to 19% over that same period. Commodities imported with relatively high volumes in 2010 were mineral products at 646,000 tonnes, products of chemicals and allied industries at 556,000 tonnes, and metals at 498,000 tonnes.

Regarding exports, vegetable products accounted for the highest volume at 821,000 tonnes, followed by mineral products at 384,000 tonnes, and foodstuffs at 330,000 tonnes. The share of vegetable products decreased gradually from 48% in 2001 to 38% in 2010. There has been considerable diversification from agricultural exports.

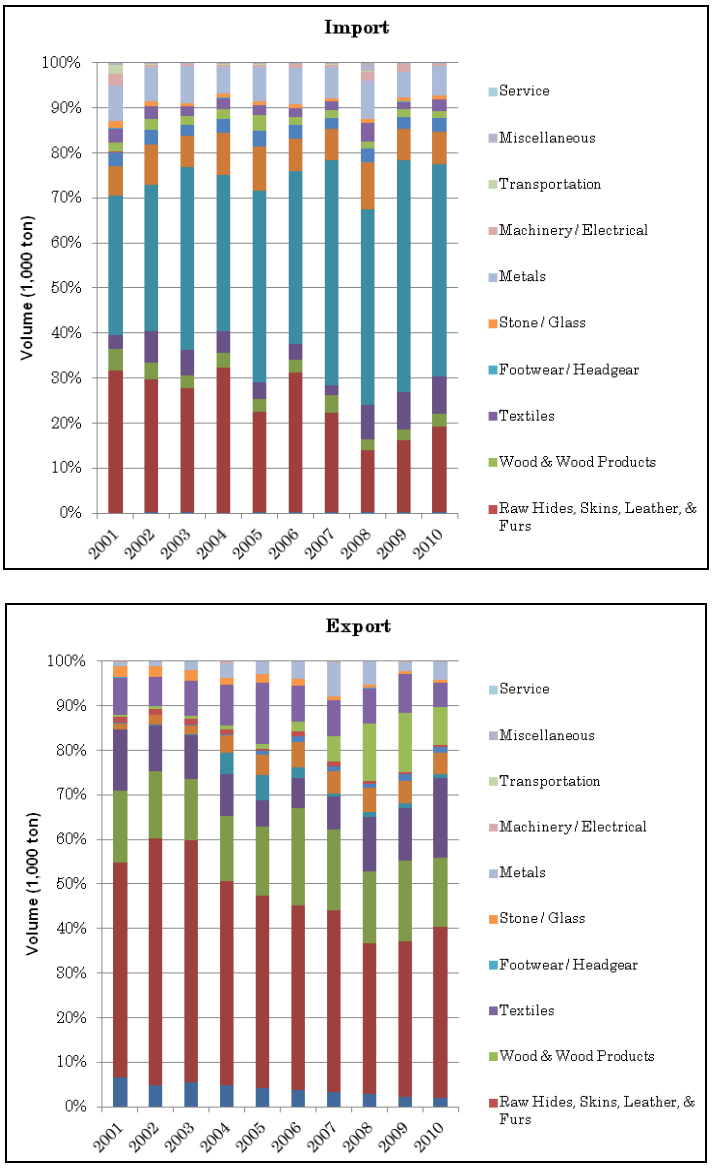


Figure 8.6: Trend of Shares by Type of Commodity

Table 8.3: Import Trends of Tanzania by Type of Commodity (2001–2010)

Unit: 1,000 tonnes

Import	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Animal and Animal Products	3.4	5.4	5.8	5.2	6.1	7.5	13.3	17.5	16.2	16.3
Vegetable Products	839.6	759.9	1,000.1	1,142.1	905.9	1,498.4	1,303.1	862.4	1,231.9	1,468.5
Foodstuffs	124.0	100.0	100.5	116.0	115.0	135.2	221.1	146.5	182.1	227.1
Mineral Products	85.9	180.7	209.9	166.7	155.3	169.1	140.9	480.1	636.7	646.0
Mineral Fuel	819.1	836.3	1,475.7	1,230.8	1,724.7	1,855.2	2,940.7	2,723.3	3,964.4	3,648.3
Chemicals and Allied Industries	177.0	235.3	252.9	334.5	395.5	354.2	401.7	664.8	530.3	556.0
Plastics/Rubber	80.7	84.7	87.9	107.2	141.1	145.6	147.8	184.9	194.3	233.2
Raw Hides, Skins, Leather, and Furs	2.6	0.1	0.2	0.3	0.4	0.6	0.6	1.1	0.9	1.2
Wood and Wood Products	55.6	59.5	66.6	81.9	141.0	85.1	104.5	105.2	139.0	122.2
Textiles	77.9	74.8	80.4	86.0	86.0	90.1	105.7	251.0	125.2	196.2
Footwear/ Headgear	5.2	0.3	0.6	0.9	0.6	1.0	0.6	1.1	1.4	1.9
Stone/Glass	40.6	25.6	26.5	30.8	34.4	38.0	46.2	57.7	67.9	68.8
Metals	211.9	200.4	299.1	214.5	309.8	397.5	410.6	533.0	441.7	497.9
Machinery/Electrical Products	71.0	11.9	12.4	16.9	24.4	34.8	27.6	130.2	132.4	31.7
Transportation	50.2	4.1	4.8	6.1	9.4	7.6	9.3	12.9	11.0	11.0
Miscellaneous	13.6	6.9	7.3	8.2	7.8	9.3	14.2	109.5	14.1	16.5
Service	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	2,658.3	2,585.8	3,630.7	3,548.1	4,057.4	4,829.1	5,887.9	6,281.3	7,689.5	7,742.9

Source: JICA Study Team

Table 8.4: Export Trends of Tanzania by Type of Commodity (2001–2010)

Unit: 1,000 tonnes

Export	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Animal and Animal Products	47.3	41.6	50.2	53.7	52.6	40.4	52.1	49.8	37.7	41.6
Vegetable Products	345.8	478.2	500.5	519.8	552.2	445.3	655.6	575.5	585.7	820.7
Foodstuffs	115.0	128.4	126.9	164.8	198.3	234.2	290.8	279.1	300.9	330.1
Mineral Products	97.8	88.1	90.2	107.1	75.3	72.9	120.3	208.3	198.1	384.6
Mineral Fuel	0.9	1.6	0.7	54.5	73.1	26.5	7.7	18.8	16.5	16.0
Chemicals and Allied Industries	9.6	18.9	18.3	42.4	58.7	61.7	81.0	89.7	84.7	105.6
Plastics/Rubber	0.6	0.7	3.1	4.4	9.2	13.3	19.5	15.0	24.7	26.6
Raw Hides, Skins, Leather, and Furs	10.1	11.0	11.2	10.8	7.8	12.3	16.1	12.4	8.7	11.5
Wood and Wood Products	2.8	5.4	6.8	9.4	12.5	21.8	92.3	219.3	222.1	180.1
Textiles	59.7	56.5	71.3	104.6	175.0	88.3	127.8	137.0	147.5	116.6
Footwear/Headgear	1.8	0.1	0.0	0.1	0.0	0.1	0.3	0.5	0.2	0.0
Stone/Glass	16.8	21.2	21.7	16.2	25.4	16.0	15.0	11.6	8.8	12.3
Metals	6.6	9.4	19.5	37.9	36.9	41.7	123.4	89.5	35.9	89.3
Machinery/Electrical	1.4	0.2	0.0	5.2	0.6	0.7	2.1	1.4	2.1	1.3
Transportation	0.0	0.0	0.0	0.4	0.1	0.2	0.3	0.4	0.2	0.2
Miscellaneous	0.1	0.1	0.0	0.2	0.1	0.3	0.4	0.3	0.7	0.3
Service	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	716.2	861.6	920.6	1,131.4	1,277.8	1,075.7	1,604.8	1,708.6	1,674.5	2,136.9

Source: JICA Study Team

(3) OD Matrix Between and Among Countries

Table 8.5 and 8.6 show the volume of foreign trade, imports, and exports, respectively, between Tanzania and the eight neighbouring countries in 2010. The total import cost to Tanzania shows in the bottom of the leftmost in Table 8.5, on the other hand, the total export from Tanzania shows in the top of the rightmost in Table 8.6.

Only 5% of Tanzania's commodities is imported from the eight neighbouring countries, while 95% is imported from the rest of the world. Of the eight neighbouring countries, Kenya has the highest import amount at USD 236 million, but this represents only about 3% of the total volume of imports.

In contrast, more than 50% of Tanzania's exports are to the eight neighbouring countries and less than 50% to the rest of the world. The share of exports to Kenya is the highest at 21%, followed by Rwanda at 7%.

Table 8.5: Import Trade between Country Pairs in 2010

Unit: USD million

to / from	Tanzania	Burundi	DRC	Kenya	Malawi	Mozam-bique	Rwanda	Uganda	Zambia	Others	Total
Tanzania	0.0	69.4	0.0	**233.3**	69.1	0.5	4.8	**86.4**	38.3	0.0	501.8
Burundi	1.5	0.0	0.0	1.2	0.0	0.0	8.2	3.5	0.0	0.0	14.4
DRC	1.5	0.3	0.0	5.8	0.0	0.0	10.6	9.6	403.2	0.0	431.0
Kenya	236.0	28.0	0.0	0.0	22.8	1.5	28.3	960.8	40.5	0.0	1,318.0
Malawi	35.1	0.0	0.0	7.4	0.0	0.9	0.0	0.0	28.6	0.0	72.0
Mozambique	83.1	0.5	0.0	72.6	70.0	0.0	0.0	0.2	19.1	0.0	245.5
Rwanda	1.4	9.6	0.0	7.8	0.0	0.0	0.0	23.5	0.0	0.0	42.3
Uganda	27.7	55.2	0.0	246.4	0.1	0.3	21.1	0.0	0.1	0.0	350.8
Zambia	29.7	98.8	0.0	12.5	213.0	0.0	0.1	0.1	0.0	0.0	354.2
Others	7,326.9	78.4	0.0	7,992.4	1,273.0	904.4	29.3	3,483.9	3,303.4	0.0	24,391.7
Total	7,742.9	340.2	0.0	8,579.3	1,648.1	907.5	102.4	4,568.0	3,833.2	0.0	27,721.7

Source: JICA Study Team based on the UN-COMTRADE data

Table 8.6: Export Trade between Country Pairs in 2010

Unit: USD million

to / from	Tanzania	Burundi	DRC	Kenya	Malawi	Mozam-bique	Rwanda	Uganda	Zambia	Others	Total
Tanzania	0.0	154.4	122.2	**464.9**	87.1	7.3	**157.0**	133.8	51.6	1,057.4	2,235.8
Burundi	5.4	0.0	3.2	9.7	0.0	0.0	3.5	5.6	0.0	23.5	50.7
DRC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Kenya	344.6	49.8	115.0	0.0	23.7	6.2	96.7	1,022.0	26.5	1,822.4	3,506.9
Malawi	25.6	0.3	0.2	17.2	0.0	16.3	0.1	0.1	34.2	908.0	1,002.1
Mozambique	0.2	0.0	0.0	1.4	10.2	0.0	0.0	0.0	1.1	913.5	926.4
Rwanda	1.8	0.7	5.1	0.0	0.0	0.0	0.0	1.1	0.0	3.4	12.1
Uganda	49.5	102.9	597.7	278.1	0.1	0.1	330.9	0.0	0.1	543.4	1,902.8
Zambia	42.3	103.3	685.2	13.7	203.5	4.3	4.8	0.1	0.0	1,666.9	2,724.0
Others	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	469.4	411.4	1,528.6	785.0	324.6	34.3	592.9	1,162.6	113.5	6,938.4	12,360.8

Source: JICA Study Team based on the UN-COMTRADE data

8.3.2 Import, Export, and Transit Movement

This section reviews the transport situation relating to import, export, and transit flows with regard to Tanzanian customs transaction data. Customs data is a useful source to grasp the overall figure of international trade and traffic passing through the national border and ports on the mainland of Tanzania.

(1) Characteristics of Data

The base data for analysis was extracted from records processed by the customs software, ASYCUDA (Automated System for Customs Data),[4] in cooperation with Tanzania Revenue Authority (TRA). ASYCUDA (version ++) had been installed into 17 major Tanzanian customs offices by the end of 2009[5] and is currently being rolled out at other stations. The software digitally processes information on customs declarations that are submitted by importers/ exporters and the data is finally stored centrally at headquarters of TRA, in Dar es Salaam. Data items shown in Table 8.7 were obtained from the customs data for the purpose of this study, i.e., to comprehend traffic volume crossing Tanzania's national boundary.

Table 8.7: Available Information from Customs Database

Category	Items	Remarks
Trade Flow	• Customs Procedure Code	
Geographical Information	• A Processing/Clearing Office • Entry/Exit Office • Trading Country	
Trade Volume	• Commodity Code • Net Weight • Customs Value	• HS[*1] commodity classification • Weight in kilograms • Value in CIF /FOB[*2] of Tsh.
Transport	• Border/Frontier Transport Mode	

Notes: (*1) Harmonized System coding is an internationally used commodity classification for trade comprising 8-digit numbers. (*2) The Cost, Insurance, and Freight price is applied to import transactions and the Free on Board price to exports. The former includes costs such as transport and insurance in addition to the latter.
Source: JICA Study Team

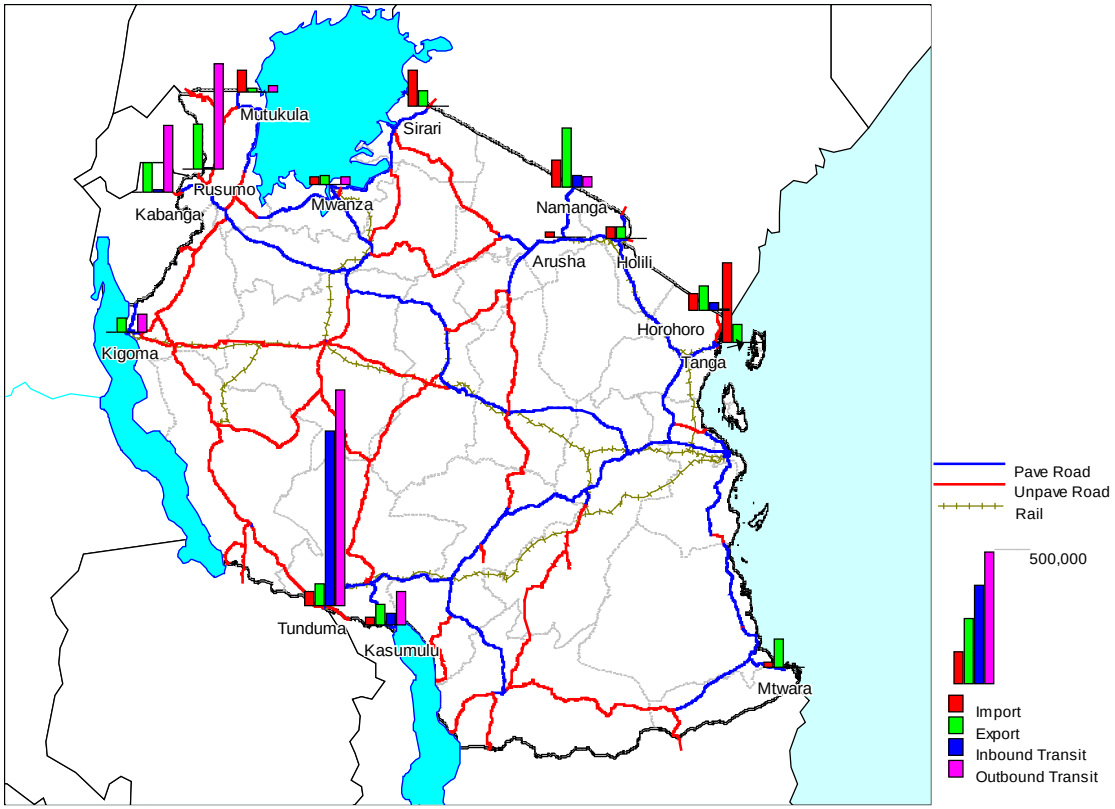
(2) Trend of Freight Movement at the Border

Using the customs data, the trade volume of Tanzania can be broken down by frontier customs office. The location and import/export throughput of major offices (except for Dar es Salaam) are shown in Figure 8.7. Also, Table 8.8 presents the details of trade volume including transit by office in 2010.

From this dataset, it is apparent that Dar es Salaam (mainly the seaport) is the trade hub of Tanzania, handling 88% of import volume and 43% of exports. The second busiest border crossing point is Tunduma, where huge volumes of transit cargo to/from Southern Africa are handled. In terms of imports, the second largest gate is Tanga, followed by two land border crossing points with Kenya (Sirari and Namanga). Besides Dar es Salaam, relatively large export points are Namanga, Rusumo, Kabanga and Mtwara. Countrywide, import volume is larger than export volume, whereas in trade with neighbouring countries the volume of exports is larger than the volume of imports. It was also found that land border crossing points generally handle more cargo volume than lakeside offices (Kigoma and Mwanza).

[4] ASYCUDA was developed by the United Nations Conference on Trade and Development (UNCTAD) and has been or us being installed in more than 90 countries and regions for modernization of customs administration. See http://www.asycuda.org/.

[5] Julius Nyerere International Airport (JNIA), Dar es Salaam Port, Kasumulu, Tunduma, Isaka, Sirari, Namanga, Holili, Horohoro, Tanga Port, Morogoro, Mwanza, Kigoma, Mtwara, Arusha, Moshi and Kilimanjaro International Airport (KIA). Source: Tanzania Revenue Authority, Tanzania Time Release Study, 2009.



Unit: Net tonne
Note: Throughput at Dar es Salaam is not shown in this figure due to the extremely high trade volumes there compared to that other border points.
Source: Summarized by the JICA Study Team based on customs data from that Tanzania Revenue Authority

Figure 8.7: Cargo Throughput at Major Border Points, 2010

Table 8.8: Trade Throughput at Major Border Crossing Points, 2010

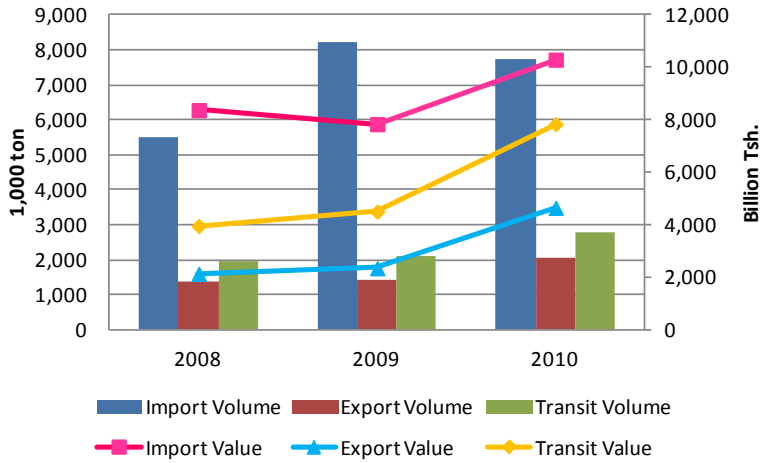
Unit: net tonnes

	Import	Export	Inbound Transit	Outbound Transit	Others	TOTAL
Dar es Salaam	6,791,377	892,969	1,982,872	836,500	1,257,468	11,761,018
Arusha & KIA	21,473	2,418	56	1		23,948
Holili	48,486	47,216		18		95,720
Horohoro	64,554	93,257	31,384	11,087	15	200,297
Kabanga	1,489	112,324	16,017	252,174	62	382,066
Kasumulu	34,626	80,250	45,987	128,080	2,138	291,081
Kigoma	3,059	58,926	880	69,880		132,746
Mtwara	21,387	110,194		163		131,744
Mutukula	84,708	18,464	130	29,359	1	132,663
Mwanza	34,882	39,364	1	35,290		109,536
Namanga	105,002	223,239	45,075	44,770	1	418,087
Rusumo	1,630	169,307	8,944	389,974	21	569,876
Sirari	137,216	58,992	3,038	10	18	199,273
Tanga	299,035	72,934	55	54		372,076
Tunduma	55,064	86,009	647,076	796,412	4,784	1,589,346
Others	3,349	3,239	728	681		8,168
Unknown	144	26		187,791		187,961
TOTAL	7,707,481	2,069,126	2,782,245	2,782,245	1,264,507	13,937,538

Source: Summarized by the JICA Study Team based on customs data from that Tanzania Revenue Authority

Figure 8.8 illustrates the recent three-year trend for each trade flow in volume and value. The growth of trade value from 2009 to 2010 was more rapid for all trade flows in comparison with 2008–2009. This figure implies that export value per unit volume is higher than the value per unit volume for imports. This finding can be explained by the export of precious stones, which have high unit values compared with other commodities.

Table 8.9 provides a breakdown by major border office. Import and export throughput volume increased at most offices during this period. In particular, Kabanga, Mtwara, Mutukula, and Rusumo showed the highest growth rates. On the other hand, Tunduma showed a slight decreasing trend both for imports and exports.



Note: Transit volume is counted once (the same volume of cargo passes through entry and exit points). Import and transit values were recorded at the Cost, Insurance Freight price, while exports were recorded at the Free On Board price.
Source: Summarized by the JICA Study Team based on customs data from that Tanzania Revenue Authority

Figure 8.8: Recent Trade Flow Trends

Table 8.9: Trends of Import and Export Volume at Major Border Points

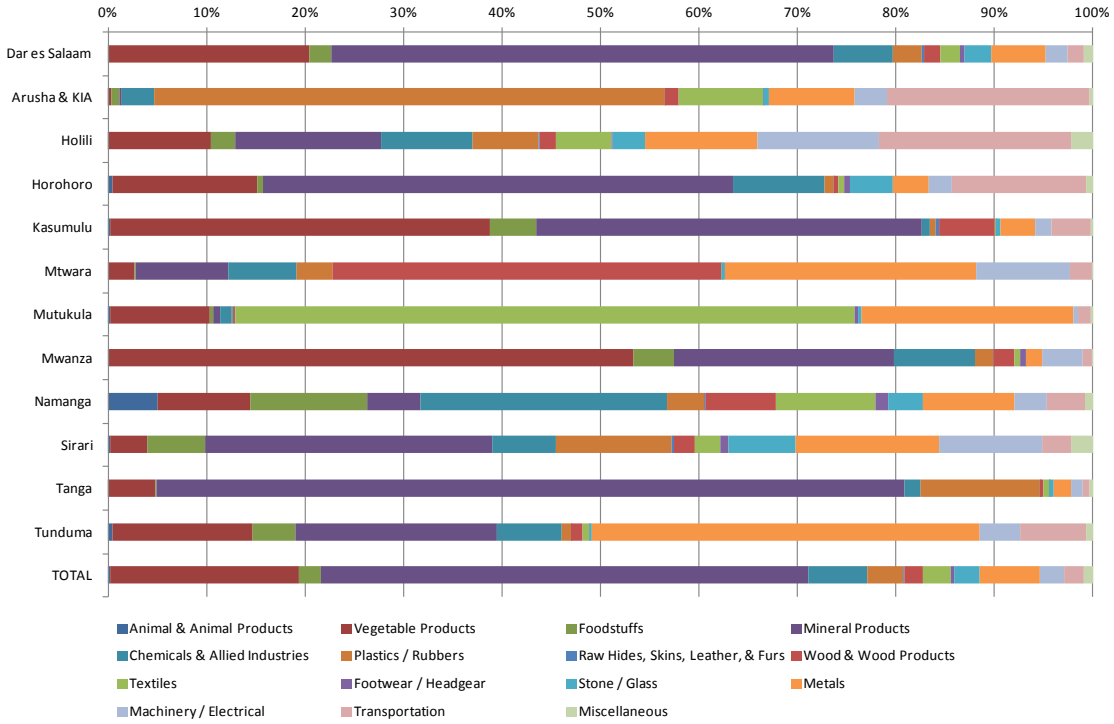
Unit: net tonnes

	Import			Export		
	2008	**2009**	**2010**	**2008**	**2009**	**2010**
Dar es Salaam	4,966,159	7,177,483	6,791,377	773,983	669,928	892,969
Arusha & KIA	1,500	137,031	21,473	3,078	3,706	2,418
Holili	36,118	49,783	48,486	23,642	10,698	47,216
Horohoro	80,042	75,982	64,554	48,746	54,929	93,257
Kabanga	29	22	1,489	7,275	6,184	112,324
Kasumulu	15,709	33,065	34,626	61,718	61,088	80,250
Kigoma	842	1,597	3,059	79,282	55,990	58,926
Mtwara	3,682	12,387	21,387	4,576	92,533	110,194
Mutukula	321	385	84,708	2,498	2,232	18,464
Mwanza	49,043	45,970	34,882	31,465	39,690	39,364
Namanga	58,045	178,293	105,002	93,143	199,954	223,239
Rusumo	46	17	1,630	20,036	16,475	169,307
Sirari	6,708	224,072	137,216	44,015	49,315	58,992
Tanga	236,922	227,697	299,035	48,708	71,327	72,934
Tunduma	59,690	53,193	55,064	116,247	84,767	86,009
TOTAL	**5,515,362**	**8,219,076**	**7,707,481**	**1,358,502**	**1,419,323**	**2,069,126**

Source: Summarized by the JICA Study Team based on customs data from that Tanzania Revenue Authority

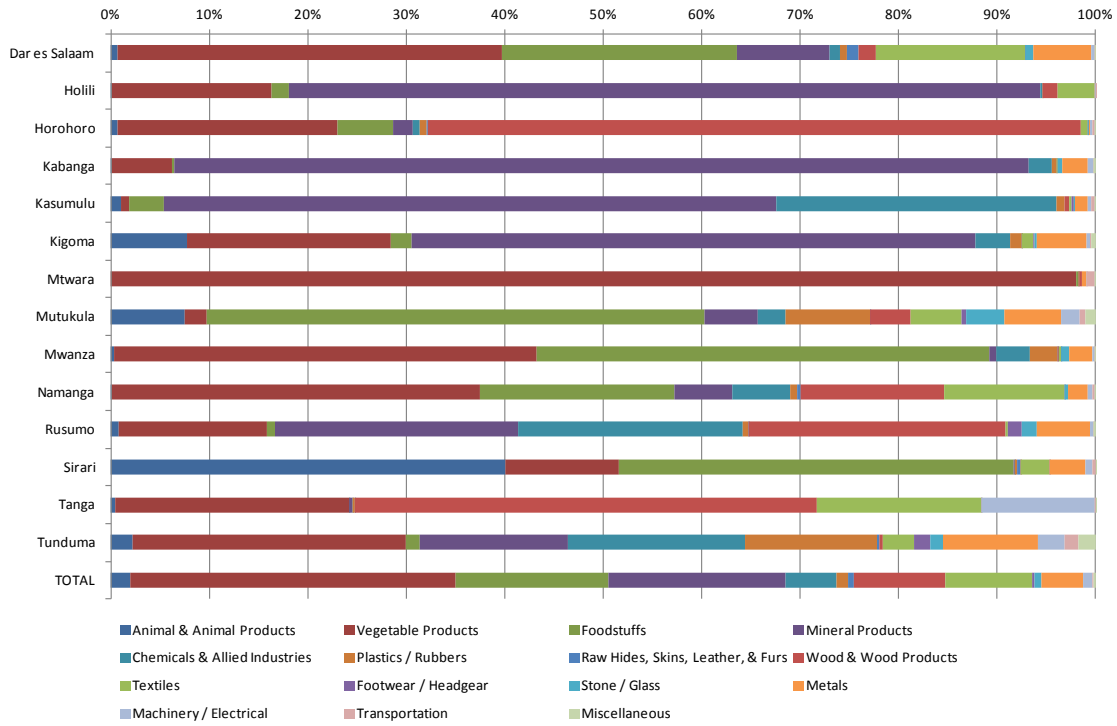
A breakdown of transported commodities by category is summarized in Figures 8.9 and 8.10 by major border point. Mineral products are the leading import in terms of volume (49% of total) and vegetable products follow (19%). Some offices specialize in a few categories of commodities; e.g., mineral products in Dar es Salaam, Horohoro, and Tanga; foodstuffs in Mutukula; and vegetable products in Mwanza. Other offices such as Holili, Namanga, and Sirari deal with a variety of import commodities.

The leading export commodities are vegetable products (33%), mineral products (18%), and foodstuffs (16%). For imports, Holili, Kabanga, Kasumulu, and Kigoma specialize in mineral exports, Horohoro in wood products, and Mtwara in foodstuffs.



Source: Summarized by the JICA Study Team based on customs data from that Tanzania Revenue Authority

Figure 8.9: Share of Import Commodities at Major Border Points, 2010



Source: Summarized by the JICA Study Team based on customs data from that Tanzania Revenue Authority

Figure 8.10: Share of Export Commodities at Major Border Points, 2010

(3) Transit Freight Movement

Besides import and export flows, there is transit trade flow passing through Tanzania to/from neighbouring countries. Transit cargo enters the territory with the submission of necessary declarations and bonds. The declaration information from the customs database is summarized as a form of origin-destination data as shown in Table 8.10.

Dar es Salaam (including the seaport, airport, and long room) is the largest transit point, where 66% of the total transit cargo departs for other inland border offices and 30% arrives from inland offices. A large portion of transit cargo from Dar es Salaam goes to the border with Zambia, Tunduma (38% of transit cargo from Dar es Salaam), which is followed by Rusumo (20%) and Kabanga (13%). On the other hand, most cargo shipped out from Dar es Salam (DSM) are transferred through Tunduma (75%).

Transit between inland border offices accounts for 6% of the total. Most of this flow is characterized by north-south movement across the country; i.e., between Namanga and Kasumulu, and between Namanga/Horohoro and Tunduma.

Table 8.10: OD between Customs Offices for Transit through Tanzania, 2010

Unit: net tonnes

	Destination											
Origin	**DSM**	**Horohoro**	**Kabanga**	**Kasumulu**	**Kigoma**	**Mutukula**	**Mwanza**	**Namanga**	**Rusumo**	**Tunduma**	**Others/ Unknown**	**TOTAL**
DSM	209,323*	174	250,499	102,421	69,141	25,966	35,290	274	389,612	748,171	152,002	**1,982,872**
Horohoro	33		1,441	10,893	565					18,248	203	**31,384**
Kabanga									47		15,970	**16,017**
Kasumulu	1,283	9,727	1			3,053		30,825	191	30	878	**45,987**
Kigoma											880	**880**
Mutukula											130	**130**
Mwanza											1	**1**
Namanga	18		84	14,741						29,961	271	**45,075**
Rusumo											8,944	**8,944**
Tunduma	625,741	1,183	148	25		341		13,658	62		5,921	**647,076**
Others/Unknown	103	4			174			13	62	3	3,517	**3,876**
TOTAL	**836,500**	**11,087**	**252,174**	**128,080**	**69,880**	**29,359**	**35,290**	**44,770**	**389,974**	**796,412**	**188,719**	**2,782,245**

Note: *Movements between/among the long term, seaport, and airport were counted.
Source: Summarized by the JICA Study Team based on customs data from that Tanzania Revenue Authority

Table 8.11 describes the trend in the direction of transit over the last three years. As a whole, transit volume in 2010 increased 44% from that in 2008. Dar es Salaam, Namanga, and Horohoro are the offices whose inbound transit volumes were bigger than outbound, while outbound movement was predominant in other offices. Kabanga and Rusumo are border points showing significant increase in outbound transit.

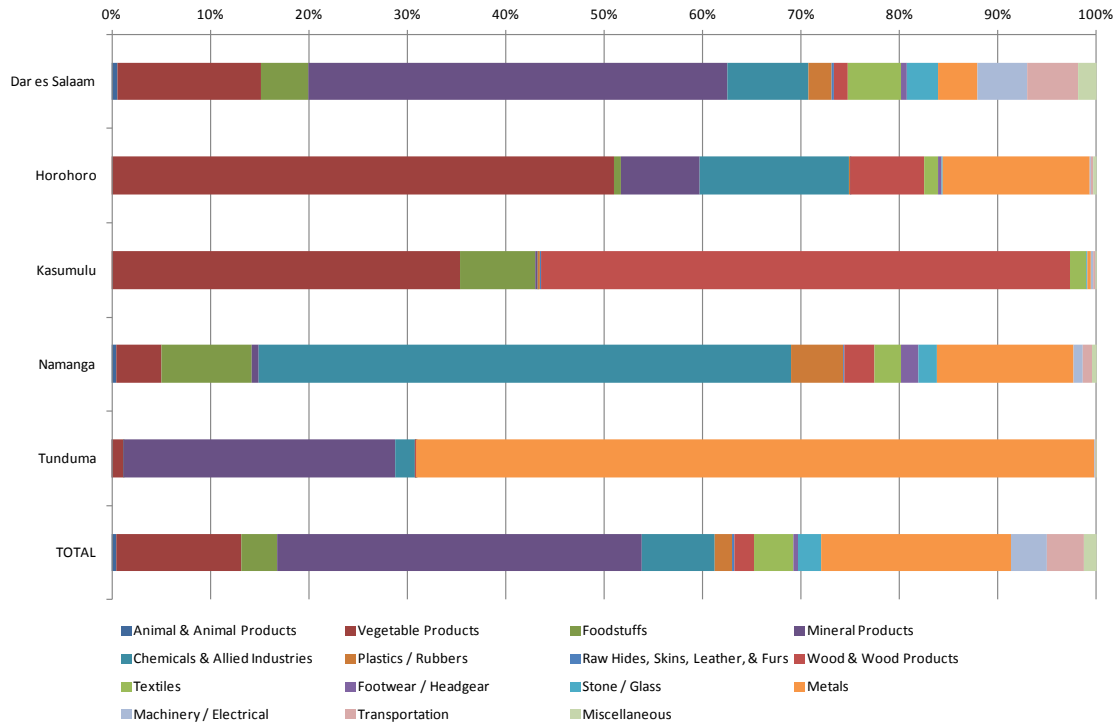
Table 8.11: Trend of Transit Volume at Major Border Points

Unit: net tonnes

	Inbound			Outbound		
	2008	**2009**	**2010**	**2008**	**2009**	**2010**
Dar es Salaam	1,345,067	1,535,747	1,982,872	677,114	683,738	836,500
Horohoro	6,345	11,217	31,384	14,082	13,178	11,087
Kabanga			16,017	71,540	177,024	252,174
Kasumulu	47,388	53,084	45,987	118,830	112,099	128,080
Kigoma	1,915	732	880	18,619	34,201	69,880
Mutukula			130	37,983	32,650	29,359
Mwanza	2,606		1	9,566	81,190	35,290
Namanga	21,013	48,655	45,075	37,450	45,660	44,770
Rusumo			8,944	142,540	238,597	389,974
Tunduma	489,566	430,843	647,076	599,207	511,289	796,412
TOTAL	**1,936,754**	**2,084,350**	**2,782,245**	**1,936,754**	**2,084,350**	**2,782,245**

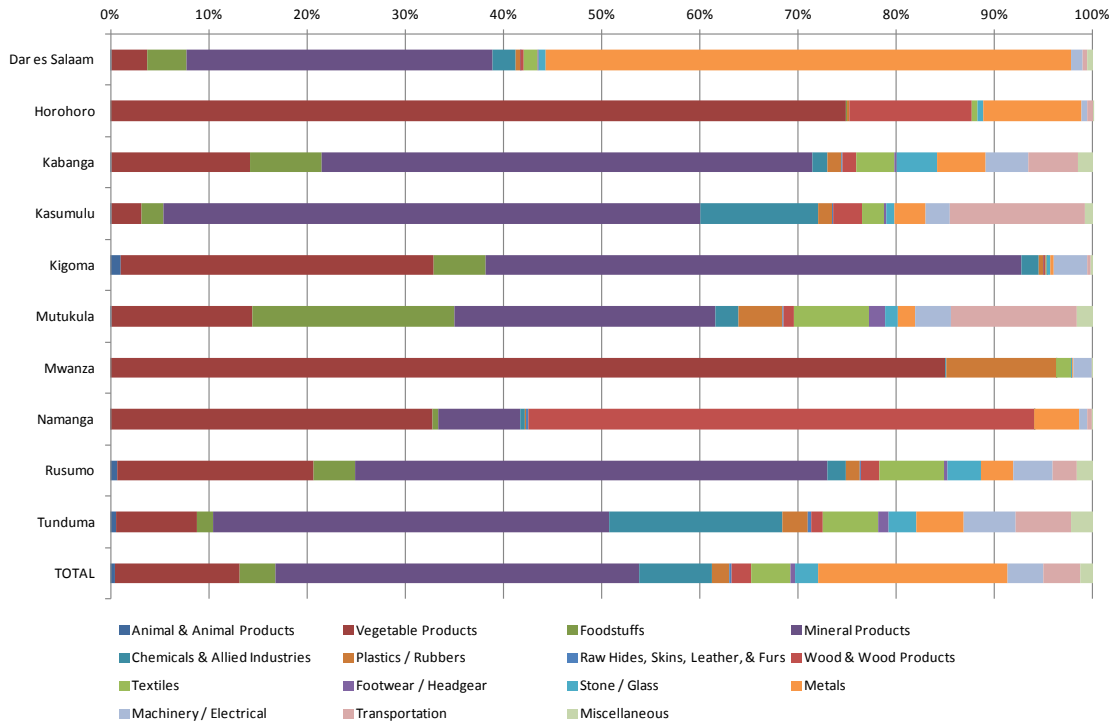
Source: Summarized by the JICA Study Team based on customs data from that Tanzania Revenue Authority

Major commodities of transit are shown in Figures 8.11 and 8.12. More than one third of transit cargo volume is accounted for by mineral products, and 19% by metals. Mineral products including fuels are distributed from Dar es Salaam to inland border points for the consumption of neighbouring countries. Metals are transferred from Southern African countries to Dar es Salaam through Tunduma.



Source: Summarized by the JICA Study Team based on customs data from that Tanzania Revenue Authority

Figure 8.11: Share of Inbound Transit Commodities at Major Border Points, 2010



Source: Summarized by the JICA Study Team based on customs data from that Tanzania Revenue Authority

Figure 8.12: Share of Outbound Transit Commodities at Major Border Points, 2010

(4) Transport Mode and Commodities by Customs Office

Railway lines are connected to border points of Tunduma (Tanzania Zambia Railway Authority, TAZARA), Kigoma, and Mwanza (Tanzania Railway Limited, TRL). By comparing railway and customs statistics, the share of railway transport was calculated as shown in Table 8.12. One quarter of outbound transit volume through Kigoma and Mwanza is transported by TRL, although it is hardly used for inbound movements. Larger volumes of transit cargo are transported to inland countries by truck on different routes, and TRL cargo volume accounts for 8.5% of total outbound cargo through Kigoma, Mwanza, Kabanga, and Mtukula. TAZARA carries a large volume of transit cargo from Southern African countries, and it accounts for nearly 30% of inbound cargo through Tunduma and 13.4% of outbound cargo through Dar es Salaam.

Table 8.12: Inland Modal Split from/to Border Points, 2010

Unit: tonne

Border	Flow	Total	Railway	Share
Dar es Salaam	Inbound	8,774,080	229,686	2.6%
	Outbound	1,729,470	231,952	13.4%
Kigoma & Mwanza (TRL line)	Inbound	38,823	180	0.5%
	Outbound	203,460	52,214	25.7%
Tunduma (TAZARA line)	Inbound	702,140	208,695	29.7%
	Outbound	882,421	178,846	20.3%

Source: JICA Study Team based on data from TRL, TAZARA, and TRA

Table 8.13 summarizes share of air cargo at cities with major international airports. The share is quite low in terms of volume, though the mode is used for transporting goods of higher value. In Mwanza, 8.1% of import cargo volume is carried by air and it accounts for 77.4% of the total import value. This is mainly due to machinery/electrical and mineral products.

Table 8.13: Share of Air Cargo, 2010

		Volume (tonne)			Value (million TZS)		
Border	**Flow**	**Total**	**Air**	**Share**	**Total**	**Air**	**Share**
Dar es Salaam	Import	6,791,208	11,650	0.2%	8,791,570	789,731	9.0%
	Export	892,970	2,482	0.3%	2,343,748	121,076	5.2%
KIA	Import	858	858	100%	24,374	24,374	100%
	Export	2,418	2,418	100%	70,427	70,427	100%
Mwanza	Import	34,882	2,812	8.1%	133,467	103,258	77.4%
	Export	39,364	–	–	589,702	–	–

Source: Summarized by the JICA Study Team based on customs data from that Tanzania Revenue Authority

8.3.3 Transport Cost by Corridor

In order to develop a model for route choice and modal choice, the relationship among transport cost/price, transport time, and distance was studied. The transport cost of a multimodal transport route consists of various components as shown in Figures 8.13 and 8.14. Although the cost components related to seaports, lake transport, and railway transport can be considered as fixed prices, it is difficult to set such fixed prices for road routes because of the large number of such routes. Therefore, the fixed cost component of road transport associated with transport time and the variable cost component associated with transport distance were calculated separately (see Figure 8.14). On the other hand, the fixed transport prices set by each agency were studied for other (i.e., non-road) transport modes. The results of transport cost/price analysis by transport mode or procedure are described in the following subsections.

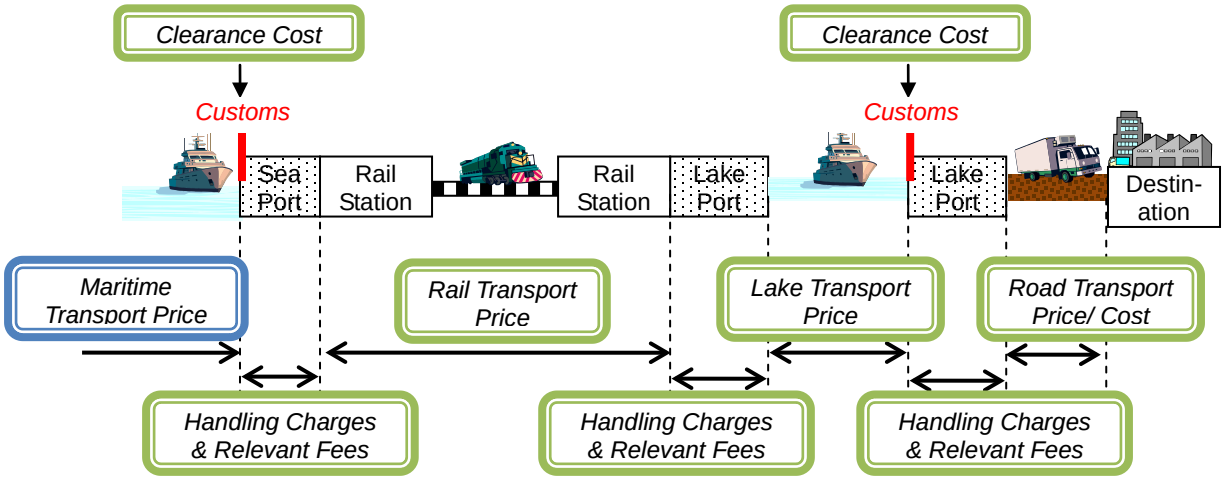


Figure 8.13: Transport Cost Components on an Example Route (1)

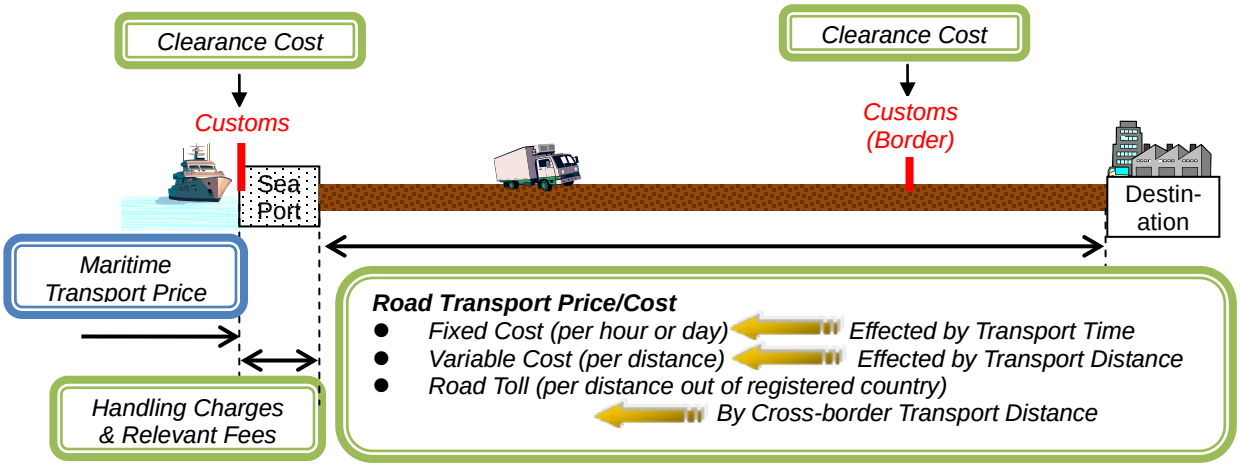


Figure 8.14: Transport Cost Components on an Example Route (2)

(1) Road Transport Cost

Road transport cost consists mainly of vehicle operating cost and road tolls, which relate to transport distance and route. Accordingly, these two cost components were assessed.

Road Transport Operating Cost: The most detailed document showing the breakdown of road transport operation cost by category of vehicle in the study area is the South Africa-based Road Freight Association (RFA) Vehicle Cost Schedule. According to Edition 39 (April 2009) of this schedule, the fixed cost, variable cost, and total vehicle operating cost per year by category of vehicle are as shown in Table 8.14, based on the following assumptions:

- Travel distance per truck of 48,000 km/year;
- Vehicles used 225 days/year;
- 12 chargeable hours/day;
- Payload utilization ratio of 70%; and
- Annual loading ratio of 75%.

Table 8.14: Vehicle Operating Cost in Southern Africa by Vehicle Category

#	Vehicle Category	Vehicle Configuration	Average Payload (tonnes)	Annual Fixed Cost (USD)	Total Variable Cost (USD)	Annual Total Cost (USD)
1	Two Axle Non-Artic (2,400 kg or Less)	4 × 2 Rigid LDV	1.0	15,111	6,506	21,617
2	Two Axle Non-Artic (2,400 to 5,000 kg)	4 × 2 Rigid	2.3	28,353	9,371	37,724
3	Two Axle Non-Artic (5,001 to 7,500 kg)	4 × 2 Rigid	3.9	30,407	13,118	43,524
4	Two Axle Non-Artic (7,501 to 10,000 kg)	4 × 2 Rigid	5.8	36,197	16,179	52,376
5	Two Axle Non-Artic (over 10,000 kg)	4 × 2 Rigid	8.1	36,672	20,305	56,977
6	Three Axle Non-Artic	6 × 4 Rigid	15.3	51,542	28,543	80,086
7	Three Axle Artic	4 × 2 TT + Single Axle ST	14.3	48,164	37,076	85,240
8	Four Axle Artic	4 × 2 TT + Tandem Axle ST	19.6	64,176	58,464	122,640
9	Five Axle Artic	6 × 4 TT + Tandem Axle ST	26.8	73,837	67,591	141,428
10	Five Axle Artic	4 × 2 TT + Tridem Axle ST	24.6	70,979	62,974	133,953
11	Six Axle Artic	6 × 4 TT + Tridem Axle ST	32.0	77,425	72,196	149,621
12	Four Axle Combination	4 × 2 Rigid + 2 Axle Trailer	16.6	56,513	27,233	83,746
13	Five Axle Combination	6 × 4 Rigid + 2 Axle Trailer	27.2	68,746	50,528	119,274
14	Seven Axle Combination	6 × 4 Rigid + 4 Axle Trailer	35.5	85,321	97,118	182,440
15	Five Axle Combination	Doubles Combination	25.9	72,598	63,742	136,340
16	Six Axle Combination	Concept 08 + 2 Axle Trailer	24.5	78,493	86,524	165,017
17	Seven Axle Combination	Concept 09 + 2 Axle Trailer	34.3	92,120	96,142	188,262
18	Seven Axle Interlink	6 × 4 TT + Tandem/Tandem ST	33.9	91,979	96,142	188,121
19	Eight Axle Interlink	6 × 4 TT + Tridem/Tandem ST	32.8	93,211	100,074	193,285

Abbreviations: LDV = light-duty vehicle; ST = semitrailer; and TT = truck tractor.
Note: The 1 April 2009 exchange rate of South African Rand 0.10464 to USD 1.00 was adopted (from www.oanda.com).
Source: Calculated and compiled from Road Freight Association (RFA) Vehicle Cost Schedule, Edition 39, April 2009

The annual fixed cost was defined as the sum of the following cost components: (i) the cost of capital; (ii) depreciation; (iii) insurance; (iv) vehicle staff costs; (v) administration expenses (overhead); (vi) operational expenses (overhead), and (vii) license fee. Variable cost was defined as the sum of the following running cost components: (i) fuel; (ii) lubricants; (iii) maintenance; and (iv) tyres.

Although fixed costs are related to transport time, variable costs relate to transport distance. Considering the assumptions on average running distance, payload utilization rate, and annual loading rate in the RFA Vehicle Cost Schedule, fixed cost per cargo transport time and variable cost per cargo transport distance were calculated as shown in Table 8.15.

Table 8.15: Vehicle Operating Cost per Cargo Transport Time and Distance[1]

#	Vehicle Category	Cost per Truck			Cost per Tonne		
		Daily fixed cost 2 (USD/day)	Hourly fixed cost 3 (USD/hour)	Variable cost per km 4 (USD/km)	Daily fixed cost 5 (USD/day)	Hourly fixed cost 6 (USD/hour)	Variable cost per km 7 (USD/km)
1	Two Axle Non-Artic (2,400 kg or less)	89.55	7.46	0.181	127.93	10.660	0.258
2	Two Axle Non-Artic (2,400–5,000 kg)	168.02	14.00	0.260	104.36	8.697	0.162
3	Two Axle Non-Artic (5,001-7,500 kg)	180.19	15.02	0.364	66.00	5.500	0.133
4	Two Axle Non-Artic (7,501–10,000 kg)	214.50	17.88	0.449	52.83	4.403	0.111
5	Two Axle Non-Artic (over 10,000 kg)	217.32	18.11	0.564	38.33	3.194	0.099
6	Three Axle Non-Artic	305.44	25.45	0.793	28.52	2.377	0.074
7	Three Axle Artic	285.42	23.78	1.030	28.51	2.376	0.103
8	Four Axle Artic	380.30	31.69	1.624	27.72	2.310	0.118
9	Five Axle Artic	437.55	36.46	1.878	23.32	1.944	0.100
10	Five Axle Artic	420.62	35.05	1.749	24.43	2.036	0.102
11	Six Axle Artic	458.81	38.23	2.005	20.48	1.707	0.090
12	Four Axle Combination	334.89	27.91	0.756	28.82	2.402	0.065
13	Five Axle Combination	407.38	33.95	1.404	21.40	1.783	0.074
14	Seven Axle Combination	505.61	42.13	2.698	20.35	1.696	0.109
15	Five Axle Combination	430.21	35.85	1.771	23.73	1.977	0.098
16	Six Axle Combination	465.14	38.76	2.403	27.12	2.260	0.140
17	Seven Axle Combination	545.90	45.49	2.671	22.74	1.895	0.111
18	Seven Axle Interlink	545.06	45.42	2.671	22.97	1.914	0.113
19	Eight Axle Interlink	552.36	46.03	2.780	24.06	2.005	0.121

Notes: [1] The 1 April 2009 exchange rate of South African Rand 0.10464 to USD 1.00 was adopted (from www.oanda.com). [2] Calculated as annual fixed cost (USD)/225 days/annual loading ratio (0.75). [3] Calculated as daily fixed cost (USD)/chargeable hours (12 hours). [4] Calculated as total variable cost per year (USD)/travel distance (48,000 km)/annual loading ratio (0.75). [5] Calculated as daily fixed cost per truck (USD/day)/average payload (tonne)/ payload utilization ratio (0.70). [6] Calculated as hourly fixed cost per truck (USD/hour)/average payload (tonne)/payload utilization ratio (0.70). [7] Calculated as variable cost per km per truck (USD/km)/average payload (tonne)/payload utilization ratio (0.70).
Source: Calculated and compiled from RFA Vehicle Cost Schedule, Edition 39, April 2009

The average road transport operating cost by commodity depends on the vehicle type(s) used for transport of each category of commodity and the average weight of the commodity. Vehicle type(s) by commodity category was considered based on analysis of the results of the traffic survey described in Section 8.2.

Road Toll: In the region including Tanzania and neighbouring countries, the major road toll is the COMESA [Common Market for Eastern and Southern Africa] Transit (Cross-border) Road User Charge (RUC), which is assessed only on foreign-registered vehicles based on transport distance in each country. Table 8.16 presents COMESA Transit RUC levels based on the applicable COMESA regulation. Most COMESA member countries [6] including the

[6] COMESA member countries are: Kenya, Uganda, Burundi, Rwanda, Democratic Republic of Congo, Angola, Zambia, Zimbabwe, Malawi, Mauritius, Madagascar, Swaziland, Seychelles, Comoros, Egypt, Libya, Djibouti, Sudan, Eritrea, and Ethiopia.

neighbouring countries of Tanzania have implemented these charges. In addition, Southern African Development Community (SADC) countries including Tanzania have applied a similar transit toll in line with the recent movement toward tripartite harmonization of the regulations of COMESA, SADC, and the East African Community (EAC). For example, the transit toll of Tanzania for 100 km is equivalent to USD 6 for 3-axle vehicles and USD 16 for vehicles with four or more axles.[7]

Table 8.16: COMESA Transit Road User Charges for Freight Vehicles

Region of Registration	Vehicle Type	Charge per 100 km (USD)
COMESA	Truck/trailer up to 3 axles	6
	Truck/trailer more than 3 axles	10
Outside of COMESA	Truck/trailer up to 3 axles	8
	Truck/trailer more than 3 axles	16

Source: Kenya Revenue Authority

This Transit RUC was included in the road transport cost in the case of cross-border transport from/to or through Tanzania.

(2) Railway Freight Tariffs

Railway freight tariffs (rates/charges) are based on weight by commodity or per container depending on the transport distance. There is a tendency for rail freight tariffs per km to decrease substantially if transport distance increases. TRL and TAZARA freight tariffs were assessed both for domestic transport and for regional transit. In addition, the transit freight tariffs of the Kenya–Uganda Railway, which is the main railway route competing with Central Corridor of Tanzania, was summarized.

TRL: TRL's current tariffs for domestic cargo are described in the Addendum to Special Traffic Notice No. 01, Revision of Tariff, July 2009 (TRL), while the tariffs for transit cargo are set out in the Addendum to Special Traffic Notice No. 01, Revision of Tariff, February 2008 (TRL).

Domestic tariffs are set per wagon except for "small quantities of goods", the tariffs for which are shown per 100 kg. The tariff per wagon is set by commodity category by distance. The maximum weight of cargo per wagon is 40 tonnes, except for tobacco, the weight of which is limited to 14 tonnes per wagon, and cotton, which can be loaded up to 18 tonnes per wagon. The average loaded weight per wagon is 36–37 tonnes. There is no transport price set per container or twenty-foot equivalent unit (TEU)[8] for domestic cargo. In other words, the freight tariff for a container depends on the content of the container. One 40-foot container or two 20-foot containers fit on a TRL wagon.

Rail freight tariffs for transit cargo are in general set higher than the tariffs for domestic cargo. Also, the freight tariff per container is specified in the case of transit cargo, and the tariffs are set for specific pairs of origin and destination stations because the routes on which transit cargo is shipped are limited.

[7] PADECO Co., Ltd., *The East African Trade and Transport Facilitation Project (EATTFP) – Study for the Harmonization of Vehicle Overload Control in the East African Community*, 2011, prepared for the Japan International Cooperation Agency and the East African Community.

[8] The lack of the container handling equipment at TRL stations discourages container transport by rail. There are only four railway stations (Itara Station, Isaka Station, Kigoma Station, and Dar es Salaam Port Station) where a crane is available for container loading and unloading; at Irara and Isaka Stations the crane is owned by TRL, while at the other two stations it is owned by the Tanaznia Ports Authority (TPA). Sometimes containerised cargo is opened at Dar es Salaam Port to be transported by rail to a railway station without a crane, which is very ineffective.

As an example of different rail freight tariffs for domestic and transit cargo by distance, the tariffs for "general goods"[9] are presented in Table 8.17.

Table 8.17: TRL Freight Tariff for "General Goods" by Distance per Large Wagon[1] (Maximum of 40 tonnes)

Distance (km)			Domestic Tariff (TZS)	Domestic Tariff (USD)[2]	Transit Traffic Tariff (USD)				
1	–	100	1,503,320	1,127	1,215	(Moshi	=>	Taveta	: 50 km)
101	–	120	1,555,240	1,166					
121	–	140	1,608,340	1,206	1,405	(Tabora	=>	Isaka	: 132 km)
					1,415	(Arusha	=>	Taveta	: 136 km)
141	–	160	1,661,440	1,246					
161	–	180	1,713,360	1,285					
181	–	200	1,766,460	1,325					
201	–	220	1,819,560	1,365					
221	–	240	1,871,480	1,404					
241	–	260	1,924,580	1,443	1,445	(Mwanza	=>	Isaka	: 245 km)
261	–	280	1,977,680	1,483					
281	–	300	2,029,600	1,522					
301	–	320	2,082,700	1,562					
321	–	340	2,135,800	1,602					
341	–	360	2,187,720	1,641					
361	–	380	2,240,820	1,681					
381	–	400	2,293,920	1,720					
401	–	420	2,345,840	1,759	2,015	(Tabora	=>	Kigoma	: 403 km)
421	–	440	2,398,940	1,799					
441	–	460	2,452,040	1,839					
461	–	480	2,503,960	1,878					
481	–	500	2,557,060	1,918					
501	–	520	2,610,160	1,958					
521	–	540	2,662,080	1,997	2,295	(Isaka	=>	Kigoma	: 535 km)
541	–	560	2,715,180	2,036	2,385	(DSM Port	=>	Moshi	: 558 km)
561	–	580	2,768,280	2,076					
581	–	600	2,820,200	2,115					
601	–	620	2,873,300	2,155	2,475	(DSM Port	=>	Taveta	: 608 km)
621	–	640	2,926,400	2,195					
641	–	660	2,978,320	2,234	2,545	(DSM Port	=>	Arusha	: 644 km)
661	–	680	3,031,420	2,274					
681	–	700	3,084,520	2,313					
701	–	720	3,136,440	2,352					
721	–	740	3,189,540	2,392					
741	–	760	3,242,640	2,432					
761	–	780	3,294,560	2,471					
781	–	800	3,347,660	2,511	2,860	(Kigoma	=>	Mwanza	: 783 km)
801	–	820	3,400,760	2,551	2,930	(KDU	=>	Isaka	: 801 km)
821	–	840	3,452,680	2,590	2,980	(KDU	=>	Taveta	: 837 km)
841	–	860	3,505,780	2,629	3,020	(DSM Port	=>	Tabora	: 850 km)
861	–	880	3,558,880	2,669					
881	–	900	3,610,800	2,708					
901	–	920	3,663,900	2,748					
921	–	940	3,717,000	2,788					
941	–	960	3,768,920	2,827					
961	–	980	3,822,020	2,867					
981	–	1,000	3,875,120	2,906	3,285	(DSM Port	=>	Isaka	: 982 km)
					2,025	(Isaka	=>	DSM Port	: 982 km)

[9] Any commodity the freight tariff of which is not specified in the Addendum to Special Traffic Notice No. 01 is included in the category general goods.

Distance (km)			Domestic Tariff (TZS)	Domestic Tariff (USD)[2]	Transit Traffic Tariff (USD)				
1,001	–	1,020	3,928,220	2,946					
1,021	–	1,040	3,980,140	2,985					
1,041	–	1,060	4,033,240	3,025	3,445	(KDU	=>	Mwanza	: 1,045 km)
					3,445	(DSM Port	=>	Shinyanga	: 1,048 km)
1,061	–	1,080	4,086,340	3,065	3,505	(KDU	=>	Kigoma	: 1,072 km)
1,081	–	1,100	4,138,260	3,104					
1,101	–	1,120	4,191,360	3,144					
1,121	–	1,140	4,244,460	3,183	3,645	(Pongwe	=>	Isaka	: 1,137 km)
1,141	–	1,160	4,296,380	3,222	3,680	(Tanga	=>	Isaka	: 1,151 km)
1,161	–	1,180	4,349,480	3,262					
1,181	–	1,200	4,402,580	3,302					
1,201	–	1,220	4,454,500	3,341					
1,221	–	1,240	4,507,600	3,381	3,830	(DSM Port	=>	Mwanza	: 1,229 km)
					2,860	(Mwanza	=>	DSM Port	: 1,229 km)
1,241	–	1,260	4,560,700	3,421	3,915	(DSM Port	=>	Kigoma	: 1,254 km)
					2,535	(Kigoma	=>	DSM Port	: 1,254 km)
1,261	–	1,280	4,612,620	3,459					
1,281	–	1,300	4,665,720	3,499	4,230	(Pongwe	=>	Mwanza	: 1,294 km)
1,301	–	1,320	4,718,820	3,539					
1,321	–	1,340	4,770,740	3,578					
1,341	–	1,360	4,823,840	3,618					
1,361	–	1,380	4,876,940	3,658					
1,381	–	1,400	4,928,860	3,697	4,200	(Taveta	=>	Isaka	: 1,384 km)
1,401	–	1,420	4,981,960	3,736	3,700	(Mwanza	=>	Tanga	: 1,407 km)
					4,155	(Pongwe	=>	Kigoma	: 1,418 km)
1,421	–	1,440	5,035,060	3,776	4,315	(Kigoma	=>	Tanga	: 1,434 km)
1,441	–	1,460	5,086,980	3,815					
1,461	–	1,480	5,140,080	3,855					
1,481	–	1,500	5,193,180	3,895					
1,501	–	1,520	5,245,100	3,934					
1,521	–	1,540	5,298,200	3,974					
1,541	–	1,560	5,351,300	4,013					
1,561	–	1,580	5,403,220	4,052					
1,581	–	1,600	5,456,320	4,092					
1,601	–	1,620	5,509,420	4,132					
1,621	–	1,640	5,561,340	4,171					
1,641	–	1,660	5,614,440	4,211	4,195	(Kigoma	=>	Taveta	: 1,654 km)
1,661	–	1,680	5,667,540	4,251					
1,681	–	1,700	5,719,460	4,290					
1,701	–	1,720	5,772,560	4,329					
1,721	–	1,740	5,825,660	4,369					
1,741	–	1,760	5,877,580	4,408					
1,761	–	1,780	5,930,680	4,448					
1,781	–	1,800	5,983,780	4,488					

Abbreviations: DSM = Dar es Salaam, TRL = Tanzania Railway Limited, and TZS = Tanzanian Shilling
Notes: [1] Although the tariff per small wagon and that per large wagon by different category of commodity are shown in TRL pricing documents, only the price per large wagon or that per 100 kg is adopted. (The small wagons are currently not used.) [2] For comparison, the price in TZS was converted to USD with the 1 July 2009 exchange rate of TZS 1 = USD 0.00075 (from www.oanda.com).
Sources: Compiled from Addendum to Special Traffic Notice No. 01, Revision of Tariff, February 2008 (TRL) [for transit traffic] and Addendum to Special Traffic Notice No. 01, Revision of Tariff, July 2009 (TRL) [for domestic traffic]

The rail freight tariff for specific commodity categories is generally lower than those for general goods. For example, the tariffs for cotton and coffee are set about half as that for general goods, while that motor vehicles is about the same as that for general goods. Only the tariff for bulk oil (which depends on the type of oil) exceeds that for general goods. There is a tendency for the tariffs for heavy commodities to be higher than for lighter ones. Also, the tariffs for traffic from

inland origins toward the sea ("down" direction) tend to be lower than for traffic in opposite ("up") direction because transport demand from inland origins is lower (reflecting the volume of trade in the two directions). Table 8.18 presents different rail freight tariffs by cargo category, for domestic transport of 900 km[10] and for transit transport of 982 km (i.e., between Dar es Salaam Port and Isaka).

Table 8.18: TRL Freight Tariffs by Commodity Category – per Large Wagon[1]

Commodity Category	Domestic Tariff (TZS) (881–900 km)	Domestic Tariff (USD)[2] (881–900 km)	Transit Traffic Tariff (USD) (DSM Port to Isaka, 982km)	Transit Traffic Tariff (USD) (Isaka to DSM Port, 982 km)
General Goods	3,610,800	2,708	3,285	2,025
Cement	3,322,880	2,492	–	–
Coffee	1,978,860	1,484	–	–
Cotton	1,551,700	1,164	–	–
Cotton Seeds and Paddy	1,806,580	1,355	–	–
Motor Vehicles	2,600,720	1,951	–	–
Fertiliser	3,033,780	2,275	–	–
Timber and Logs	3,037,320	2,278	–	–
Salt	4,086,340	3,065	3,470	2,140
Grain – up direction	3,160,040	2,370	–	–
Maize – up direction	3,313,440	2,485	–	–
Maize, Rice, and Grains – down direction	1,897,440	1,423	–	–
Empty Bottles in Crates/Pallet	1,538,720	1,154	–	–
Bulk Oil (Petrol and Others)	4,754,220	3,566	5,100	–
Bulk Oil (LPG)	6,636,320	4,977	–	–
Bulk Oil (IDO and Fuel Oil)	3,195,440	2,397	4,660	–
Bulk Oil (Petrol and Others in Tanktainers)[3]	4,469,840	3,352	–	–
Bulk Oil (LPG in Tanktainers)	5,262,800	3,947	–	–
Bulk Oil (IDO and Fuel Oil in Tanktainers)	3,003,100	2,252	–	–
Full Container[4] (1 × 40 ft or 2 × 20ft)	–	–	3,380	2,560
Empty Container (1 × 40 ft or 2 × 20 ft)	736,320	552	1,460	1,990

Abbreviations: DSM = Dar es Salaam, IDO = industrial diesel oil, TRL = Tanzania Railway Limited, and TZS = Tanzanian Shilling

Notes: [1] Although the tariff per small wagon and that per large wagon by different category of commodity are shown in TRL pricing documents, only the price per large wagon or that per 100 kg is adopted. (The small wagons are currently not used.) [2] For comparison, the price in TZS was converted to USD with the 1 July 2009 exchange rate of TZS 1 = USD 0.00075 (from www.oanda.com). [3] A tanktainer is a tank built on a standard (generally 20-foot) container frame for the transport of liquids. [4] The container tariff for transit transport is set only for full containers and empty containers. The tariff for domestic transport of full containers depends on the weight and commodity category of the cargo in the containers.

Sources: Compiled from Addendum to Special Traffic Notice No. 01, Revision of Tariff, February 2008 (TRL) [for transit traffic] and Addendum to Special Traffic Notice No. 01, Revision of Tariff, July 2009 (TRL) [for domestic traffic]

TAZARA: The rail freight tariffs of TAZARA are set for 11 commodity categories by distance. The categorization of more than 1,000 types of commodities is specified in detail in the Tanzania Zambia Railway Authority Official Tariff Book 2nd Edition, Effective Since 1st July, 1988. Although this tariff book has not been revised since 1988, the tariffs themselves are officially revised every year by TAZARA. These days TAZARA sets its tariffs in USD rather than TZS. Table 8.19 summarizes TAZARA's rail freight tariffs for 11 commodity categories and presents information on the major commodities in each category.

[10] Although the rail freight tariff for distances up to 1,800 km are set for most types of commodities, they are defined up to about 900 km for some commodity categories.

Table 8.19: TAZARA Freight Tariffs by Commodity Category (USD/tonnes)

Distance (km)	Category 1 Mixed Goods, Chemicals, Rice	Category 2 Empty Bottles, Machinery	Category 3 Furniture	Category 4 Containers - Loaded, Fuel, Batteries, Used Clothes, Caustic Soda, Concentrates, Manganese (ore)	Category 5 Leather	Category 6 Asphalt (in tank cars)	Category 7 Beer	Category 8 Coffee, Cocoa, Tea, Soap, Manganese (dioxide), Copper (steel cored)	Category 9 Copper (scrap)	Category 10 Timber, Cotton, Sugar, Paper	Category 11 Containers – Empty, Cement, Maize, Fertilizer, Pulp, Molasses, Aggregate Stones, Cotton Seed, Bitumen, Logs
200	14.74	14.62	14.52	14.40	14.30	14.20	14.08	13.98	13.88	13.76	13.68
300	22.11	21.93	21.78	21.60	21.45	21.30	21.12	20.97	20.82	20.64	20.52
400	29.48	29.24	29.04	28.80	28.60	28.40	28.16	27.96	27.76	27.52	27.36
500	36.85	36.55	36.30	36.00	35.75	35.50	35.20	34.95	34.70	34.40	34.20
600	44.22	43.86	43.56	43.20	42.90	42.60	42.24	41.94	41.64	41.28	41.04
700	51.59	51.17	50.82	50.40	50.05	49.70	49.28	48.93	48.58	48.16	47.88
800	58.96	58.48	58.08	57.60	57.20	56.80	56.32	55.92	55.52	55.04	54.72
900	66.33	65.79	65.34	64.80	64.35	63.90	63.36	62.91	62.46	61.92	61.56
1,000	73.70	73.10	72.60	72.00	71.50	71.00	70.40	69.90	69.40	68.80	68.40
1,100	81.07	80.41	79.86	79.20	78.65	78.10	77.44	76.89	76.34	75.68	75.24
1,200	88.44	87.72	87.12	86.40	85.80	85.20	84.48	83.88	83.28	82.56	82.08
1,300	95.81	95.03	94.38	93.60	92.95	92.30	91.52	90.87	90.22	89.44	88.92
1,400	103.18	102.34	101.64	100.80	100.10	99.40	98.56	97.86	97.16	96.32	95.76
1,500	110.55	109.65	108.90	108.00	107.25	106.50	105.60	104.85	104.10	103.20	102.60
1,600	117.92	116.96	116.16	115.20	114.40	113.60	112.64	111.84	111.04	110.08	109.44
1,700	125.29	124.27	123.42	122.40	121.55	120.70	119.68	118.83	117.98	116.96	116.28
1,800	132.66	131.58	130.68	129.60	128.70	127.80	126.72	125.82	124.92	123.84	123.12

Abbreviation: TAZARA = Tanzania Zambia Railway Authority

Sources: Tanzania Zambia Railway Authority Official Tariff Book 2nd Edition, Effective since 1st July, 1988 and Tanzania Zambia Railway Authority Rates Effective 1st July 2011

Kenya-Uganda Railway: The transit transport routes of the Kenya-Uganda Railway include: (i) the route between Mombasa Port and Kampala Station; and (ii) the routes between Mwanza Port in Tanzania and Kampala Station, connected with the TRL route between Dar es Salaam Port and Mwanza Station. In addition, fuel (a major transit cargo item carried by the railway) is transported to Kampala from the oil terminal in Mzoma in Tanzania. Tables 8.20 and 8.21 summarize freight tariffs by commodity along these routes.

Table 8.20: Kenya–Uganda Railway Tariffs for Transit Traffic, Containerised Cargo

Origin Station	Destination Station	Distance (km)	2 × 20 ft (each) (USD)	1 × 20 ft (heavy) (USD)	40 ft (USD)	20 ft (empty) (USD)	40 ft (empty) (USD)
Mombasa (Kilindini)[1]	Kampala	1,330	1,613	2,992	2,992	-	-
Kampala	Mombasa (Kilindini)	1,330	851	1,008	1,008	227	454
Mwanza	Kampala	(10)[2]	851	1,311	1,700	126	252

Notes: [1] Kilindini Station is in Mombasa Port Terminal. [2] The tariff includes: (i) lake transport from Mwanza Port to Port Bell; and (ii) the railway tariff price between Port Bell Station and Kampala Station.
Source: Rift Valley Railways Freight Rates 2008, Effective 1st August 2008

Table 8.21: Kenya–Uganda Railway Tariffs for Transit Traffic, Bulk Cargo between Kampala and Mombasa

Origin Station	Destination Station	Distance (km)	General Cargo (USD)	Salt and Cement (USD)	Fuel Oil (USD)	White Oil (USD)	Vegetable Oil (USD)
Mombasa	Kampala	1,330	91	85	123	124	99
Kampala	Mombasa	1,330	51	-	-	-	-
Mwanza	Kampala	(10)	44	-	-	-	-
Mzoma	Kampala	(10)	-	-	52	-	-
Kampala	Mwanza	(10)	25	-	-	-	-

Source: Rift Valley Railways Freight Rates 2008, Effective 1st August 2008

(3) Seaport Tariffs

The tariffs of the seaports on the major transport corridors in East Africa, including Dar es Salaam Port, Tanga Port, Mtwara Port, and Mombasa Port, were assessed. In Tanzania, the port tariff is commonly set for all ports under the Tanzania Ports Authority (TPA) but separately from those for lake ports. The detail of the various categories of seaport tariffs for Tanzania are set out the Tariff Book of Harbour Dues and Charges, Marine, Shipping and Stevedoring Charges, Wharfage, Shore Handling and Miscellaneous Services on Deep Sea Going Vessels and Coasters, Effective Date 1st July, 1997 (TPA); the seaport tariffs for Kenya including those for Mombasa Port are set out Kenya Port Authority Tariff Book, Effective Date 1st February, 2008. Tables 8.22 and 8.23 summarize the major tariffs directly charged for cargo (excluding for the fees charged vessels) in Tanzania and Kenya, respectively.

Table 8.22: Major Seaport Tariffs in Tanzania (Directly Charged for Cargo)

Category	Rate (USD)	
(1) Shorehandling Charges1		
Domestic Traffic: General Cargo		
Import (per tonne)	USD 7.00	
Export (per tonne)	USD 3.50	
Transshipment and overloaded cargo (per tonne)	USD 4.00	
Transit Traffic: General Cargo		
Import (per tonne)	USD 6.00	
Export (per tonne)	USD 4.00	
Domestic Traffic: Containerised	(up to 20ft)	(over 20ft)
FCL Containers	USD 90.00	USD 135.00
Empty Containers	USD 10.00	USD 20.00
Transit Traffic: Containerised	(up to 20ft)	(over 20ft)
FCL Containers	USD 80.00	USD 120.00
Empty Containers	USD 10.00	USD 20.00
(2) Wharfage Charges2		
Import (General Cargo, Liquid Bulk, and Containerised)		
Domestic	Additional 1.6% of cargo value	
Transit	Additional 1.25% of cargo value	
Export (General Cargo, Liquid Bulk, and Containerised)		
Domestic and Transit	Additional 0.5% of cargo value	
Transshipment and overlanded cargo - charged once (General Cargo, Liquid Bulk, and Containerised)	Additional 0.8% of cargo value	
(3) Wayleave Dues		
Import and Export: General Cargo (per tonne)	USD 3.00	
Import: Container (per TEU)	USD 90.00	
Export: Container (per TEU)	USD 75.00	
(4) Storage Charges		
Domestic (Import): General Cargo		
First 7 days	Free	
Next 30 days (per tonne per day)	USD 1.00	
Thereafter (per tonne per day)	USD 1.50	
Domestic (Export): General Cargo		
First 7 days	Free	
Thereafter (per tonne per day)	USD 0.50	
Transshipment and Overloaded Cargo: General Cargo		
First 10 days	Free	
Thereafter (per tonne per day)	USD 0.50	
Transit (Import): General Cargo		
First 7 days	Free	
Next 30 days (per tonne per day)	USD 1.00	
Thereafter (per tonne per day)	USD 1.50	
Transit (Export): General Cargo		
First 21 days	Free	
Thereafter (per tonne per day)	USD 0.50	
Domestic (Import): FCL Container	(up to 20ft)	(over 20ft)
First 7 days	Free	Free
Next 30 days (per container per day)	USD 20	USD 40
Thereafter (per container per day)	USD 27	USD 54
Domestic (Export): FCL Container	(up to 20ft)	(over 20ft)
First 7 days	Free	Free
Thereafter (per container per day)	USD 16	USD 32
Transit (Import): FCL Container	(up to 20ft)	(over20ft)
First 15 days	Free	Free

Category	**Rate (USD)**	
Next 30 days (per container per day)	USD 20	USD 40
Thereafter (per container per day)	USD 27	USD 54
Transit (Export): FCL Container	(up to 20ft)	(over 20ft)
First 21 days	Free	Free
Thereafter (per container per day)	USD 16	USD 32
Empty Container	(up to 20ft)	(over 20ft)
First 5 days	Free	Free
Next 10 days (per container per day)	USD 4.00	USD 8.00
Thereafter (per container per day)	USD 8.00	USD 8.00

Abbreviations: FCL = full container load; ft = foot; SUMATRA = Surface and Marine Transport and Regulatory Authority, TEU = twenty-foot equivalent unit, and TPA = Tanzania Ports Authority
Notes: [1] Shore-handling charges are applicable only for general cargo and containerised cargo but not for liquid bulk because liquid bulk is transported by pipeline. Only wharfage charges are applicable for liquid bulk. [2] Wharfage charges are assessed all cargo passing over the quays, wharves, jetties, and buoys belonging to the TPA.
Sources: Compiled from: (i) Tariff Book of Harbour Dues and Charges, Marine, Shipping and Stevedoring Charges, Wharfage, Shore Handling and Miscellaneous Services on Deep Sea Going Vessels and Coasters, Effective Date 1st July, 1997 (TPA); and (ii) Public Notice, SUMATRA Order No. SMTRA/05/2011 for Upward Tariff Review of Stevedoring and Shorehandling Charges for Dry General, Dry Breakbulk, Dry Bulk and Bagged Cargoes.

Table 8.23: Major Seaport Tariffs in Kenya (Directly Charged for Cargo)

Category	**Rate (USD)**	
(1) Shorehandling Charges		
Domestic Traffic: General Cargo		
Import (per tonne)	USD 7.50	
Export (per tonne)	USD 6.00	
Transit Traffic: General Cargo		
Import (per tonne)	USD 6.00	
Export (per tonne)	USD 4.80	
Domestic Traffic: Containerised	(20 ft)	(40 ft)
Import: FCL Containers	USD 90.00	USD 135.00
Export: FCL Containers	USD 45.00	USD 68.00
Import: Empty Containers	USD 20.00	USD 30.00
Export: Empty Containers	USD 20.00	USD 30.00
Transit Traffic: Containerised	(20ft)	(40ft)
Import: FCL Containers	USD 72.00	USD 110.00
Export: FCL Containers	USD 35.00	USD 55.00
Import: Empty Containers	USD 20.00	USD 30.00
Export: Empty Containers	USD 20.00	USD 30.00
(2) Handling Charges at ICDs[1)]		
General Cargo		
Import (per tonne)	USD 6.00	
Export (per tonne)	USD 4.00	
Container	(20 ft)	(40 ft)
Import & Export: FCL Containers	USD 35.00	USD 52.50
Import & Export: Empty Containers	USD 20.00	USD 30.00
(3) Wharfage Charges[2]		
General Cargo and Liquid Bulk[3] (per tonne) (Domestic & Transit/Import & Export)	USD 5.00	
Motor Vehicles (per tonne) (Domestic & Transit/Import & Export)	USD 5.00	
FCL Container (Domestic & Transit/Import & Export)	(20 ft) USD 60.00	(40 ft) USD 90.00
Empty Container (Domestic & Transit/Import & Export)	(20 ft) USD 20.00	(40 ft) USD 30.00

Category	Rate (USD)	
(4) Storage Charges		
Domestic (Import): Conventional Cargo (per tonne)		
First 10 days	Free	
Thereafter	USD 1.50	
Domestic (Export): Conventional Cargo (per tonne)		
First days	Free	
Thereafter	USD 1.20	
Transshipment: Conventional Cargo (per tonne)		
First days	Free	
Thereafter	USD 1.00	
Transit (Import): Conventional Cargo (per tonne)		
First days	Free	
Thereafter	USD 1.20	
Transit (Export): Conventional Cargo (per tonne)		
First days	Free	
Thereafter	USD 1.00	
Domestic (Import): FCL Container	(20 ft)	(40 ft)
First 7 days	Free	Free
Thereafter	USD 25.00	USD 37.50
Domestic (Export): FCL Container	(20 ft)	(40 ft)
First 11 days	Free	Free
Thereafter	USD 20.00	USD 30.00
Transit (Import): FCL Container	(20ft)	(40ft)
First 15 days	Free	Free
Thereafter	USD 20.00	USD 30.00
Transit (Export): FCL Container	(20 ft)	(40 ft)
First 21 days	Free	Free
Thereafter	USD 16.00	USD 24.00
Domestic through ICDs (Import): FCL Container	(20 ft)	(40 ft)
First 11 days	Free	Free
Thereafter	USD 20.00	USD 30.00
Transit through ICDs (Import): FCL Container	(20 ft)	(40 ft)
First 15 days	Free	Free
Thereafter	USD 20.00	USD 30.00
Domestic & Transit through ICDs (Export): FCL Container	(20 ft)	(40 ft)
First 15 days	Free	Free
Thereafter	USD 20.00	USD 30.00
Empty (Import) Container	(20 ft)	(40 ft)
First 2 days	Free	Free
Thereafter	USD 15.00	USD 22.50
Empty (Export) Container	(20 ft)	(40 ft)
First 4 days	Free	Free
Thereafter	USD 15.00	USD 22.50

Abbreviations: FCL = full container load; ft = foot; and ICD = inland clearance/container depot

Notes: [1] Where import or export cargo is handled at ICDs, extra handling charges are assessed in addition to sharehandling charges. [2] Wharfage charges are assessed all cargo passing over the quays, wharves, jetties, buoys, and other installations within the harbour limits except for transhipment cargo. [3] The rate shown here is for domestic and transit general cargo and liquid bulk leaving or entering the port on a truck, train or equivalent mode of transport. In the case of bulk cargo handled via conveyors or pipeline from/to the vessel to/from existing liquid facilities within the port or a storage facility outside the port, the rate is USD 2.00 per tonne. The rate for such cargo handled through private jetties or buoys is USD 1.00–2.00 per tonne.

(4) Lake Port Tariffs and Lake Transport Freight Tariffs

Lake port tariffs in Tanzania are set by the TPA and are simpler than those for seaport. Table 8.24 summarizes lake port tariffs directly charged for cargo. In addition to the lake port tariffs, lake freight transport tariffs are charged cargo transported through lake ports. Although lake freight transport tariffs vary by vessel operator, those of the major operator in Tanzania, Marine Services Company Limited (MSCL), are shown in Tables 8.25 and 8.26. As indicated, although

the tariffs for general goods are set differently for each of the three international lakes, the tariffs for containers, rail wagons, and vehicles are the same for transport across these three lakes.

Table 8.24: Major Lake Port Tariffs in Tanzania (Directly Charged for Cargo)

Category	Local Rate[1] (TZS)	Foreigners Rate (USD)
Port Charges		
Shore handling (per tonne)	3,600	3.00
Stevedoring (per tonne)	6,000	5.00
Survey tally charges (per tonne)	1,800	1.50
Wharfage Charges[2]		
Goods/parcels/luggage (per tonne)	3,600	3.00
Motor cars	6,000	5.00
Small animals (per animal)	240	0.20
Large size animals (per animal)	600	0.50
Motorbike	5,400	4.00
(Minimum charge per consignment)	(5,400)	(4.00)
Wayleave Dues		
Imports/exports (per tonne)	1,728	1.20
Containerised import (per TEU)	51,840	36.00
Containerised export (per TEU)	43,200	30.00
Warehousing and Storage of Goods[3]		
For the first 3 days	Free	Free
After 3 days (per tonne per 24 hours)	1,200	1.00

Abbreviations: TEU = twenty-foot equivalent unit; TPA = Tanzania Ports Authority; TZS = Tanzanian shilling
[1] Including 18% value added tax. [2] Wharfage charges are assessed all cargo including cargo accompanied by passengers passing over quays, wharfs, jetties, and buoys belonging to the TPA. [3] Goods remaining in the Authority's warehouses, sheds or stacking grounds in excess of allowable free period shall be levied storage.
Source: Tanzania Ports Authority

Table 8.25: Lake Freight Transport Charges in Tanzania – General Goods

Distance	Lake Tanganyika		Lake Nyasa		Lake Victoria	
(km)	(TZS)	(USD)	(TZS)	(USD)	(TZS)	(USD)
1–20	16,142	9.85	21,594	13.17	16,142	9.85
21–40	17,488	10.67	24,473	14.93	16,142	9.85
41–60	18,833	11.49	25,913	15.81	16,142	9.85
61–80	18,833	11.49	28,792	17.56	17,488	10.67
81–100	20,178	12.31	30,232	18.44	18,833	11.49
101–120	21,523	13.13	33,111	20.20	21,523	13.13
121–140	21,523	13.13	35,990	21.95	21,523	13.13
141–160	25,559	15.59	38,869	23.71	24,214	14.77
161–180	25,559	15.59	44,628	27.22	24,214	14.77
181–200	26,904	16.41	46,067	28.10	25,559	15.59
201–220	26,904	16.41	48,946	29.86	25,559	15.59
221–240	28,249	17.23	50,386	30.74	25,559	15.59
241–260	29,594	18.05	53,265	32.49	28,249	17.23
161–280	29,594	18.05	56,144	34.25	28,249	17.23
281–300	30,940	18.87	60,463	36.88	30,940	18.87
301–320	32,285	19.69	61,903	37.76	30,940	18.87
321–340	33,630	20.51	64,782	39.52	33,630	20.51
341–360	33,630	20.51	66,222	40.40	33,630	20.51
361–380	34,975	21.33	69,101	42.15	33,630	20.51
381–400	36,320	22.16	73,420	44.79	34,975	21.33
401–420	37,666	22.98	77,738	47.42	34,975	21.33
421–440	39,011	23.80	79,178	48.30	37,666	22.98
441–460	40,356	24.62	82,057	50.05	40,020	24.41
461–480	41,701	25.44	83,497	50.93	40,356	24.62
481–500	41,701	25.44	87,816	53.57	40,356	24.62

Distance (km)	Lake Tanganyika		Lake Nyasa		Lake Victoria	
	(TZS)	(USD)	(TZS)	(USD)	(TZS)	(USD)
501–520	43,046	26.26	89,255	54.45	43,046	26.26
521–540	44,392	27.08	92,134	56.20	43,046	26.26
541–560	44,392	27.08	95,014	57.96	44,392	27.08
561–580	47,082	28.72	99,332	60.59	44,392	27.08
581–600	47,082	28.72	100,772	61.47	44,392	27.08
601–620	48,427	29.54	105,091	64.11	47,082	28.72
621–640	49,772	30.36	106,530	64.98	49,436	30.16
641–660	49,772	30.36	109,410	66.74	49,772	30.36
661–680	52,463	32.00	110,849	67.62	49,772	30.36
681–700	53,808	32.82	115,168	70.25	51,118	31.18
701–720	53,808	32.82	116,608	71.13	51,118	31.18
721–740	55,153	33.64	120,926	73.77	53,808	32.82
741–760	55,153	33.64	122,366	74.64	53,808	32.82
761–780	56,498	34.46	126,685	77.28	53,808	32.82
781–800	56,498	34.46	128,124	78.16	58,853	35.90

Source: Marine Services Company Limited

Table 8.26: Lake Freight Transport Charges in Tanzania – Containers, Railway Wagons, and Vehicles (Common Rate for All Three International Lakes)

Distance (km)	Loaded Rail Wagon (per unit)		Loaded Container (per TEU)		Empty Container (per TEU)		Vehicle (per unit)	
	(TZS)	(USD)	(TZS)	(USD)	(TZS)	(USD)	(TZS)	(USD)
1–40	566,348	345.47	523,802	319.52	206,264	125.82	54,280	33.11
41–60	592,622	361.50	550,942	336.07	219,834	134.10	59,000	35.99
61–80	615,977	375.75	575,368	350.97	227,976	139.07	66,080	40.31
81–100	642,250	391.77	602,508	367.53	238,832	145.69	70,800	43.19
101–120	659,766	402.46	629,648	384.09	249,688	152.31	73,160	44.63
121–140	686,040	418.48	656,788	400.64	257,830	157.28	77,880	47.51
141–160	706,475	430.95	683,928	417.20	265,972	162.24	82,600	50.39
161–180	732,749	446.98	711,068	433.75	282,256	172.18	92,040	56.14
181–200	753,185	459.44	735,494	448.65	290,398	177.14	94,400	57.58
201–220	776,539	473.69	762,634	465.21	295,826	180.45	99,120	60.46
221–240	799,894	487.94	784,346	478.45	309,396	188.73	103,840	63.34
241–260	823,248	502.18	814,200	496.66	317,538	193.70	108,560	66.22
161–280	843,683	514.65	841,340	513.22	328,394	200.32	113,280	69.10
281–300	869,957	530.67	882,050	538.05	339,250	206.94	120,360	73.42
301–320	890,393	543.14	887,478	541.36	347,392	211.91	125,080	76.30
321–340	916,666	559.17	914,618	557.92	355,534	216.88	127,440	77.74
341–360	937,102	571.63	941,758	574.47	371,818	226.81	134,520	82.06
361–380	963,376	587.66	968,898	591.03	379,960	231.78	136,880	83.50
381–400	983,811	600.12	996,038	607.58	388,102	236.74	143,960	87.82
401–420	1,010,085	616.15	1,031,320	629.11	398,958	243.36	148,680	90.69
421–440	1,030,520	628.62	1,047,604	639.04	409,814	249.99	153,400	93.57
441–460	1,059,713	646.43	1,072,030	653.94	423,384	258.26	158,120	96.45
461–480	1,080,148	658.89	1,101,884	672.15	428,812	261.58	162,840	99.33
481–500	1,106,422	674.92	1,126,310	687.05	436,954	266.54	169,920	103.65
501–520	1,126,858	687.38	1,153,450	703.60	453,238	276.48	174,640	106.53
521–540	1,147,293	699.85	1,175,162	716.85	461,380	281.44	179,360	109.41
541–560	1,173,567	715.88	1,205,016	735.06	469,522	286.41	184,080	112.29
561–580	1,196,921	730.12	1,232,156	751.62	480,378	293.03	188,800	115.17
581–600	1,220,276	744.37	1,253,868	764.86	488,520	298.00	195,880	119.49
601–620	1,243,630	758.61	1,281,008	781.41	499,376	304.62	198,240	120.93
621–640	1,264,066	771.08	1,305,434	796.31	507,518	309.59	202,960	123.81
641–660	1,290,339	787.11	1,338,002	816.18	521,088	317.86	210,040	128.12
661–680	1,313,694	801.35	1,365,142	832.74	526,516	321.17	212,400	129.56
681–700	1,337,049	815.60	1,386,854	845.98	540,086	329.45	217,120	132.44
701–720	1,357,484	828.07	1,413,994	862.54	550,942	336.07	224,200	136.76

Distance	Loaded Rail Wagon (per unit)		Loaded Container (per TEU)		Empty Container (per TEU)		Vehicle (per unit)	
(km)	(TZS)	(USD)	(TZS)	(USD)	(TZS)	(USD)	(TZS)	(USD)
721–740	1,383,758	844.09	1,441,134	879.09	559,084	341.04	228,920	139.64
741–760	1,404,193	856.56	1,462,846	892.34	567,226	346.01	233,640	142.52
761–780	1,430,467	872.58	1,492,700	910.55	583,510	355.94	238,360	145.40
781–800	1,450,902	885.05	1,517,126	925.45	588,938	359.25	243,080	148.28

Source: Marine Services Company Limited

(5) Other Cost Factors to Be Considered

In addition to the transport charges described in subsections (1), (2), (3), and (4) above, a clearing charge is assessed if a cargo owner requests a freight forwarder to represent him or her for the entire cross-border transport operation. In the case of transport between an inland country and a seaport from/to overseas, clearing charges for both the inland country and the coastal country where the seaport is located are assessed. In the case of a land transport operation between two countries, clearing charges for the importing country and the exporting country are assessed. In other words, although there is no clearing charge for transport through an inland transit country, the cost of the procedure is charged for passing through a seaport of a coastal transit country. Clearing charges are about USD 200–300 in the case of a 40-foot container. However, the charges vary widely depending on the commodity and cargo type. Because the charge does not vary much among coastal countries in the region, this factor does not affect route choice.

(6) Total Transport Cost by Transport Route and by Combination of Different Transport Modes on Each Route

The total transport cost by route and by transport mode combination (e.g., railway, lake transport and road transport from/to railway) were studied taking into account the transport costs of each mode.

8.4 Method of Traffic Forecast – in Case of Burundi Ports

8.4.1 Summary of Forecasting Methodology

This section describes a method for forecasting traffic at Bujumbura port, which was an input to the Master Plan Study for this port. This section first presents the present situation of freight flow by reviewing statistical indicators, and then analyzes the relationship between the economic situation and traffic volumes, to develop a traffic forecasting model. Using socioeconomic indicators such as population and gross domestic product (GDP), this model estimates the volume of traffic generated in and arriving at Burundi, as well as the traffic flow from neighbouring countries (Republic of Rwanda, Democratic Republic of the Congo) to foreign countries (some of which is handled as transit cargo at Bujumbura port).

Of the import/export cargo of the country, the traffic handled at Bujumbura port consists of freight that uses corridors, including Bujumbura port, and it was estimated here by each possible commodity. The possibility of using the Bujumbura port corridor was assumed based on feasible scenarios and statistics obtained in a survey. Alternative transport routes for bilateral freight flows analyzed in this estimation were assumed as shown in Table 8.27. Among these, routes 1) and 2) involve transit at Bujumbura port.

Table 8.27: Alternative Routes for the Transport of Freight between Country Pairs

Country	Export to/ Import from	Alternative Transport Routes		
Burundi	Rwanda	Land		
	Tanzania	Land	Water to Kigoma and Railway 2)	
	Kenya	Land		
	Uganda	Land		
	DRC	Land		
	Southern Africa	Water to Mpulungu and Land 1)		
	Other Countries	Land to Mombasa	Land to DES	Water to Kigoma and Railway to DES 2)
Rwanda	Burundi	Land		
	Tanzania	Land	Land to Bujumbura, Water to Kigoma and Railway 2)	
	Kenya	Land		
	Uganda	Land		
	DRC	Land		
	Southern Africa	Land to Bujumbura, Water to Mpulungu and Land 1)		
	Other Countries	Land to Mombasa	Land to DES	Land to Bujumbura, Water to Kigoma and Railway to DES 2)
DRC	Burundi	Land		
	Rwanda	Land		
	Tanzania	Land	Land to Bujumbura, Water to Kigoma and Railway 2)	
	Kenya	Land		
	Uganda	Land		
	Southern Africa	Land to Bujumbura, Water to Mpulungu and Land 1)		
	Other Countries	Land to Mombasa	Land to DES	Land to Bujumbura, Water to Kigoma and Railway to DES 2)

Source: JICA Study Team

8.4.2 Estimates of Trade Amount by Country

(1) Trade Estimation Model

By analyzing the relationship between socio-economic data such as population and GDP, which was obtained from the website of the International Monetary Fund (IMF), and trade amount, a model for estimating the amount of future trade was developed as follows:

$$y = a \cdot x_1 + b \cdot x_2 + c$$

Where y : Import and Export (USD million);
x_1: GDP (USD billion);
x_2: Population (million); and
a, b, c: Parameters (see Table 8.28).

Table 8.28: Model Parameters for Trade Forecasting

Country/ Parameter	Item (USD) (y)	GDP (USD billion) (a)	Population (million) (b)	Constant (c)	Correlation Coefficient r^2
Burundi	Import	2.15	135.3	−2,001.6	0.832
	Export	0.63	101.4	−996.1	0.923
Rwanda	Import	0.67	251.2	−2,505.3	0.970
	Export	0.23	73.6	−773.2	0.955

Source: JICA Study Team

(2) Forecasting Framework

In order to forecast future trade for the countries analyzed, it was necessary to make assumptions concerning future population and GDP. These assumptions were made by adopting the outlook below:

- For GDP and population, the IMF's estimates were directly employed until 2016.
- After 2016, an annual rate of increase of 4.5% was assumed for GDP and 1.5% for population.

Table 8.29 presents projections of GDP and population for Burundi and Rwanda.

Table 8.29: Projections of GDP and Population

Year	GDP		Population (million)	
	Burundi (billion BDF)	Rwanda (billion RWF)	Burundi	Rwanda
2010	696.2	1,417.2	8.3	10.0
2015	882.7	1,956.4	9.1	11.1
2020	1,104.8	2,485.2	9.9	12.0
2025	1,376.8	3,097.0	10.6	13.0
2030	1,715.8	3,859.4	11.5	14.0

Source: JICA Study Team

(3) Trade Volume Forecasts

Table 8.30 presents forecasts of trade volumes in USD million made by inputting the GDP and population projections into the trade estimation model. Trade in Burundi was forecast to increase about fourfold between 2010 and 2030.

Table 8.30: Forecasts of Trade Volume

Unit: USD million

Nation / Year	Burundi				Rwanda			
	Import	Growth	Export	Growth	Import	Growth	Export	Growth
2010	832.5	1.0	275.5	1.0	1,112.0	1.0	237.8	1.0
2015	1,129.0	1.4	484.9	1.8	1,590.5	1.4	496.6	2.1
2020	1,708.0	2.1	701.1	2.5	2,177.4	2.0	687.4	2.9
2025	2,395.4	2.9	949.7	3.4	2,820.2	2.5	897.5	3.8
2030	3,234.6	3.9	1,246.4	4.5	3,581.8	3.2	1,147.7	4.8

Source: JICA Study Team

8.4.3 Forecasting Freight OD Volumes

In this subsection, total trade amounts estimated in the previous subsection are broken down by partner country and by commodity type, to estimate bilateral traffic volumes for each item. In

order to break down the trade volumes by partner country and commodity type, the average shares of partners and of commodities in the past were applied. Since the freight OD volumes thereby obtained are bilateral trade amounts in terms of currency, they were converted to tonnages by multiplying the ratio of currency to weight by each commodity with the freight OD obtained above.

Tables 8.31 to 8.34 present the results of this exercise for the subject countries: Burundi and Rwanda.

Table 8.31: Forecast Import Freight OD by Commodity (Burundi, 2030)

Unit: 1,000 tonnes

Partner/ Commodity	Animal & Animal Products	Vegetable Products	Foodstuffs	Mineral Products	Mineral Fuel and Oil	Chemicals & Allied Industries	Plastics/ Rubbers	Raw Hides, Skins, Leather, & Furs	Wood & Wood Products	Textiles	Footwear / Headgear	Stone/Glass	Metals	Machinery/ Electrical	Transpor-tation	Total
Rwanda	0.1	3.0	0.6	8.6	1.3	0.2	0.0	0.8	0.0	0.1	0.2	0.4	0.7	0.0	0.0	16.2
Tanzania	0.3	25.3	1.3	148.3	7.1	1.1	0.3	6.6	2.0	0.0	2.6	3.7	1.4	0.2	0.2	200.4
Kenya	1.0	3.7	5.2	156.4	16.1	3.3	0.0	8.5	1.8	0.5	7.3	53.4	5.9	0.3	1.0	264.3
Uganda	1.4	45.9	6.1	120.1	7.4	0.9	0.1	22.3	1.6	0.5	0.3	23.2	1.6	0.2	0.1	231.7
DRC	0.0	0.2	0.0	11.0	1.9	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.2
Southern Africa	0.1	1.0	22.0	203.1	2.8	0.3	0.0	12.0	0.3	0.1	0.2	9.8	5.2	0.9	0.7	258.5
Other Africa	0.0	20.8	3.0	8.6	11.8	0.5	0.0	0.9	0.3	0.1	0.5	6.8	3.3	0.3	0.1	57.1
Asia	1.0	27.3	3.4	9.9	61.1	5.8	0.2	12.4	10.0	1.6	7.2	23.5	54.7	19.2	2.1	239.0
Middle East	0.9	0.5	3.2	299.5	5.9	1.9	0.1	6.6	2.9	0.1	3.8	20.1	22.5	1.8	0.5	370.4
Europe	2.3	73.0	18.1	11.0	113.9	5.0	0.2	23.6	8.2	0.5	2.2	46.2	122.9	6.4	5.2	438.8
Other	0.2	9.2	0.8	1.4	3.8	0.7	0.3	3.7	4.0	0.1	0.5	1.9	7.1	0.8	0.3	34.8
Total	7.3	209.9	63.7	977.9	233.1	19.8	1.2	97.4	31.2	3.6	24.8	189.0	225.3	30.0	10.3	2,124.4

Source: JICA Study Team

Table 8.32: Forecast Export Freight OD by Commodity (Burundi, 2030)

Unit: 1,000 tonnes

Partner / Commodity	Animal & Animal Products	Vegetable Products	Foodstuffs	Mineral Products	Mineral Fuel and Oil	Chemicals & Allied Industries	Plastics/ Rubbers	Raw Hides, Skins, Leather, & Furs	Wood & Wood Products	Textiles	Footwear/ Headgear	Stone/Glass	Metals	Machinery/ Electrical	Transpor-tation	Total
Rwanda	0.0	0.5	3.4	0.4	1.4	0.2	0.0	0.1	0.4	0.0	0.0	0.0	4.7	0.0	0.0	11.3
Tanzania	0.0	0.4	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	5.0	0.1	0.0	6.0
Kenya	0.0	7.2	0.0	0.0	0.0	0.0	3.2	0.0	0.0	0.0	1.4	0.0	3.4	0.2	0.1	15.6
Uganda	0.0	1.1	1.8	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.0	4.6
DRC	0.0	0.4	1.7	1.2	0.6	0.5	0.0	0.6	0.3	0.0	0.0	0.0	5.6	0.2	0.0	11.0
Southern Africa	0.0	1.8	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.1	0.0	3.8
Other Africa	0.0	0.2	0.1	0.0	0.1	0.0	0.0	0.0	0.3	0.0	0.6	0.0	6.8	0.1	0.0	8.3
Asia	0.0	5.2	0.0	0.7	0.1	0.4	1.0	0.1	0.1	0.0	0.0	0.0	6.4	0.7	0.1	14.8
Middle East	0.0	1.6	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	24.6	0.0	0.7	0.0	0.0	27.7
Europe	0.1	63.8	0.0	0.5	0.1	0.0	1.3	0.1	2.9	0.0	8.5	0.0	7.3	0.0	0.0	84.7
Other	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	1.3
Total	0.1	83.0	7.2	2.9	2.5	1.3	6.4	1.1	4.1	0.0	35.1	0.0	43.2	1.5	0.3	189.0

Source: JICA Study Team

Table 8.33: Forecast Import Freight OD by Commodity (Rwanda, 2030)

Unit: 1,000 tonnes

Partner/ Commodity	Animal & Animal Products	Vegetable Products	Foodstuffs	Mineral Products	Mineral Fuel and Oil	Chemicals & Allied Industries	Plastics/ Rubbers	Raw Hides, Skins, Leather, & Furs	Wood & Wood Products	Textiles	Footwear/ Headgear	Stone/Glass	Metals	Machinery/Electrical	Transportation	Total
Burundi	0.3	1.5	6.8	0.0	0.0	0.8	0.0	0.0	0.0	0.7	0.0	0.0	0.1	0.0	0.2	10.5
Tanzania	7.0	82.4	2.4	2.1	7.0	20.3	2.4	0.0	1.0	3.1	0.1	1.8	6.7	0.3	0.2	136.8
Kenya	2.2	71.7	48.3	184.4	140.0	36.0	17.1	0.1	13.4	8.0	10.3	15.0	35.8	2.5	2.0	587.0
Uganda	16.1	254.9	23.1	567.1	6.3	29.4	6.8	0.3	8.1	7.2	1.2	2.0	79.8	0.8	0.5	1,003.4
DRC	0.4	20.5	2.6	0.1	0.0	0.4	0.0	0.0	1.7	0.9	0.0	0.0	0.0	0.0	0.1	26.9
Southern Africa	0.5	1.4	48.3	6.4	16.1	5.7	2.4	0.0	4.1	1.5	0.1	0.9	16.9	3.7	1.0	109.0
Other Africa	0.2	5.9	28.3	0.4	5.2	6.9	3.6	0.0	4.1	2.3	0.0	2.7	6.8	1.1	0.9	68.4
Asia	0.2	60.3	2.0	3.0	62.6	48.6	22.3	0.7	14.2	34.8	3.6	20.4	64.3	15.8	29.2	382.1
Middle East	1.0	3.8	11.8	4.8	346.4	7.0	11.8	0.7	6.7	23.6	2.1	12.5	18.5	8.5	7.0	466.3
Europe	2.7	106.5	22.9	5.9	51.4	103.5	14.3	0.1	15.9	36.5	0.6	8.5	35.2	27.5	12.6	444.1
Other	0.7	59.4	6.8	2.3	2.0	11.1	3.5	0.1	1.8	9.7	0.4	4.8	11.5	3.5	1.2	118.8
Total	31.4	668.3	203.2	776.6	637.1	269.7	84.3	2.1	70.9	128.3	18.4	68.8	275.8	63.7	54.7	3,353.2

Source: JICA Study Team

Table 8.34: Forecast Export Freight OD by Commodity (Rwanda, 2030)

Unit: 1,000 tonnes

Partner	Animal & Animal Products	Vegetable Products	Foodstuffs	Mineral Products	Mineral Fuel and Oil	Chemicals & Allied Industries	Plastics Rubbers	Raw Hides, Skins, Leather, & Furs	Wood & Wood Products	Textiles	Footwear/ Headgear	Stone/Glass	Metals	Machinery/ Electrical	Transportation	Total
Burundi	0.3	2.5	6.7	0.5	1.8	0.8	0.7	0.0	0.4	0.1	0.6	2.6	6.1	0.4	0.4	23.7
Tanzania	0.0	0.7	0.6	0.4	0.3	0.0	0.0	0.0	0.0	0.1	0.0	4.7	1.0	0.4	0.2	8.4
Kenya	0.0	77.9	23.5	0.3	0.6	0.0	0.2	4.0	0.4	0.1	0.0	1.8	0.9	0.2	0.1	110.1
Uganda	0.2	3.9	2.0	0.3	0.0	0.4	0.1	0.4	0.7	0.1	0.0	0.6	11.9	0.4	0.1	21.1
DRC	24.8	1.4	116.9	1.0	3.6	1.7	1.1	0.0	0.1	0.1	1.1	1.5	11.4	0.2	0.5	165.4
Southern Africa	0.0	10.6	0.0	13.4	0.0	0.0	0.0	0.0	0.1	0.1	0.0	1.1	0.6	0.5	0.1	26.6
Other Africa	0.0	0.3	0.0	0.0	0.6	0.1	0.0	0.0	0.1	0.4	0.0	0.2	5.3	0.8	2.3	10.2
Asia	0.2	0.8	0.0	41.5	0.5	0.2	0.0	3.9	0.1	0.0	0.0	4.3	0.3	0.0	0.0	51.9
Middle East	0.2	0.1	0.5	0.5	0.1	0.0	0.0	0.1	0.1	0.0	0.0	4.8	0.1	0.5	0.0	7.0
Europe	0.0	64.6	3.3	55.9	0.2	0.1	0.0	5.9	0.5	0.3	0.0	17.1	1.7	0.6	0.1	150.3
Other	0.2	6.2	0.2	1.9	0.0	0.4	0.0	0.3	1.7	0.1	0.0	3.0	0.5	0.3	0.1	14.8
Total	25.9	169.0	153.8	115.7	7.8	3.8	2.2	14.6	4.1	1.2	1.8	41.8	39.8	4.3	3.8	589.6

Source: JICA Study Team

8.4.4 Forecasting Freight Loads at Bujumbura Port

Based on the forecast freight OD matrices presented in the previous section, cargo with the possibility of being transported through Bujumbura port is summarized in Table 8.35.

Table 8.35: Potential Freight through the Port of Bujumbura (2030)

Unit: 1,000's of tonnes

		Partner Country/Area						
Country	Import/ Export	Tanzania	Southern Africa	Other African Region	Asia	Middle East	Europe	Others
Burundi	Import	200.4	258.5	57.1	239.0	370.4	438.8	34.8
	Export	6.0	3.8	8.3	14.8	27.7	84.7	1.3
Rwanda	Import	136.8	109.0	68.4	382.1	466.3	444.1	118.8
	Export	8.4	26.6	10.2	51.9	7.0	150.3	14.8
Total		351.7	397.9	143.9	687.8	871.4	1,117.9	169.6

Source: JICA Study Team

Applying the concept of alternative transport routes between country pairs mentioned in subsection 8.4.1, it would appear that in Southern Africa (including Zambia), the annual potential cargo volume transported using waterways through Lake Tanganyika (which connects Bujumbura and Mpulungu ports), whether in Burundi or in Rwanda, is 397,900 tonnes.

Other possibilities include trade between/among Burundi, Rwanda, and Tanzania, and cargo transported from Burundi and Rwanda to foreign countries. While there are options for this cargo to be transported either by corridor/land or by water, a questionnaire survey of carriers in Burundi showed that, compared to the land route, about 9% responded that they might go to Tanzania from Kigoma Port by water. This volume would total 3,342,000 tonnes, with the subject traffic totalling 290,800 tonnes, resulting in 688,700 tonnes combined with that of Southern Africa.

Traffic through Tanzania by inland waterway will be discharged mainly at Kigoma Port. Considering the past average throughput at Kigoma Port, and assuming a maximum throughput of 130,000 tonnes, the traffic will total 527,900 tonnes together with that at Mpulungu Port.

Table 8.36 presents the results of this analysis, while Table 8.37 presents cargo composition by commodity.

Table 8.36: Potential Cargo Load through the Port of Bujumbura (2030)

Unit: 1,000 tonnes

Case	Southern Africa	Others	Total
Base	397.9		397.9
Base + Kigoma	397.9	130.0	527.9
Potential	397.9	290.8	688.7

Source: JICA Study Team

Table 8.37: Potential Cargo Volume at the Port Bujumbura by Commodity Type (2030)

Unit: 1,000 tonnes

Commodity	Base	Base + Kigoma	Potential
Animal and Animal Products	0.6	0.8	2.1
Vegetable Products	14.8	31.0	68.7
Foodstuffs	70.5	71.3	80.0
Mineral Products	222.9	316.3	275.0
Mineral Fuel and Oil	19.1	23.6	78.3
Chemicals and Allied Industries	6.0	6.8	24.6
Plastics/Rubber	2.5	2.7	7.9
Raw Hides, Skins, Leather, and Furs	12.0	16.2	17.8
Wood and Wood Products	4.5	5.8	11.2
Textiles	1.7	1.7	11.5
Footwear/Headgear	0.3	1.9	5.3
Stone/Glass	11.9	14.2	28.1
Metals	24.2	28.2	58.1
Machinery/Electrical Products	5.2	5.4	13.0
Transportation	1.7	1.9	7.2
Total	397.9	527.9	688.7

Source: JICA Study Team