UNITED REPUBLIC OF TANZANIA

UNITED REPUBLIC OF TANZANIA
DATA COLLECTION SURVEY ON
URBAN TRANSPORTATION
IN
DAR ES SALAAM

FINAL REPORT

MARCH 2020

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

EIGHT-JAPAN ENGINEERING CONSULTANTS INC.

NIPPON KOEI CO., LTD.

6R
CR
20-004

CURRENCY EXCHANGE RATE (as of February, 2020)

(1) Tanzania Shillings (TZS) to Japanese Yen

1TZS = 0.0475 JPN (JICA Monthly Exchange Rate, February 2020)

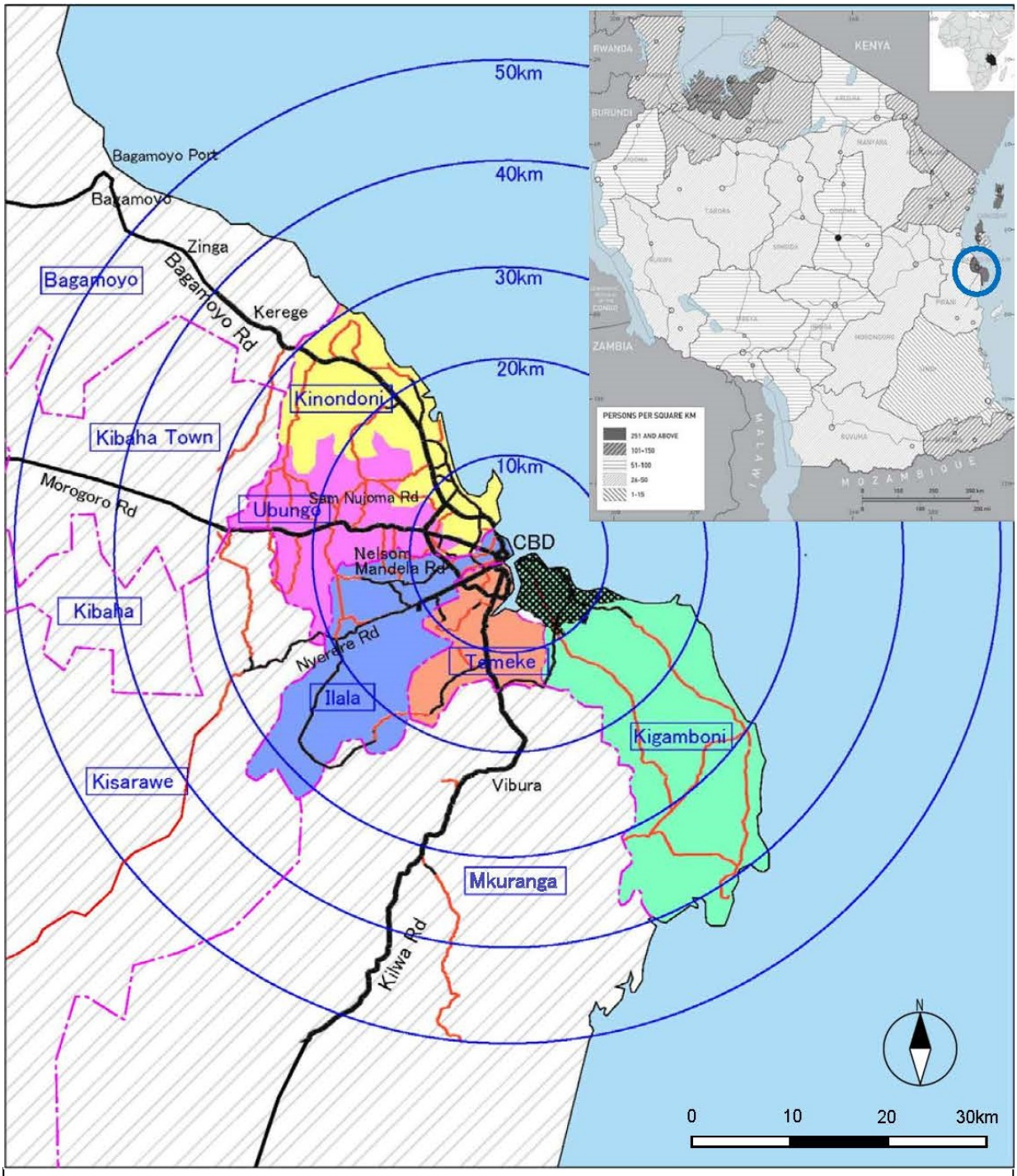
(2) US Dollar to Japanese Yen

1 USD =109.122 JPN (JICA Monthly Exchange Rate, February 2020)

(3) US Dollar to J Tanzania Shillings (TZS)

1 USD =2297 TZS (JICA Monthly Exchange Rate, February 2020)

LOCATION MAP



Dar es Salaam City
Population: 4.3 million in 2012.
Annual population growth rate from 2002 to 2012: 5.6%
Area: 1,393 km².
Population density: 3,087 person/km² in2012.
GDP Growth Rate: approximately 8% (2009-2018)
TANZANIA GDP: 1,050 USD/person

United Republic of Tanzania
Data Collection Survey on Urban Transportation in Dar es Salaam
Final Report

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ABBREVIATIONS

Abbreviations	Description
AFD	Agence Française de Développemen: French Development Agency
AfDB	African Development Bank
AGTF	Africa Growing Together Fund
BCR	Benefit Cost Ratio
BRT	Bus Rapid Transit
CA	Contracting Authority
CBD	Central Business District
CMT	Council Management Team
DART	Dar es Salaam Rapid Transit
DCC	Der es Salaam City Council
DSM	Dar es Salaam
EAR	East African Railways
ICD	Inland Container Depot
IRR	Internal Rate of Return
JST	JICA Survey Team
LOS	Level of Service
LVC	Land Value Capture
MC(s)	Municipal Council(s)
MOLHHSD	Ministry of Land, Housing and Human Settlements Development
MOWTC	Ministry of Works, Transport and Communication
MP	Master Plan
MRT	Mass Rapid Transit
NPV	Net Present value
ODA	Official Development Assistance
PHPDT	Peak Hour Peak Direction Trips
PO-LALG	President Office, Regional Administration and Local Government
PPP	Public Private Partnership
RAHCO	Rail Assets Holding Company
ROW	Right of Way
SGR	Standard Gauge Railway
TANROADS	Tanzania National Roads Agency
TARURA	Tanzania Rural and Urban Road Authority
TAZARA	Tanzania-Zambia Railways
TDM	Traffic Demand management
TDR	Transferable Development Rights
TOD	Transit-Oriented Development
TRC	Tanzania Railways Corporation
TRL	Tanzania Railways Limited
TT	Truck Terminal
WB	World Bank

CHAPTER 1 INTRODUCTION

1.1 Background of the Survey

Dar es Salaam (hereinafter referred to as "DSM".) is the economic center of the United Republic of Tanzania (hereinafter referred to as "Tanzania".) with a population of approximately 4.36 million (2012: Bureau of Statistics). Between 2002 and 2012, the population of DSM increased by 5.8% per year, and is expected to exceed 10 million by 2027 (2014: The World Bank (hereinafter referred to as "WB")). Nationwide automobile registrations also increased at an annual rate of 7% (2001 – 2010 average, Bureau of Statistics). While the motorization rate is growing progressively rapidly, the development of the road network has not progressed, causing traffic congestions.

In its 2nd 5-year development plan covering FY 2016/2017 to FY 2020/2021, the Tanzanian government set the target of "Industrial development and human development for economic structural transformation" and raised the issue of providing appropriate infrastructure services, including roads.

In Dar es Salaam City, the operation of the Bus Rapid Transit System (hereinafter referred to as "BRT".) started a few years before, but the system has not been able to deal with the increasing traffic needs nor solve traffic jams. It is still necessary to enhance transportation capacity by improving roads and development of new transportation systems. In addition, road inundation damage during the rainy season has become serious, and it has been pointed out that flood countermeasures along with improvement of road networks are necessary.

In "Development Cooperation Policy for the United Republic of Tanzania" (September 2017), Japan regards infrastructure development to support economic and social development as among top priorities. Up to now, cooperation has been extended in the field of transport, with a focus on road development.

In 2018, the Master Plan for Urban Transport in Dar es Salaam 2018-2040 (Hereinafter referred to as "Revised MP".) was formulated through the "Dar es Salaam Urban Transport Master Plan Revision Project" to support the country's top transport policies. The revised MP proposes the introduction of ITS, improvement of intersections, development of public transportation terminals, and development of urban railways in the city in order to deal with chronic traffic congestion and to efficiently utilize existing road infrastructure. In order to implement these recommendations, the Tanzanian government is conducting a related study. Based on the results of these surveys, the technical validity and priority of each project plan and the application of Japanese advanced technology will be examined. The data collection survey was conducted for the confirmation of availability of these Projects by Japanese ODA loan or grant aid in consideration of the above-mentioned situation.

1.2 Objectives of the Survey

The objective of the survey is to confirm the cooperation policy of JICA by comprehensive analysis and examination of the impact by on-going urban transport improvement projects in DSM for traffic alleviation along with the possibility of introducing Japanese technologies.

1.3 Survey Area

The target area of the survey is DSM City, particularly areas with chronic congestions.

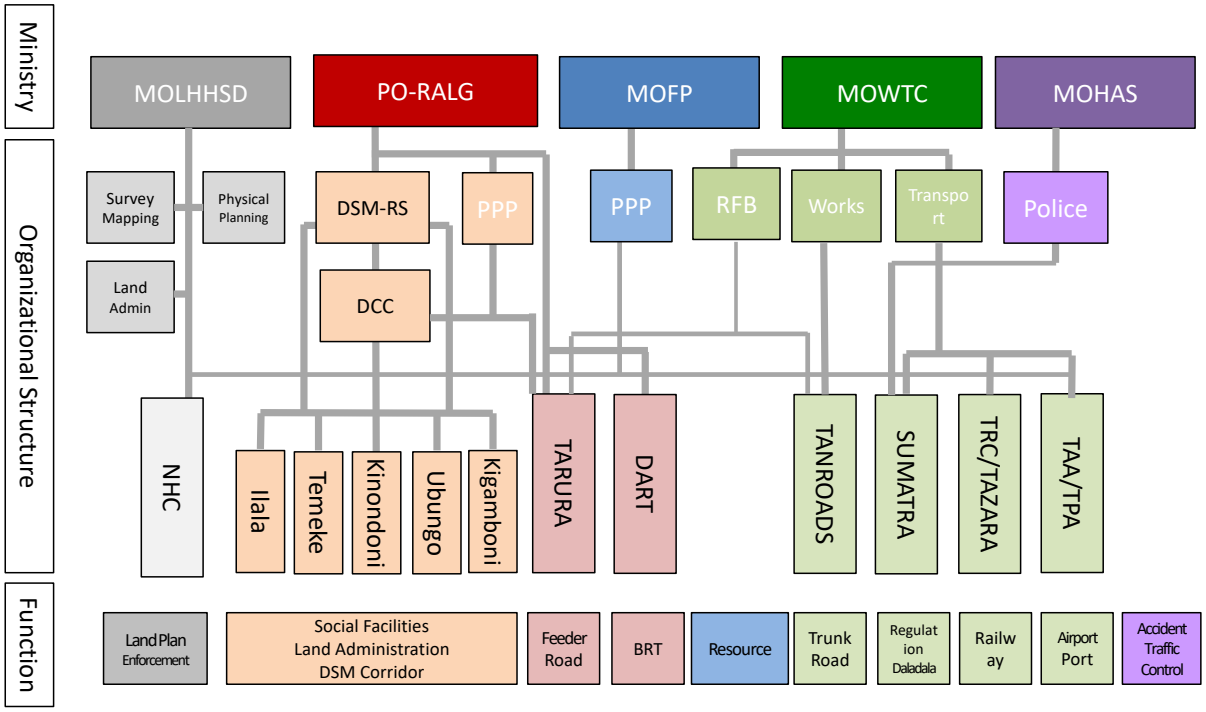
1.4 Relevant Organizations

Organizations interviewed for information collection in this survey is shown in Table 1.1.

Table 1.1 Relevant Organizations

Government Organization	Donor
PO-RALG: President Office, Regional Administration and Local Government	WB: World Bank
DCC: Der es Salaam City Council	AfDB: African Development Bank
TARURA: Tanzania Rural and Urban Road Authority	AFD: Agence Française de Développement
DART: Dar es Salaam Rapid Transit	
MOWTC: Ministry of Works, Transport and Communication	
TANROADS: Tanzania National Roads Agency	
TRC: Tanzania Railways Corporation	
MOLHHSD: Ministry of Land, Housing and Human Settlements Development	

Source: JICA Survey Team (hereinafter referred to as JST)



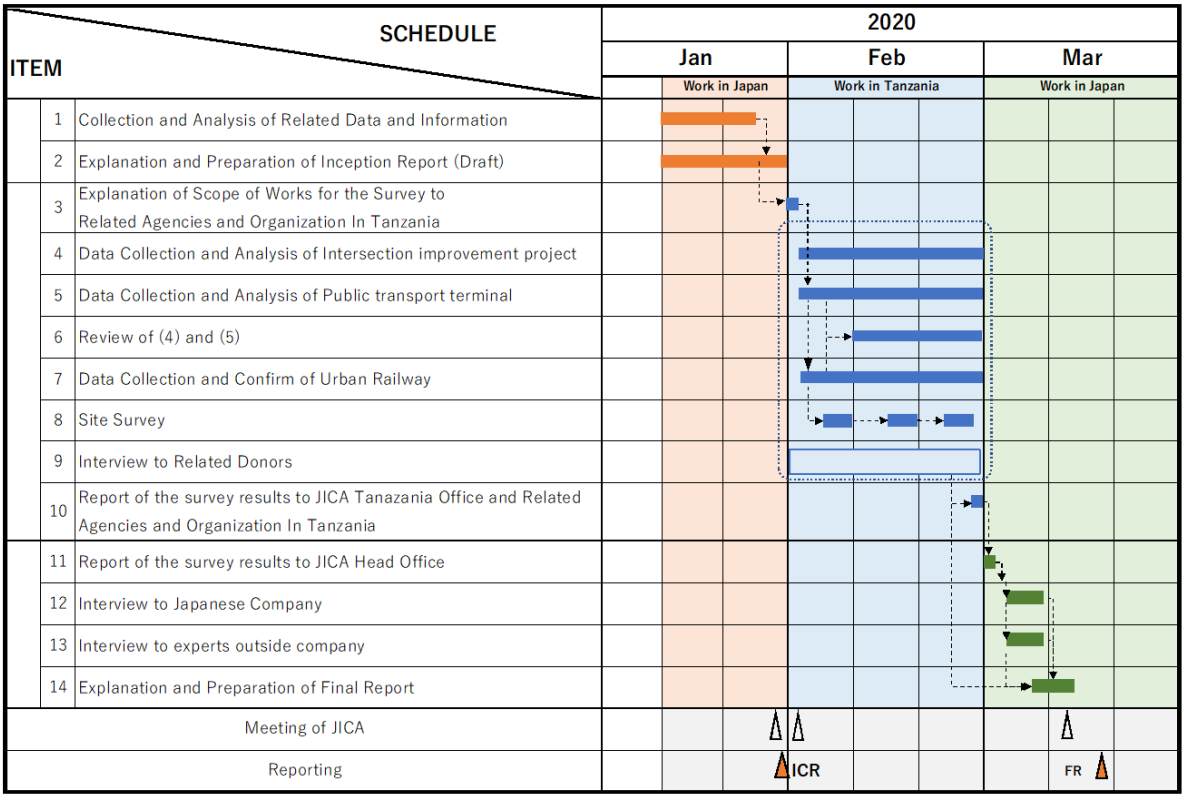
Source: JST

Figure 1.1 Organization Structure and Relation

1.5 Survey Schedule

The survey was commenced at middle of January and completed at the end of March as shown in Table 1.2. The work in Tanzania was from 5th February 2020 to 29th February 2020.

Table 1.2 Survey Schedule



Source: JST

1.6 Survey Member

The survey was carried out by four members, as shown in Table 1.3.

Table 1.3 Survey Team Members

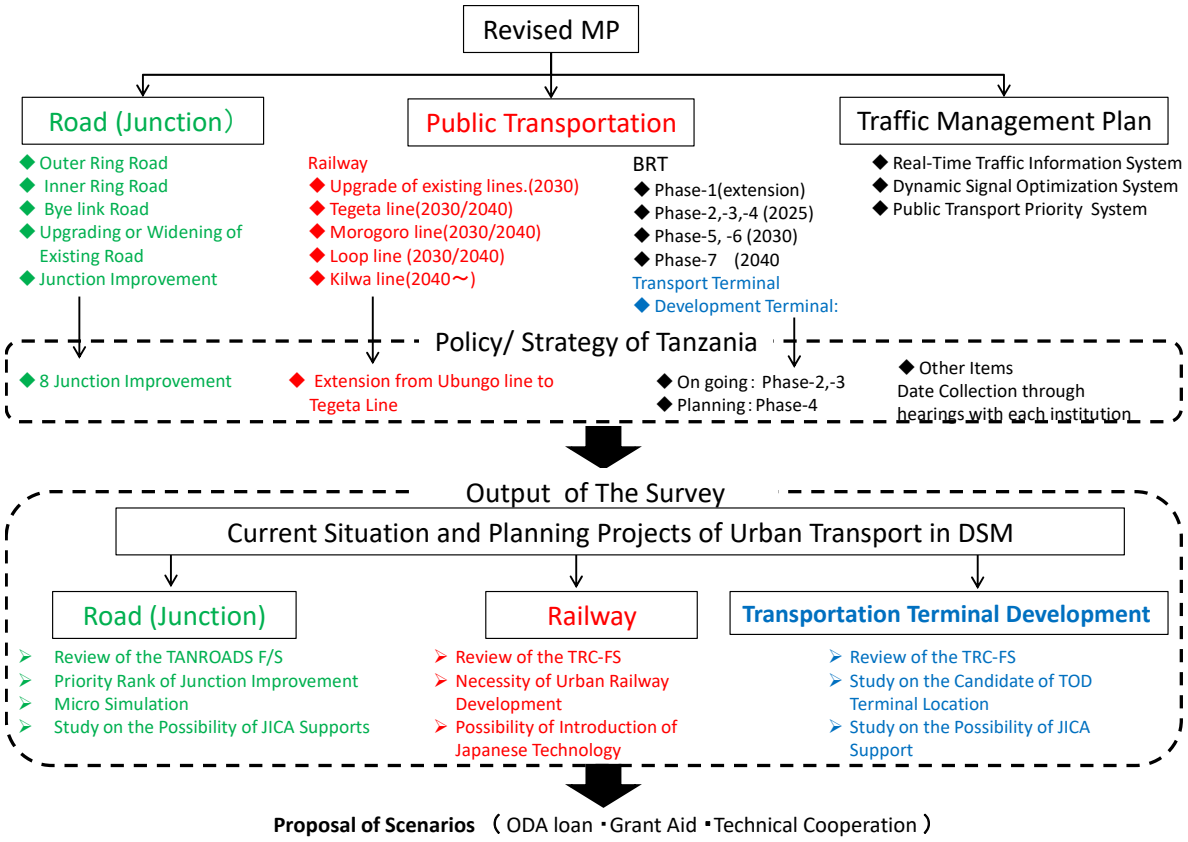
Name	Responsible for	Organization
Satoshi MIZUNO	Team leader/Junction Improvement Plan	Eight-Japan Engineering Consultants Inc.
Akio OKUTSU	Urban Transport (Railway)	Nippon Koei Co., Ltd.
Shuei YAMADA	Terminal Development for Public Transport	Nippon Koei Co., Ltd.
Ryo SAITO	Traffic Analysis (Simulation)	Eight-Japan Engineering Consultants Inc.

Source: JST

1.7 Output of the Survey

(1) Survey Procedure

The output of the survey and the procedure to achieve the output is shown in Figure 1.2.



Source: JST

Figure 1.2 Output and Procedure of the Survey.

(2) Composition of the Report

Seven chapters compose the report as shown in Table 1.4.

Table 1.4 Composition of the Report

Chapter	Title	Contents
1	Introduction	Objectives, contents and procedure of the survey
2	Outline of Urban Transport Master Plan	Contents and proposal of Revised Master Plan in 2018
3	Urban Transport Related project	Review of on-going urban transport related projects and review of results of major projects
4	Road/Junction Improvement Plan	Survey results on road/junction improvement priorities conducted in this survey
5	Railway Plan	Survey results on railways conducted in this survey
6	Terminal Development Plan	Survey results on TOD including terminal development conducted in this survey
7	Proposal on Cooperation Policy	Proposals for Japan's cooperation policy and method based on the results of the survey.

CHAPTER 2 OUTLINE OF URBAN TRANSPORT MASTER PLAN (REVISED MP)

2.1 Current Situation and Issues of Urban Transport in DSM

(1) Increasing Tendency of Traffic

Table 2.1 shows items closely related to traffic demand, such as growth rates of population, vehicle (Bike and Car) registration, and number of trips. According to the revised MP, the number of trips in 2040 is expected to be about 2.2 times that of 2017.

Table 2.1 Tendency of Traffic Demand

Item	Growth rate	Forecast
Population growth rates (Population and Housing Census in 2002 and 2012)	Annual average growth rate of 5.8% （2002/2012）	Population: 10 million (estimation for 2027)
Registration of Vehicles	Motorbike: Annual average growth rate of 28% Passenger Car: Annual average growth rate of 28% (2010/2014)	Number of vehicles will increase continuously in conjunction with economic growth of Tanzania.
Number of trips (Person trip survey in 2007 and 2017)	Annual average growth rate of 11.8% (2007/2017)	19 million trips/day in 2040 8.7 million trips/day in 2017

Source: JST

(2) Expanding Gap between Demand and Supply

As described above, while traffic demand is expected to increase substantially in the future, road development level is forecast to fall behind, and the gap in the road network infrastructure is expected to increase even further.

Table 2.2 Current Situation of Road Network

Item	Current situation
Road Density	Road Density in radius of 30km from CBD: lower than 2km/㎢ 4-lane road：Total length 102km、Paved 2-lane: Total length 36 ㎞
Travel Speed along trunk roads	Travel speed of less than 20km/h for the entire length of roads It takes approximately 2.5 hours at morning peak hours from the city boundary to CBD (inbound) along Bagamoyo Road.

Source: Revised MP

(3) Need for Collaboration of BRT and Railway

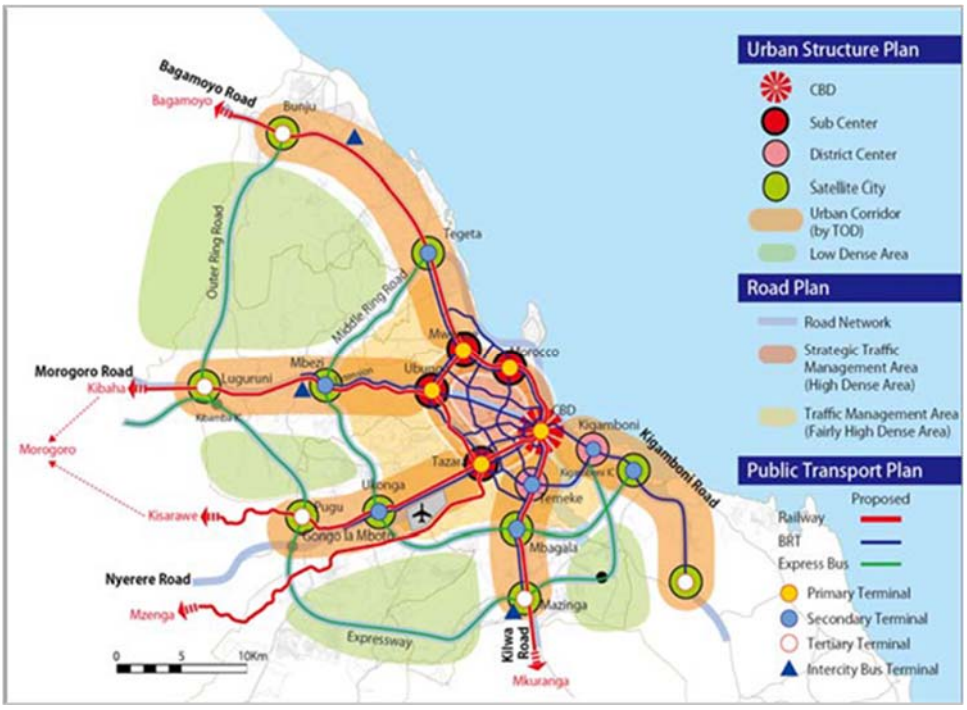
Phase 1 of the BRT (Bus Rapid Transit) has provided citizens with stable mobility at a speed of approximately 20 km/h in regular situation, and has been of service to between 200,000 and 300,000 daily users. The conventional minibus has a peak speed of 10 ~ 15 km/h, meaning the BRT has brought about a tremendous improvement in terms of service. However, if future traffic demands of DSM are to be met, the BRT alone will not close the infrastructure gap. Therefore, an urban railway system with larger transport capacity, greater long-distance speed, and lower flood risk than BRT is needed.

2.2 Outline of Revised MP

Based on the issues indicated above, "Transit Oriented Mega City", which aims to achieve efficient transport system by the reinforcement of Mass Rapid Transit (MRT) and BRT, is established as the concept of Urban Transport Master Plan. To achieve the concept, the Revised MP proposes an integrated plan composed of urban structure, road network, public transport network, traffic management and institutional framework required for the realization of the plan.

To this end, Revised MP plans the expansion of total length of road with two or more carriageway by 2.45 times from 2017 to 2040, the expansion of railway length from 50km in 2017 to 120km in 2040 (about 2.4 times) and the expansion of BRT length from 21km in 2017 to 163km in 2040 (about 8 times). Consequently, under the increasing traffic demand which doubles from present, the gap between supply and demand will be corrected and the average vehicle speed on urban arterial road will be improved to 31km/h. However, the realization of the plan requires enormous investment and appropriate administrative management. The challenges rest in how to create a management system to implement the plan sustainably and steadily in long term, and how to develop human resources and how to utilize private sector.

At present, "Land Use master Plan 2012-2032", the upper level plan of Revised MP, is under the process of finalisation and will be authorised. By the authorisation of upper plan, Revised MP will be authorised as a part of the upper plan. However, PO-RALG expressed that Revised MP is in the process of implementation before authorisation of the upper plan.



Source: Revised MP

Figure 2.1 Dar es Salaam Urban Transport Master Plan Vison

(1) Urban Structure

- Palm and Fingers with Sub-Centres and Satellite Cities

Future Urban Structure is proposed to be called "Palm and Fingers structure". The palm consists of the CBD (Central Business District) and four Sub-centers (Morocco, Mwenge, Ubungo, Tazara) located along the Loop corridor with a radius of approximately 5km. The five fingers are Bagamoyo, Morogoro, Nyerere, Kilwa and Kigamboni corridors which connect between CBD or Subcenters and Satellite Cities in suburb within 30km from the CBD.

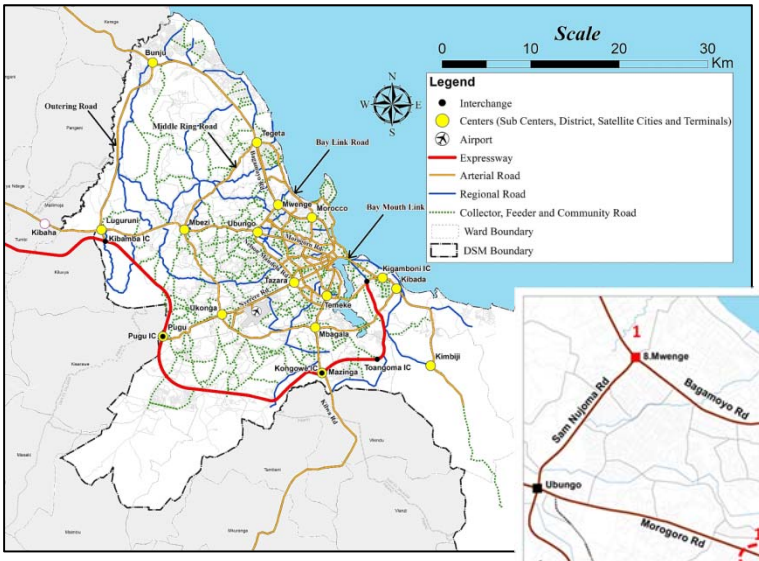
(2) Road Network

◆ Radial and Ring Road Network with Advanced Technology

Roads are fundamental infrastructure in cities, and have a close relationship with urban structure, public transport, traffic management and other lifelines. Future Road Network will be structured by Middle Ring Road, Outer Ring Road and Bay Link Road adding to the existing radial arterial roads to utilize transport infrastructure more efficiently. Middle Ring Road is proposed as a smart way with advanced technology such as Dynamic-Lane-Management and Automated Driving Lanes. It will also enable smooth access to the International Airport connecting to urban corridors. In addition, 11 Flyover projects are proposed at the major intersections which suffer from traffic congestion, traffic accident and flood.

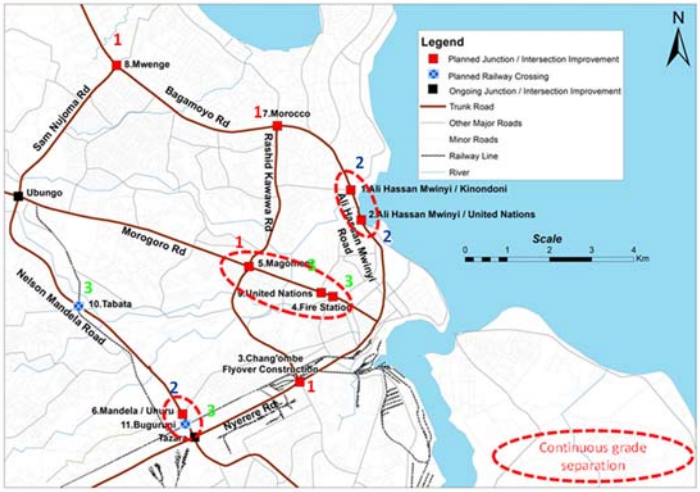
◆ Improvement of Regional/Collector/Feeder Road Network Density

Three kinds of areas divided by Nelson Mandela and Middle Ring Road are set up to improve road density with respect to the target density. Especially in current suburbs outside the Nelson Mandela Road, a proposal to increase the density to 2.0km/km^2 with two-lane, paved carriageway and maximum grade of less than 10% will contribute to improve accessibility to feeder bus services in the suburbs.



Source: Revised MP

Figure 2.2 Future Road Network



Source: Revised MP

Figure 2.3 Junctions to Be Improved

(3) Public Transport

◆ Collaboration and Integration of BRT and Railway

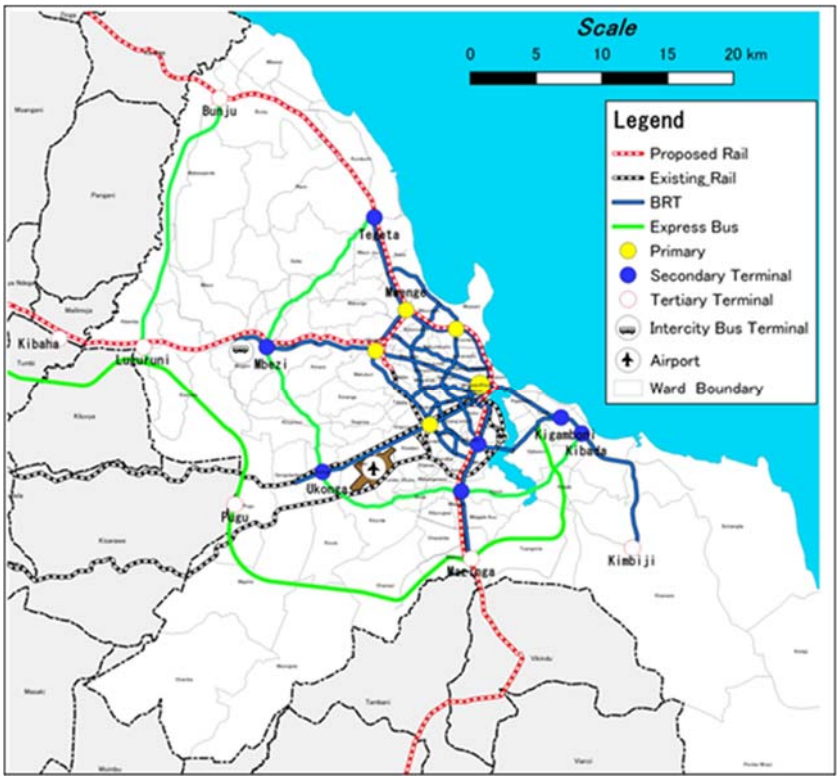
Enhancement of public transport system is crucial for the future of DSM. Collaboration and integration of BRT and Railway is proposed to deal with the future huge traffic demand and provide better services for public transport users. BRT covers mainly short-medium distance trip up to 20km, while railway covers longer trips. Future railway network is proposed to add new lines to existing lines (TRL Line and Tazara Line); Bagamoyo line, Morogoro line, Loop line and Kilwa line. This future public transport network will enable citizens to commute from anywhere to the CBD in Dar es Salaam within one hour.

◆ Feeder Bus and Express Bus Service

Feeder bus services connecting to BRT, railway and public transport terminals are proposed in suburbs. In addition, Express-Bus services for longer bus trips are proposed to be provided by utilization of the Middle Ring and Outer Ring roads.

◆ Terminal Establishment for the Connectivity

Primary, Secondary, and Tertiary Transport Terminals are proposed to ensure smooth transit among different types of transport mode. Seventeen terminals at CBD, Sub-Centres, and Satellite Cities are proposed to enhance connectivity between Railway lines, Railway and BRT, BRT and feeder buses and so on.



Source: Revised MP

Figure 2.4 Future Public Transport Network

(4) Traffic Management

◆ Dynamic Signal Optimization System and Travel Information System

"Smart and Safe Mobility" is the key term for the traffic management in the future. Dynamic Signal Optimization System, Real-Time Traffic Information System and Public Transport Priority System are proposed to manage traffic movement and provide information to achieve shorter travel time to destination and punctual arrival time of public transport, to divert congested route and to decrease traffic accident. The installation of the new systems will be implemented together with the establishment of Traffic Control/Emergency Centre and the designation of Strategic Traffic Management Area.

◆ Parking Management and Non-Motorized Transport (NMT)

The Transport network of BRT and Railway is expected to promote the modal shift from private vehicle to public transport. The Master Plan proposes encouragement of Park & Ride (P&R) system to ensure parking spaces for P&R users near transport terminals. The parking inside CBD will be controlled by parking fee or regulation on roadside parking. For the NMT, ensuring space or network around transport terminals is proposed for pedestrians and bicycles, in particular.

CHAPTER 3 URBAN TRANSPORT RELATED PROJECT

3.1 Implementation System of Urban Transport

3.1.1 Road Sector

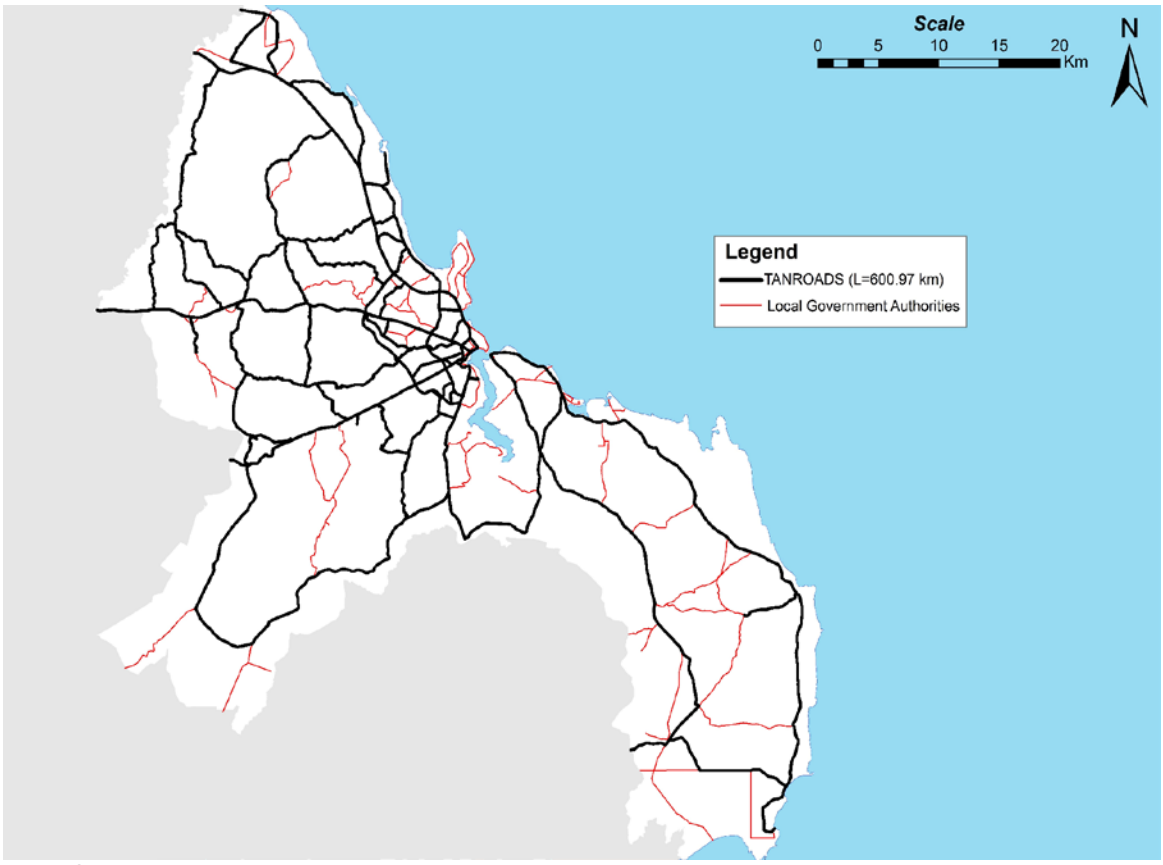
Implementation system regarding road management, development and maintenance is shown in Table 3.1.

Table 3.1 Road Related Organizations in Tanzania

Organization	Jurisdiction and Responsibility
PO-RALG	**President Office of Regional Administration and Local Government** PO-RALG is responsible for managing urban and rural road networks: monitoring, coordination, dissemination of policy issues and supporting local government authorities (LGAs) in implementation of their road works.
MOWTC	**Ministry of Works, Transport & Communications** The objective of MOWTC in its road sector is to provide expertise and support on development and maintenance of roads. MOWTEC is upper level organization of TANROADS.
TANROADS	**Tanzania National Roads Agency** The core business of TANROADS is maintenance and development of the network and is responsible for the management of 35,000km of national roads.
TARURA	**Tanzania Rural and Urban Road Agency** TARURA is responsible for implementation of LGAs' road works: District Roads, Feeder Roads and Urban Roads.

Source: JST

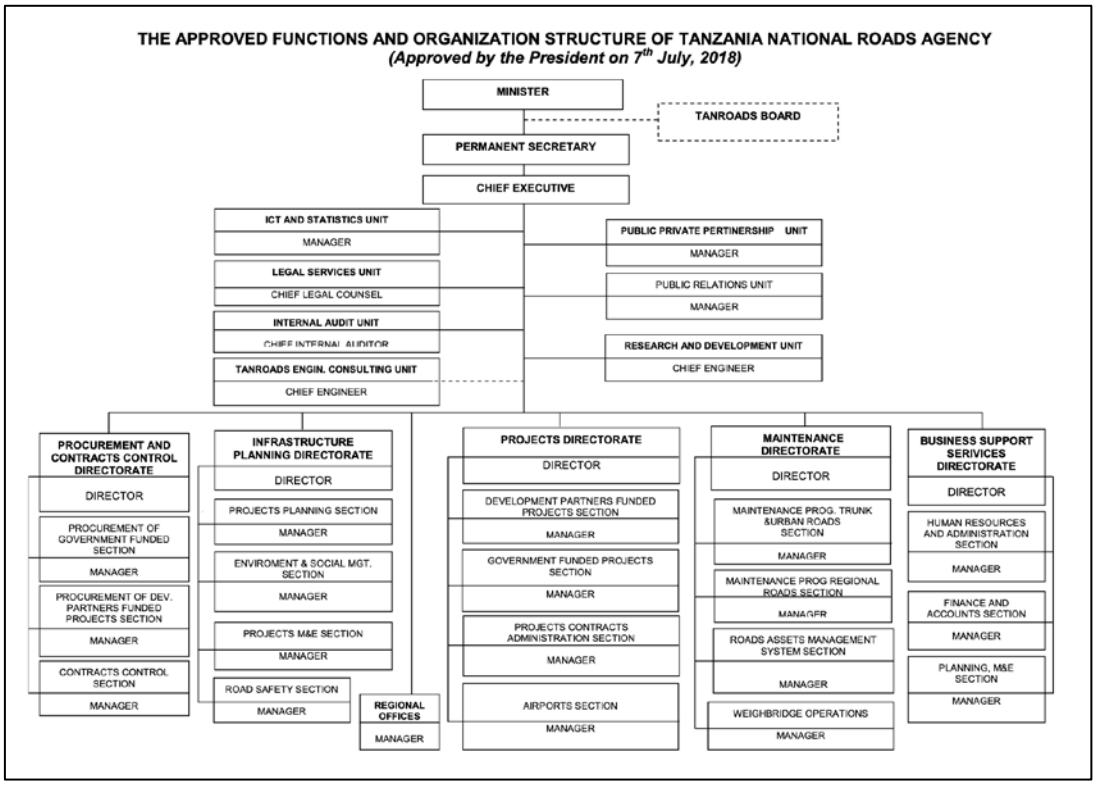
Figure 3.1 shows the current major road network under jurisdiction of TANROADS by pavement type.



Source: JST

Figure 3.1 Roads under Jurisdiction of TANROADS in DSM

Figure 3.2 shows organization structure of TANROADS.



Source：TANROADS HP(https://www.tanroads.go.tz/)

Figure 3.2 Organization Structure of TANROADS

3.1.2 Railway Sector

(1) Organization Structure of TRC

There are two different railways operating in Tanzania, namely, Tanzania Railways Corporation (TRC) which carries domestic freights and passengers, and Tanzania-Zambia Railways (TAZARA) which connects Zambia and Dar es Salaam Port of Tanzania.

TAZARA is constructed by Chinese technical and financial support to transport copper and cobalt from Zambia, a land-locked and leading producing country, and Dar es Salaam Port. Construction started in 1967 and its operation has been since 1976. TAZARA is operating passenger trains along the line; however, its function as a commuter train operation is limited.

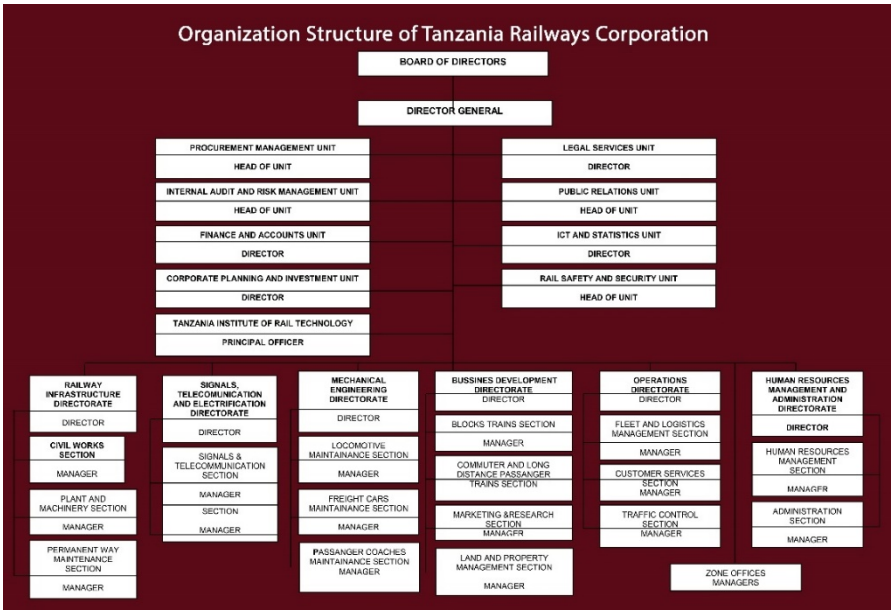
TRC has an long history. East African Railways (EAR) was divided and TRC was founded as an independent company in 1877. TRC has been operating ex-EAR lines within Tanzania since then. Due to the trend of railway privatization, TRC had agreed with RITES (India) in 2007 and RITES obtained the right of railway operation for 25 years. TRC changed the name to Tanzania Railways Limited (TRL) and operating railway together with RITES. Railway infrastructure belonged to the Government and was managed by Rail Assets Holding Company (RAHCO) which was divided from TRC.

Privatized railway operation by RITES and TRL could not get desirable result, and funding arrangements created conflicts between RITES and TRL. Consequently, RITES released the share in 2011 and the company was nationalized again.

TRL and RAHCO were merged in 2017 by the Railway Act No. 10 and forming TRC again.

TRC is an organization under the MOWTC. On the other hand, TAZARA is an organization co-

operated under Tanzania and Zambia Governments. Operation is managed by the Ministers of both countries and 5 directors from each country. There is a training facility for staff in Dar es Salaam constructed by China, however, there is no training facility in TRC. TRC staff are mainly trained by OJT.



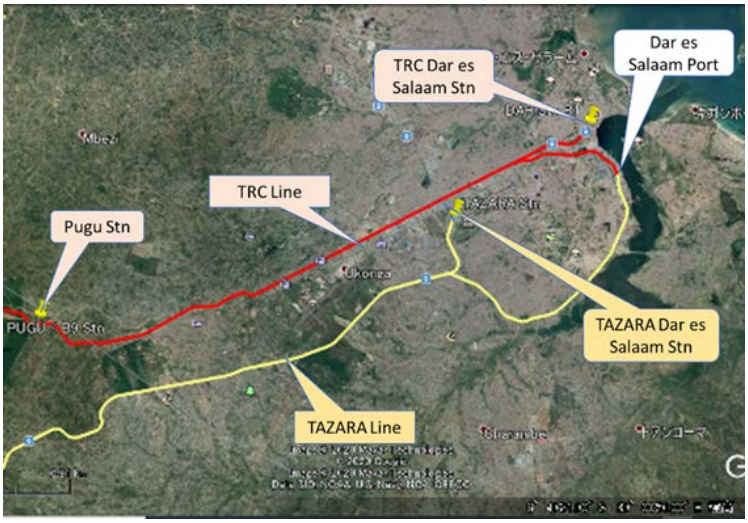
Source: TRC HP (http://www.trc.co.tz/)

Figure 3.3 Organization Structure of TRC

(2) Function of TRC in Railway Transportation

TRC is now responsible for planning, construction and operation of railway in Tanzania except the part relating to TAZARA, including on-going SGR (Standard Gauge Railway), commuter rail projects in DSM and Dodoma.

Railway connections of TRC and TAZARA with Dar es Salaam Port are shown in Figure 3.4. Since track gauge of TRC is 1,000mm and that of TAZARA is 1,067mm, no through operation is not possible between two railways. Although TRC is organized under the MOWTC, TAZARA railway is the organization that is co-operated by Government of Tanzania and Zambia, and supervised by each Minister and five directors of each ministry. Although there is a Training Center for TAZARA railway, no training center is provided for TRC, thus the training might be conducted by On the Job Training.



Source: JST

Figure 3.4 TRC and TAZARA Port Connection

(3) Function of TRC Relating to Terminal Development

The tenant at SGR Dar es Salaam station will be the Business Development Directorate, and the number of people is about 30.

TRC has ownership of four hotels in Tanzania, all of which have regular tenant income; in other words, TRC has experience in real estate management. Business Development Directorate is responsible for planning and negotiating tenants for both the hotel business and the commercial facilities at Dar es Salaam Station. The directorate has 30 employees.

3.1.3 Terminal Development Sector

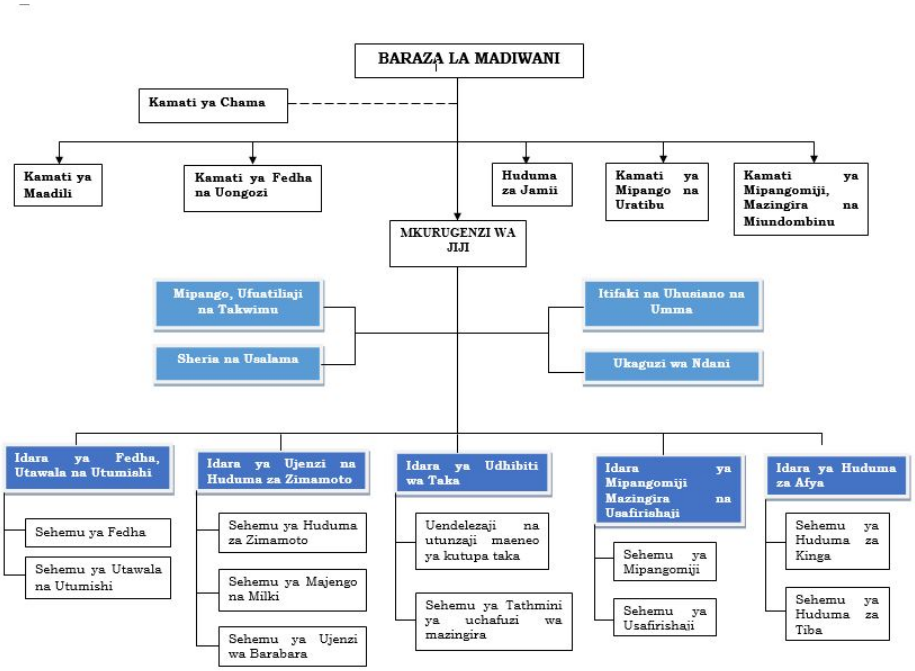
(1) Related Organization

1) Dar es Salaam City Council: DCC

DSM is made up of five Municipal Councils (MCs): Ilala, Kinondoni, Temeke, Ubungo, and Kigamboni. DCC is responsible for coordinating the work of these Municipal Councils. When planning a wide area that spans multiple MCs, the DCC will take initiative and formulate a plan with the related MCs. For example, the DCC is currently in charge of the development plan for the Msimbazi River Project, The Msimbazi Opportunity Plan, which is currently being implemented with the support of the World Bank, as it is a wide-area plan that spans multiple MCs. In addition, transport and waste disposal planning are handled by the DCC, not each MC, since those matters should be considered in city wise level, not by MC level. Regarding waste, there is one dam site in DSM, which DCC is planning.

In terms of land use planning, DCC is in charge of the General Planning Scheme. Detailed Planning is the responsibility of each MC. The differences of general planning scheme and detailed planning scheme is described in Chapter 4. In addition, the building permit is also assigned to each MC, not the DCC.

As for personnel, the Urban Planning Section has four staff members, and the community development department has five staff members.

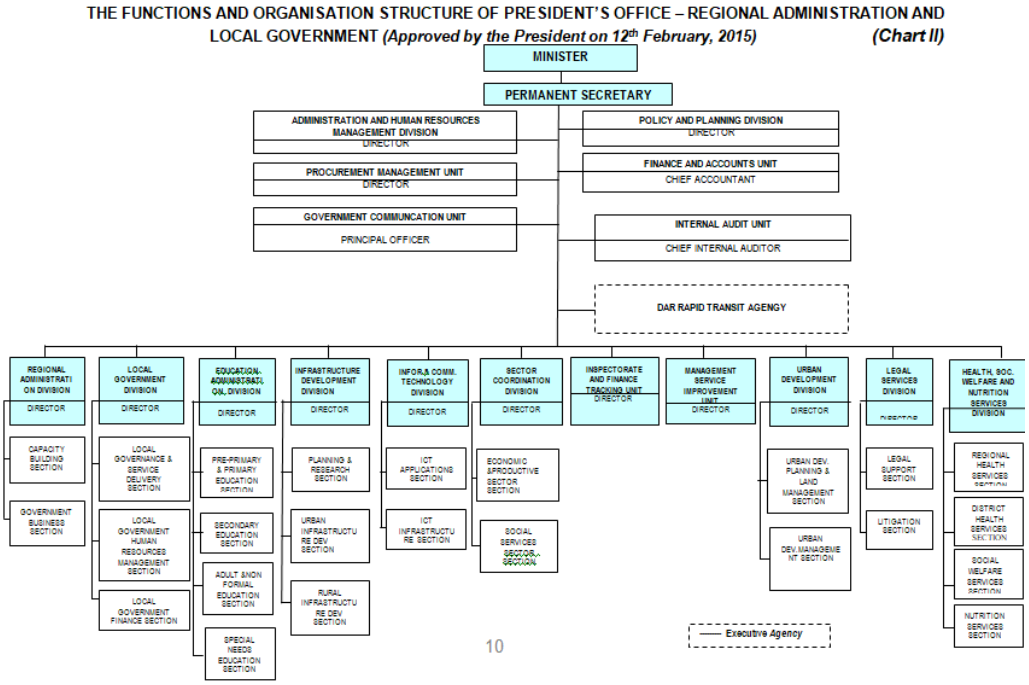


Source: DCC HP (http://dcc.go.tz/)

Figure 3.5 Organization Structure of DCC

2) President Office, Regional Administration and Local Government: PO-RALG

As for PO-RALG, it is a supervising agency of each local government. The objectives of PO-RALG are to promote coordination among ministries, decentralization of rights to the local government, and promotion of urban and rural development through the assistance of local governments.



Source: PO-RALG HP (https://www.tamisemi.go.tz/)

Figure 3.6 Organization Structure of PO-RALG

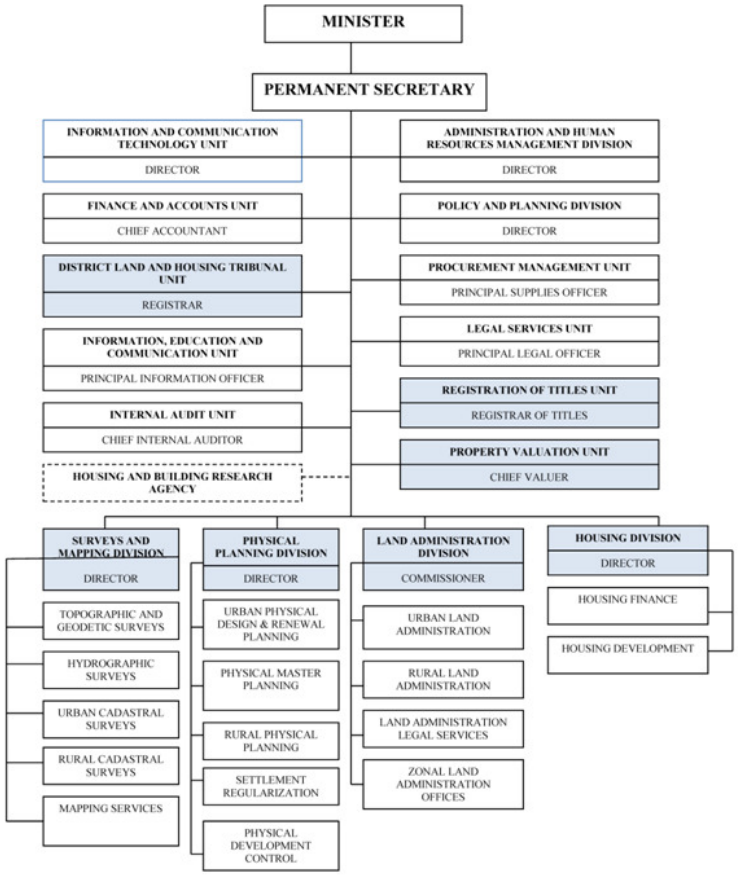
3) MC (Municipal Council)

There are five MCs: Kinondoni, Ilala, Temeke, Ubungo, and Kigamboni. Each MC has created a Detailed Land Use Plan. According to the Revised M/P, tasks for each MC are mentioned as follows. Regarding the number of staff, Kinondoni MC has seven staff in the Town Planning Section, which is in charge of urban planning and building permits. The main tasks are summarizing the Detailed Land Use Plan and issue of building permits.

- Preparing drawings for detailed land use plan
- Reviewing & Issuing of building permits
- Arrange for development control
- Transferring of land ownership
- Settling land dispute, Land adjudication
- Producing Deed plans
- Evaluate development projects
- Valuation of land property
- Explanation to the residents
- Topographical survey and base maps

4) MOLHHSD

The Physical Planning Division of MOLHHSD is responsible for approving and formulating land use plans. As indicated in the Revised M/P, MOLHHSD has five departments, Urban Physical Design and Renewal Planning Section, Physical Master Planning Section, Rural Physical Planning Section, Settlement Regularization Section, and Physical Development Control Section. MOLHHSD is not involved in building permits.

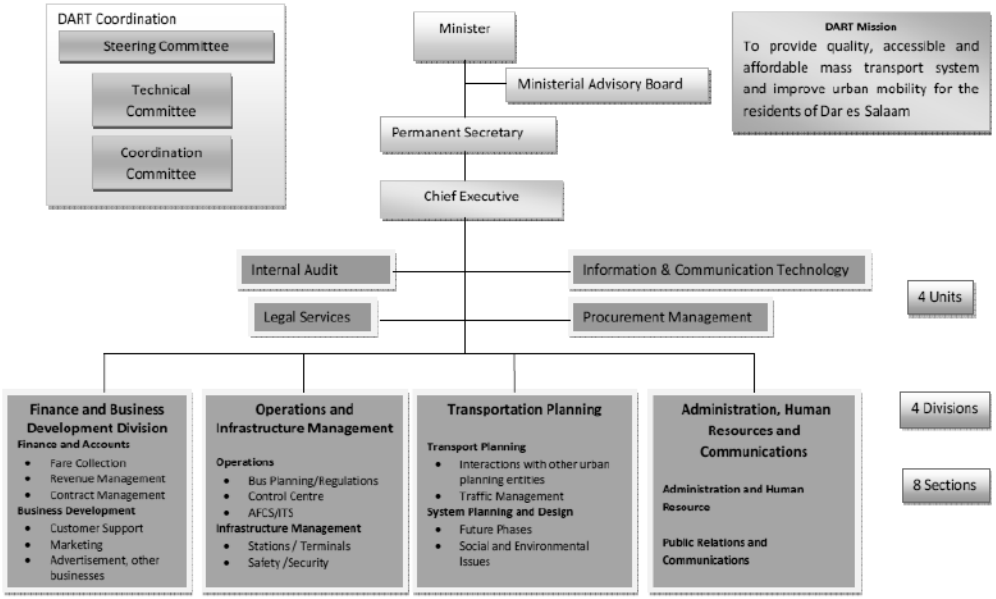


Source: MOLHHSD HP (https://www.lands.go.tz/)

Figure 3.7 Organization Structure of MOLHHSD

5) DART

DART is the agency that oversees the operation of the BRT. If there is a TOD project around the BRT station, it is likely that DART will be responsible for planning the commercial facilities, since the terminal facilities and surrounding land may also be owned by DART. In that case, the Business Development Unit will be responsible for tenant negotiations and planning.



Source: Revised MP

Figure 3.8 Organization Structure of DART

(2) Law

1) The Urban Planning Act 2007

The urban planning act is an act to provide basic principles for urban planning and the objectives of land use planning, and planning process. Revised MP shows the contents of the Urban Planning Act 2007.

Table 3.2 Outline of Urban Planning Act

Part	Article	Item	Main Provisions
I	1-2	Preliminary Provisions	Short title and commencement, Interpretation
II	3-4	The Policy Framework	Fundamental principles of urban planning, Objectives of Land use planning
III	5-7	Institutional Framework	Responsibilities of the Minister, Appointment and Responsibilities of the Director, Planning Authorities
IV	8-59	The Planning Process	Declaration of planning areas, General Planning Scheme, Detailed Planning Scheme, Control of Development of Land and Planning Consent
V	60-71	Purchase of Land, Acquisition, and Compensation	Purchase of Land by Planning Authority, Land Acquisition, Compensation, Claim for Betterment, Dispute Settlements
VI	72-75	Supplementary Planning Powers	Powers of entry, Redistribution of land, Enforcement notice
VII	76-81	Miscellaneous Provisions	Regulations, Amendments of Schedules, Annual Report

Source: Revised MP

2) Urban Planning (Planning Space Standards) Regulations 2018

Urban Planning (Planning Space Standards) Regulations 2018 shows the specific development regulations based on Article 77 of The Urban Planning Act 2007. It is composed of several Government Notices. For example, No. 93 describes regulations on the site area, building coverage, and setbacks of buildings for land use of housing, health facilities, educational facilities, golf courses, recreation facilities, and public facilities. Regulations are also set for public infrastructure such as electricity, water supply, roads, telecommunications, drainage, regulating ponds, transportation terminals, and waste disposal. Each Municipal Council (MC) reviews and approves building permits based on the Urban Planning Regulations 2018.

Table 3.3 Contents of Urban Planning (Planning Space Standards) Regulations 2018

Land use		Contents
Residential Areas	・Detached house and Maisonette ・Duplex, Terrace/Row houses, Apartment Blocks / Block of Flats / Real Estate, Gated Communities ・Low Rise, High Rise and Skyscrapers	Plot size, Max Plot coverage, Max Plot ratio, Max No of storeys, Setbacks
Health Facilities		Plot size, Max Plot coverage, Max Plot ratio, Max No of storeys, Setbacks
Education Facilities		Plot size, Max Plot coverage, Max Plot ratio, Max No of storeys, Setbacks
Service Trade and Industries		Plot size, Max Plot coverage, Max Plot ratio, Max No of storeys, Setbacks
Public Facilities		Plot size, Max Plot coverage, Max Plot ratio, Max No of storeys, Setbacks
Recreational Facilities		Gross area/ 1000 persons, Population, Plot size
Parking		Parking Ratio, Area required, Area by angle of parking
Road		RoW, Carriageway (metres)
Electricity, Water, Gas supply, Railway		RoW, Distance from Centre Line
Railway Stations, Airports, Solid and Liquid Waste Disposal		Area by type
Agricultural facilities		Area by type

Source: Urban Planning (Planning Space Standards) Regulations 2018

3) Guidelines for the Preparation of General Planning Schemes and Detailed Schemes for New Areas, Urban Renewal and Regularization

Based on related laws such as the Urban Planning Act (2007), the Human Settlements Development Policy (2000), and the Land Act (1999), this guideline was formulated as a guideline for conducting practical process. The necessary work items and considerations for formulating the plan are described separately for redevelopment and new development. It also describes the monitoring method after the planning and the operation of the plan.

3.2 Urban Transport Project

3.2.1 Road/Junction Project

(1) Road/Junction Development Project: Finance Fixed

Table 3.4 to Table 3.6 and Figure 3.9 show road related projects under construction and projects for which financing is fixed around DSM urban area.

Table 3.4 Road Development Projects (finance fixed)

New Road Development Project				
Name	Beginning	Ending	Stage	Finance
New Selander Bridge	Oysterbay	Barack Obama	Under Construction	Korean Loan
Road Widening Projects				
New Bagamoyo Rd	Kawawa Rd	Sam Nujoma	Under Construction	Japanese Grant
Shekilango Rd	New Bagamoyo	Morogoro	Under Construction	WB
Gerezani Rd	Kamata	Kikwa	Under Construction	WB
Gerezani Bridge			Under Construction	Japanese Grant

Source: JST

Table 3.5 Junction Improvement Projects (finance fixed)

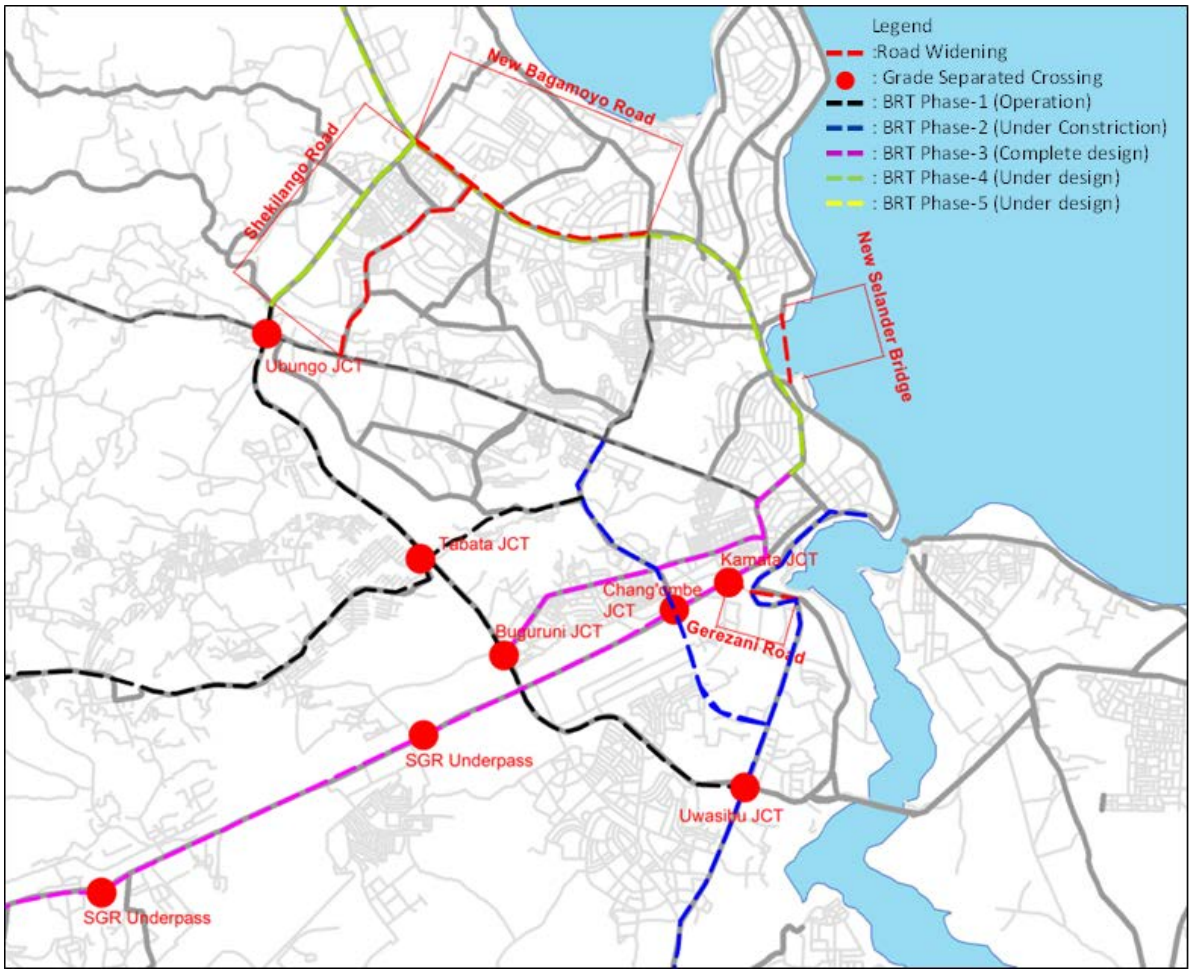
Name	Crossing Road		Stage	Remark
Ubungo	Morogoro Rd.	Nelson Mandela Rd	Under Construction	WB
Kamata	Nyerere Rd.	Kigogo Rd	Under design	BRT Phase-2
Uwashibi	Nelson Mandela Rd.	Kilwa Rd	Under design	BRT Phase-2
Chang'ombe	Nyerere Rd.	Rashid Kawawa Rd.	Under design	BRT Phase-3
Buguruni	Nelson Mandela Rd.	Uhuru St.	Under design	BRT Phase-5
Tabata	Nelson Mandela Rd.	Tabata to Kinyurezi Rd	Under design	BRT Phase-5
SGR Crossing	Nyerere Rd.	SGR (Airport west)	Under planning	SGR
SGR Crossing	Nyerere Rd.	SGR (Airport east)	Under planning	SGR

Source: JST

Table 3.6 BRT Development projects (finance fixed)

Name	Road	Stage	Finance
Phase-2	Kilwa RD	Under construction	AfDB
Phase-3	Nyerere RD	Complete dsign	WB
Phase-4	Bagamoyo RD	Under design	WB
Phase-5	Nelson Mandela RD	Under design	AFD (Financing for implementation is not fixed)

Source: JST



Source: JST

Figure 3.9 Road Related Projects around Urban Area of DSM

(2) Road/Junction Development Project: Finance not fixed

Port Access Road is a part of Nelson Mandela Road from crossing with Kilwa Road (Uwabisi Junction) to the beginning point of Kilwa Road. The road is under design for 6-lane widening as BRT phase 5 project. According to AFD, however, financing for construction is not scheduled.

Table 3.7 Road/Junction Development Project (finance not fixed)

Name	Beginning	Ending	Stage	Remark
Port Access Road	Uwasibi Junction	Kilwa Rd.	Under design	BRT Phase 5

Source: JST

TANROADS conducted "Feasibility Study, Detailed Design & Tender Documents For Eight Critical Intersections in Dar es Salaam City" (hereinafter referred to as TANROADS F/S). Nine target junctions of the study is shown in Table 3.8. According to AfDB, financing for the construction is difficult and implementation is not scheduled, however, if JICA manifests interest, co-financing will be considered positively.

Table 3.8 Junction Improvement Projects by TANROADS F/S

NO	Junction	Crossing Road		Status
1	Oysterbay	Ali Hassan Mwinyi Rd.	Kinondoni Rd	At present, Draft Final Report was submitted from the consultants. However, re-examination is under way because of large amount of building resettlement and large
2	Ali Hassan	H. Mwinyi Rd.	United Nations Rd.	
3	Magomeni	Morogoro Rd.	Rashid Kawawa Rd.	
4	Buguruni	Nelson Mandela Rd.	Uhuru St.	

NO	Junction	Crossing Road		Status
			& Mnyamani Rd.	social impact. Final Report will be submitted in April or May.
5	Morocco	New Bagamoyo Rd.	Kawawa Rd.	
6	Mwenge	Bagamoyo Rd.	Sam Nujoma Rd.	
7	United Nations	Morogoro Rd.	United nations Rd.	
8	Tabata	Nelson Mandela Rd.	(Railway)	
9	Bugruni	Nelson Mandela Rd.	(Railway)	

Source: JST based on TANROADS F/S

(3) Technical Cooperation

TANROADS is conducting "Improvement of Traffic Management in Dar es Salaam City and Capacity Building Under BRT Phase 2" financed by Africa Growing Together Fund (AGTF) and AfDB as a part of BRT Phase 2 project. Contents of the capacity building project is as follows:

- To forecast the traffic demand of arterial roads and regional roads, to determine the capacities of 110 junctions along these roads and to propose the improvement of signals for appropriate movement of vehicles in DSM;
- To analyse the movement pattern in DSM and to propose and implement the design of proper centralized traffic management system;
- To conduct detailed engineering design of proposed system and to prepare bidding documents:
- To supervise the project implementation, and
- To enhance capacities of six traffic engineering staff of TANROADS for design and supervision of traffic engineering scheme.

The project is on-going and improvement of junctions by installation of signals and improvement of road geometry is scheduled as a pilot project. Target junctions for pilot project are not major junctions along arterial roads but small junctions.

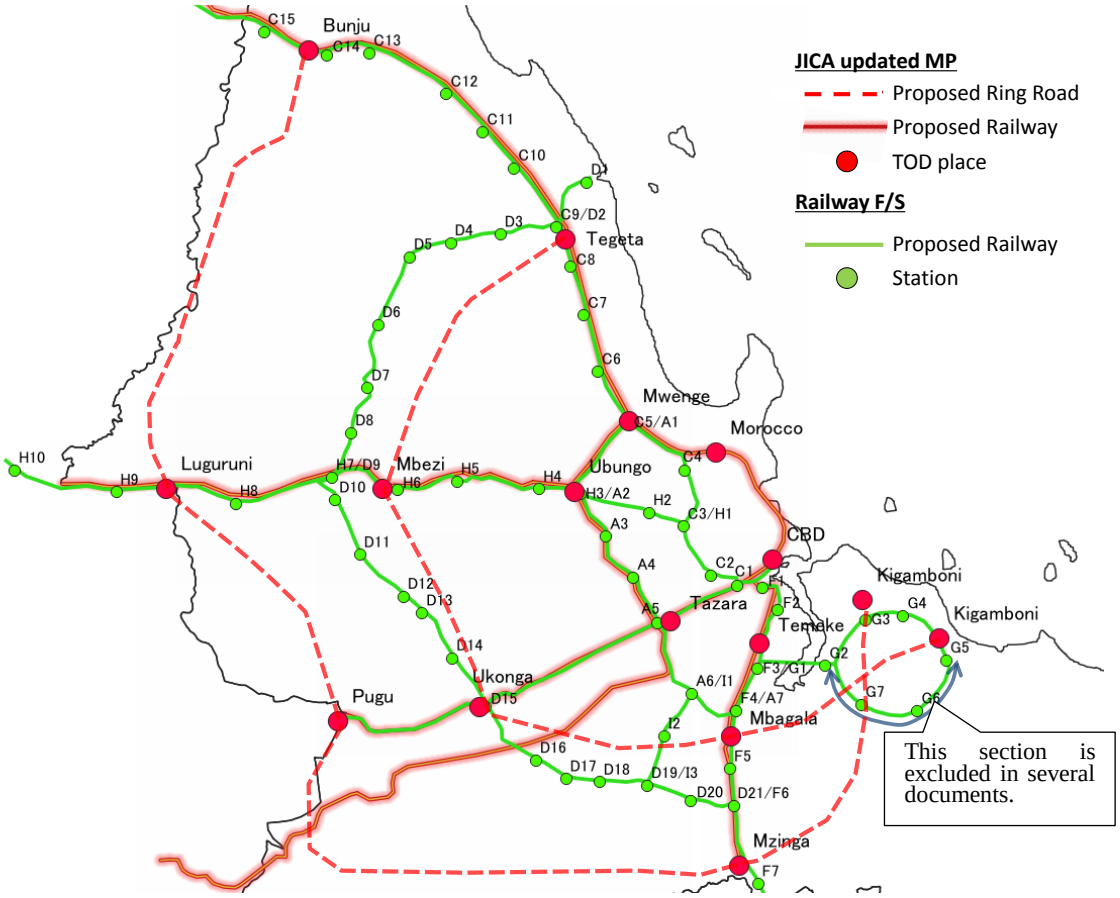
3.2.2 Railway Project

(1) TRC Project

There are two project studies of urban railway construction in DSM at present. JICA has prepared a Pre-feasibility Study of Tegeta Line during the Project for Revision of Dar es Salaam Urban Transport Master Plan in 2018. The other study is a Feasibility Study of Dar es Salaam Commuter Rail Project prepared by TRC in 2019.

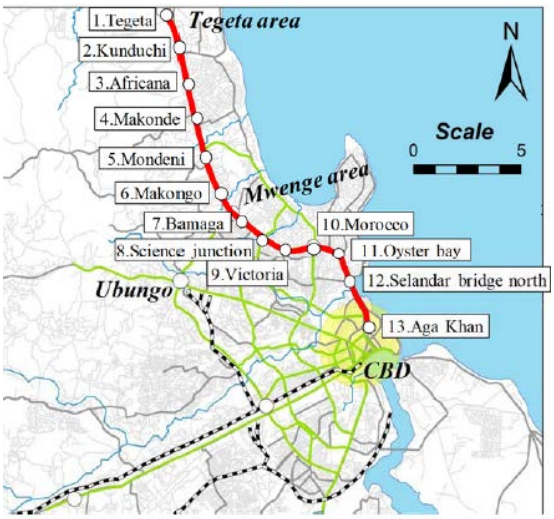
TRC F/S had been planned before Revised M/P and the concept of integrated plan of BRT and railway has not been followed. Furthermore, demarcation of the function between BRT and railway is not found in the report, so the BRT plan might not be considered. Therefore, in TRC F/S, the railway is planned to run within CBD while revised MP is proposed to develop the loop line and outer radiation direction from Nelson Mandela road.

Route maps of each study are shown in Figure 3.10 and Figure 3.11.



Source: TRC FS 2019

Figure 3.10 The Route Comparison between Revised MP and TRC F/S



Source: JICA Pre-FS 2018

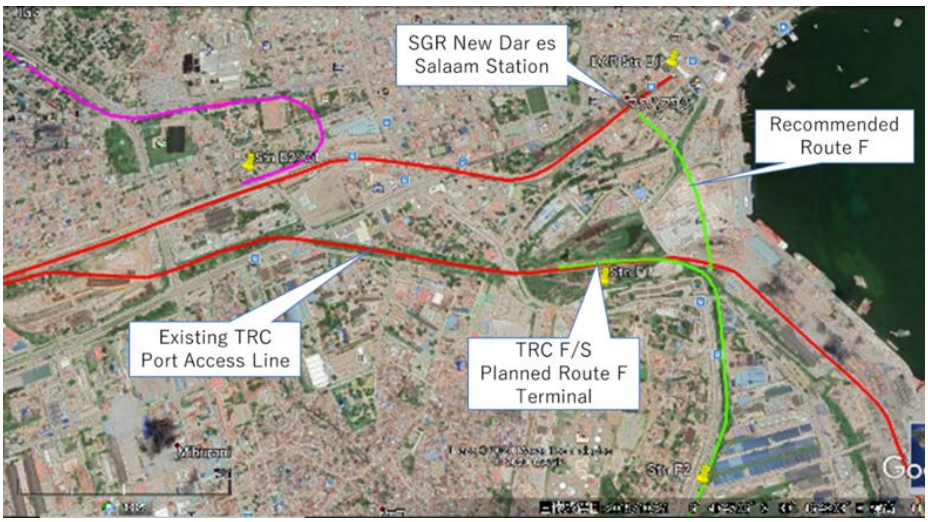
Figure 3.11 Route Plan of Tegeta Line (JICA Pre-FS)

(2) SGR Project

According to the contractor and the consultant of SGR project, the completion date of the SGR Project Phase 1 (DSM – Morogoro) is scheduled on 30th April 2020. Information of the progress after Pugu station is not clear, however, in light of no progress of track work and power supply work between Dar es Salaam and Pugu station on site, it might be difficult to start on operation on schedule. No clear answers were given by the contractor and consultants of the SGR project.

The final destination of SGR project is Mwanza, a port town at Victoria Lake, passing through Isaka ICD (Inland Container Depot). The target user of this project is freight train operation carrying goods from not only domestic products but also goods from land-lock countries, such as Uganda, Rwanda and Brundi. Therefore, SGR is considered to be connected to Dar es Salaam Port in future. However, the connection to the port is not included in the scope of Phase 1 project. According to TRC staff, freight trains also make stops at Pugu Station, and goods will be handled at planned ICD near Pugu Station. Considering the distance of 20km between Pugu and Dar es Salaam port, transportation by trucks are not economical and may cause traffic congestion. Construction of Route F (Vikindu Line) Terminal at the existing TRC freight yard near the port may be the reason why no direct rail connection to the port is planned. However, the planned location of Route F terminal which cannot connect to Dar es Salaam station shall be reviewed. If the section near Route F Terminal is elevated, both of rail track to the port and Route F connection to Dar es Salaam station will be possible as shown below.

The reason why the line is not connected to Dar es Salaam port might be that the terminal station of Vikindu line (Route F) is planned at freight yard adjacent to the port. If Route F is elevated, however, it would be easy to extend the freight line to the port. Elevation of the planned Route F Terminal is 8m below that of New Dar es Salaam Station. Therefore, if Route F is elevated and changes direction, it is possible to connect with New Dar es Salaam Station.



Source: JST

Figure 3.12 TRC Port Access Line and Route F Terminal

3.2.3 Terminal Development Project

(1) BRT Phase 1 Corridor Development Strategy

This plan indicates that the TOD concept will be applied to the entire BRT route, and it will introduce the concept of Land Value Capture (LVC) for implementation.

At the time of the summarization of the plan, the number of residents along the route is about 1 million, but it is projected to increase to 7 million by 2032. This plan shows a land use plan along the railway alignment that includes a residential area of 2.2 million people. In addition, this plan introduces the concept of Land Value Capture (LVC), which will benefit from TOD such as increase in tax revenue, economic development, improvement of Quality of life, and formation of compact city by implementing TOD. This plan shows the current and future land use plans, road networks, drainage plans, power plans, and waste plans for areas along the BRT.

(2) Dar es Salaam Commuter Rail Project Feasibility Study Report

Since this report is mainly for railway projects, there are few descriptions for urban development

projects such as TOD. The description on urban planning is that the cooperation between urban planning and public transport planning is indispensable to realize the railway project. Because it is important to secure passenger demand in the railway business, it is recommended that urban planning increase the number of users along the railway.

In this report, land development scenarios for 2020, 2030, 2040, 2050, and 2060 are prepared to estimate the number of passengers, and the future population according to the land development scenarios is estimated. The population is expected to more than double from 2020 to 2060 as follows:

Table3.9 Population Projection

Year	2020	2030	2040	2050	2060
Population	7 mil	8 mil	12 mil	15 mil	20 mil

Source: Dar es Salaam Commuter Rail Project Feasibility Study Report

3.3 Review of Urban Transport Project

3.3.1 Review of TANROADS F/S

(1) Outline of the Study

In the study, eight target intersection were selected and 1) traffic survey, analysis and future demand forecast, 2) establishment of three or four grade separation alternatives, and 3) evaluation and selection of alternatives by delay time and LOS (Level of Service) were conducted. The eight junctions are selected by TANROADS considering the present traffic flow and mostly correspond to the junctions selected by Revised MP. Table 3.10 shows the comparison of junctions proposed by TANROADS F/S and by Revised MP.

Table 3.10 Comparison between TANROADS FS and Revised MP

NO	Junction	Proposal		Crossing Road	
		TANROADS	Revised MP (Priority)		
1	Oysterbay	✓	✓ (2)	Ali Hassan Mwinyi Rd.	Kinondoni Rd
2	Ali Hassan	✓	✓ (2)	H. Mwinyi Rd.	United Nations Rd.
3	Chang'ombe	-	✓ (1)	Nyerere Rd.	Rashid Kawawa Rd.
4	Fire Station	-	✓ (2)	Morogoro Rd.	Msimbazi St.
5	Magomeni	✓	✓ (1)	Morogoro Rd.	Rashid Kawawa Rd.
6	Buguruni	✓	✓ (3)	Nelson Mandela Rd.	Uhuru St. & Mnyamani Rd.
7	Morocco	✓	✓ (1)	New Bagamoyo Rd.	Kawawa Rd.
8	Mwenge	✓	✓ (1)	Bagamoyo Rd.	Sam Nujoma Rd.
9	United Nations	✓	✓ (2)	Morogoro Rd.	United nations Rd.
10	Tabata	-	✓ (3)	Nelson Mandela Rd.	(Railway)
11	Bugruni	-	✓ (3)	Nelson Mandela Rd.	(Railway)
12	Tabata	✓	-	Nelson Mandela Rd.	Tabata to Kinyurezi Rd
13	Tazara	Completed		Complete	Nelson Mandela Rd
14	Ugungo	Under construction		Morogoro Rd.	Nelson Mandela Rd

Source: JST based on TANROADS F/S and Revised MP

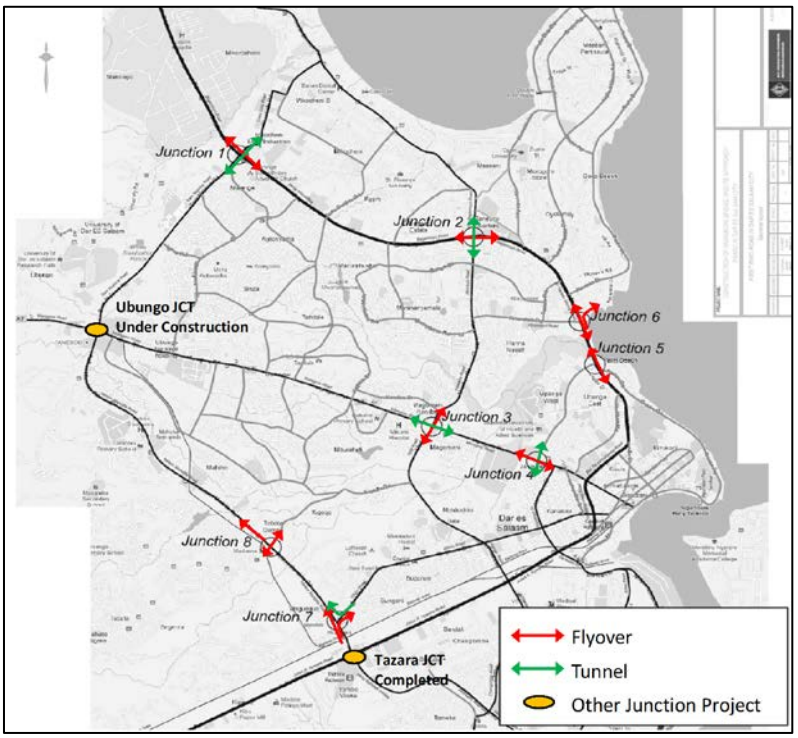
(2) Grade Separation Method

Method of grade separation of selected alternative by TANROADS F/S is shown in Table 3.11 and Figure 3.13. Both flyover and tunnel are proposed at the most of all the intersections.

Table 3.11 Grade Separation Method by TANROADS F/S

No.	Intersection	Traffic volume at peak hour (pcu)	Present LOS (2017)	Method of grade separation	LOS (2031)	LOS (2041)
1	Mwenge	5,658	F	Flyover and tunnel	D	E
2	Morocco	8,196	F	Flyover and tunnel	C	C
3	Magomeni	5,732	F	Flyover and tunnel	B	A
4	Fire	4,540	F	Flyover and tunnel	B	B
5	Ali Hassan	6,220	F	Flyover (through traffic)	B	E-B
6	Oysterbay	6,000	F	Flyover (through and right turn)	B	D
7	Buguruni	3,864	F	Flyover (through and right turn) Tunnel (right turn)	B	C
8	Tabata	3,821	F	Flyover (both crossing road) and additional road	C	D

Source: TANROADS F/S



Source: JST based on TANROADS F/S

Figure 3.13 Location and Grade Separation Method of TANROADS F/S Junction

(3) Review Result of TANROADS F/S

This survey is conducted based on the TANROADS F/S. To this end, the TANROADS F/S was reviewed and items to be confirmed in the survey and necessary survey method is shown in Table 3.12.

Table 3.12 Review of TANROADS F/S

Items	Review result	Confirmed information and survey method
Prospect of implementation	Prospect and scheme of implementation should be confirmed.	・ Financing and implementation priority of eight junctions will be confirmed by interview.
Traffic survey and Traffic demand forecast	Traffic surveys at eight intersections are conducted and demand is forecast by an annual growth rate. Detailed information and data is required.	・In this survey, in addition to the two previous survey results, a peak congestion length survey will be conducted. Based on this result, the degree of congestion at each junctions will be evaluated. ・In this survey, the results of TANROADS F/S will be used for the traffic demand forecast. Additionally, the effect of road improvement (Second Sarender Bridge, etc.) will be predicted and applied for analysing the junction traffic volume.
Structure of Grade-separation	At each junction, improvement results were compared between the Without and the Four alternatives with different flyover structures. However, only the delay time and LOS are compared regardless of the construction cost, so the Full Option was recommended.	・Lay-out plan for priority junction will be drawn. ・Possibility of underpass or three storey structure will be appraised by field survey.
Drainage	The drainage calculation was carried out, and drainage facilities (culvert) were installed in the junctions according to the calculation. Since the water is	・Information collection on flood-related reports by WB

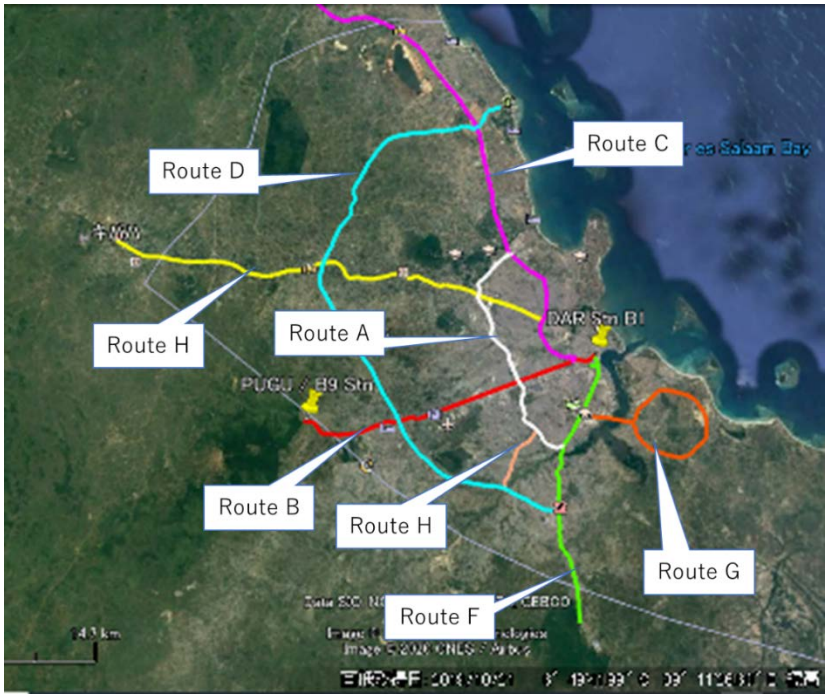
Items	Review result	Confirmed information and survey method
	flowed through existing drainage facilities, the water will expect to flood at the boundary between existing and planned facilities.	
Priority rank	8 junctions were not prioritized in the report. The reason why these 8 junctions were selected is also unclear.	・Implementation priority of 11 junctions will be evaluated. ・Traffic alleviation effect will be evaluated primarily and flood risk, traffic accident risk and conformity with public transportation development will be also considered. ・Response for a letter issued by JST to TANROADS regarding the implementation priority was not received. It is surmised that the response is difficult until the final report of TANROADS F/S scheduled in April or May is submitted.
Cost	Total project cost is presented in the report. (Unit cost is not shown.)	・Project cost for priority junction will be estimated.
Environmental Impact	In the ESIA report, impact facility surveys, social impact surveys, and environmental impact surveys were conducted.	・TANROADS is re-examining the FS design because the implementation is difficult due to the large amount of land acquisition. The FS final report will be submitted In April or May. ・The number of affected buildings will be examined in this survey.

Source: JST

3.3.2 Review of TRC F/S

(1) Outline of TRC F/S

Figure 3.14 shows the railway network of TRC F/S. “Commuter Rail/ Commuter Train” means the contents of TRC F/S and “MRT (Mass Rapid Transit) and EMU (Electric Multiple Unit)” mean the contents of JICA Pre-FS.



Source: TRC F/S 2019

Figure 3.14 Proposed Commuter Rail Network (TRC F/S 2019)

Table 3.13 Outline of TRC F/S

TRC F/S Dar es Salaam Commuter RailProject - Phasing Plan and Outline of Each Route

Phase	Route	Section	Route Length (km)	Target Completion	Construction Period (month)	Land Ownership of Planned Alignment	Planned Structures	Planned Station Structure	Remarks	Evaluation
1	B	B1 - B9	20.3	2024-06	36	Mainly along TRC R.O.W. Partly on private lands.	Mainly at grade, partly elevated.	B2 Stn only elevated. others are at grade	Ongoing SGR track will not ne used.	Technically feasible
	C	C2 - C11	23.1	2025-05	48	Land acquisition will be required at whole section	Elevated section is 1.5 km only. Remaining part is at grade.	C2 Stn only elevated. others are at grade	C1-C2 section is excluded.	Feasibility is doubtful. F/S is requird.
2	F	F1 - F6	10.7	2029-03	36	Partly using ROW of freight line, then go on existing road.	At grade	At grade	Road widening will be required.	Feasibility is doubtful. F/S is requird.
	H	H1 - H7	16.0	2030-02	24	On the Morogoro road	At grade	At grade	It is not mentioned how to share the space with BRT	Feasibility is doubtful by at grade alignment
3	F	F6 - F9	7.3	2033-12	24	Go on existing road	At grade	At grade	Road widening will be required.	Very difficult.
	A	A1 - A7	17.4	2034-11	36	A1 to A5: ROW of TRC A5 to A7: Private/road	At grade	At grada	No consideration for crossing Neyerere road	Technically feasible at A1-A5, difficuly at A5-A7.
4	G	G1 - G5	10.5	2038-09	60	Partly on existing road and partly on private land	At grade	At grada	Demand seems very small	F/S is required.
	C	C11 - C21	39.3	2041-06	24	Land acquisition will be required at whole section	At grade	At grada	Demand will depend on Bagamoyo port project.	F/S is required.
5	I	I1 -I3	4.9	2045-04	36	Go on existing road	At grade	At grada	Demand is very small	Very difficult.
	H	H7 - H10	14.0	2046-03	24	On the Morogoro road	At grade	At grada	Road widening is required.	F/S is required.
6	G	G5 -G2	7.7	2050-06	24	Partly on existing road and partly on private land	At grade	At grada	Demand seems very small	F/S is required.
	D	D9 - D21	25.4	2051-11	48	Mainly on private lands	At grade	At grada	It depends on future demand.	F/S is required.
7	D	D1 - D9	19.4	2056-08	36	Mainly on private lands	At grade	At grada	It depends on future demand.	F/S is required.

Source: TRC F/S

The exiting condition and future prospects of TRC F/S routes are summarized in Table 3.14. The evaluation item of orange highlight route is considered to be a short and middle term project by the Survey Team and that of grey highlight route is considered to be a long term project. Route H is considered to be a short and middle term project (orange highlight) because the route is planned to be constructed along the under the expansion construction and early implementation is possible if the construction site for elevated railway is secured.

Table 3.14 Existing Condition and Future Prospects of TRC FS Routes

Phase	Route	Section (planned completion)	Route Length (km)	Construc-tion Period (month)	Land Ownership of Planned Alignment	Existing Condition of Planned Route / Palarell Road	Remarks	Evaluation
1	B	B1 - B9 (2024/06)	20.3	36	Within TRC R.O.W.	TRC R.O.W. is cleared. Rehabilitation project of MGR is also going on. Track work and electrification work for SGR is not started yet between Dr es Salaam and Pugu.	TRC decided to use SGR track for commuter train operation as Route B.	Exclusive F/S will be required for commuter train project on Route B.
	C	C2 - C11 (2025/05)	23.1	48	Land acquisition will be required at whole section	Road widening for BRT project is on-going between Moroco and Mwenge junctions. Existing Bagamoyo road after Mwenge has wide R.O.W. with wide median.	Elevated MRT can be accomodated on the widened Bagamoyo road.	Exclusive F/S is recommended on the alignment going on Bagamoyo road.
2	F	F1 - F6 (2029/03)	10.7	36	Partly using ROW of freight line, then go on existing road.	Road widening for BRT project has been completed up to km12+200 (Route F 1st phase) section.	Additional road widening may be required if MRT is going on Kilwa road.	Exclusive F/S is recommended on the alignment going on Kilwa road.
	H	H1 - H7 (2030/02)	16.0	24	On the Morogoro road	BRT is operating the section between H1 and H5 already.	Coordination shall be made with Tanroads how to construct on the road.	Exclusive F/S is required.
3	F	F6 - F9 (2033/12)	7.3	24	Go on existing road	Existing road is not wide enough for BRT /MRT.	Road widening will be required.	Future project
	A	A1 - A7 (2034/11)	17.4	36	A1 to A5: ROW of TRC	TRC is operating commuter train on this reoute.	Connection to Route B shall be considered.	Technically feasible at A1-A5 section.
					A5 to A7: Private/road	Crossing over TAZARA station is very difficult.	No consideration for crossing Neyerere road and Tazara station.	Re alignment is required between A5-A7 section.
4	G	G1 - G5 (2038/09)	10.5	60	Partly on existing road and partly on private land	There is no major roads at planned route. It is difficult to see site condition at present.	Demans seems too small. F/S is too early at this moment.	Future project
	C	C11 - C21 (2041/06)	39.3	24	Land acquisition will be required at whole section	There is no major roads at planned route. It is difficult to see site condition at present.	Demand will depend on Bagamoyo port project.	Future project
5	I	I1 -I3 (2045/04)	4.9	36	Go along existing road	Along small road.	This can be a branch line.	Future project
	H	H7 - H10 (2046/03)	14.0	24	On the Morogoro road	Road widening for BRT project has been completed up to Kibaha (H10).	Coordination shall be made with Tanroads how to construct on the road.	Exclusive F/S is required.
6	G	G5 -G2 (2050/06)	7.7	24	Partly on existing road and partly on private land	There is no major roads at planned route. It is difficult to see site condition at present.	Demans seems too small. F/S is too early at this moment.	Future project
	D	D9 - D21 (2051/11)	25.4	48	Mainly on private lands	There is no major roads at planned route. It is difficult to see site condition at present.	Demans seems too small. F/S is too early at this moment.	Future project
7	D	D1 - D9 (2056/08)	19.4	36	Mainly on private lands	There is no major roads at planned route. It is difficult to see site condition at present.	Demans seems too small. F/S is too early at this moment.	Future project

Source: JST

Note1: The land ownership items of orange highlight route show the less land acquisition routes because of the alignment which is planned to construct within ROW of TRC and the major road width. Those of grey highlight route show that the land acquisition is difficult due to the many affected housing.

Note 2: The remarks items of orange highlight route show the possibility of the short and middle term project. Those of grey highlight route show the long term project due to the difficulty of project implementation.

Due to the lack of detailed information regarding the following subjects, it is very difficult to evaluate

the TRC F/S report. The following information is missing as a normal F/S for project implementation.

- Detailed alignment plan (plan and profile): The detail route plan such as plan and profile is shown only for Route C. Rough route and station location are shown on Google Map for other routes, therefore, the evaluation would be difficult. For evaluation, the drawing of 1/1,000 for Route C, which is shown in Appendix Q shall be necessary.
- Detailed demand forecast: It is not possible to make plans for the required number of rolling stocks, operation plan, the size of depot, etc. The demand covering 30 years in 5 year each from the operation start year and a peak hour peak direction trips (PHPDT) shall be required.
- Preliminary design of civil work, E&M, rolling stock, etc.: The F/S routes are basically planned to be constructed at grade, so no consideration for the time spend for land acquisition is the current problem. There are many crossing roads because of the central area, however, the construction for flyover shall not be considered. The composition of rolling stock is planned to be 4 trains in a train set however, the station and other facilities should be expansible up to 6 to 8 trains in a train set by considering the future population. The detail demand forecast should be necessary.
- Cost estimate: There is no detailed breakdown of cost estimate. Only the cost for rough items by each phase are shown.
- Economic and financial analysis: Although Cost Benefit Analysis (CBA) and Internal Rate of Return (IRR) of all projects and Phase 1 for high demand case and medium demand case are shown in the F/S, the evaluation is difficult due to the lack of the information of the cost estimation.
- Natural and social environmental study: The schedule for resettlement which is required for a long time is not considered for implementation schedule.

(2) The Comparison between JICA Pre-F/S and TRC F/S

Tegeta Line planned at JICA Pre-FS (2018) is similar to Route C of TRC FS. Both studies gave high priority in the studie, however, there are many different points as follows. Table 3.15 and Table 3.16 show the comparison between TRC F/S and JICA Pre-FS.

- Route C of TRC FS is running on private lands parallel to existing roads throughout the whole section. On the other hand, Tegeta Line of JICA Pre-FS is running above existing Bagamoyo Road using viaduct structure.
- Tegeta Line of JICA Pre-FS is running on Bagamoyo Road from Tegeta to Aga Khan towards Dar es Salaam Station. Route C of TRC FS is turning to right near Moroco inter section and running in parallel to Rashid Kawawa Road towards B2 Station of Route B.
- The reason why TRC FS selected to run on private lands is assumed to avoid conflicts with on-going BRT projects. Because existing BRT System design is using majority of road center for carriage way and bus stops of widened road section with public road and separators at both sides, it is very difficult to secure space for construction of MRT on the same road. At present, it is not anticipated by MOWTC and TANROADS that the transport capacity of BRT will reach to its limit due to the increase of population in future.
- Transfer of passengers between routes are considered in the network plan prepared by TRC FS. However, there is no central station having hub function. Dar es Salaam Station is a terminal of Route B but has no connection with other route. In JICA Pre-FS, Dar es Salaam Station is considered as the central station having hub function.

Table 3.15 The Comparison between TRC F/S and JICA Pre-F/S

	TRC Commuter Rail F/S		Pre-F/S in JICA Transport M/P
Level of the Study	Master Plan level		Pre-F/S
No. of Routes studied	7 lines		1 line (5 alternative routes)
Priority Routes (Phase 1 in TRC F/S)	Bagamoyo Route	Neyerere Route	Bagamoyo Line
Track Structure	At Grade	At Grade	Elevated
Length of the Line (km)	23.1 (Pase 1) 39.3 (Phase 2)	20.3	21.7
No. of Stations	11 (Ph1) + 10 (Ph2)	9	13
Land Ownership of Planned Alignment	Private Land	TRC	Municipal Government
Land Acquisition (m2)	NA	NA	8,600
Commencement of Construction	2022	2022	2023
Investment Cost (Mi. USD)	2,377 (Phase 1 only)		1,550
Ridership (2030)	NA	NA	1.29 Mil.
EIRR	NA	NA	32.3 %
FIRR	NA	NA	8.2 %

Source: JST

Table 3.16 The Result of Comparison between TRC F/S and JICA Pre-F/S

Item	Review Result of TRC F/S	Revised MP（Pre-F/S）	Confirmation and Further Analysis
Route	The detail routes are not shown in the report except Route C.	The detail routes are not shown in the report due to the Pre-FS.	Need to design the detail route alignment.
Demand Forecast	No results are found in the report. It is not possible to make plans for the required number of rolling stocks, operation plan, the size of depot, etc.	The number of daily boarding passengers is described in the report.	The more detail demand forecast shall be done. For train operation plan and rolling stock procurement plan, the daily demand and PHPDT forecast shall cover the 30 years from the operation year in each 5 year.
Preliminary design for Civil. E&M and Rolling Stock	TRC F/S is planned to construct the route at grade and the time period for land acquisition and land acquisition is not considered.	Rolling stock plan, depot location and electrification facility are described in the report. The civil structure is planned to be elevated by considering the land acquisition and resettlement.	The realistic route shall be considered by considering the eland acquisition and resettlement.
Cost Estimate	The detail breakdown of cost estimate is not described in the report.	The cost estimate has a breakdown of civil work, electric facility, railway system etc.	The evidence of the cost estimate is necessary. Furthermore, if electrification and telecommunication facility are considered, those items shall also be added.
Economic and Financial analysis	The evaluation result is described in the report, however, prerequisite such as interest and cost estimate is not clear.	Prerequisite is shown in the report and sensitive analysis was done by considering the cost increase.	The abovementioned cost estimation result shall be considered for economic and financial analysis.
Natural and social Environmental Survey	The schedule for resettlement which is required for a long time is not considered for implementation schedule.	Environmental and social considerations are conducted.	The realistic implementation plan shall be considered by considering the eland acquisition and resettlement.

Source: JST

The Routes B, C and A which are the highest priorities are possible to go forward to implement the project if the detail F/S is conducted from now on. Therefore, the review of each line is done as follows. The other lines, on the other hand, are not matured for the detail study to be conducted.

(3) Outline of Pugu Line (Route B)

Pugu Line (Route B) is designed as a new structure apart from on-going SGR in the TRC FS. However, according to the hearing from TRC staff, MRT trains will be operated using SGR track. TRC is planning to terminate long distance trains at Pugu Station and passengers to Dar es Salaam Station shall transfer to MRT trains. TRC is planning to construct 7 intermediated stations between Pugu and DSM.

Under the above condition, Route B is the highest priority route to implement in near future because the current ROW can be utilized for construction. According to the hearing at the time of Pre-FS Study, commuter train was planned to be developed separately and land acquisition was one of the problems to implement. The plan of Route B becomes more realistic plan to implement. On the other hand, the more detail study about addition civil construction, depot construction and rolling stock procurement will be required to operate the EMU as an urban railway.

Source: JST

Figure 3.15 Route Map of Route B

It is possible to operate MRT trains on SGR track tentatively because it will take more years to start full-scale long-distance train operation on SGR track. In order to operate MRT trains on the SGR track, the following points shall be studied in detail:

- Demand Forecast: It is unavoidable to operate MRT on the double track in future. Demand forecast is required to estimate the timing of double track construction.
- Track Layout of Dar es Salaam Station: Dar es Salaam Station is designed having a single platform facing one track and double track. This layout can handle a long-time headway train operation. However, when headway become short, another platform will be required to handle more passengers.
- Location and Design of Intermediate Stations: Intermediate stations shall be designed to handle double track train operation.
- Power Supply System: Outline of the additional substation and power supply facilities to meet

MRT train operation shall be studied.

- Signal and Telecommunication System: Outline of the additional signal and telecommunication system to meet the MRT train operation shall be studied.
- Procurement Plan of Rolling Stock: Detailed specification and procurement schedule of rolling stock shall be studied based on the demand forecast.
- Depot and Workshop: Location, size and maintenance facilities of the depot and workshop shall be studied considering total number of train sets procured in future.
- Cost Estimate: Detailed cost estimate shall be prepared based on the abovementioned subjects.
- Economic and Financial Analysis: Economic appraisal to find benefits for passengers and for society, such as saving of travel time, travel cost, safe and comfortable travel, reduction of pollution, and improvement of ambience. Financial appraisal is to know the profitability from the project and compare borrowing options.
- Safeguard Issues: Poverty and social assessment, resettlement, environmental impact assessment, etc.

(4) Outline of Ubungo Line (Route A)

There is a branch line from TRC main line near Tazara intersection. The branch line is connecting Dar es Salaam Station and Ubungo Station by meter gauge track. Commuter trains are operating 3 trains each in the morning and evening using locomotive and passenger coaches. One train is consisting 6 coaches and carrying 1,500 passengers in average.

TRC is planning to operate Commuter rail (EMU: Electric Multiple Unit) between Mwenge – Ubungo – Tazara – Mbagala 36 km section as Route A in the TRC FS. Among those sections, TRC has ROW at Mwenge – Ubungo section along existing Sam Nujoma Road. Since there is operating railway track at Ubungo – Tazara section, construction of new line at this section has no difficulty. However, because the planned route is shared between the main line and branch line of TAZAR at Tazara – Mbagara section, agreement shall be made with TAZARA. The route and station location is shown in Figure 3.16.

Source: JST

Figure 3.16 Route Map of Route A

It is not difficult to prepare a feasibility study of this route because the land issue is less than that of other routes. The following points shall be studied in detail:

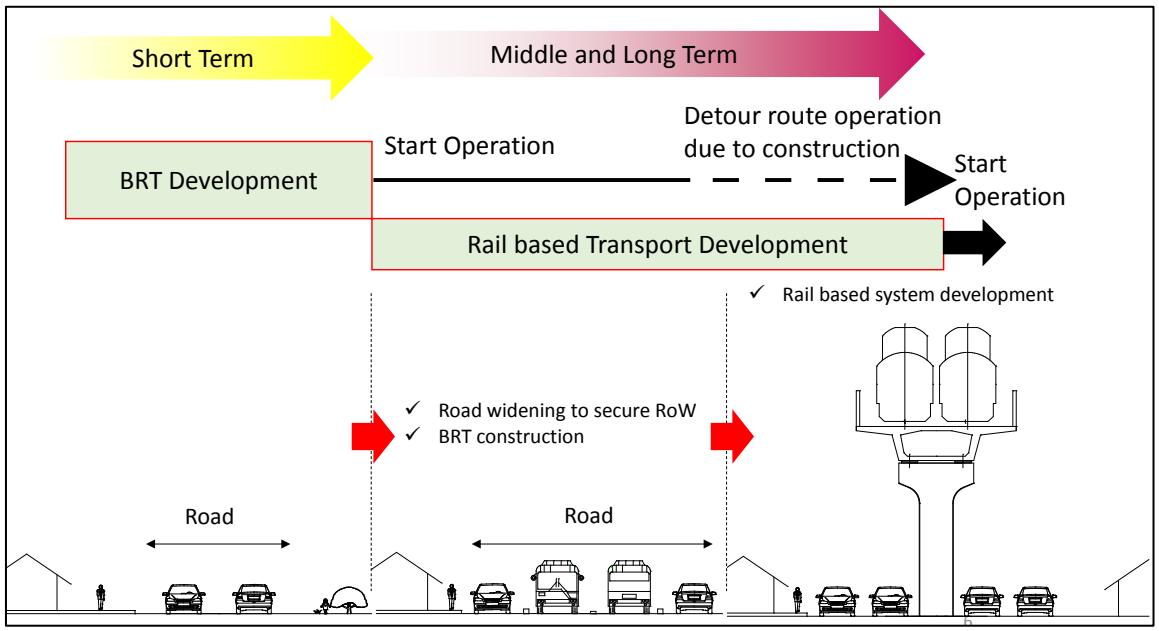
- Demand Forecast: High demand can be expected because the route is passing through CBD area. However, the route may be changed due to site condition.
- There will be a BRT line at the section between Mwenge and Ubungo. Therefore, space for MRT construction shall be secured by utilizing median of the road. Since the ROW (Right of Way) at the section between Ubungo and Tazara is very narrow, the track structure shall be elevated. When constructing Tazara – Mbagara section, very high structure will be required to pass over Tazara flyover. After the flyover, if TAZARA will not agree to share the ROW with TRC, alternative route shall be considered.
- Location and Design of Intermediate Stations: There are 7 intermediate stations. Among those 4 stations are crossing with other routes such as Routes C, H, B and F. Special designs shall be provided for those interchange stations.
- Power Supply System: Outline of the new substation and power supply facilities to meet MRT train operation shall be studied.
- Signal and Telecommunication System: Outline of the new signal and telecommunication system to meet the MRT train operation shall be studied.
- Procurement Plan of Rolling Stock: Detailed specification and procurement schedule of rolling stock shall be studied based on the demand forecast.
- Depot and Workshop: Location, size and maintenance facilities of the depot and workshop shall be studied considering total number of train sets procured in future.
- Cost Estimate: Detailed cost estimate shall be prepared based on the abovementioned subjects.
- Economic and Financial Analyses: Economic appraisal is to find benefits for passengers and for society, such as saving of travel time, travel cost, safe and comfortable travel, reduction of pollution, and improvement of ambience. Financial appraisal is to know the profitability from the project and compare borrowing options.
- Safeguard Issues: Poverty and social assessment, resettlement, environmental impact assessment, etc.

(5) Outline of Tegeta Line (Route C)

The highest priority was given to Tegeta Line (Route C) by TRC FS. In order to avoid conflicts with BRT, planned alignment is passing through private lands at grade.

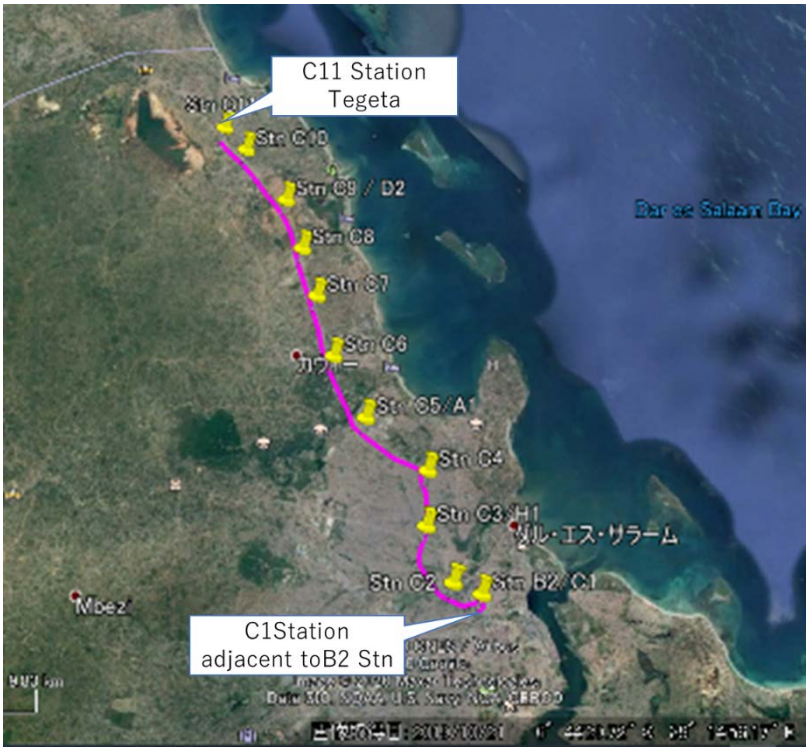
Due to the bumpy terrain and the design by the embankment and cut construction, the required width of ROW will be more than 30m at many locations. Considering the passing route in CBD, it may be difficult to acquire the required ROW. Therefore, the following assessment is based on the elevated structure.

Road widening project for BRT construction is on-going between Moroco and Mwenge intersections. The widened road seems to have enough width to construct MRT in future if the layout is designed for future MRT construction. It is possible to secure 12 to 15m width if the median/separator and service road is properly designed. The image of conversion from BRT to MRT is shown in Figure 3.17. If the proposal is matched with the design of BRT, it is possible to consider the conversion from BRT to MRT. The route and station location of Route C is shown in Figure 3.18.



Source: JST

Figure 3.17 Conversion from BRT to MRT



Source: JST

Figure 3.18 Route Map of Route C

The following points shall be studied in detail for the construction of Tegeta Line:

- Demand Forecast: High demand can be expected because the route is passing through CBD area. However, the route may be changed due to site condition.
- Flyovers at Mwenge and Moroco: Because flyovers will be constructed at Mwenge and Moroco intersections, diversion of track structure shall be planned.
- Location and Design of Intermediate Stations: There are 11 intermediate stations. Among those 2 stations are crossing with other routes. Special designs shall be provided for those interchange stations.

- Power Supply System: Outline of the new substation and power supply facilities to meet MRT train operation shall be studied.
- Signal and Telecommunication System: Outline of the new signal and telecommunication system to meet the MRT train operation shall be studied.
- Procurement Plan of Rolling Stock: Detailed specification and procurement schedule of rolling stock shall be studied based on the demand forecast.
- Depot and Workshop: Location, size and maintenance facilities of the depot and workshop shall be studied considering total number of train sets procured in future.
- Cost Estimate: Detailed cost estimate shall be prepared based on the abovementioned subjects.
- Economic and Financial Analysis: Economic appraisal to find benefits for passengers and for society, such as saving of travel time, travel cost, safe and comfortable travel, reduction of pollution, and improvement of ambience. Financial appraisal is to know the profitability from the project and compare borrowing options.
- Safeguard Issues: Poverty and social assessment, resettlement, environmental impact assessment, etc.

3.3.3 Review of Transportation Terminal Development in DSM

(1) BRT Phase 1 Corridor Development Strategy

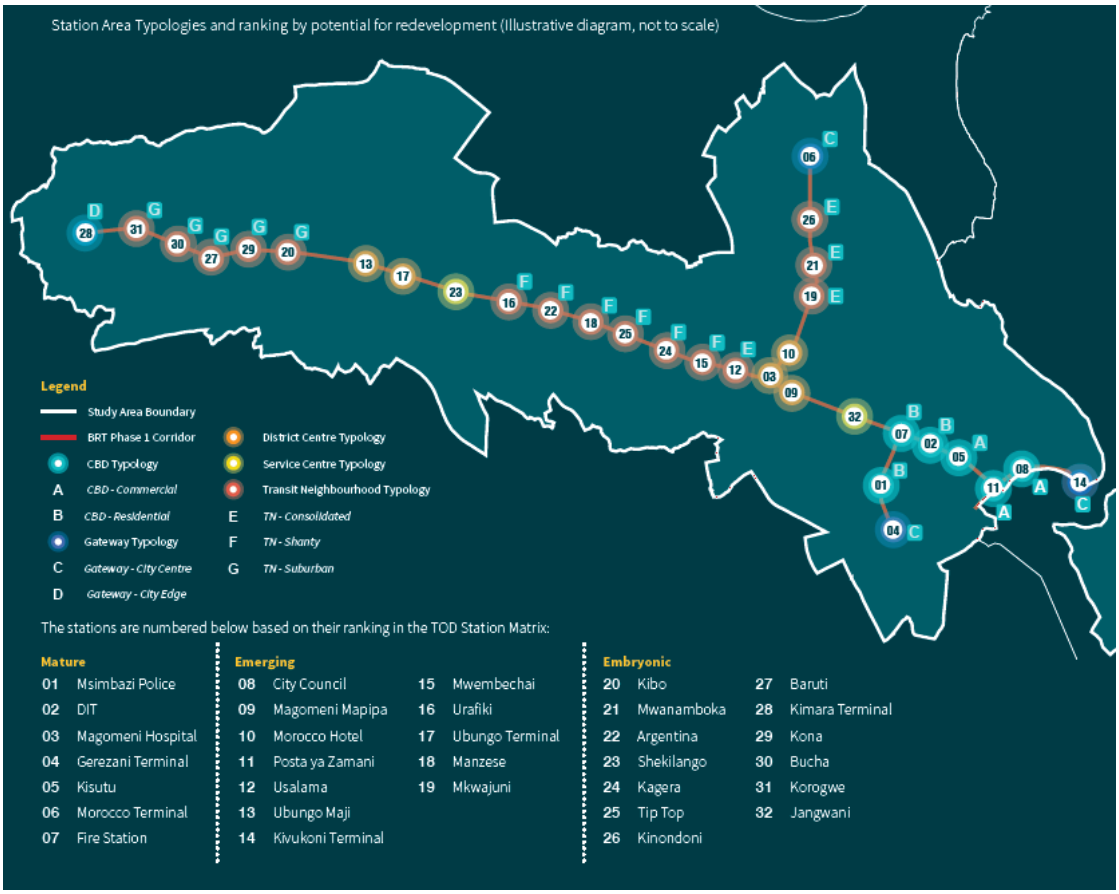
1) Outline

The outline of this report is written below.

TOD priority areas are Ubungo, Magomeni, Morocco, Gerezani, City Council and Kivukoni. For example, Gerezani is located where three BRT routes intersect, and is close to the port and the airport. The waterfront from Kuvukoni to the Town Hall is considered to be a tourist base.

In connection with housing improvements, a September 2017 income survey showed that most populations could not afford to pay market price rents. Although the lowest monthly rent is 300 USD, two third of people were paid less than 66 USD per month. In other words, low wage levels in Tanzania are assumed to be an obstacle on housing supply, so future growth in income levels is essential for stable housing supply. Therefore, as a concrete measure for housing development, it states that the development of affordable housing with low rent is necessary. The report also states that collecting a certain amount of tax and pooling the collected money, then using the pooling money to construct new affordable housing.

Proposed interventions include capacity building programs on TOD policies, development of district plans, infrastructure development, implementation of land pooling such as urban redevelopment projects, and pilot projects in TOD priority areas. In particular, the capacity building program on TOD is described in the Revised MP as well. Since concept of TOD has not been carried out in Tanzania, it seems to be worthwhile to do the capacity building.



Source: Dar es Salaam Metropolitan Development Project

Figure 3.19 Priority of Redevelopment

The case of a successful TOD states that it is important that there is high density development and that land use is mixed within walking distance. By proceeding with phased development, it will be possible to prevent a sale in a situation where real estate demand is not strong and to obtain appropriate profits.

Several methods are being considered for the return of land development profits. The first approach is mainly driven by DCC or DART, and uses the land readjustment system which is applied in Delhi and Ahmedabad. Idea is to acquire the land ownership from the original inhabitants and transfer a percentage of the FAR instead. The surplus space created by land readjustment will be used for public infrastructure. Second, the proposed mechanism is to collect the land in the TOD area and then auction the development rights. The merit of this case is that the integrated development can be expected. As a third model, a company specializing in development shall be established in a government agency, and land acquisition and development are centralized. In it, three more schemes have been proposed depending on which institution is being established.

2) Comparison with Revised M/P

As a result of comparison with Revised M/P, comparison result is summarized as follows:

Table 3.17 Comparison with Revised MP

Items	Revised MP	Dar es Salaam Metropolitan Development Project (WB survey)	Comparison Result
Cooperation of urban development with railway project	It is proposed to invest the development profits from the urban development to the railway project.	Apply the land value capture scheme, return will be invested to the development of infrastructure in the TOD development area.	It can be seen that the use of development profits differs between the Revised MP and WB survey.
TOD candidate	Priorities for redevelopment are divided into three stages.	Priorities for redevelopment are divided into three stages. 7	In the CBD area, Morocco and Ubungo, both have

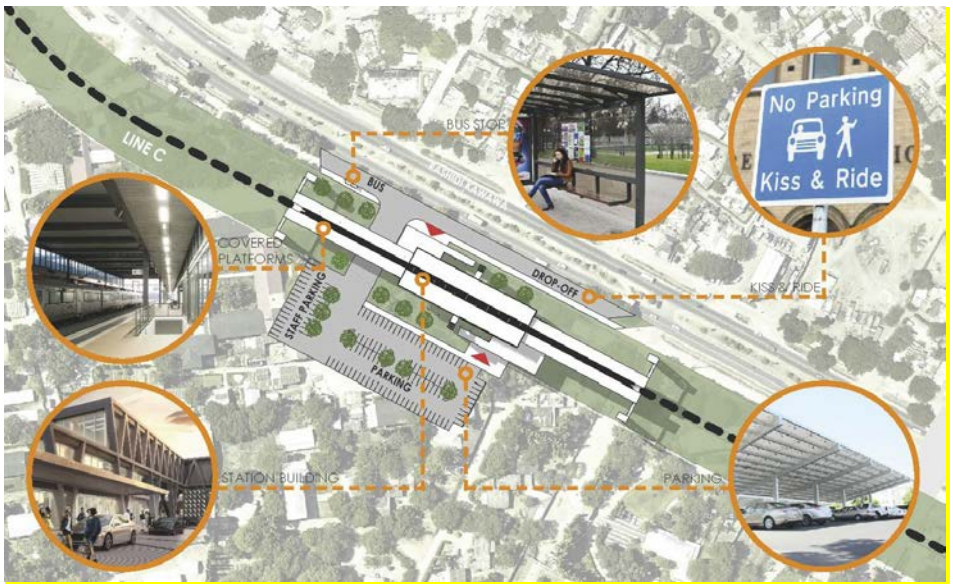
Items	Revised MP	Dar es Salaam Metropolitan Development Project (WB survey)	Comparison Result
place	Five candidate sites have high priority.	candidate sites with high priority	high priority results.
Policy on urban development	The policy is to develop satellite cities and sub-centers. However, no specific future land use for each location is described.	The land use plan for each section along the BRT is shown.	The BRT survey is examining land use more in detail.
Development concept on each TOD locations	For the candidate sites with high priority, the required functions are clearly specified. However, specific development plan such as land use plan etc. is written.	The development policy at each candidate TOD site is shown. The two pilot projects show specific development images.	Both surveys show the development concept. However, WB survey have been described in more detail at candidate sites for pilot projects.
TOD Project supported by the donor	Proposal of capacity building project for TOD implementation	The following projects are proposed to promote TOD. -Capacity building program on TOD policy, development of district plans, infrastructure development, implementation of land pooling projects such as urban redevelopment projects, pilot projects in TOD priority areas	Regarding TOD, the WB survey is conducting a more detailed study.

Source: JST

(2) Dar es Salaam Commuter Rail Project Feasibility Study Report

1) Outline

Although there is no specific description of TOD, the area within 1 km around the station is set as the station catchment area and it can be seen that future passenger demand is predicted from future land use within 1 km. In other words, it can be seen that the area within 1 km around the station is set as a small hub in the city (Mini hub) and is considered as an important area for TOD. The following is the example of the development plan around the station indicated in the report. Park and ride and kiss and ride facilities are shown.



Source: Dar es Salaam Commuter Rail Project Feasibility Study Report

Figure3.20 Example of TOD Development

Regarding the implementation structure, the railway project will be partially implemented by PPP, and the construction stage will be implemented by the government, and a 20-year concession contract will be signed with a private company during operation. The reason is that the burden on

the government can be reduced. Therefore, although the government will pay the initial investment during the construction stage, the government intend to collect initial cost not only from the Tanzania government itself but also foreign funds including the World Bank and JICA.

As a result of the financial analysis under this implementation structure, the IRR was calculated to be as low as -7.8%. Therefore, at the time of project implementation, it is required that the government subsidies to private businesses even during operation.

Table 3.18 Result of Financial Analysis

Items	Scenario: High
NPV (mil USD)	-1,798
BCR	0.23
IRR	-7.8%

Source: Dar es Salaam Commuter Rail Project Feasibility Study Report

Economic analysis pointed out benefits such as a reduction in travel costs due to modal shift, a reduction in travel time cost, a benefit from increase of employment opportunity and economic development, a reduction in traffic accidents, and a reduction in environmental impact.

Looking at the results, the B/C was 2.96 with only three benefits were recorded including travel time reduction, travel cost reduction benefit, and traffic accident reduction benefit. Taking into account the indirect benefits of economic development and redundancy, which is substitutability when other modes of transportation become unavailable, the B/C is 4.65.

Table 3.19 Result of Economic Analysis

Items	Result
B/C (only direct benefit)	2.96
B/C (including indirect benefit)	4.65

Source: Dar es Salaam Commuter Rail Project Feasibility Study Report

From the above results, although the validity was not confirmed from the results of the financial analysis, it can be said that project is worth to realize as a public project because the economic benefits can be expected.

However, this report does not mention, for example, the cooperation between TOD and railway development, and does not consider the benefits of urban development. In other words, the Land Value Capture (LVC), which returns the benefits of urban development to the railway business, may improve the financial analysis results. Therefore, the results of financial analysis will fluctuate as a result of cooperation with urban development.

Table 3.20 Review Result of Dar es Salaam Commuter Rail Project Feasibility Study Report

Items	Review Result
Place of TOD (Candidates Location)	・Railway alignment is studied in the TRC F/S. ・Implementation Plan is studied from Phase1 to Phase 7
TOD candidate location (Land use around the station)	Land use development scenario is proposed every 10 years from 2020 to 2060. And the number of generated trips were studied from the rail catchment area, which is considered to be the area within a 1km radius of the railway stations. However, land use scenario is not shown in detail. Future population is shown in below. 2020 : 7 mil 2030 : 8 mil 2040 : 12mil 2050 : 15mil 2060 : 20mil
Possibility of the collaboration between Urban Development and railway project	TRC F/S consider only railway project itself, not consider urban development along the railway corridor as a project component.
	Government will be in charge of initial construction stage, instead private sector will join from the operation stage by making concession contract with the government. The implementation structure is called “partial PPP”

Items	Review Result
Implementation plan	The project will be conducted by "partial PPP" scheme as shown above. The result of financial analysis revealed the IRR is quite low, meaning the project is not viable in terms of financial affairs. Although IRR is low, there is a possibility to change the result since urban development is not considered in the revenue nor cost.
Urban Planning	The city will need to commit to a land use Masterplan incorporating strong 'traffic demand management' (TDM) policies and explicit measures to promote a modal shift. However, the Revised MP is not agreed officially
Law	Section 38 of the Railways Act provides that when someone applies for a railway order the railway construction etc. will be an exempted development for the purposes of the Land Act. It is not sure whether station plaza is contained or not, and the detail information after applying railway act.

Source: JST

2) Comparison with Revised M/P

A comparison between the Revised MP and the TRC F/S reveals differences in the location of railway alignment. The Revised MP prioritized the candidate sites for terminal development as Primary, Secondly, and Tertiary based on the proposed railway network and BRT network. However, due to the difference in the proposed route alignment, the candidate site may be changed from the revised MP.

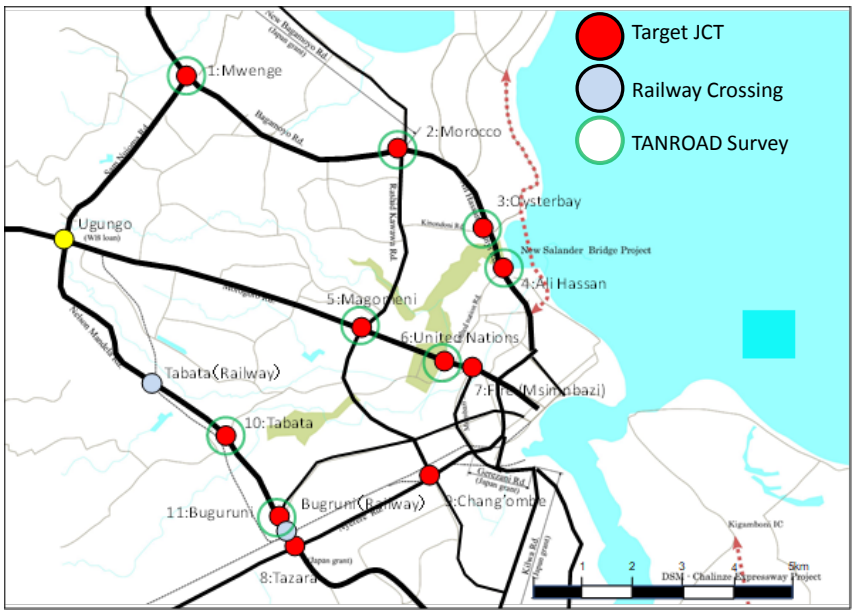
For example, Mbagala, which was selected in the second ranking in the Revised MP, has a clear difference in the proposed position of the station on the TRC F/S. The TRC F/S has also proposed a new ring railway route D. For example, in the case of Mbezi, in the Revised MP, the cross point of the ring road and the railway was considered as a terminal development candidate, but the presence of a newly proposed ring railway may require a review of the candidate site for TOD.

CHAPTER 4 STUDY POLICY AND RESULT OF JUNCTION IMPROVEMENT PROJECT

4.1 Policy and Procedure

(1) Target Junctions

Target junctions in this survey are the junctions proposed in the Revised MP, junctions targeted in TANROADS F/S and Tazara Junction which is completed and in operation. The number of junctions studied in TANROADS F/S is eight and junctions proposed by Revised MP includes another two junctions, making the total number of junction 11, including Tazara Junction. Tazara Junction is still congested after the completion of flyover due to the traffic from Dar es Salaam port. The effectiveness of grade separation of Nelson Mandela Road is analysed in the survey. Two railway crossings proposed in the Revised MP are excluded in this survey as the operation frequency of railway is low and effect to road traffic is small at present.



Source: JST

Figure 4.1 Target Junctions in This Survey

Table 4.1 Target Junctions in This Survey

NO	Junction	Priority in Revised MP	TANROADS 8 critical JCTs	Flyover by BRT Project	Crossing Road	
1	Mwenge	High	✓	-	Bagamoyo Rd.	Sam Nujoma Rd.
2	Morocco	High	✓	-	New Bagamoyo Rd.	Kawawa Rd.
3	Oysterbay	Middle	✓	-	A H Mwinyi Rd.	Kinondoni Rd
4	Ali Hassan	Middle	✓	-	A H. Mwinyi Rd.	United Nations Rd.
5	Magomeni	High	✓	-	Morogoro Rd.	Kawawa Rd.
6	United Nations	Middle	✓	-	Morogoro Rd.	United nations Rd.
7	Fire (Msimbazi)	Middle	-	-	Morogoro Rd.	Msimbazi St.
8	Tazara	Complete (Flyover on Nyerere Road)		-	Nyerere Rd.	Nelson Mandela Rd
9	Chang'ombe	High	-	Phase 3	Nyerere Rd.	Rashid Kawawa Rd.
10	Tabata	-	✓	Phase 5	Nelson Mandela Rd.	Tabata Rd
11	Buguruni	Low	✓	Phase 5	Nelson Mandela Rd.	Uhuru St.

Source: JST

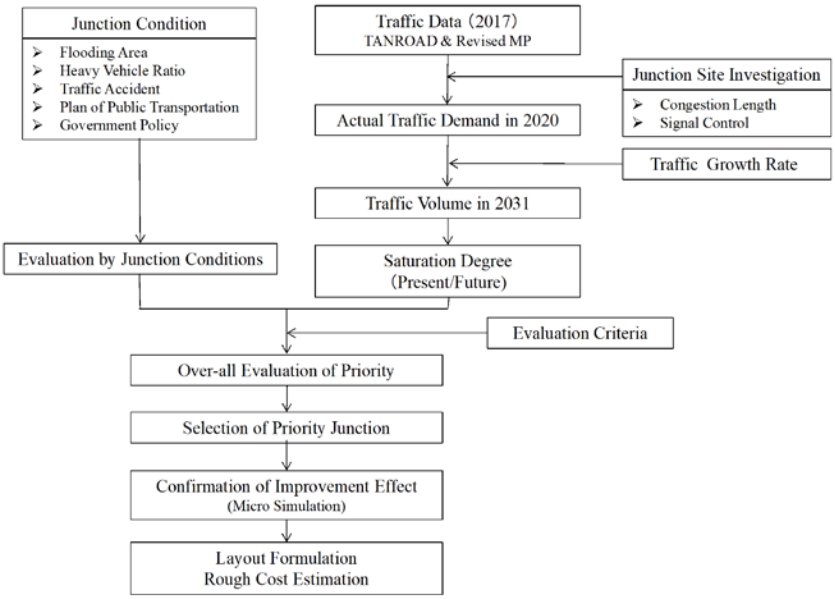
(2) Policy in the Survey

The followings are policy for this survey.

i Traffic volume by TANROADS F/S is applied to this survey. In order to reflect the change of traffic from 2017, congestion length survey is conducted and traffic volume in 2017 will be revised.
ii The priority of project implementation, which is not shown in TANROADS F/S, will be evaluated in this survey.
iii As the primary indicator for priority evaluation, saturation degree of each junction will be calculated based on the present traffic volume and future traffic demand.
iv Additionally, risk for flooding damage, risk for traffic accident and Tanzania Government policy will be considered and evaluated.
v For the high priority junctions, lay-out plan will be formulated and rough project cost will be estimated.

(3) Procedure for Survey

Based on the aforesaid policy, the survey is carried in accordance with the procedure shown in Figure 4.2.



Source: JST

Figure 4.2 Work Procedure

4.2 Condition of Junctions

(1) Traffic Movement

1) Traffic Control

Traffic control at junctions confirmed by field survey is shown in Table 4.2. All the junctions are signal-controlled and signal cycle are 120seconds.

Table 4.2 Traffic Control at Junctions

NO	Junction	Traffic control	Cycle length
1	Mwenge	Signal	120sec.
2	Morocco	Signal	120sec.
3	Oysterbay	Signal	120sec.
4	Ali Hassan	Signal	120sec.
5	Magomeni	Signal	120sec.
6	United Nations	Signal	120sec.
7	Fire (Msimbazi)	Signal	120sec.
8	Tazara	Signal	120sec.
9	Chang'ombe	Signal	120sec.
10	Tabata	Signal	120sec.
11	Buguruni	Signal	120sec.

Source: JST

2) Congestion Length

To confirm the actual traffic congestion, congestion length survey at peak hour was conducted. The result of the survey is shown in Table 4.3.

Table 4.3 Result of Congestion Length Survey

No.	Junction	No. of legs	Congestion length (m)				Total	Congestion length per leg (m)
1	Muwenge	4	Coca Cola	Bagamoyo East	Sam Nujoma	Bagamoyo West		
			100	350	300	100	850	212.5
2	Morocco	4	Old Bagamoyo	Ali Hassan	Rashid Kawawa	Bagamoyo West		
			150	300	200	250	900	225
3	Oysterbay	4	Ali Hassan North	Kenyatta	Ali Hassan South	Kinondoni		
			300	10	150	250	710	177.5
4	Ali Hassan	4	Ali Hassan North	Barak Obama	Ali Hassan South	UN		
			300	50	200	200	750	187.5
5	Magomeni	4	Kawawa North	Morogoro East	Kawawa South	Morogoro West		
			200	150	150	150	650	162.5
6	United Nations	4	UN	Morogoro East	Swahili	Morogoro West		
			250	100	100	150	600	150
7	Fire (Msimnbazi)	4	Mazungo	Morogoro East	Msimnbazi	Morogoro West		
			150	150	100	250	650	162.5
8	Tazara	4	Mandela North	Nyerere East	Mandela South	Nyerere West		
			350	300	350	100	1100	275
9	Chang'ombe	4	Kigogo	Nyerere East	Chang'ombe	Nyerere West		
			300	450	300	200	1250	312.5
10	Tabata	3	Mandela South	Tabata (Kigogo)	Mandela North			
			300	200	250		750	250
11	Buguruni	4	Mandela North	Uhuru East	Mandela South	Uhuru West		
			200	150	200	100	650	162.5

Source: JST

3) Traffic Volume

Junction traffic volume for analysis is basically derived from junction traffic volume by direction in TANROADS F/S. Traffic volume estimated by Revised MP is applied to three junctions: Fire, Chang'ombe and Tazara, which are not covered by TANROADS F/S. Since the target junctions are chronically congested at peak hours, excess traffic demand which does not pass through junctions should be considered. To this end, actual traffic volume in 2020 was calculated by adding the number of vehicles in waiting queue. Traffic volume at each junction is shown in Appendix 2.

Future junction traffic volume in 2031 is estimated by applying annual traffic volume growth rate of 6.3% which is the same as TANROADS F/S. Junctions with heaviest traffic are Morocco, Tazara and Chang'ombe. Traffic volume at Oysterbay Junction and Ali Hassan Junction is estimated considering the traffic conversion by Salander Bridge.

Table 4.4 Incoming Traffic Volume at Junctions

No.	Junction	No. of Legs	Traffic Volume (pcu /hour)	
			2020	2031
1	Mwenge	4	5,868	11,491
2	Morocco	4	6,562	12,850
3	Oysterbay	4	6,213	9,582
4	Ali Hassan	4	6,443	9,937
5	Magomeni	4	5,900	11,554
6	United Nations	4	4,652	9,110
7	Fire (Msimnbazi)	4	5,425	10,623
8	Tazara	4	8,698	17,033
9	Chang'ombe	4	8,791	17,215
10	Tabata	3	4,523	4,523
11	Buguruni	4	4,024	7,880

Source: JST

(2) Congestion at Junction

Saturation degree for without project case in 2020 and 2031 is calculated as shown in Table 4.5. Generally, when the demand factor exceeds 0.9, traffic cannot pass through junction during single signal cycle and congestion begins.

Highest demand factor is found at Tazara and Chang'ombe followed by Muwenge and Morocco. Serious traffic jam is predicted at those junctions.

Table 4.5 Saturation Degree at Junctions

No.	Name	Legs	Traffic Volume (pcu/hour)		Saturation degree (volume/capacity)	
			2020	2031	2020	2031 WO
1	Mwenge	4	5,868	11,491	1.15	2.25
2	Morocco	4	6,562	12,850	1.14	2.24
3	Oysterbay	4	6,213	9,582	1.10	1.70
4	Ali Hassan	4	6,443	9,937	1.09	1.68
5	Magomeni	4	5,900	11,554	0.97	1.90
6	United Nations	4	4,652	9,110	1.05	2.06
7	Fire (Msimnbazi)	4	5,425	10,623	0.80	2.06
8	Tazara	4	8,698	17,033	1.59	3.11
9	Chang'ombe	4	8,791	17,215	1.38	2.70
10	Tabata	3	3,990	7,733	0.87	1.68
11	Buguruni	4	4,024	7,880	1.00	1.96

Source: JST

(3) Heavy Vehicle Ratio

Slow movement of heavy vehicles at junction causes pavement damage. Therefore improvement of junction contributes to not only logistic efficiency but also reduction of maintenance work through improvement of vehicle speed.

Currently number of heavy vehicles is large at Nyerere Road and Nelson Mandela Road, where improvement effect of junction is expected.

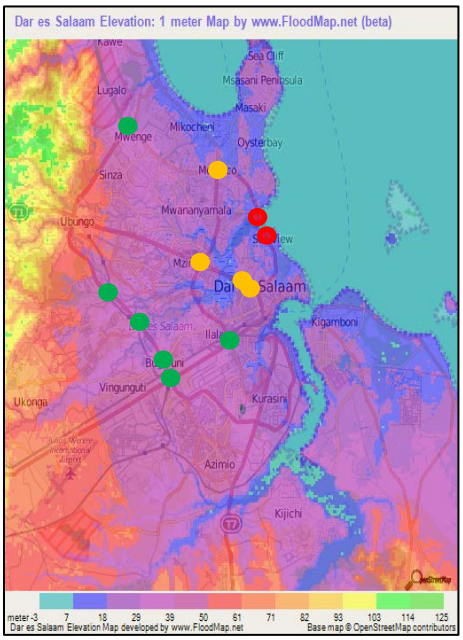
Table 4.6 Heavy vehicles at Junctions

No.	Name	Heavy vehicle (%)	No. of Heavy vehicle (vehicle/peak hr)
			2020
1	Mwenge	7.7	180
2	Morocco	3.7	96
3	Oysterbay	2.7	67
4	Ali Hassan	2.8	71
5	Magomeni	6.5	154
6	United Nations	4.8	89
7	Fire (Msimnbazi)	4.8	104
8	Tazara	9.0	313
9	Chang'ombe	11.0	387
10	Tabata	13.8	221
11	Buguruni	15.1	243

Source: JST

(4) Flood Risk

Figure 4.3 shows the hazard area of the target area. Oysterbay and Ali Hassan which are close to coast have high flood risk, and Morocco, Magomeni, United Nations and Fire which are close to river or flood area have medium flood risk. Other junctions have comparatively low flood risk.

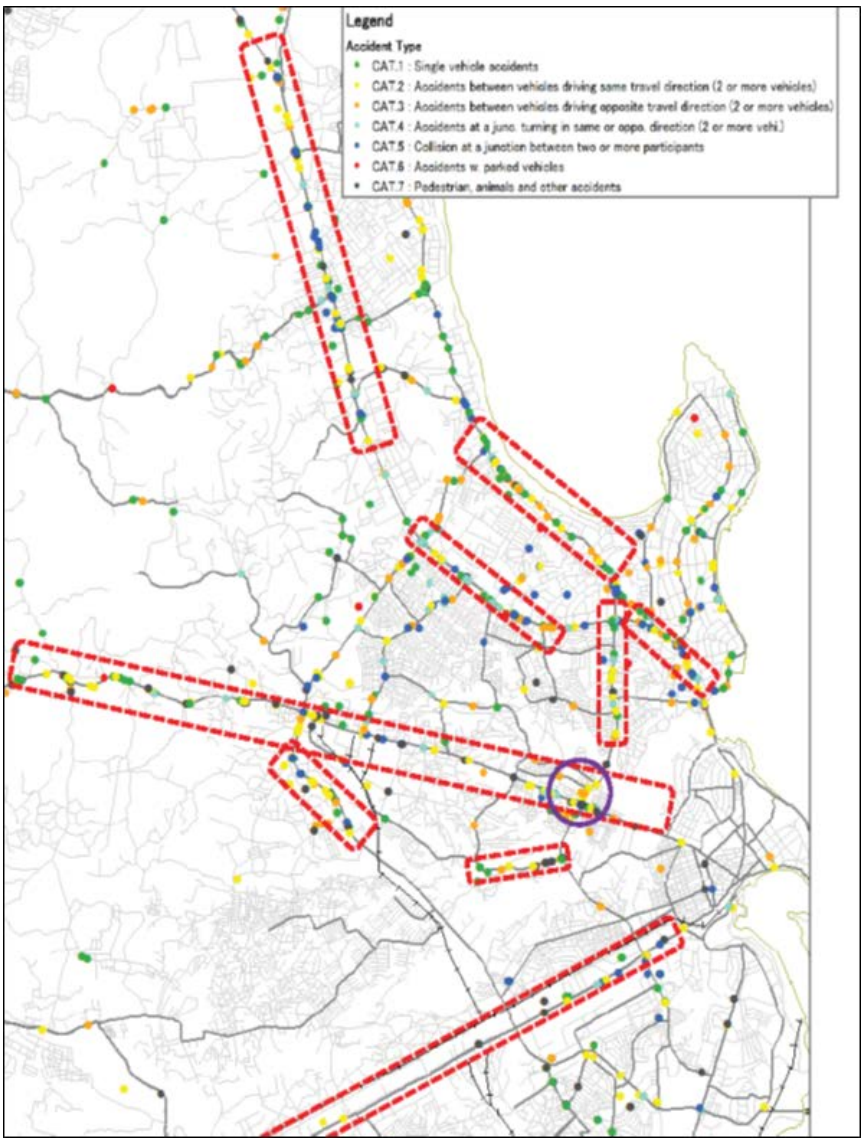


Source: The World Bank

Figure 4.3 Hazard Map of DSM

(5) Traffic Accident

The distribution of traffic accidents in DSM in 2016 is shown in Figure 4.4. Number of traffic accidents at target junctions is shown in Table 4.9.



Source: Revised MP

Figure 4.4 Distribution of Traffic Accidents in DSM

Table 4.7 Traffic Accidents at Target Junction

No.	Name	Accident Risk	
		Number	Rate
1	Mwenge	9	High
2	Morocco	8	Moderate
3	Oysterbay	6	Moderate
4	Ali Hassan	0	Low
5	Magomeni	12	High
6	United Nations	0	Low
7	Fire (Msimnbazi)	1	Low
8	Tazara	10	High
9	Chang'ombe	9	High
10	Tabata	3	Moderate
11	Buguruni	0	Low

Source: Revised MP

(6) Government Policy

Although it is said that TANROADS directed the consultants for TANROADS F/S to give priority rank to the improvement of junctions, priority rank of junctions is unclear at present. Therefor the government is supposed to have positive intention of improvement to the target junction of TANROADS F/S and other planned junction.

Table 4.8 Positive Intention of Improvement by the Government

No.	Name	Government Policy
1	Mwenge	✓
2	Morocco	✓
3	Oysterbay	✓
4	Ali Hassan	✓
5	Magomeni	✓
6	United Nations	✓
7	Fire (Msimnbazi)	-
8	Tazara	-
9	Chang'ombe	✓
10	Tabata	✓
11	Buguruni	✓

Source: JST

(7) Building Density

Table 4.9 shows the number of affected buildings by TANROADS F/S junction project inspected from aerial photograph. However, TANROADS is reviewing the improvement plan by F/S because the number of affected buildings is so large. Therefore, Table 4.9 is tentative.

Table 4.9 Number of Affected Buildings by Junction Improvement Project

No.	Name	No. of Affected Buildings
1	Mwenge	40
2	Morocco	5
3	Oysterbay	0
4	Ali Hassan	10
5	Magomeni	20
6	United Nations	0
7	Fire (Msimnbazi)	-
8	Tazara	-
9	Chang'ombe	-
10	Tabata	150
11	Buguruni	40

Source: JST

(8) Summary

Table 4.10 gives a comprehensive comparison of all the conditions across all junctions.

Table 4.10 Summary of Junction Condition

Junction Name		1. Mwenge	2. Morocco	3. Oysterbay	4. Ali Hassan	5. Magomeni	6. United Nations
Crossing Road	Road A	Bagamoyo Rd.	Bagamoyo Rd. Ali Hassan Rd	Ali Hassan Rd.	A H. Mwinyi Rd.	Morogoro Rd.	Morogoro Rd.
	Road B	Sam Nujoma Rd.	Kawawa Rd.	Kinondoni Rd	United Nations Rd, Barak Obama Rd.	Kawawa Rd.	United Nations Rd, Swahili Rd
BRT Project	Road A	Phase-4 (Design Stage)	Phase-4 (Design Stage)	Phase-4 (Design Stage)	Phase-4 (Design Stage)	Phase-1 (Operation)	Phase-1 (Operation)
	Road B	Phase-4 (Design Stage)	Phase-1 (Operation)	-	-	-	-
Related Project		Mwenge Bus Terminal, New Bagamoyo Widening Project (Under Const.)	New Bagamoyo Widening Project (Under Const.)	-	-	-	-
Flood Risk		Low	Middle	High	High	Middle	Middle
Traffic Accident		Low	Middle	Middle	Low	High	Low
Government Policy		selected	selected	selected	selected	selected	selected
Traffic Volume (2020) (pcu/peak hour)		5,868	6,562	6,213	6,443	5,900	4,652
Saturation Degree (2020)		1.15	1.14	1.1	1.09	0.97	1.05
No of Heavy vehicle (vehicle/peak hour)		180	96	67	71	154	89

Junction Name		7. Fire (Msimnbazi)	8. Tazara	9. Chang'ombe	10. Tabata	11. Buguruni
Crossing Road	Road A	Morogoro Rd.	Nyerere Rd.	Nyerere Rd.	Nelson Mandela Rd	Nelson Mandela Rd
	Road B	Msimbazi St.	Nelson Mandela Rd	Kawawa Rd	Tabata Rd.	Uhuru Rd.
BRT Project	Road A	Phase-1 (Operation)	Phase-3 (Design completed)	Phase-3 (Design completed)	Phase-5	Phase-5
	Road B	-	Phase-5 (Design Stage)	Phase-2 (Design completed)	-	Phase-3 (Design completed)
Related Project		-	-	Chang'ombe Flyover by BRT Phase-2 Project	-	-
Flood Risk		selected	Not selected	Not selected	selected	selected
Traffic Accident		Middle	High	High	Middle	Low
Government Policy		Not selected	Not selected	Selected	Selected	Selected
Traffic Volume (2020) (pcu/peak hour)		5,425	8,698	8,791	3,990	4,024
Saturation Degree (2020)		0.8	1.59	1.38	0.87	1
No of Heavy vehicle (vehicle/peak hour)		104	313	387	221	243

Source: JST

4.3 Evaluation of Improvement Priority

(1) Evaluation Criteria

In order to evaluate the improvement priority of junctions, evaluation criteria is established as shown in Table 4.11.

- Future congestion
  As the most essential factor for improvement necessity, saturation degree in 2031 for without project case was evaluated.

- Decrease in maintenance cost
  Since the maintenance cost is expected to be reduced by effect of reducing the pavement damage due to low-speed running of large vehicles is expected to reduce road maintenance costs, the ratio of heavy vehicles mixed was evaluated. To this end, number of heavy vehicles was evaluated.

- Flood risk
  The risk of road closure due to flooding was evaluated.

- Traffic accident risk
  Traffic accident risk was evaluated by the number of past traffic accidents.

- Government Policy
  Existence of grade separation plan and priority by the government was evaluated.

Table 4.11 Evaluation Criteria for Priority of Junction Improvement

Category	Index	Criteria		
		Low	Middle	High
Future Congestion (2031)	Saturation degree	1.0>X	2.5>X>1.0	X>2.5
	Score	0	50×(*x*-1)/1.5	50
Decrease in Maintenance Cost	Number of heavy vehicle at peak hour	100>X	300>X>100	X>300
	Score	0	10	20
Flood Risk	Extent of flood risk	Low	—	High
	Score	0	—	10
Traffic Accident Risk	Extent of accident risk	Low	Middle	High
	Score	0	5	10
Government Policy	Included in government plan	Not included	—	Included
	Score	0	—	10

Source: JST

(2) Evaluation Result

Evaluation result by applying the criteria is shown in Table 4.12. Junctions given high priority are Chang'ombe, Tazara and Mwenge.

Table 4.12 Evaluation of Priority of Junction Improvement

No.	Name	Saturation degree		No of Heavy vehicle (Peak hour)		Flooding Risk		Accident Risk		Government Policy		Total Score	Affected Buildings (tentative)
		Number	Score	Number	Score	Extent	Score	Extent	Score	Plan	Score		Number
1	Mwenge	2.25	40	180	10	L	0	L	0	Y	10	70	40
2	Morocco	2.24	40	96	5	L	0	M	5	Y	10	60	5
3	Oysterbay	1.70	20	67	0	H	10	M	5	Y	10	45	0
4	Ali Hassan	1.68	20	71	0	H	10	L	0	Y	10	40	10
5	Magomeni	1.90	30	154	10	L	0	H	10	Y	10	60	20
6	United Nations	2.06	30	89	5	L	0	L	0	Y	10	45	0
7	Fire (Msimnbazi)	2.06	30	104	5	L	0	L	0	N	0	35	-
8	Tazara	3.11	50	313	20	L	0	H	10	N	0	80	-
9	Chang'ombe	2.70	50	387	20	L	0	H	10	Y	10	90	-
10	Tabata	1.71	20	250	15	L	0	M	5	Y	10	45	150
11	Buguruni	1.96	30	243	15	L	0	L	0	Y	10	55	40

Source: JST

4.4 Outline Study of Priority Junction

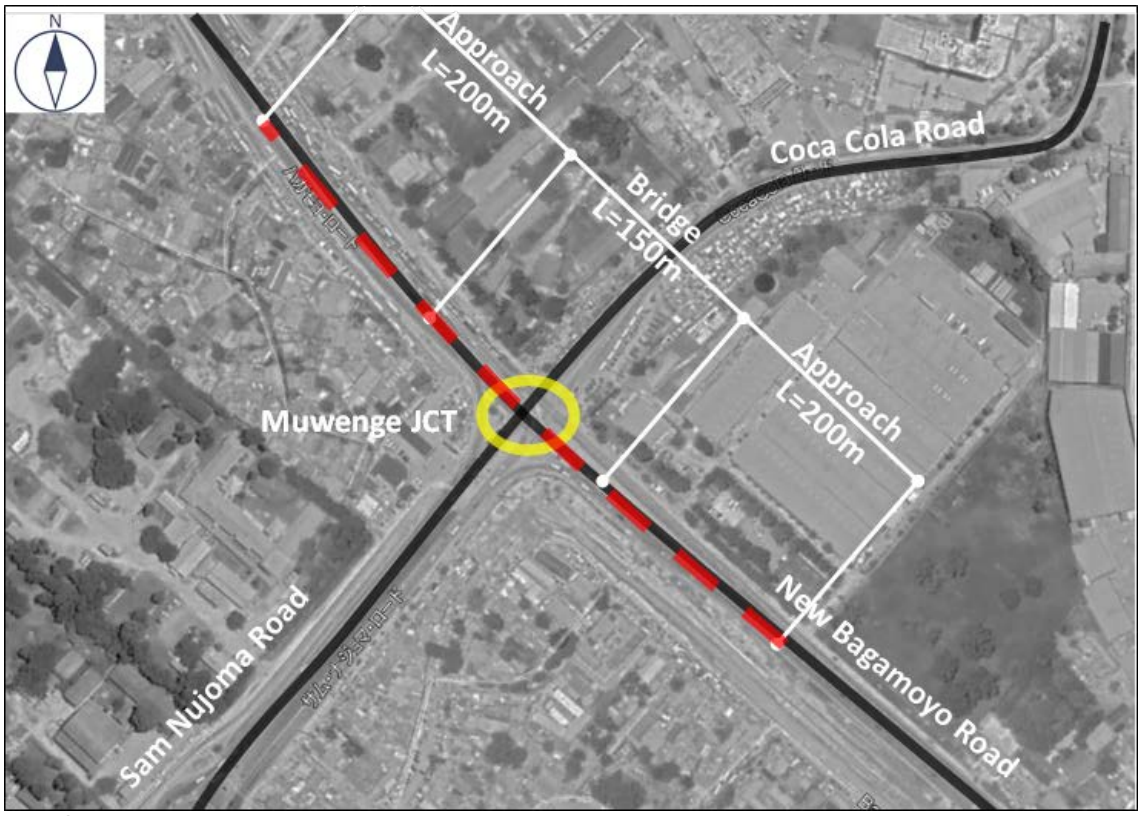
Since underpass structure has problems of rain water drainage and permeation of ground water, method of grade separation of Mwenge Junction is installation of flyover on New Bagamoyo Road which is the primary traffic flow of the junction.Layout plan was formulated and rough cost was estimated for the selected priority junctions. Among three high priority junctions, Chang'ombe was eliminated because grade separation is contained in the BRT phase 3 project. Additionally, saturation degree and micro simulation of traffic flow after the completion of grade separation project was conducted and efficacy was confirmed.

(1) Mwenge Junction

1) Layout Plan

. Layout plan is shown in Figure 4.5.

- ◆ Outline of the structure
- − Bridge length: 150m
- − Approach length: 200m (each side)
- − Width: 10m (each side)



Source: JST

Figure 4.5 Layout Plan of Mwenge Flyover

2) Rough Cost Estimation

Rough cost was estimates by applying the unit cost for flyover construction obtained from the Japanese contractor operating in Tanzania.

- ◆ Approximate cost: 3 – 3.5 billion JPY

3) Saturation Degree and Micro Simulation

It is clarified by the calculation of saturation degree and micro simulation that the additional grade separation and promotion of modal shift to public transport may be required after 2031.

a) Saturation Degree

Even after the installation of flyover, saturation degree in 3031 indicates 0.92 which exceeds threshold of 0.90. After 2031, additional countermeasure will be required.

b) Micro Simulation

Micro simulation of traffic movement at the junction indicated that the flyover will decongest the junction until 2031, however after 2031 additional grade separation, namely Coca Cola-Sam Nujoma flyover or right turn flyover, will be required.

(2) Tazara Junction

1) Layout Plan

Since flyover on Nyerere Road is already constructed, grade separation of Nelson Mandela Road is needed to alleviate congestion. The following condition should be taken into account for grade separation of Nelson Mandela Road:

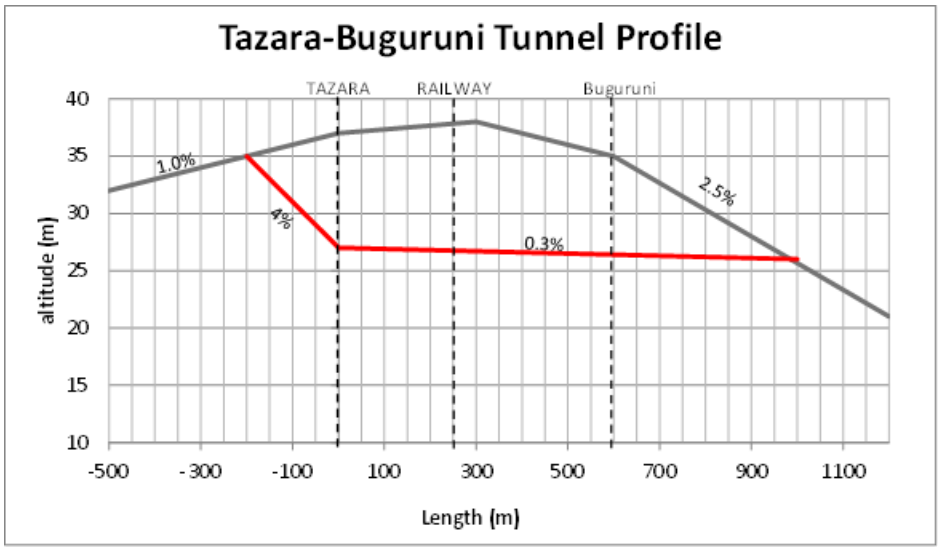
- At 200m north of the junction, railway is crossing the road. Elevated railway is planned for coming SGR project.
- At 300m of railway crossing, Buguruni Junction exists.

Therefore, continuous grade separation is required to clear both railway and Buguruni Junction. For the grade separation structure, underpass is appropriate because long flyover is necessary to over cross the existing Tazara flyover and elevated SGR. Additionally north side of Buguruni Junction is declivity which also makes flyover length longer (Estimated bridge length is L=900m, bridge pier is H=20m). Layout plan is shown in Figure 4.6 and rough longitudinal profile is shown in Figure 4.7.

◆ Outline of the structure
- Underpass length: 700m
- Approach length: 200m (each side)
- Width: 10m (each side)

Source: JST

Figure 4.6 Layout Plan of Tazara-Buguruni Underpass



Source: JST

Figure 4.7 Rough Longitudinal Profile of Tazara-Buguruni Underpass

2) Rough Cost Estimation

- Approximate cost: 13 – 14 billion JPY

3) Saturation Degree and Micro Simulation

Micro simulation of traffic movement at the junction indicated that even in 2031 the congestion cannot be alleviated by the underpass. The major reason of the congestion is that most of freight traffic from Dar es Port concentrates to Tazara Junction. Development of diversion route and dispersion of traffic is required.

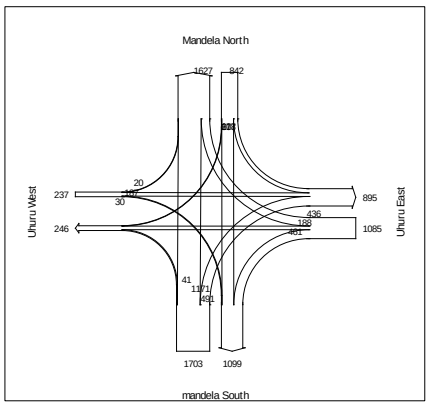
a) Saturation Degree

Even after the installation of flyover, saturation degree in 3031 becomes 1.47 which indicates congestion still continues and additional countermeasure will be required.

b) Micro Simulation

Even in 2031 the congestion cannot be alleviated by the underpass.

It is confirmed by micro simulation that Uhuru Rd.-Mnyamant Rd. flyover which was proposed by TANROADS has less effect for decongestion. Figure 4.8 shows Traffic flow at-Buguruni JCT. in 2020.



Source: JST

Figure 4.8 Traffic flow at-Buguruni JCT. in 2020

CHAPTER 5 STUDY POLICY AND RESULT OF RAILWAY PROJECT

5.1 Study Policy

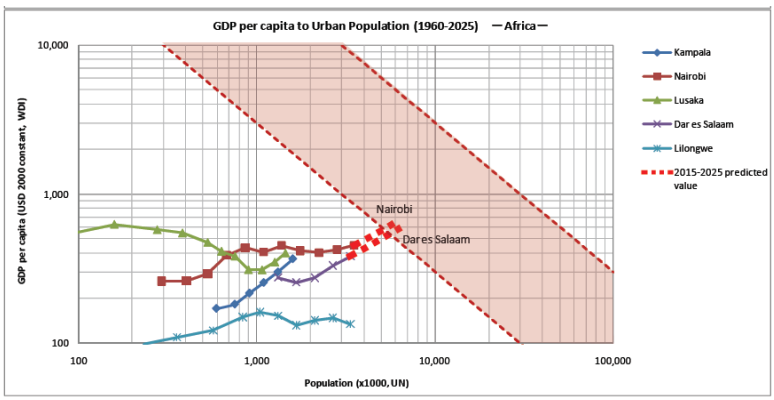
(1) Method of the Study

Main subject of this survey is to scrutinize the contents of TRC F/S Report. Therefore, the followings surveys are carried out:

1. Review of TRC F/S
2. Hearing from TRC staff (the number of staffs, grasp the current capacity and technique)
3. Hearing from groups/persons related to SGR project
4. Site survey of each route

(2) Necessity of Urban Railway Development

JICA has issued "The Research on Practical Approach for Urban Transport Planning" in 2010. In the report, a diagram showing a relation between GDP per capita and Urban Population as shown on the following figure. It is mentioned in the report that the GDP per capita and population of DSM will reach to the timing to have a metro in 2025. In addition to such research outcome, the result of traffic survey done by revised MP can reveal the necessity of urban railway.



Source: The Research on Practical Approach for Urban Transport Planning (2010 JICA)

Figure 5.1 Timing of Metro Operation (Africa)

The total number of trips increased from 2.8 million in 2007 to 8.6 million in 2017. Among those, share of the public transportation is 47.9%. When adding BRT and walking, the share will be over 90 %. It can be said that DSM is a city not depending on private car transportation at this moment. On the other hand, private car ownership increased from 78,477 in 2007 to 191,825 in 2017, 2.4 times approximately in accordance with economic growth. Traffic congestion will become worse if development of public transportation system is delayed.

Since population and economic activity of DSM are increasing, it is necessary to provide urban railway system with bigger transportation capacity than BRT to avoid the shifting of people's traffic mode to private cars Bagamoyo road, Morogoro road and Neyerere road are forming main trunk road system of DSM having radial axle. Among those, BRT system has been introduced on Morogoro road and existing railway is operating along Neyerere road. However, there is no mass transit system operating on Bagamoyo road, only small busses are operating at this moment. Based on this background, in order to improve the traffic from Tegeta and Bunju areas to CBD, an urban railway system (Tegeta line) was planned and a Pre-FS was conducted in the Master Plan.

Under the above background, issues for railway project implementation by TRC are summarized as a result of the study.

5.2 Study Result

(1) Existing TRC Organization

As shown in Figure 3.3 organization chart, TRC composes 8 units, 5 technical directorates and HR/Admin Directorate under Director General. Technical directorate is divided into "Railway Infrastructure Directorate", "Signals, Telecommunication and Electrification Directorate", "Business Development Directorate" and "Operation Directorate".

Railway Infrastructure Directorate of TRC is not only responsible for operation and maintenance of operating railway facilities, but also planning, construction and supervision of new railway lines. This directorate has almost half share of all TRC staff and core team of them. Number of Civil Department staff is summarized Table 5.1 according to the hearing from TRC.

Table 5.1 Number of TRC Railway Infrastructure Directorate Staff

No.	Designation	Estimate	Actual	Variance
1	Civil Engineer	14	9	-5
2	Surveyor	8	2	-6
3	Administration	36	11	-25
4	Secretary	11	4	-7
5	Permanent Way Inspector	58	53	-5
6	Gagman Staff	1848	1144	-704
7	Works Staff	26	10	-16
8	Mechanical	25	15	-10
9	Motor Drivers	7	4	-3
10	Trolley Drivers	26	19	-7
Total		2059	1271	-788

Source: TRC

The above table indicates the planned and actual number of TRC staff of Railway Infrastructure Directorate. Currently, 60% personnel is assigned to conduct the daily work against the estimation. The functions of each designation are assumed as follows:

1. Civil Engineer: Planning, design and construction supervision of civil and architectural works
2. Surveyor: Survey work
3. Administration: General administration
4. Secretary: Secretary work
5. Permanent Way Inspector: Supervision of track work
6. Gagman Staff: Track maintenance work
7. Work Staff
8. Mechanical: Rolling stock maintenance work
9. Motor Drivers: Locomotive drivers
10. Trolley Drivers: Locomotive/motor car drivers

The required number of the Railway Infrastructure Directorate staff estimated by TRC is 2,059, and the actual number is 1,271, only 61% of the required number at present. There is no information on how to calculate the required number of the staff. Staff No. 5 to 10 are working for operation and maintenance of the existing facilities. Therefore, those staff who can work for planning and construction supervision of new projects are 9 civil engineers and 2 surveyors. TRC is now constructing SGR project Phase 1 and Phase 2, and MGR Track Rehabilitation project. In addition to those projects, Civil Department is responsible for the planning of Dodoma Urban Railway. Therefore, not enough time is shared for FS of Dar es Salaam Commuter Rail Project.

Although the number of TRC staffs is insufficient, it is informed that there are many new staffs in TRC. This fact may come from the time of privatization when TRC was divided into TRL and RAHCO. At the time, TRL was reorganized by RITES and forced to work in a way of Indian style.

Many track maintenance staff left TRL because of the new style. Similarly, maintenance staff of locomotives also left TRL. This may be the reason of shortage of staff and many new staff in TRC.

Regarding the other technical directorates except Railway Infrastructure Directorate, the organization structure is not suitable for electrified SGR operation. For example, Electrical Directorate, EMU Maintenance Section and specialized sector for commuter railway operation are missing. The current staff is covering the non-electrified railway operation.

(2) Capacity and Engineering Knowledge of TRC

Although there is no response for our questionnaire about TRC F/S, the knowledge for urban railway planning and design are insufficient based on the understanding of hearing and discussion. Even when the proposed plan for an elevated railway proposed by JICA pre-FS was presented, the content of constructing an elevated railway on a main road was not fully understood.

It is not possible to confirm the accumulation of experience and engineering knowledge through planning, design and construction of SGR, because there was no answer to questions regarding SGR. There was no person in charge during the survey period because the working site is far from DSM.

The current levels of TRCs' capability are inferred from TRC F/S reviews and interviews. These capabilities and engineering knowledge are indispensable for planning and designing railways. This assessment was made by JST based on the results of TRC F/S and interviews, and therefore does not evaluate the capabilities and engineering knowledge of the entire TRC.

Table 5.2 Evaluation of Capability and Engineering Knowledge of TRC

Item	Evaluation
Route Plan	Lack of convenience for passenger at stations: The convenience improvement of passengers in the transfer is not achieved in the station plan which carries out the transfer between the railway lines. Pedestrian's safety at level crossings: When a railway line passes through the ground, the installation of a level crossing is indispensable at an intersection with the road. However, measures for preventing an approach in the railway by pedestrians, etc. at a level crossing have not been examined, therefore we assume recognition of railway safety is lacking. Long interruption time at level crossings leads to serious road congestion and huge economic loss: In addition, because railways and roads are planned to cross especially within urban areas, interruption time of roads at level crossings is longer around level crossings. Especially for urban railways with high frequency transportation, serious congestion will occur. Assessment from the viewpoint of urban transportation is insufficient. In addition, there is a lack of consideration from the viewpoint of urban planning, because the urban city exchange between east and west or between north and south does not occur. Overall, the route plan does not satisfy both the railway side and the urban side viewpoints.
Demand Forecast	Lack of the necessary information: The F/S does not specify the number of daily passengers, PHPDT, etc. Though these information are the basic information of the required number of rolling stocks, train operation plan, and depot size for the cost estimation, it may not be able to grasp these necessary information. Application of old data: In addition, since the survey results for 2007, more than 10 years ago, are applied for demand forecast analysis, it is not an appropriate demand forecast result, and it may not recognize the importance of demand forecast itself.

Item	Evaluation
Civil Structure	Elevated structure (general): Elevated structure (increase in cost) of the railway at the point crossing the road has not been examined. Therefore, it is difficult to determine the necessity of the elevated structure of the intersection and the increase in cost associated therewith. Elevated structure (pier): Elevated roads at road crossings do not significantly affect road traffic, because a width of only about 3 m will occupy the road after providing roads, except during construction periods. It is also very useful because serious traffic jams associated with the installation of level crossings can be avoided as described above. TRC may not be aware of the above.
Railway System	Modernized system: There is no experience of operation and maintenance of modernized signal and telecommunication.
Natural and Social Environment	Risk of land acquisition and resettlement: It is planned to pass through the ground residential area, and there is a possibility that TRC does not understand the risk of prolonged project due to the occurrence of land acquisition and large-scale resettlement.
O&M	O&M experiences: There is no experience in the operation of high-frequency transportation and electrified railways such as 12 trains (5 minute headway) per hour. Personnel shortage: Furthermore, there is a shortage of daily maintenance personnel. In addition, operation of commuter railways in DSM will require additional maintenance personnel.

Source: JST

5.3 Issues to Implement the Railway Project

As shown above, the current railway plans may not have been able to adequately see TRC F/S due to a lack of staff and busy. In such a situation, revised plan and proposal would not be acceptable.

Focusing on the current manpower and organization of TRC, the issues for implementing railway project in the future are summarized below.

Issue 1: Re-organization of the Current Organization

No clear answer has been obtained in regards to what organizational structure TRC intends to operate SGR and MGR in the future.

However, in order to plan and manage modernized electrified railway, it is essential to enhance and reorganize the organization structure, such as recruiting staffing, establishment of new technical departments, and capacity building of engineers, in order to solve the issues shown in Table 5.2.

Issue 2: Elimination of the Staffing Shortage

According to the organization system of urban railways in other cities such as Panama Metro etc., for example, the number of people required for planning, construction, and operation of urban railways varies depending on the length of the railway lines and the number of stations and the train composition to be operated. However, the number of persons required for the planning, construction, and operation of urban railways is approximately 30 for planning, 50 to 100 for designing, and 500 for operating. This number excludes consultants and contractors.

In contrast, the current TRC have a shortage of staff members involved in new projects (nine Civil Engineer and two Surveyor members only) for the development of urban railways in the future, and thus the issue is to recruit new staffs.

Issue 3: Recognition of the Land Acquisition Risk

From the results of TRC F/S reviews, many staff members of TRC may not be aware of the risks of land acquisition. This is due to the less experiences so far. In reality, it may not take time to acquire land because land belongs to the Tanzanian government, but it is assumed that a certain amount of time will still be required for TRC F/S route plans to pass through many residential areas. (Reference: In TANROADS F/S covered by this survey, there are many relocated houses in the initial plan, so the design is being reviewed.) Therefore, it is an issue to recognize the risks of land acquisition, and a route plan based on the risk needs to be updated.

Issue 4: Learning the basic for electrified railway planning

Knowledge of electrification facilities is insufficient because non-electrified trains have been operated until now and found that TRC has an assumption that electrified trains can run on the SGR track without any additional installation through questionnaires and interviews. For running of electrified train, feeder line and substation facilities, equipment of depot, and preparation of Operation Control Central (OCC) are necessary. Civil engineers and architects who are familiar with the functions of stations of urban railway are also indispensable for the planning of stations and structures. The participation of engineers who understood the operation is also necessary for the planning of depot and various railway facilities. To learn the basic plans for electrified railway planning is an issue. Since there is no experienced personnel in Tanzania, it is important for them to learn overseas cases including Japan.

Issue 5: Learning the Know-how of Urban Railway Operation and Maintenance

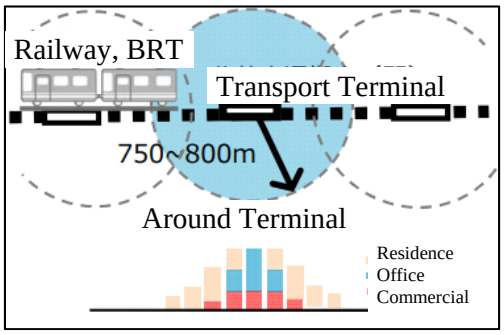
Currently, only one round trip is operated per hour, and there is no experience in the operation and maintenance of urban railways as a high-frequency mass transportation system with about 12 trains (5 minute headway) per hour within a specific area. Therefore, it is necessary to learn the know-how of urban railway operation and maintenance before opening urban railways. It is also important to learn overseas cases including Japan.

CHAPTER 6 STUDY POLICY AND RESULT OF TERMINAL DEVELOPMENT PLAN

6.1 Necessity of TOD

Terminal development as used in this report is defined as a term that includes development of public transport station facilities and surrounding urban development projects. Generally referred to as TOD (Transit Oriented Development), the basic concept of TOD is to improve accessibility to public transport station and surrounding spaces with other modes of transportation, and to promote urban development around stations.

The concept of TOD is to form a compact city by focusing on commercial buildings and residences around public transportation stations, aiming of modal shift. Considering the traffic situation in DSM and population growth in the future, it is necessary to switch from urban structure with private traffic to urban structure with a focus on public transport, as indicated in the Revised M/P. The area covered by TOD concept is considered in a walking area from the terminal station, in some cases, which refers to the development of a station area within a range of about 400 m to 1 km. In the figure below, the station area is set within the range of 750m to 800m.



Source: MLIT

Figure 6.1 Idea of Transit Oriented Development

In Japan, urban development has been promoted in line with the railway business. In Japan, private companies have been promoting the integrated development of railway lines and urban development to secure stable profits for the railway business. In recent years, due to the urban sprawls, demand for the compact cities that will contribute to limiting the use of private vehicles is increasing. The government supports TOD by giving incentives to promote TOD more effectively.

In other countries, railway development and urban development have not been promoted in cooperation with each other, thus there are several cases where the connectivity among different transport modes is missing. In order to improve users' convenience, seamless connectivity of the public transport stations is required.

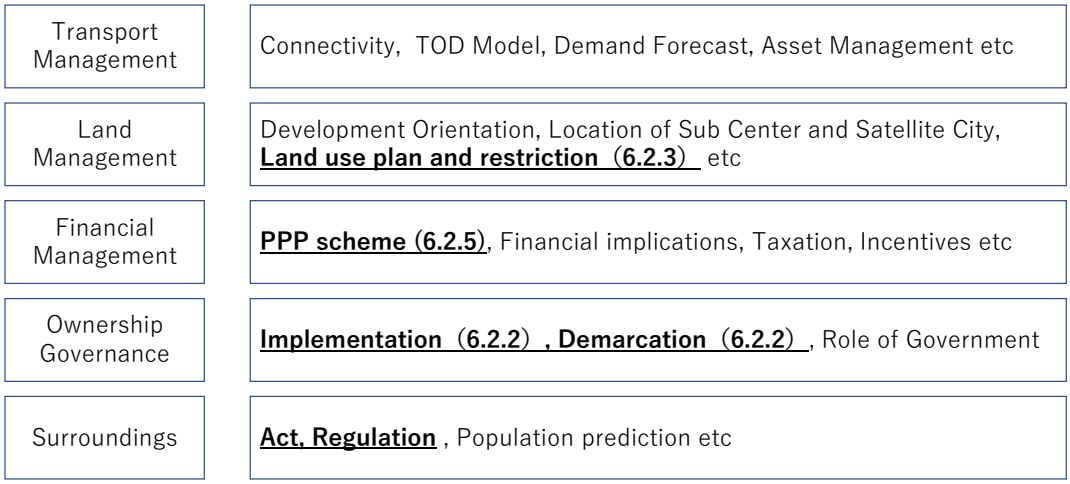
To that end, the merits of implementing TOD are summarized below. In particular, the merit of traffic congestion mitigation is an important point considering future population growth of DSM.

- The business performance of public transport will be enhanced since it is possible to secure public transport users.
- By integrating public transport projects and urban development projects, the profits from urban development projects can be used for the development of public infrastructure and urban development.
- The use of public transportation can be promoted; therefore, private traffic can be reduced. It will contribute to the effect of alleviating traffic congestion and reducing air pollution.
- Commercial agglomeration can be expected, leading to efficient economic activities.
- Commercial areas and transportation nodes are located within walking distance, promoting walking and contribute to health promotion.

6.2 Consideration on Terminal Development and Urban Development

6.2.1 Study Items

The following items are listed in the Revised M/P regarding the necessary items for promoting TOD. In this survey, general information was collected which is necessary for implementing TOD, not limited to specific locations. Therefore, the current status of the necessary licensing procedures and implementation systems related to urban development and the legal system related to PPPs were reviewed.



Source: JST

Figure 6.2 Necessary Consideration for TOD

6.2.2 Organization related to Terminal Development

TOD needs to be implemented with collaboration between the public and private sectors. In the Revised M/P, Dar es Salaam City Council (DCC), Dar es Salaam Regional Administrative Secretary (DSM-RS), President Office, Regional Administration and Local Government (PO-RALG) and related organizations are mentioned as the government-executing agencies. The administration in DSM is ultimately decided by PO-RALG. The following organizations are related to TOD:

- ✓ MOLHHSD：Authority for city planning
- ✓ DCC: City planning, urban development, city bus (Daladala) terminal planning and landowners
- ✓ MCs : Issuance of building permits, planning within Municipality
- ✓ TANROAD: Main road owner, maintenance and maintenance, maintenance of BRT facilities
- ✓ TARURA: Branch road owner, development and maintenance
- ✓ DART: Control of BRT operation
- ✓ TANESCO: Electricity supply agency
- ✓ TPDC: Gas supply agency
- ✓ TTCL: Telecommunication supply agency
- ✓ DAWASA: Water supply agency

6.2.3 Urban Development Scheme

(1) Planning Scheme

In general, in order to obtain a development permit, it is necessary to acquire land use approval and building approval. First, in order to obtain land use approval, it is necessary to be consistent with the land use plan. The classification of the land use plan is as follows.

- General Planning Scheme: Urban planning in wider area
    - Master Plan : urban plan for DSM, Dar es Salaam Master Plan 2012-2032 (DSM MP 2012-2032) is included.
    - Interim Land Use Plan：Land use plan summarized by each MC and District Council
- Detailed Planning Scheme: Land use plan in certain area in the Interim land use plan, plot level planning. It needs to be updated every 5 years.
    - Redevelopment Plan：Objective is to convert to high density development.
    - Renewal plan for squatter
    - Layout Plan

However, DSM has no city-wise master plan at present. Although there was a city master plan with a target years of 1979-1999, there has been no government-approved master plan after the target year of 1999. Regarding DSM MP 2012-2032, it is currently in the process for government approval. The Revised MP will be approved by MOLHHSD through the process. As of February 2020, JST collected information that Permanent Secretary is in the process of approving the plan. Each MC has not been able to summarize an Interim Land Use Plan because there is no upper plan. However, it is legally possible to create a Detailed Plan without an Interim Land Use Plan. Therefore, each MC has controlled land use by creating a Detailed Plan with reference to the DSM MP 2012-2032, which has not been officially approved. Therefore, at the interview with Kinondoni MC, they had the opinion that the content was consistent with the DSM MP 2012-2032.

On the other hand, the problem in the city is that many people illegally set up houses without complying with the Layout Plan. About 70-80% of DSM is unplanned land use. Once settled, compensation will be required. Therefore, it is a problem in DSM that development cannot be easily carried out.

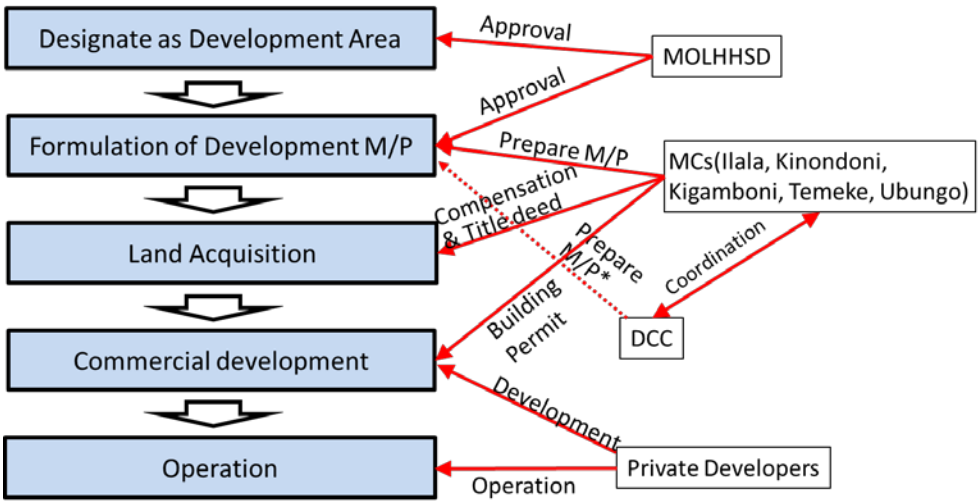
Land use regulations basically correspond to the laws of Tanzania. Each MC have individual development regulations by establishing ordinances (Bylaw). All of the above land use plans require MOLHHSD approval.

In addition, it is also possible to change the land use specified in the layout plan, MC has approved the change of land use in each parcel. When changing the land use, the approval procedure is performed by the UPC (Urban Planning Committee) in each MC.

As for building permit, it is basically the responsibility of each MC, thus DCC and MOLHHSD do not issue building permits. Building application is reviewed based on the Urban Planning Regulation 2018, an appendix to the Urban Planning Act 8 of 2007. There is no difference in the responsible organizations and required permission depending on the scale of development.

The procedure of the land development is summarized below. The development process is divided into (1) land acquisition and (2) building application. (1) For land acquisition, it is necessary to obtain title deeds for real estate from MC. Land acquisition should be carried out by those who wish to occupy the land. If a public facility is planned, the MC may carry out land acquisition. (2) When applying for a building permission, a person applying for a building must first submit to the MC an application form that specifies information such as the area of the development, the purpose of the building, and the owner of the building. Upon receiving the application, a technician at the MC makes

a request to the Technical Committee for approval. For the approval, site visits and confirmation of consistency with the land use plan shall be reviewed. When a building permit is granted, the developer must pay the application fee.



Source: JST

Figure 6.3 Flow of Urban Development

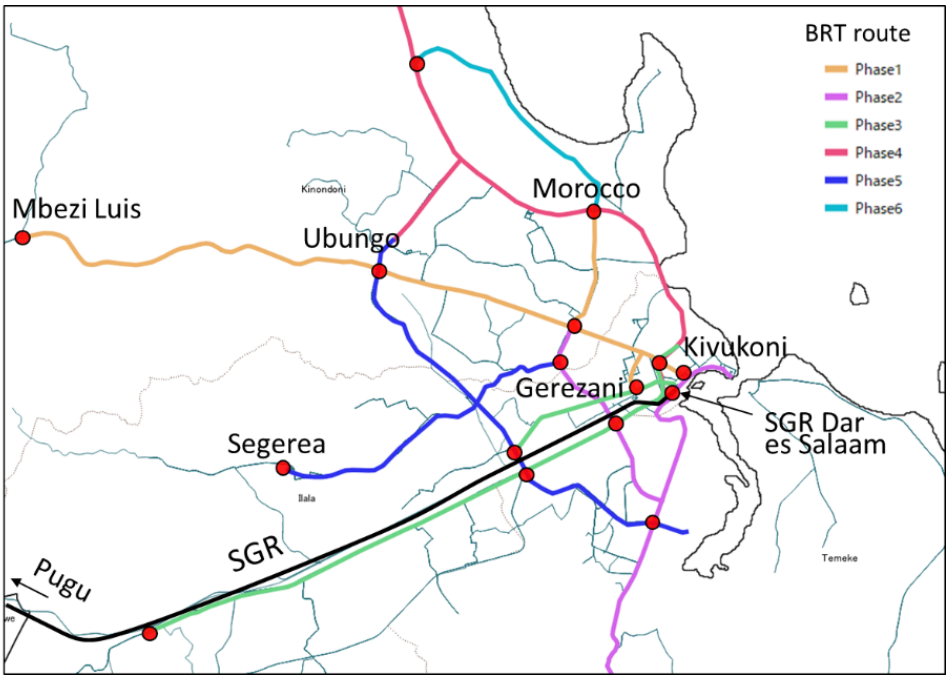
(2) Land Lease Period

Generally, when a private sector occupies land, land lease period is divided into three categories: 33 years, 66 years and 99 years. Generally, 33 years is for residential use. Educational facilities, commerce, offices and industries have a 66- or 99-year periods. After those periods, the land will be returned to the government. However, there are some cases which MCs have established ordinances and set a certain land use period as a special case.

6.2.4 Existing Public Transportation and Future Plan

(1) BRT

The required condition for terminal development site is that it is a transportation node on the public transport network. The following shows the BRT implementation plan. The BRT is planned until Phase 6 to date, and further extension from the 6-phase route is also being considered. The donor of each phase is shown below. In particular, as described in Section 3.2.3, the World Bank is currently formulating a corridor development strategy in the DMDP along the Phase 1 line. In the phase 2 supported by the AfDB, the study on TOD is underway with PO-RALG.



Source: DART

Figure 6.4 Development Plan of BRT

Regarding the current situation of the BRT project, Morocco Station is the terminal station of BRT Phase 1. There is a city bus terminal (daladala) next to the BRT station, making it easy to transfer between city bus and BRT. At Ubungo terminal, there is a city bus terminal next to the BRT station.

Figure 6.5 Morocco Terminal

Figure 6.6 Ubungo Terminal

At the site of the Ubungo Bus Terminal, East Africa Commercial and Logistic Center is planned, involving TANNROAD, DART, DCC and Chinese companies. Also, BRT depot and BRT terminal which connect for phases 1 and 4 and 5 are planned. DART will operate and maintain the planned BRT facilities. TANROAD will also be involved in the design and construction management of the BRT facilities.

Commercial facilities are also planned in the existing Ubungo bus terminal. It has 3,550 stores and 5,000 parking lots, and DCC will manage the building because it is the land owner.

Source: Revised M/P

Figure 6.7 Development Plan at Current Ubungo Bus Terminal

(2) City Bus (Daladala)

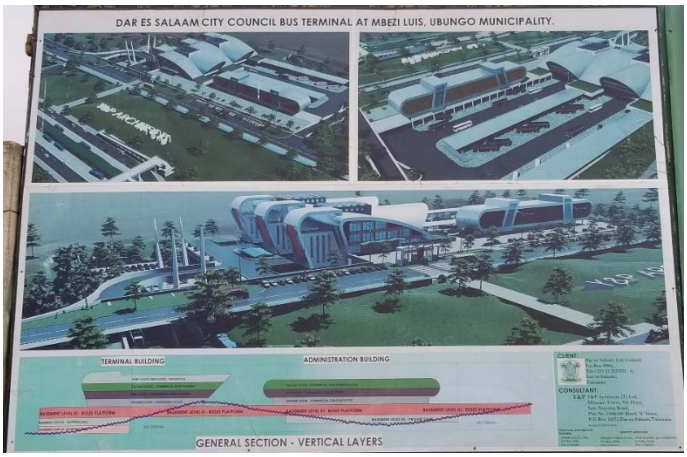
Major city bus terminals are listed below. Of the following, Ubungo Bus Terminal is scheduled to relocate intercity buses terminal and build BRT stations and commercial facilities. Intercity buses will be relocated to Mbezi Luis.

Table 6.1 City Bus Terminal in DSM

Type of Bus	Terminal
City Bus Daladala	Inside CBD (4): Posta, Mnazi Mmoja, Muhimbili, Stesheni along Bagamoyo Road (3): Makumbusho, Mwenge, Tegeta along Morogoro Road (2): Simu2000, Mbezi along Nyerere Road (2): Buguruni, Gongo la Mboto along Kilwa Road (2): Temeke, Mbagala

Source; JST

At Mbezi Luis, terminal facility is under construction apart from the existing bus terminal location.



Source: JST

Figure 6.8 Bus Terminal at Mbezi Luis

(3) Railway

In the project of SGR construction, a station facility with commercial spaces is under construction at Dar es Salaam station. For the station facilities, the first and second floors will be used as SGR and MGR station, and the third and fourth floors will be used as commercial spaces where restaurants and kiosk are planned. TRC owns the land and buildings, and TRC plans and negotiates tenants. Tenants need to pay rent to TRC, so that TRC can earn revenue other than railway fare. It is also planned a station facility at Pugu Station that has the same commercial space as Dar es Salaam Station.

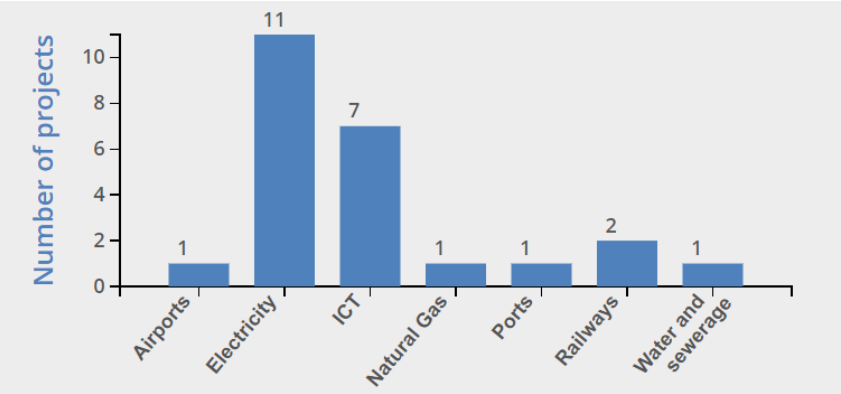
When implementing TOD, TRC may be involved in real estate development around railway stations.

Source: JST

Figure 6.9 Development Plan of Dar es Salaam Station of SGR

6.2.5 Current Situation of PPP

This section describes the current condition of PPP law and scheme. First of all, the projects of PPPs in Tanzania are summarized. According to the World Bank's PPI database, Tanzania has 23 PPP projects (1990-2019), with the largest number in the power sector. In each case, companies from outside Tanzania are participating, and there are few cases where companies in Tanzania participate. According to PO-RALG, all of PPP projects are solicited projects, and there is no experience of unsolicited project up to now.

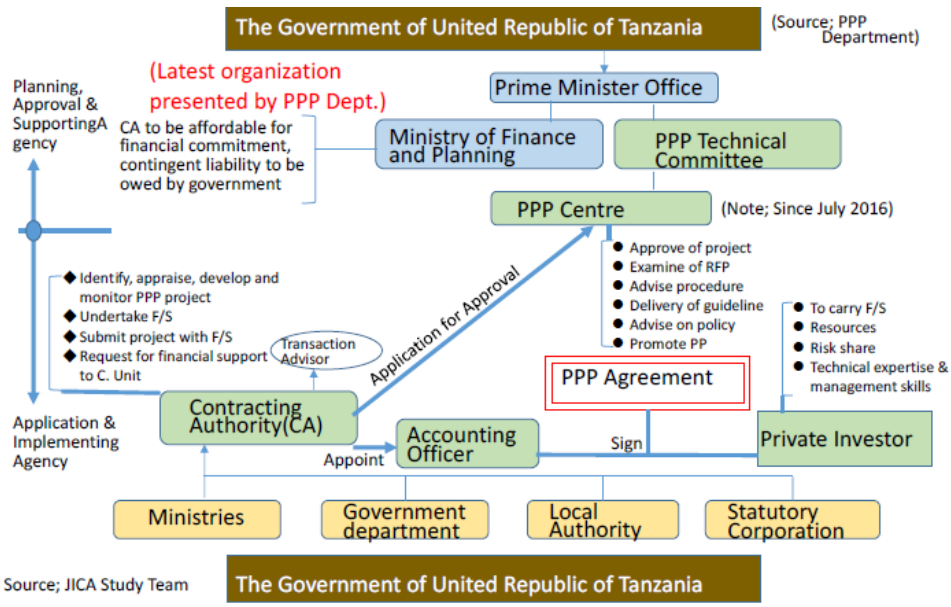


Source: PPI database

Figure 6.10 PPP projects in Tanzania by Sector

(1) Flow of PPP Project

In the PPP Act and PPP Regulation, the following procedures are indicated to implement PPP project. First, a Contracting Authority (CA) will be appointed on behalf of the government agency to sign the PPP Agreement. Between the CA and the private sector, the PPP Agreement will be concluded. PPP agreement describes the implementation period, the risk sharing between the public and private sectors, the asset amortization after the PPP agreement is completed, the private company's actions, distribution of revenue, etc.

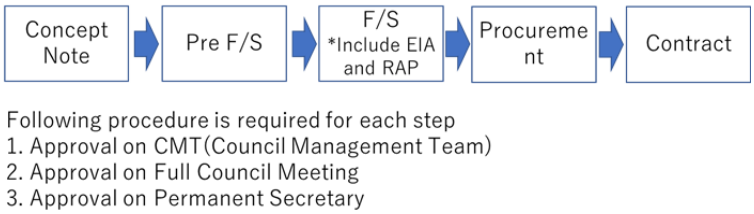


Source: Revised M/P

Figure 6.11 Procedure of Implementation of Infrastructure Projects by PPP scheme

The figure above shows the role of each organization in PPP projects. Flow of PPP approval is described using an example where the MC (Municipal Council) is the CA and applying infrastructure development.

As shown in the figure below, after concept note submission to PPP center, the pre-F/S and the F/S are approved, and the procurement process of the private company is started. In the implementation phase after contract agreement, contract management and management for contract changes and agreements at the end of the PPP contract are defined.



Source: JST

Figure 6.12 Flow of PPP Approval

At the stage of Pre F/S, market hearing shall be conducted to hear the interest of private sectors. At the F/S stage, the purpose of F/S is to determine whether the PPP project is really financially feasible. The contents of the F/S report are as follows in the Revised M/P. When approving a PPP project, the purpose and scope of the project must be clear, and it must be considered on political, economic, environmental, and legal systems. It is required that the business plan is reasonable from the viewpoint of financial analysis.

(a) Identify/define activities to outsource private party
(b) Assess the impact for Government on staff, assets, liabilities and revenues
(c) Assess the need for the Government on activities
(d) Demonstrate advantage of strategic and operational benefits under PPP Agreement
(e) Describe (1) contracting authority's functions (2) the extent to which such functions can lawfully and effectively performed by private
(f) Demonstrate that PPP Agreement shall;
  i) Affordable to the contracting authority
  ii) Provide VFM
  iii) Transfer appropriate technical, operational or financial risks to private sector
(g) Explain the capacity of the contracting authority to effectively enforce the PPP Agreement
(h) Asses the capacity, resources and ability of private

Public and private risk sharing is determined based on the results of financial analysis. One of the criteria for determining the feasibility of a project is the internal rate of return, and in Tanzania 20% IRR is required for projects in any field. This is a criteria determined taking into account the interest rates from commercial banks.

When the feasibility study is completed, next step is the procurement stage of the private sector. In procurement, it is necessary to open tender and evaluate bidders. At present, there is no uniform standard for evaluating private companies in Tanzania. According to an interview with PO-RALG, evaluation criteria is under preparation which all of CAs can refer. Therefore, the summarization of evaluation criteria is urgently needed to promote transparent PPP tender.

The approval procedures for each of the concept notes and pre-F/S are stipulated to follow the same procedure. First, the document shall be reviewed in the Council Management Team (CMT) which all of department's head are present. After the approval of the CMT, it will be approved by a full council

meeting, which shall be held by the mayor, and then approved by the central government. The approval process of the central government means the approval process from the Permanent Secretary. In the approval process, PPP department shall check from the view point of finance, and PPP node in PO-RALG shall check technical matters.

The above is the procedure when MC becomes CA. If a national project is planned under PPP, the PPP Technical Committee will be involved in the approval process.

(2) Laws and Regulation of PPP

Laws and regulations related to PPP are PPP Act 2018 and PPP Regulation 2020. The PPP Act 2018 is an update law of the PPP Act 2010 and the revised version 2014. The Revised points are described below.

Regarding PPP-related organizations, the PPP Act 2010 described the PPP Coordination Unit. However, the organization was changed to a PPP Center since the PPP Act 2018. All PPP projects are to submit concept notes and Pre-FS survey results to the PPP Center. The materials received shall be reviewed by the PPP Center and then submitted to the PPP Steering Committee. The roles of the PPP Center include:

- Mobilize resources for project development and government support to PPP projects
- Develop a mechanism to ensure that all local government and central government integrate PPP into their sector strategies and plans
- Develop operational guidelines for CA
- Design and implement a fair, transparent, competitive and cost effective procurement process
- Deal with fiscal risk allocation and other financial matters of all PPP projects
- Advise CA on all matters relating to PPP projects
- Provide technical assistance to local government and central government
- Examine request for proposals to ensure conformity with the approved feasibility study
- Ensure relevance and adequacy of proposals submitted to it by CA
- Monitor, review and evaluate implementation of PPP Facilitation Fund
- Monitor and evaluate the performance of the PPP projects and prepare periodic performance report
- Design and implement programs for PPP capacity building to public & private sectors
- Develop and implement programs intended to promote public awareness on PPP
- Undertake research on PPP

A description of the Facilitation Fund has been added as a budget to be executed by the PPP Center from the PPP Act 2018. The purposes of the Facilitation Fund are listed below. Contribution of funds requires the approval of the PPP Steering Committee.

- Financing fully or partly the feasibility study and other projects preparation costs as may be required by a CA
- Providing resource to enhance the viability of projects which have high economic benefits that have been demonstrated to be of limited financial viability
- Any such other purposes as may be prescribed in the regulations

The next revision is the clarification of the role of the government and private sector in PPP. In addition, the description has been added for unsolicited projects proposed by private companies.

6.3 Issues in Collaborating Terminal Development and Urban Development

The current situation in Tanzania has been described above. The issues for terminal development are summarized below.

Issue 1 : Lack of upper level plan:

Current situation: In order to link terminal development and urban development, it is necessary to have an integrated urban plan. To this end, upper plan should summarize the development plans around the terminal along the public transportation corridor for the reference by individual plan. Because upper level plan stipulates the policy for entire city and consider harmonization with terminal area and its surrounding area. However, DSM MP 2012-2032, which is the upper level plan, has not been approved by the government at this time.

Issue: It is desirable to consider the policy of DSM as a whole and then proceed with the terminal development.

Related Organization: DCC, PO-RALG, MOLHHSD

Issue 2 : Low-density urban development:

Current situation: Many low-rise houses is found in DSM. Because there are many unplanned land use areas in the city and land use was not be controlled, there are areas where many low-rise houses are located. It is also pointed out in the World Bank's Corridor development plan.

Issue: It is needed to control land use of low density development around the terminal. By increasing the density, it is possible to increase the resident in the station area and increase the number of railway users.

Related Organization: DCC

Issue 3 : Responding to unplanned settlements:

Current situation: approximately 70% of DSM is unplanned settlements, and government agencies have not been able to regulate land use. In order to realize integrated urban development and terminal development, it is necessary to regulate land use by government agencies. Several agencies mentioned that the land is basically owned by the Tanzanian government, thus there is little hindrance in conducting land acquisition.

Issue: Regulation and incentives are important factors for urban development around the terminal. It is desirable that these rights will be strengthened.

Related Organization: MCs, DCC, MOLHHSD

Issue 4 : Insufficient schemes for infrastructure development:

Current situation: In order to carry out integrated development, large-scale areas need to be acquired and the costs for infrastructure development will be high.

Issue: A mechanism for efficient infrastructure development is needed. For example, a land readjustment (LR) can secure public land such as roads and open spaces while protecting the authority of people who occupy the land. On the other hand, if the concept of land value capture (LVC) is introduced, it is possible to use a part of the profits from urban development for financing public infrastructure development. Also, applying the concept of Transferable Development Rights (TDR), floor area ratio can be transferred. It encourages investment by private sectors.

Related Organization: MCs, DCC, MOLHHSD

Issue 5 : Lack of an organization structure for TOD project:

Current situation: Organizational issues generally require the coordination between railway business and urban development projects. However, in many countries, coordination between the two sectors is controlled by separate organizations and vertically divided. Accordingly, coordination is not enough. Since TOD integrates urban development projects with public transportation development, coordination of related organizations is important.

Issue: It is important to clarify the role of the organization in charge of urban development and the organization in charge of public transportation. And it is important to set the special organizations for TOD, such as task force or committee, in order to promote TOD efficiently.

The reasons are described below. One of the features of TOD is the “integrated development” of terminal facilities and surrounding areas. The difference from “individual development” is common infrastructure development. The “integrated development” can promote the common infrastructure development such as affordable house and common parking space etc. It is possible that specific agencies will be responsible for the development of infrastructures shown in the table "Discussion is required". However, common infrastructure will be borne large financial burden. Therefore, it is desirable to work across the organization.

The second reason is that it is necessary to formulate a plan for TOD. To create a blueprint, it is necessary for several related organizations to participate and finalize the plan.

Table 6.2 Related Organization for Terminal Development

Land Use	Components	Organization
Office		Private Sectors
Retail		Private Sectors
Condominium, Residences（for medium and high income）		Private Sectors
Affordable house（for low income level）		Discussion is required
Terminal facility	Railway Station	TRC
	BRT Station	TANROAD (Construction)、DART(Operation)
	Bus Terminal	DCC
	Station plaza, park & ride	TRC, TANROAD, DCC
Terminal connection	Connection among station and surrounding buildings（i.e. skywalk in Bangkok）	Discussion is required
	Common Parking	Discussion is required
	Taxi pool	Discussion is required
Road		TANROAD, TARURA
Utility		TANESCO, TPDC, TTCL, DAWASA

Source: JST

Related Organization: No specific organization

Issue 6 : Increased automobile traffic:

Current situation: In some cases, residents along the railway are using their private cars since residents are rich and afford to have their own cars. The purpose of urban development around the terminal is to prevent the traffic congestion by modal shift to public transport, and to secure the profit of public transport.

In Dar es Salaam City, although BRT is currently operated, housing development is not being planned intensely at the BRT corridor. As mentioned in Chapter 3, there is a concern that high-income people live at the newly developed houses since only a limited people can pay the rent with market price.

Issue: It is necessary to promote the use of public transportation around the terminal. TRC F/S promotes TDM measures. The World Bank's BRT Phase 1 Corridor Development Strategy indicates that the developed profits will be used to finance affordable housing, with consideration to becoming a resident of various income levels.

Considering the traffic situation in DSM and population growth in the future, it is necessary to switch the urban structure from structure mainly relies on car traffic to urban structure mainly on public transport as shown in Revised M/P. Otherwise future traffic volume will exceed the road capacity.

Related organizations: DCC, MOWTC, police

Issue 7 : Lack of Support for private sectors in PPP:

Current situation: PPP may be applied to promote urban development around the terminal. However, there are few PPP cases in Tanzania in the transportation and urban development sectors.

Issue: It is necessary to increase PPP cases. In addition, since the details of compensation provided by the government are not clear, it is necessary to clarify the details of compensation to private sectors. For example, the BRT phase 1 is reconsidering the contract between the current operator and DART, and changing to a form of payment that secure profits for private operators. As a result, it is expected that the demand risk will be handed over to the government, and by increasing the number of such cases, the obstacles to PPP are expected to be reduced.

Related organization: PO-RALG, MOFP

CHAPTER 7 THE WAY FORWARD

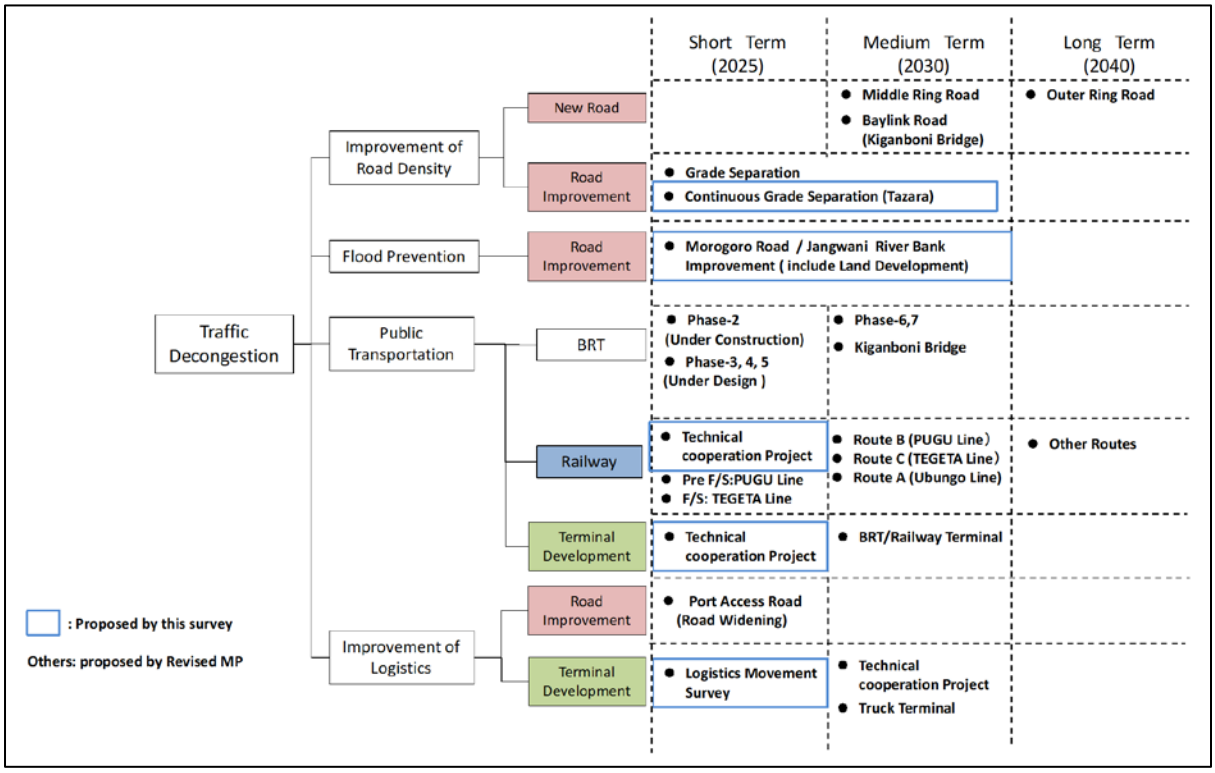
7.1 Measures for Alleviation of Traffic Congestion

This survey aims to confirm the cooperation policy of JICA for traffic alleviation in DSM based on the Revised MP. Table 7.1 and Figure 7.1 show the required measures to alleviate traffic congestion in short, middle and long terms.

Table 7.1 Measures for Alleviation of Traffic Congestion

Objective	Effect
Improvement of road density	Alleviation of traffic congestion is expected by the formulation of appropriate road network and elimination of bottle neck.
Flood disaster prevention	Road closure and traffic diversion caused by flood worsen road congestion in rainy season. Reduction of flood risk contribute to alleviation of congestion in rainy season.
Modal shift to public transport	The development of road alone cannot cope with increasing traffic demand. Through enhancement of public transport by upgrading network and improving accessibility and convenience, decongestion of traffic can be expected.
Freight traffic improvement	Due to freight traffic from Dar es Port, roads around the port have a high rate of heavy vehicles, which causes traffic congestion. By the study on the freight traffic flow and developing truck terminals and improving roads for logistics, inflow of trucks into urban area can be reduced and traffic congestion will be alleviated.

Source: JST



Source: JST

Figure 7.1 Measures to Alleviate Traffic Congestion in Short, Middle and Long Term

7.2 Road Sector

7.2.1 Project Proposal

(1) Project Proposed by Revised MP

Table 7.2 shows the projects proposed by Revised MP.

Table 7.2 Projects proposed by Revised MP

Type	Project Name	Location / Priority Rank	No. of Carriageway	Work Type	Length (km)
New Development	Outer Ring Road		4	New	77.5
	Middle Ring Road		4	New	48.3
	Bay Link Road/ Kigamboni Road		4	New	46.7
Improvement of existing arterial road	Widening of Old Bagamoyo Road	Mbezi Beach	4	Widening (2 lane to 4 lane)	9.9
	Improvement of Morogoro Road	Msimbazi Basin (Jangwani river)	4	Widening (2 lane to 4 lane)	11.9
	Widening of Mandela Road （Port Access Road）	Dar Port – TAZARA	6	Widening (2 lane to 6 lane)	9.1
Improvement of existing collector road	Upgrading of Existing Road Inside Mandela Rd.	Inside Mandela Rd.	2	Upgrading (Paving)	73.8
Intersection Improvement	Tazara-Buruguni Tunnel	Priority Rank: High	-	Tunnel	-
	Mwenge	Priority Rank: High	-	Flyover	-
	Morocco	Priority Rank: Middle	-	Flyover	
	Magomeni	Priority Rank: Middle	-	Flyover	

Source: Revised MP

(2) Issues and Countermeasures

Table 7.3 shows immediate issues and their countermeasures in road sector extracted from the Revised MP and this survey.

Table 7.3 Issues and Countermeasures in Road Sector

Issue	Countermeasure	Objective
Reinforcement of road function	Grade separation of junction	Elimination of bottleneck
	Improvement of river bank and elevation of road level	Resolution of road closure caused by flood
Improvement of freight traffic	Road development for heavy vehicle	Streamlining of freight traffic
	Logistic movement survey	Clarification of freight traffic

Source: JST

(3) Project Proposal by This Survey

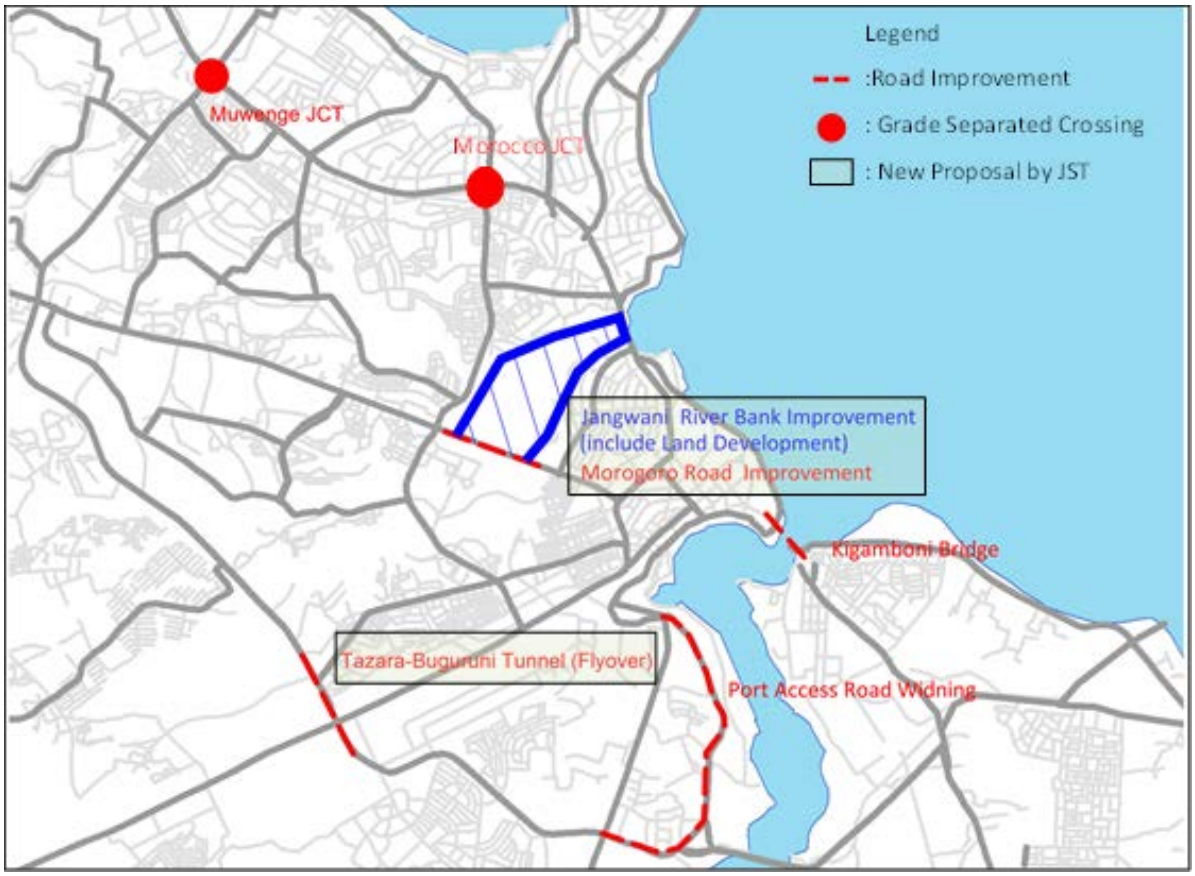
The projects shown in Table 7.4 are the candidate projects in middle and long term based on the projects proposed by Revised MP and the result of this survey. These projects need to be discussed and examined by relevant authorities hereafter.

Table 7.4 Candidate Projects for Traffic Improvement

Type	Project name	Work Type	Objective
Development /improvement Project	Grade separation of Mwenge Junction	Flyover	Improvement of junction capacity
	Improvement of north part of Port Access Road	Widening	Streamlining of freight traffic
	Continuous grade separation of Tazara-Buguruni Junction	Underpass	Improvement of junction capacity
	Grade separation of Morocco Junction and development of	Flyover Terminal	Improvement of junction capacity, modal shift to public transport

	terminal	development	
	Grade separation of Morocco Junction and Magomeni Junction	Flyover	Reinforcement of fuction of ring road, improvement of junction capacity
	Jangwani River bank improvement and Morogoro Road improvement	Raising ground elevation	Anti-inundation
	Development of Kiganboni Motor and BRT Bridge (Request by DART)	Long-span bridge, BRT line	Modal shift to public transport
Technical Cooperation	Study on freight transport in DSM	Study	Comprehensive improvement of freight traffic

Source: JST



Source: JST

Figure 7.2 Location Map of Proposed Projects

(4) Development/improvement Project

1) Grade Separation of Mwenge Junction

Mwenge Junction flyover is a high priority project and can be separated from other projects. The project cost of 3 to 3.5 billion is comparatively low. Hence, early implementation is expected.

2) Improvement of North Part of Port Access Road

According to the analysis for improvement of Tazara Junction, it became clear that grade separation alone cannot alleviate congestion and measures to disperse the traffic from Dar es Port are required. Traffic analysis by the Revised MP shows most of freight traffic has its origin and destination inside DSM and freight traffic from Dar es Port has its destination inside the city. Currently, Nelson Mandela Road via Tazara Junction is the only route for the traffic moving from/to the port. Therefore, the widening of the north part of Port Access Road will provide a diversion route to the traffic from/to the port, and relieve the congestion of Nelson Mandela Road.

3) Continuous Grade Separation between Tazara-Buguruni Junction

Tazara Junction is still congested even after the completion of Tazara Flyover, hence alleviation of congestion is expected by grade separation as shown in 3.4. Near Tazara Junction, public transport lines, namely railway, SGR, and BRT, run in parallel and public transport terminal for BRT and SGR is envisaged as shown in 7.3. Promotion of modal shift to public transport and further alleviation of traffic is expected by integrated development of terminal and junction.

4) Grade Separation of Morocco Junction and Development of Terminal

Around Morocco Junction, development of public transport terminal for three BRT lines (Phase-1, Phase-2 and Phase-3) and high priority rail line, Tegeta Line, is highly effective. Therefore area around Morocco Junction is candidate development area of terminal in 7.3. Although improvement priority of Morocco Junction is No. 4, integrated development of junction and terminal will contribute to promotion of modal shift to public transport and thus decongestion of peripheral traffic.

5) Grade Separation of Morocco Junction and Magomeni Junction

Since Chang'ombe Junction will be improved by BRT Phase 3 project, by the improvement of Morocco Junction and Magomeni Junction, all the major junctions along the Kawawa Road will be grade-separated. Enhancement of function of ring road will alleviate the congestion throughout the city.

6) Jangwani River Bank Improvement and Morogoro Road Improvement

Morogoro Road near Jangwani River is repeatedly flooded and closed because of low altitude. By the elevation of road level, the issue of congestion by flood is solved.

(5) Technical Cooperation

1) Study on Freight Transport in DSM

In order to improve the freight traffic flow in DSM, a study on freight transport is proposed. Based on the analysis of freight movement, measures to improve logistical efficiency, such as development of logistics center and enhancement of co-operative transportation, are enabled.

7.2.2 Necessary Information for Project Implementation

Table 7.5 shows the additional necessary information for project implementation. For the improvement of junction, examination of final report of TANROADS F/S scheduled to be May 2020 is required and consistency with this survey should be confirmed.

Table 7.5 Existing and Necessary Information for Project Implementation

Major item	Item	Data	
Transport demand forecast	Traffic demand forecast	Revised M/P in 2030 and 2040 in DSM	Needs to be updated
Traffic condition	Junction traffic volume	TANROADS survey in 2017 8 junctions	Needs to be updated
	NMT traffic volume	N/A	Needs to survey.
	Traffic volume	Revised M/P in 2017. Traffic count 37 points, OD survey 7 points	Needs to be updated
	Congestion length	JST in 2020 8 junctions(Refer to P4-3)	Unnecessary
	Travel speed	Revised M/P in 2017. 12 route in peak hour.	Unnecessary
	SP/RP Survey	Revised M/P in 2017. 500 person (BRT and Railway)	Unnecessary
Maps	Cadastral map	To be obtained from Tanzani ILMIS, MOLHHSD	Collect to information on the target location.
	Aerial	To purchase the corresponding photograph	Collect to information on

	photograph		the target location.
	Flood MAP	WB survey in 2020	Unnecessary
Geology	Geological data	TANROAD conducted geological survey. Additional survey is required for structural design.	Needs to additional survey on bridge and underpass plan.
Utilities	Underground and overhead utilities	Documents related to utilities were requested to the following organizations: ✓ Electricity: TANESCO ✓ City gas: TPDC ✓ Communication cable: TTCL ✓ Water supply: DAWASA	Collect to information on the target location.
Topological survey	Topological map	TANROADS survey in 2017	Needs to additional survey on bridge and underpass plan.
Environmental Impact	ESIS	TANROADS survey in 2017	Needs to be updated
Cost	-	N/A	Needs to be updated
Economic analysis	EIRR, B/C, NPV	N/A	Needs to be updated

Source: JST

7.3 Railway Sector

7.3.1 Project Proposal for Railway Project Implementation

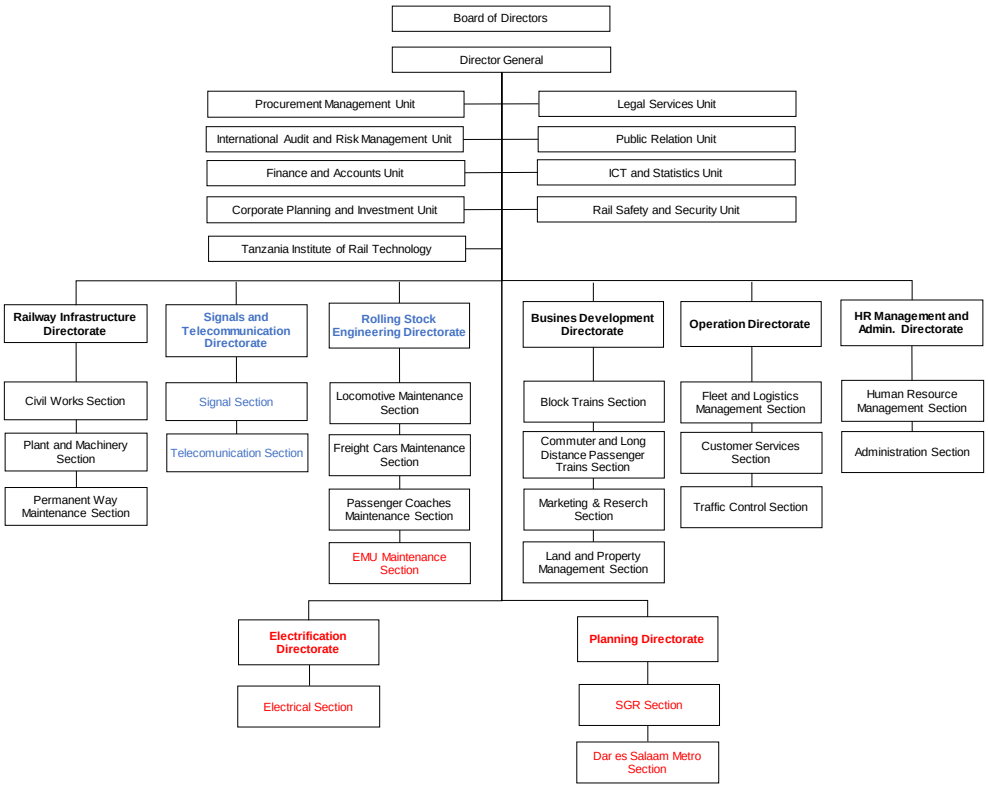
Issues and countermeasures which are described in Chapter 5 are summarized in Table 7.6.

Table 7.6 Issues and Countermeasures for Railway Sector

Issue	Countermeasure
Issue 1: re-organization of the current organization	Establish the new department and strength the management system
Issue 2: Elimination of staffing shortage	Appoint the experienced staff which has the transport related knowledge
Issue 3: Recognition of the land acquisition risk	
Issue 4: Learning the basic of the electrified railway planning	Capacity building by railway experts
Issue 5: Learning the know-how of urban railway operation and maintenance	

(1) Establish the New Department and Strength the Management System

For the operation and maintenance of SGR which is the modernized electrified urban railway, a number of experts and its independent department shall be required. Electrification Directorate and Rolling Stock Engineering Directorate, for example, is required before the SGR operation. In addition, no planning directorate/section exists at present; on the other hand, Railway Infrastructure Directorate is handling the planning substantially. Therefore, the establishment of the Planning Directorate is desirable. With regards to Signals and Telecommunication Directorate, since the required technology is different between signal and telecommunication, Signals and Telecommunication section should be divided to manage the modernized signal and the telecommunication. Under the above consideration, Figure 7.3 shows the new organization which is the proposal of JST. The comparison of current organization and proposed organization by JST is summarized in Table 7.7.



Source: JST
** Red colour means additional section, blue colour means re-organization and re-name.*

Figure 7.3 TRC Organization (JST Proposal)

Table 7.7 The Comparison of Current Organization and JST's Proposal

Directorate	Current Organization	JST Proposed Organization
Signals, Telecommunication and Electrification Directorate	Only "Signal and Telecommunication Section" is existed under the "Signals, Telecommunication and Electrification Directorate"	"Signal and Telecommunication Directorate" and "Electrification Directorate" shall be divided because of the different technical field. "Signal and Telecommunication Directorate" shall have "Signal Section" and "Telecommunication Section" to manage the modernized technology for SGR.
Mechanical Engineering Directorate	"Locomotive Maintenance Section", "Freight Cars Maintenance Section" and "Passenger Coaches Maintenance Section" are existed.	"EMU Maintenance Section" shall be required for SGR operation. The name of directorate shall be modified to "Rolling Stock Engineering Directorate" because the electrical engineering shall be required for EMU maintenance.
Planning Directorate	No planning directorate exists to conduct the study for new lines and Railway Infrastructure Directorate is handling the planning substantially.	It is preferable to establish the new "Planning Directorate" to focus on SGR extension and Dar es Salaam metro project.

Source: JST

In order to implement the railway project, management level of TRC shall recognize the necessity of the above reorganization and make action as so. Managers of each directorate shall also be recognize and enhance the capacity to educate and manage the staffs. Therefore, capacity building for management level shall also be required.

(2) Personnel Exchange between TRC and TANROADS/DART

TANROADS which is covering roads of 600 km long within DSM and implementing the road planning, design, construction and maintenance have the variety of common knowledge with railway sector such as transport planning, civil design, construction, maintenance etc. Although the current railway project of TRC is constructed within ROW, TANROADS has much experience in land acquisition and resettlement through the road widening projects and new road construction projects. Such experience and knowledge can be utilized for railway planning, design, construction and maintenance activity.

DART, which supervises the BRT operation, is operating the high frequency public transport and conducting the bus management, staff management and bus maintenance management with high frequency operation. Such experience can be utilized for the high frequency operation of TRC in the future.

In order to solve the issues of staff shortage of TRC and the recognition of the land acquisition risk, personnel exchange between TRC and TANROADS, DART so that the experience in risk of construction project, and public transport operation can be shared. In addition, recruiting the young engineer and educating to them internally may also help to eliminate the issues of staff shortage and capacity building of each staff. UDART is the subsidiary organization of BRT and driver and station services are outsourced; therefore, personnel exchange is not necessary at this moment.

(3) Capacity Building by Overseas Railway Experts

Technical transfer project is necessary to assist the railway planning and operation and maintenance technical by the overseas experts who has such experiences. The detail information is described in section 7.3.1 (5) below.

7.3.2 Potential Railway Projects and Proposed Technical Cooperation

(1) Outline

Potential projects for the financial support by development partners are classified in short, medium, and long-term projects as follows

Table 7.8 Priority Project

Short（～2025）	Mid（～2030）	Long（～2040）
・Technical Cooperation on Urban Railway ・Formulation of Implementation Structure	・Route B（Pugu Line） ・Route C（Tegeta Line） ・Route A（Ubungo Line）	・Other lines

1) Short Term Projects

As described above, existing organization of TRC is insufficient in terms of number of their staff due to the management of on-going SGR project. There is no staff who has experience on the planning of urban railway project. In terms of capacity, the staff does not have much experience on mid- to long-term planning and implementation. Therefore, if TRC is planning to operate MRT trains on the SGR track between DSM and Pugu as discussed in Chapter 3, a feasibility study by JICA is recommended to carry out detailed study as mentioned. Capacity building of TRC staff during the study shall be a scope of the work.

Technical cooperation from overseas countries including Japan is essential in the early stage of railway project implementation. Special technology and product procurement shall also be supported by overseas companies. Although outsourcing is an easy way to implement the project and necessary to get the assistance up to the construction completion, operation and maintenance shall be done by TRC themselves. According to the similar case of other countries' experience, the procurement cost will be extremely high due to the exclusive market. Therefore, JST strongly recommends to do the capacity building project and TRC can make the railway network plan, supervise the design and construction and conduct the operation and maintenance by themselves in the near future. If proper knowledge and experience are missing, the following problems will happen;

- Increased operation and maintenance cost
- Proper operation and maintenance cannot be done because the modernized electrified railway requires different know-hows compared to the current non-electrified operation.
- Proper supervision cannot be done even if TRC outsources the work.
- Competitiveness between manufacturers will be lost for extension and other line because the first manufacturer will be stronger.
- Difficulty in managing various organizations if there is no knowledge and experience because the railway project will require the general management involving many organizations.
- If there are accidents TRC must take responsibility, not outsource company because railway operation is the safety first philosophy.

Under the consideration of the above, capacity building is necessary through the technical transfer project.

2) Mid Term Projects

Although the highest priority is given to Route C (Tegeta Line) in TRC FS, implementation will be difficult due to the issue of land acquisition. If the space above Bagamoyo road is secured for the construction of MRT, as proposed in JICA Pre-FS, MRT project can be implemented.

Since TRC has 2/3 of the Route A (Mwanza – Ubungo – Tazara – Mbagara), it is not difficult to

start the implementation of the project. If the R.O.W. issue with TAZARA can be solved, a feasibility study by JICA can be implemented. If the R.O.W. issue cannot be solved with TAZARA, alternative route shall be planned.

Application of PPP scheme is often discussed on urban railway projects in many developing countries, however, success projects are very rare. Since the planning of urban railway project has just started in DSM, discussion of PPP scheme can be made at a later stage.

According to the alignment drawings of TRC F/S, all the routes are running at grade except limited CBD area. However, the period required for land acquisition and resettlement is not considered in the Implementation Program (Appendix J). Even though all the land belongs to the Government and the Government order is given for the land acquisition and resettlement along the planned routes, it may take years to clear more than 30m wide and 20 to 30km long R.O.W. for each route.

3) Long Term Projects

Other routes, Route D, E, F and G are not planned in detail in the TRCA FS. Those routes shall be studied in detail when passenger demands cannot be covered by BRT. Because there is no road available to visit the site, it is difficult to evaluate Routes D and G.

(2) Technical Cooperation

As mentioned in 7.3.1, establishment of the new department and strengthening of its management system will be required, therefore, JST will propose a capacity building project for management level and civil engineer.

At present, knowledge of urban railway planning, especially in electrification and elevated structure, is insufficient so the urban railway planning is too early to be carried out. First of all, the target of the technical cooperation section shall be Railway Infrastructure Directorate (Civil Engineer) which is the core of TRC. DG and manager of each directorate are also the target of the technical cooperation because of the understanding, early action, education etc.

The contents of technical cooperation project is shown in the box below.

Contents of Technical Cooperation Project

Overall goal: Promote urban development considering railway transportation in DSM.

Goal: The responsible department will be established and capacity of related organization will be strengthened regarding formulation of urban railway system

Target section: Civil Engineer (Planning, Design and Construction supervisor) and Management Level

Items :

- Assistance on urban railway construction plan by dispatching railway experts

  Assistance on summarization of construction plan for priority corridor, Route B – Pugu line and Route C – Tegeta line.

- Assistance on planning conversion / co-exist of BRT and MRT at the arterial road

  Road planning experts and urban railway experts will assist in the transition from BRT to MRT on arterial roads or the development of coexisting plans.

- Assistance on urban railway network plan

  Review the urban railway network proposed by TRC FS and support the development of more

feasible plans.

・Assistance on establishment of new department

Introduce the necessary resources and the method of operation and maintenance of MRT and modernized SGR to management level by the experience of Japanese railway operator. Assist the formulation of the action plan of operation organization establishment.

Capacity building to human resources from MOWTC, TRC, TANROADS, etc. through the above work and might possible to propose to establish an independent organization from TRC in charge of Dar es Metro construction when the Dar es Metro activity gets going.

Counterpart：

MOWTC、TRC

Output

・Summarization on detail survey plan for Pugu line and Tegeta line

・Capacity building on urban railway experts

・Proposal on the smooth transition from BRT to MRT

・Formulate the action plan of the establishment of new department

7.4 Terminal Development Sector

7.4.1 Suggestions for Terminal Development

Suggestions corresponds to section 6.2 are written in the following table.

Table 7.9 Issues and Suggestions

Issues	Suggestion
Issue 1：Lack of Upper level plan	Suggestion 1: Formulation of Urban Planning related to TOD
Issue 2：Low-density urban development	Suggestion 2：Incentives for Private Sectors
Issue 3：Responding to unplanned settlements	Suggestion 3: Study on Land Development Scheme such as Land Readjustment and Land Value Capture
Issue 4：Insufficient schemes for infrastructure development	
Issue 5：Lack of an organization structure for TOD project	Suggestion 4: Organize Implementation Structure
Issue 6：Increased automobile traffic	Suggestion 5: Promote Public Transportation Use
Issue 7：Lack of Support for private sectors in PPP	Suggestion 6: Development on PPP scheme

Source: JST

(1) Suggestion1: Formulation of Urban Planning related to TOD

To carrying out TOD, development of master plan is necessary in the target area. This is a guideline for realizing the TOD concept and guidelines for promoting integrated development. It describes measures to landscape design, implementation structure, and development concepts.

The items described in the master plan include the following. One of the features of TOD is that it can integrate urban development and public transport projects. In many countries, urban development and transportation projects are executed by different agencies, thus it is necessary to coordinate these various agencies. By clarifying the role of each organization, it is possible to the feasibility of TOD.

Although the World Bank is also considering the TOD, it is necessary to formulate a plan at the other candidate sites. In addition, a detailed study of implementation structure of TOD and the sharing risks among public and private should be done.

Table 7.10 Contents of TOD Master Plan

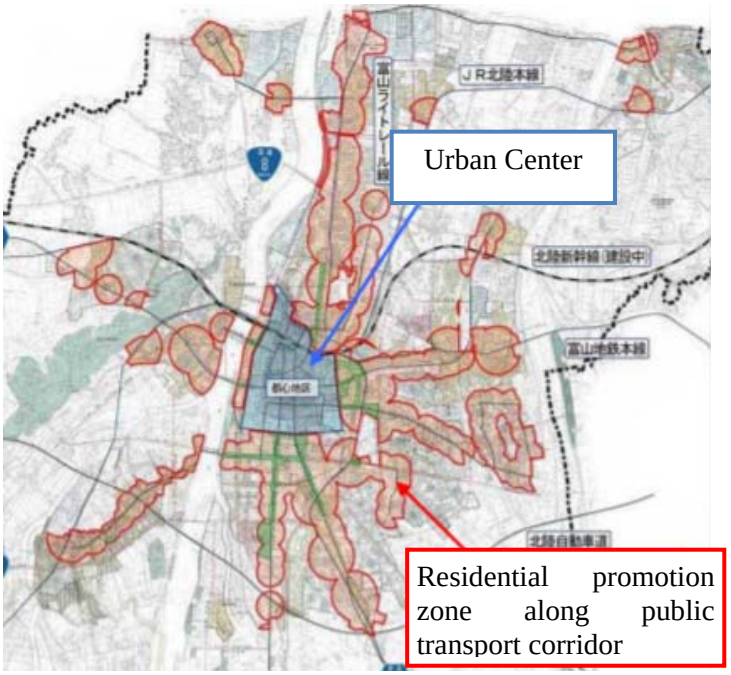
Category	Contents
Policy on TOD	Policy on TOD, Objectives, Goal of the Project
TOD location	Location of the priority place Development policy by location
Urban Development Policy	Land Use plan, Plot ratio, FAR, Maximum height, Parking regulation
Development Policy on Transportation Terminal	Station plaza Railway facility, BRT facility, Bus, Park & Ride facility
Development Policy by Mode of Transportation	Car：Pickup space, Road network, Parking space Bicycle：Cycle network, parking space, share cycle Pedestrian：Pedestrian way
Landscape Planning	Planting, architectural design and color, public infrastructure design
Implementation Methodology	Efficient measures to promote urban development, such as land readjustment and incentives for private sectors
Implementation Structure	Implementation structure, Role of each organization

Source: JST

Another recommendation is on the current status of land use planning. As mentioned above, individual development plans are being formulated and operated without upper level plan. However, the operation of the individual plan should consider future vision of the upper level plans. Therefore, it can be said that the approval of the DSM City needs to be issued.

(2) Suggestion 2：Incentives for Private Sectors

In Japan, the government has controlled land use through restriction and incentives. These are knowledge for promoting TOD in Japan, and it is valuable to study its applicability to Tanzania. For example, Toyama City is known for its compact city, and has set up a central city area and a residential promotion zone along public transport corridor, and has subsidized the construction and purchase of houses. Furthermore, in order to revitalize the central area, several facilities and public transportation network were improved. Therefore, it is important to provide incentives such as tax incentives and floor area ratio easing as to attract private investors. A possible measure is that the DCC or MC grants tax incentives or special leasing period.

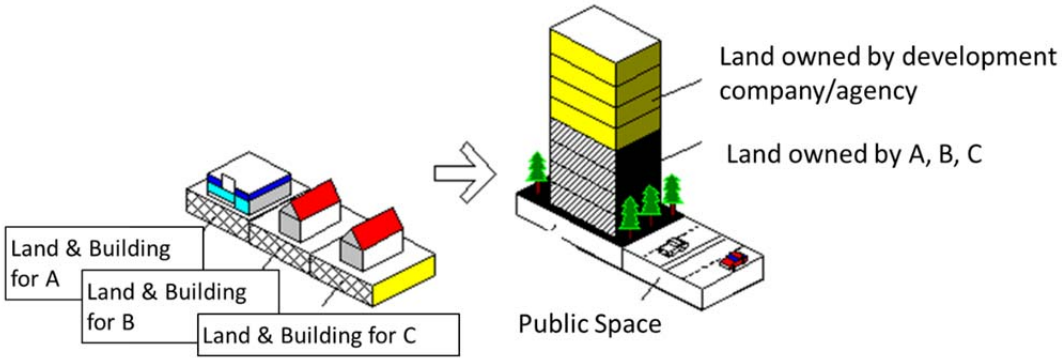


Source: Toyama City

Figure 7.4 Zoning to promote TOD in Toyama City

(3) Suggestion 3: Study on Land Development Scheme such as Land Readjustment and Land Value Capture

According to interviews with related organizations, several authorities pointed out that land acquisition was not difficult, because the land is owned by the Tanzanian government. However, difficulties can be expected when land acquisition is widespread or when land acquisition is performed in the city center. Therefore, it is desirable to consider a land acquisition mechanism such as a land readjustment scheme or an urban redevelopment scheme, both schemes have been performed in Japan, and secure space for infrastructure. The urban redevelopment scheme is to replace the right of the building owner before development with the right on the floor of a newly constructed building, as shown in the figure below. It is also necessary to consider measures to efficient urban development by land readjustment. Also, applying the concept of Transferable Development Rights (TDR), floor area ratio can be transferred. It encourages investment by private sectors. In the floor area ratio relocation, the unused FAR obtained from the current building that can be transferred on the site is used for new building construction.



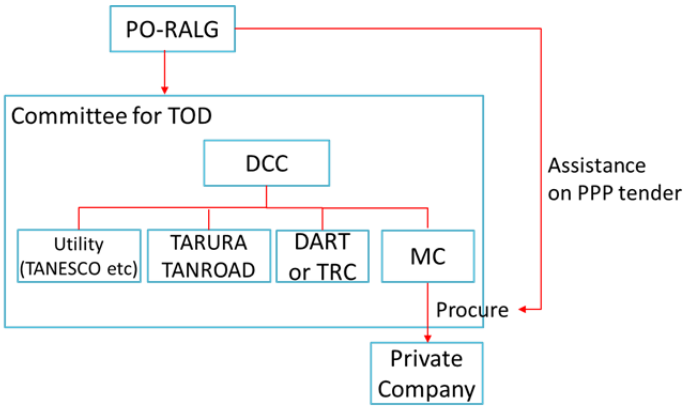
Source: MLIT

Figure 7.5 Urban Redevelopment Scheme

(4) Suggestion 4: Organize Implementation Structure

When proceeding with terminal development and its surrounding areas, it is necessary to clarify the implementation structure. The reason is that developments require multi-sector organization such as roads and public infrastructure. In other words, it is necessary to cooperate by multi specialized government agencies to realize the widespread development.

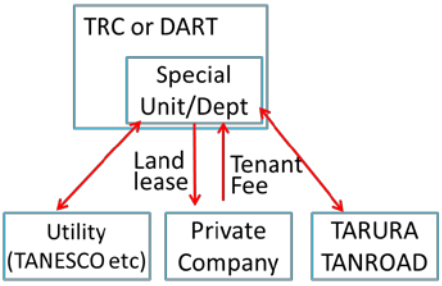
Interviews with several local government agencies regarding the implementation system indicated that it would be desirable to establish an implementation structure taking initiatives by PO-RALG. The reason is that TANROAD, DART and DCC are under different ministries, so it is recommended that the central ministry or agency will be the coordinator.



Source: JST

Figure 7.6 Implementation Structure – Case 1

The next case is the implementation structure led by TRC or DART. In the case, the land for terminal development is owned by TRC or DART. Therefore either agency will take ownership. However, in the case of urban development around the terminal facilities, there is no experience in both agencies, thus it is necessary to establish a dedicated department or team for urban development.



Source: JST

Figure 7.7 Implementation Structure – Case 2

(5) Suggestion 5: Promote Public Transportation Use

It is desirable to take some measures to promote public transport use. For example, the development of park and ride facilities as a TDM and the development of feeder transport mode to improve accessibility. These practices will not only avoid traffic congestion around the terminal, but it will also stabilize public transport revenue. It is better to promote the use of public transportation through development of park and ride facilities and to improve the convenience of the feeder transportation network such as summarizing bus route maps and providing bus location information to users.

(6) Suggestion 6: Development on PPP scheme

It is desirable that private sectors will participate in the terminal development. Therefore, PPP can be one option, but it is necessary to expand the PPP support measures for private companies. In addition, Chapter 5 stated that the criteria for selection of private business by PPP is now under preparation. Clarifying the selection criteria will lead to highly transparent PPP implementation. Further development of the PPP mechanism for terminal development is required.

7.4.2 Terminal Development

(1) Outline

Necessary support on terminal development was examined in short, medium and long terms. Basically, in the short term, technical cooperation projects and surveys are recommended. In the medium and long term, terminal development will be conducted.

To realize “suggestion 6” in the 7.4.1, technical cooperation regarding PPP can be considered. For example, in the technical cooperation project, study on the sharing of public and private responsibilities and calculation of project costs are included. In the medium-term and long-term, support for PPP bidding (preparation of tender documents, Technical Cooperation) can be considered.

Table 7.11 Cooperation in TOD

	Short（～2025）	Medium（～2030）	Long（～2040）
Public Transportation	Technical Cooperation	Technical Cooperation on development of BRT / Railway / Bus Terminal	Technical cooperation on development of BRT / Railway / Bus Terminal
Logistics	Logistic improvement survey	・Technical cooperation ・Development of truck terminal	

Source: JST

(2) Technical Cooperation on TOD

It is necessary to implement the above proposal on terminal development in the future. Counterpart should understand that TOD is not just a commercial building development around the terminal, but comprehensive project that includes soft measures such as TDM, development of feeder traffic, and incentives for private sectors. It is recommended not only to conduct surveys but also to conduct capacity development. It is necessary for counterpart to understand the measures for TOD, and it is also desirable to improve the capacity through technical cooperation projects.

The purpose of the technical cooperation project on TOD is to strengthen the implementation capacity of the counterpart.

Contents of Technical Cooperation Project

Overall Goal: Urban development considering the public transport network is promoted in DSM.

Goal : Capacity of related organization will be strengthened by conducting following measures

Items :

- Assistance to summarize concept design around TOD candidate sites

  Support for summarizing detailed land use plans and development policies for each plot which is an urban planning for TOD area

- Transport Planning in TOD Area

  In order to enhance the convenience of public transportation, develop feeder traffic from terminal, consider park and ride facilities, and plan soft components

- Assistance to implement pilot projects based on the concept design and transport plan

  Civil work that promotes public transport use (i.e. improvement of intersections, improvement of city bus operation)

- Study on Urban Development Scheme

  The study on the implementation method of urban development to realize the concept design, detailed cost allocation to public and private sectors, incentives to private sectors, land readjustment.

  Example: Whether cost of the sky deck directly connected to the commercial facilities from the terminal station is paid by the private or public?

- Cost estimate and economic and financial analysis

Counterparts :

PO-RALG

Outcome

The role and implementation structure of each government agency regarding TOD shall be clear

- Improve the feasibility of TOD projects through concept design and economic and financial analysis

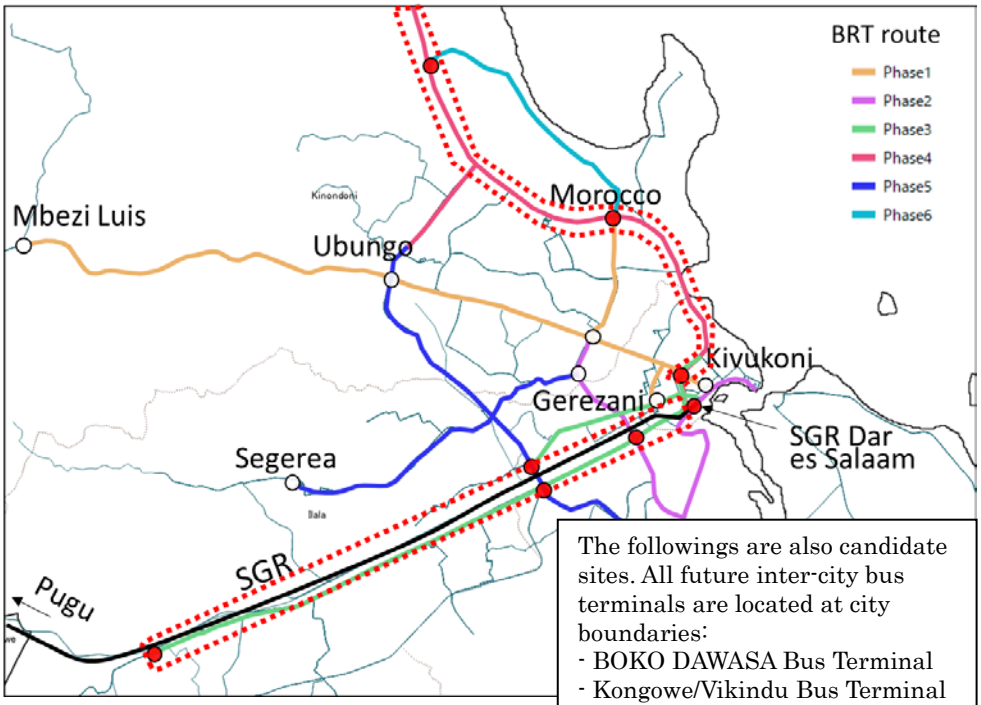
- Capacity building for TOD project implementation through pilot project

(3) Technical Cooperation on Terminal Development

After the technical cooperation project, terminal development project will be proceeded at the TOD candidate site. The candidate site for was examined. The priority areas are between CBD and Pugu

and between CBD and Tegeta. The reasons are shown below. Intercity bus terminals are also considered as candidate sites.

- Avoid duplication with BRT Phases 1 and 2, since TOD is already being studied. Pilot projects are proposed in Kariakoo and Ubungo.
- Selected area alongs the public transportation route which will be realized in the near future
- A place where demand of urban development is expected



Source: JST

Figure 7.8 TOD Sites

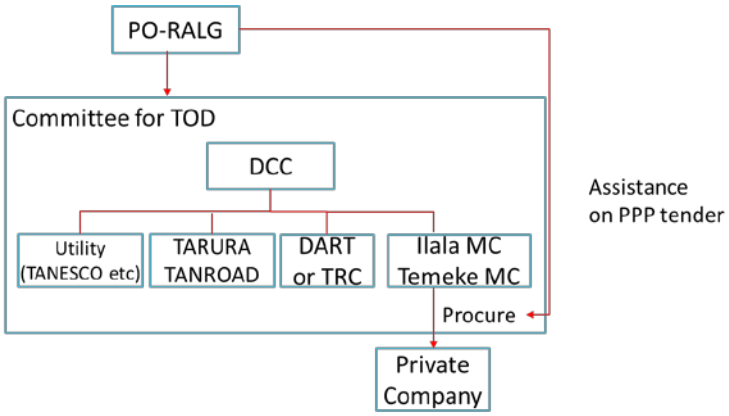
The contents of support are as follows.

- Support on Bid process (support for preparing bidding document, support for selection and evaluation of private sectors)
- Support for building an implementation system
- Technical cooperation for feasibility studies
- Examination of necessary urban development scheme

The implementation system with specific locations is shown below.

Example 1: SGR Dar es Salaam Station

Terminal development based on rail and BRT station. TRC is already building station facilities and commercial space. In addition, BRT Phase2 and 3 are planned in the surrounding area, thus it will be a transportation node for railways, BRT and city buses.

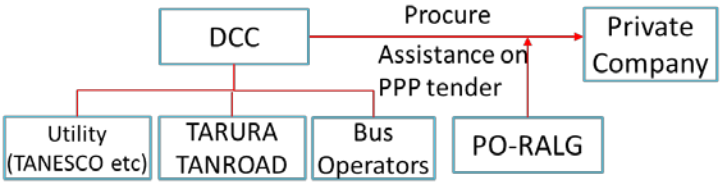


Source: JST

Figure 7.9 Implementation Structure（SGR Dar es Salaam Station）

Example 2: Bus Terminal Development

This is the case of bus terminal development and development of the surrounding commercial spaces. Currently, two intercity bus terminals are in the planning stage. DCC will basically coordinate with other organizations.



Source: JST

Figure 7.10 Implementation Structure（Bus Terminal）

(4) Development of Truck Terminal

In Tokyo, a special corporation Nippon Automobile Terminal was established to reduce traffic congestion in 1960. Keihin TT (Truck Terminal), Adachi TT, Itabashi TT, Kasai TT have been developed. The function of the conventional truck terminal is to unload luggage from large trucks arriving from all over the country to the cargo handling area, and reload the luggage sorted for each area to small collection, and deliver them to destinations throughout Tokyo. In addition, since TT has not only function of transhipment but also warehouse and distribution functions, TT has an important role in improving logistics efficiency and improving urban transportation. Therefore, it is recommended to develop truck terminal.

To address the “issues 6 Increased automobile traffic” written in the chapter 6, it is recommended to improve logistic movement in DSM. In addition, SGR is under developed and will be utilized for logistic movement in the future. It is better to study the logistic system considering SGR.

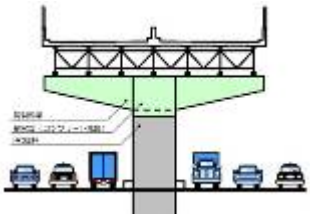
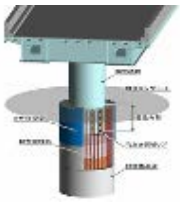
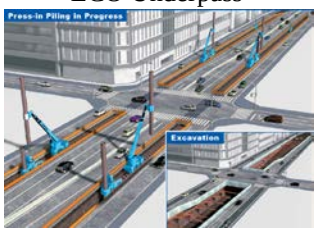
In the case of DSM, transhipment of cargo outside the city is not suitable because most of the logistics is carried through port. Therefore, after investigating the current logistics network, possible location for terminal should be studied, further support for conversion to SGR, and restrictions on the routes of large vehicles.

7.5 Advanced Technology

Advanced technologies applicable to candidate projects are shown as follows:

(1) Road Project

Table 7.12 Applicable Advanced Technologies in Road Project

Type	Construction Method	Characteristics and advantages	Applicability to DSM
	Steel beam 	・A steel pier head beam with steel or concrete column. The steel column will be slimmer than the concrete one. ・The steel beam will be prefabricated and attached with crane. No temporary support is necessary. ・Construction period is the shortest among all options. Erection can be done in one night.	・Construction experienced in Uganda. ・Introduction to DSM is possible.
	 Screwed Steel Pile	・Bearing capacity per pile is larger for the same diameter of the pile due to the blade welded to the pile end. ・Size of the pile cap can be reduced. ・Environmentally friendly with no wasted soil.	・Construction experienced in Uganda. ・Introduction to DSM is possible.
	Integration of Steel Pier and Bored Pile 	・A large diameter bored pile integrated with steel pier column. ・Area to be occupied by piers will be minimized by omitting the pile cap. ・Construction period can be reduced.	・Construction experienced in Africa other than East Africa. ・Willingness to enter into DSM is vigorous.
Underpass	ECO Underpass 	・Systemized machineries can be small and compact, allowing works to be carried out under restricted working space, allowing general vehicles to pass. ・Scheduled completion can be achieved because of the systematic sequence of works. Earlier completion can be achieved if multiple units are employed.	・No experience of construction in Africa. ・Willingness to enter into DSM is vigorous.
Soft Ground Stabilization	Bon Terrain Method 	・Applicable for road elevation of Morogoro Road and embankment. ・This method is to reuse the soil unusable to embankment by mixing with fibrous mud improving material and solidification material	・No experience of construction in Africa. ・Japanese government promotes oversea expansion.

Source: JST

(2) Railway Project

Japanese technologies in the railway field are shown below. Regarding the possibility of introduction, it is necessary to consider its necessity in future studies.

Table 7.13 Applicable Advanced Technologies in Railway Project

Advanced Technology	Contents
AFC, IC card	The Automatic Fare Collection System (AFC), which is being introduced worldwide, has just been introduced in Tanzania for BRT. At present, QR code is mainly used. The code is written on the receipt purchased at the counter, and it passes through the gate by holding it. In the process of urban railway development following the BRT, it is expected that the introduction of a common IC card system will promote mutual use of these public transportation systems and improve passenger convenience. Japanese companies are also actively expanding overseas, and there is a possibility of introducing Japanese technologies. Japanese IC card system has advantages in the speed and security compared to other IC card systems. However, if other card system is introduced earlier, it will be difficult to replace the position. There will be a chance if railway system select the Japanese system for their business because of its high security level.
HH rail	The proposed urban railway line has a relatively different gradient between the CBD and the suburbs, and there is a concern that premature wear of the rails due to intermittent use of brakes may occur, especially on distribution gradients. In addition, as the number of trains will increase in the future, there is a possibility of introducing a heat treatment head rail with high friction resistance (hereinafter "HH rail"). HH rail is competitive with Japanese steel makers. HH rail having high harness and toughness, is suitable for freight line and railway having many curve sections, such as Tegeta line and Pugu line. Japanese HH rail has high reputation and therefore has been exported to USA, Canada, India, Australia, and Tanzania. Share of Tanzania portion is 8%.
Synthetic sleepers	Synthetic sleepers are excellent in corrosion and high load resistance, and can be handled easier than wood sleepers. Although the price is higher than wooden sleeper, demand is increasing due to protection of forests. It is suitable to install in bridge sections that cannot be easily replaced and near the ocean where salt damage may occur. The location passing near the existing Surrender Bridge satisfies these conditions, so there is a possibility of adaptation, and Japanese manufacturers are actively expanding overseas.
Packaging of vehicle procurement and maintenance operations	Japanese train operation and maintenance technologies is world famous in terms of high safety, punctuality and low life cycle costs. At TRC, where there are still issues in vehicle maintenance technology and organizational strengthening, the use of Japanese technology can be expected by forming package projects that include maintenance work in addition to vehicle procurement. Hearing with major rolling stock manufactures in Japan asking their interest for the railway project in Tanzania, positive answer were not obtained because of distance and less information of the country.

Source：JST

(3) Terminal Development Project

Outline: Advanced technologies for terminal development include urban development techniques. For example, the land readjustment project and urban redevelopment project are know-how on urban development in Japan.

Possibility in DSM: The land readjustment project and the urban redevelopment project can be applied to places where land acquisition is difficult, and can be used to secure land for urban infrastructure such as roads and open spaces.

Interest of Japanese company: As a result of interview, it was pointed out that although land readjustment projects are advanced technologies, the system needs to be executed under the situation that government can control the land use and have certain rights for development. To promote land readjustment, government should apply the scheme with certain percentage of approval from land users, but sometimes not 100% of land users. Therefore, it is needed to strengthen the right of government agencies.

ANNEX

ANNEX-1 LIST OF MEETTING/ PARTIES

List of Metting

No	Date	Organization	Purpoase
1	2020/1/31	JICA Headquarter	Explainationn of the Summary of the Inception
2	2020/2/7	JICA TANZANIA Office	Explainationn of the Summary of the Inception
3	2020/2/7	TANROADS	Data Collection about Road
4	2020/2/10	MOLHHSD	Data Collection about City Planning
5	2020/2/10	C-Labs	Data Collection about Geological conditions
6	2020/2/10	TRC	Data Collection about Railway
7	2020/2/11	TARURA	Data Collection about Urban Transport
8	2020/2/12	MOWTC	Data Collection about Urban Transport
9	2020/2/12	PO-RALG	Data Collection about Urban Transport
10	2020/2/12	KMC	Data Collection about Urban Transport
11	2020/2/13	TRC	Data Collection about Railway
12	2020/2/14	DART	Data Collection about BRT
13	2020/2/14	MOLHHSE	Data Collection about City Planning
14	2020/2/18	AfD	Data Collection about Urban Transport
15	2020/2/18	AfDB	Data Collection about Urban Transport
16	2020/2/19	DCC	Data Collection about Urban Transport
17	2020/2/19	SGR Consultants/ TRC	Data Collection about Railway
18	2020/2/19	TANROADS	Data Collection about Road
19	2020/2/19	WB	Data Collection about Urban Transport
20	2020/2/20	TARURA	Data Collection about Road
21	2020/2/24	PO-RALG	Data Collection about Urban Transport
22	2020/2/24	TANROADS	Data Collection about Road
23	2020/2/25	TRC	wrap up meeting
24	2020/2/27	TANROADS	wrap up meeting
25	2020/3/6	JICA Headquarter	Explainationn of the Summary of the Site Survey

Contact Person in Tanzania

Organization	Position	NAME
PO-RALG	Assistant Director	Eng. Dr. Fiuiri Magafu
PO-RALG	Engineer	Gilbert Mfiang
PO-RALG	Senior Urban Planner	Charles A. Mariki
PO-RALG(PPP node)	Head of PPP Node	Hemedi Mpili
MOWTC	Permanent Secretary	Dr. Leonard M. Chamuriho
MOLHHSD	Principal Town Planner	Anna Msigaro
MOLHHSD	Zonal Town Planner	Paulo Kliosi
MOLHHSD	Zonal Town Planner	Hellenica Mpetula
DART	CEO	Eng. Ronald Rowakatale
DART	Ag. Chief Engineer	Eng. Ahmed O. Wasmala
DCC	Senior Town Planning Officer	Grace Mbena
KMC	Principle Town Planner	M Komba
TANROAD	Ag. Director – Design & Standards	Eng. Japherson M. Nnko
TANROAD	Project coordinator: director	Eng. Arnold J. Maeda
TANROAD	Senior Engineer, Donor project coordinator	Eng. Rajab
TANROAD	RMMS-Engineer	Eng. Mussa George
TANROAD	Contract specialist-BRT unit	Eng. Frank J. Mbilinyi
TANROAD	Ag. Head of Planning)	Eng. Arnold Masaki
TARURA Kinondoni Municipal	Manager	Eng. Leopold Runji
TRC	Director Planning and Investment	Nzeyimana Dyegula
TRC	DG's Projects Technical Assistant	Eng. Tito Mateshi
TRC	Senior Civil Engineer	Eng. Oliva Kilyenyi
TRC	Assistant Planning Manager	Innocent B Hunja
World Bank	Transport Specialist	Yonas Eliesikia Mchomvu
AfDB	Principal Transport Engineer	Mariehellen M. Minja
AFD		Mtanya MATUJA
SGR Consultants Korail/Unitec	Project Manager	Jong Hoon Cho
SGR Consultants Korail/Unitec	Deputy Project Manager	Chedi N. Masanbaji

ANNEX-2 REFERENCE OPINIONS FROM EXPERTS

Annex-2. REFERENCE OPINIONS FROM EXPERTS

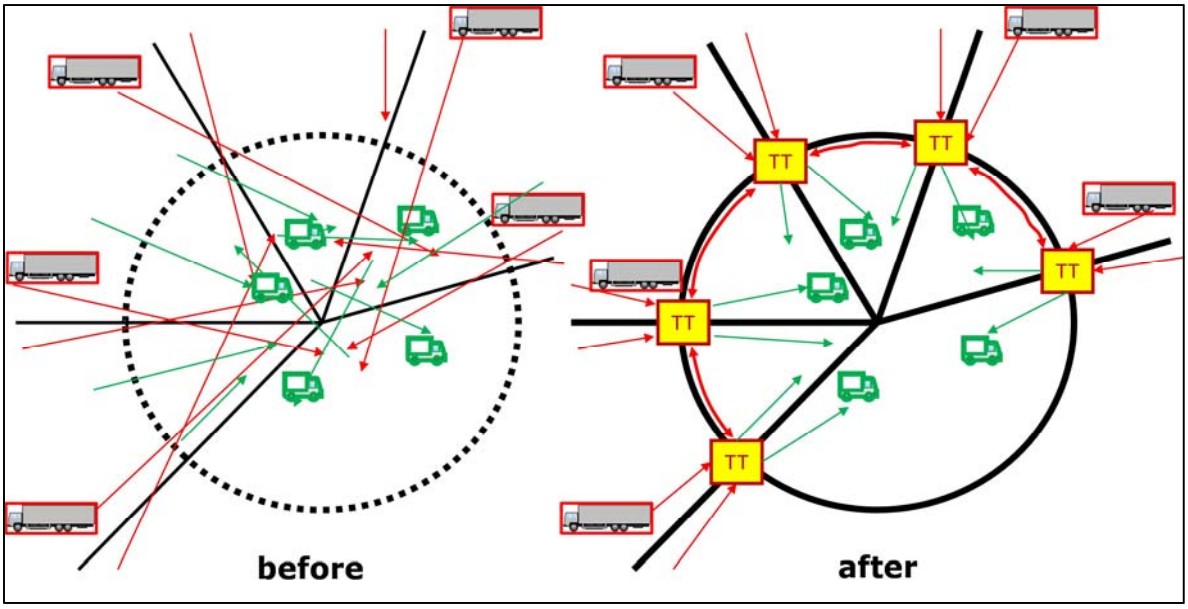
Comment by an academic expert on urban transport

Since the residents of northern DSM is in wealthy class and car ownership is high, after development of BRT, possibility of modal shift to public transport may be low. Therefore road improvement project along New Bagamoyo Road is effective.

Comments by an academic expert on freight transport

In Tokyo, in order to solve the issues caused by heavy traffic coming into city center, Japan Motor Terminal Co., Ltd. was established in 1965 by joint investment from public sector and private sector, and developed truck terminals.

In developing countries, study on freight transport is scarcely implemented, study method should be examined discreetly.



Finger Trunk Terminal Development in Tokyo

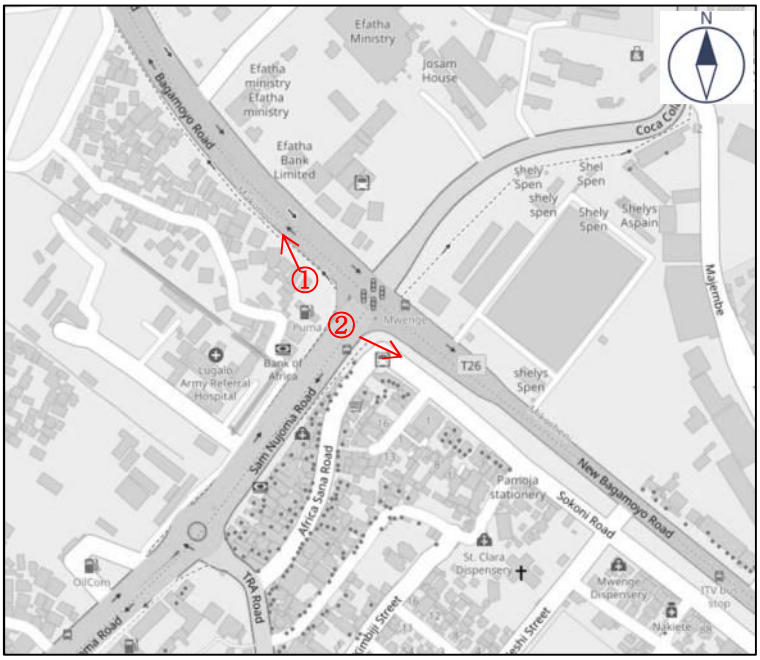
Comments from academic expert on public transport

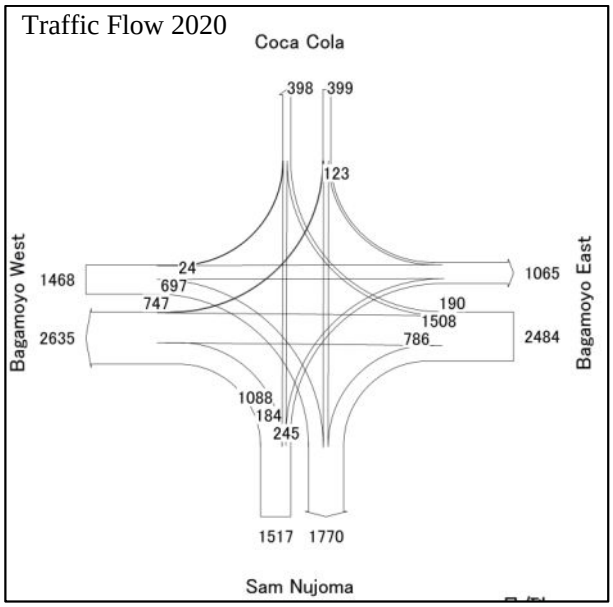
It is necessary for the Tanzania government to understand that it is difficult to shift from the BRT to the elevated railway due to spatial restriction, and it is also difficult to shift to the subway due to cost issues. In addition, it should be carefully studied about the plan of operating railway and BRT pararelly. In the plan, railway will be catered for long distance trip and BRT will cater short distance trip. The reason is that BRT has limited capacity and convenience of transfer is not yet studied in detail.

ANNEX-3 CURRENT TRAFFIC DEMAND

(1) **MwengeJunction**

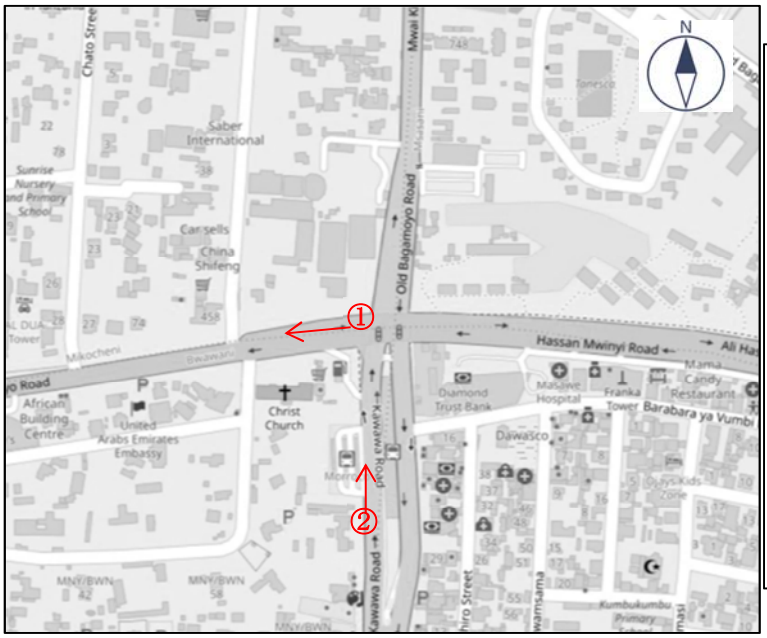
Crossing Road	Bagamoyo Rd.	Sam Nujoma Rd.
BRT Project	Phase-4（Design Stage）	Phase-4（Design Stage）
Traffic Volume (2020)	5,868 PCU/Peak Hour	
Saturation Degree (2020)	1.15	
No of Heavy vehicle	180 Vehicle/ Peak Hour	

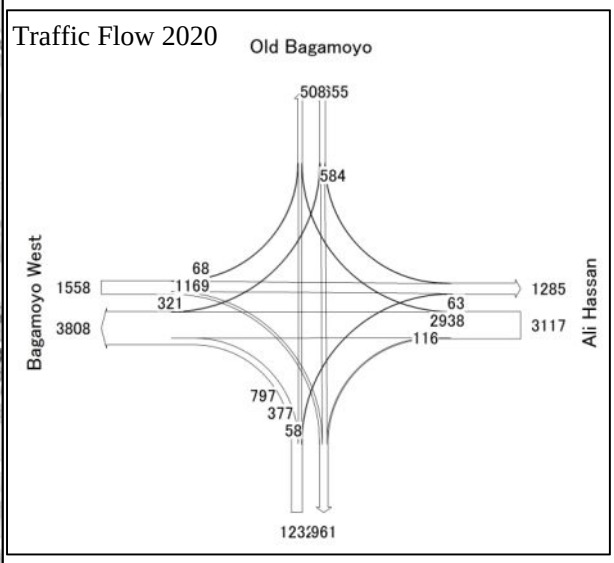




(2) **Morocco Junction**

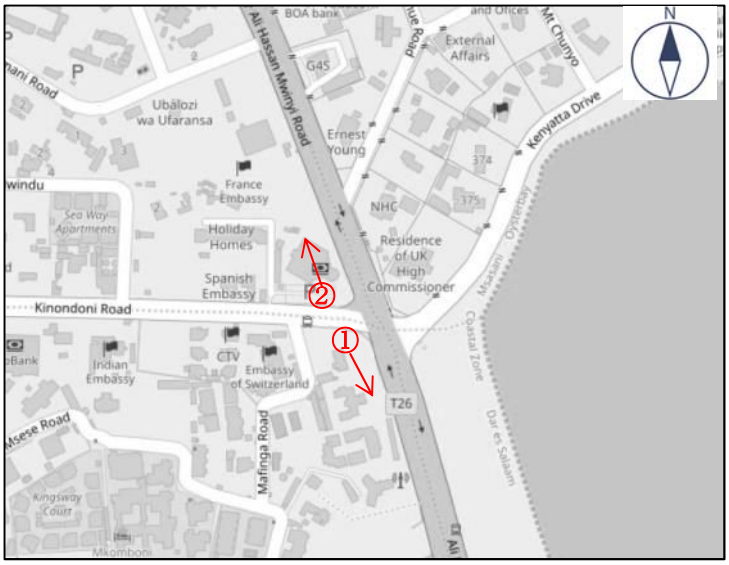
Crossing Road	Bagamoyo Rd. Ali Hassan Rd	Kawawa Rd.
BRT Project	Phase-4 (Design Stage)	Phase-1 (Operation)
Traffic Volume (2020)	6,562 PCU/Peak Hour	
Saturation Degree (2020)	1.14	
No of Heavy vehicle	96 Vehicle/ Peak Hour	

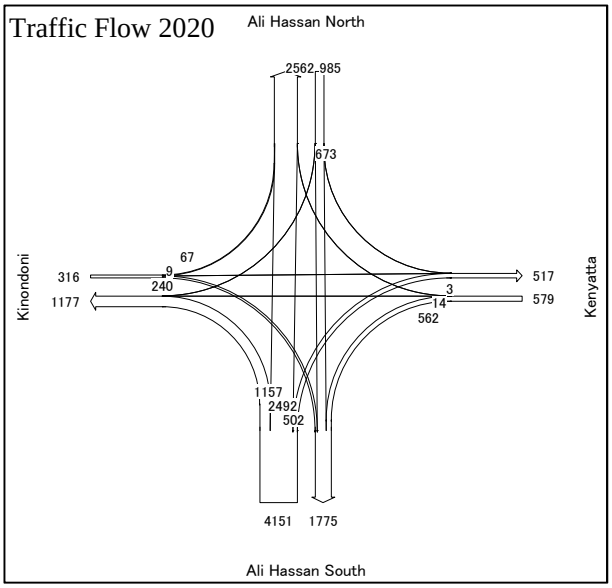




(3) **Oysterbay Junction**

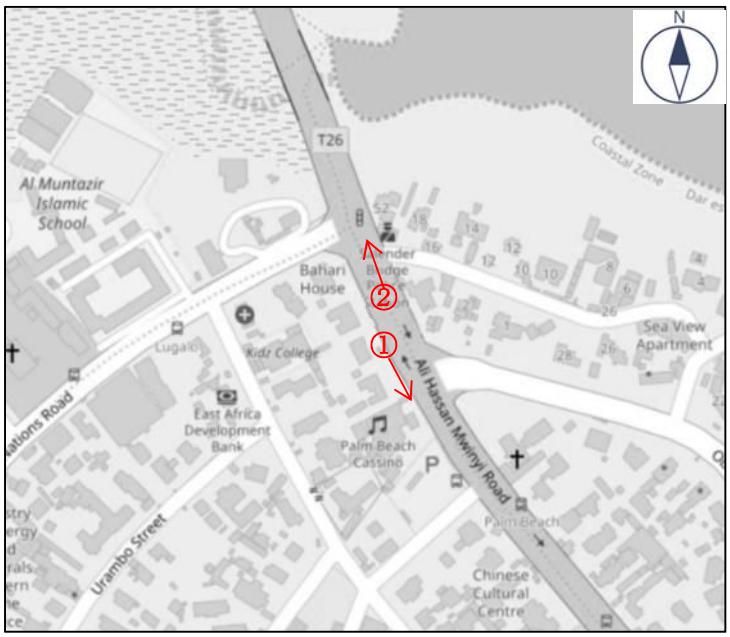
Crossing Road	Ali Hassan Rd.	Kinondoni Rd
BRT Project	Phase-4（Design Stage）	-
Traffic Volume (2020)	6,213 PCU/Peak Hour	
Saturation Degree (2020)	1.10	
No of Heavy vehicle	67 Vehicle/ Peak Hour	

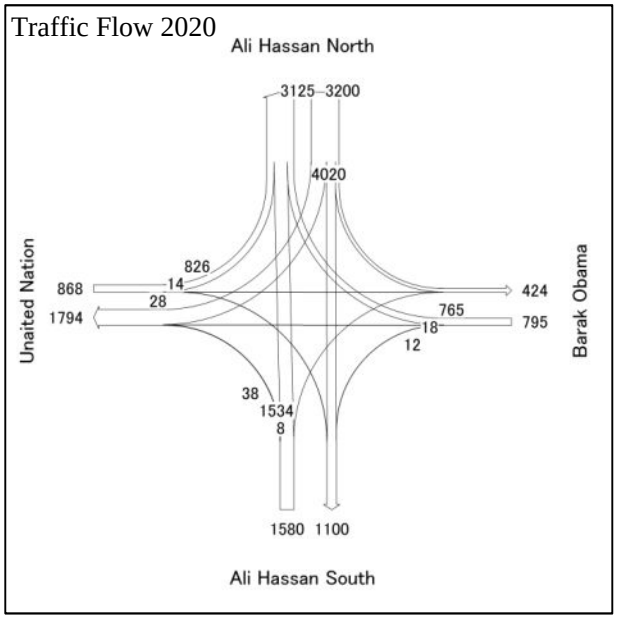




(4) **Ali Hassan Junction**

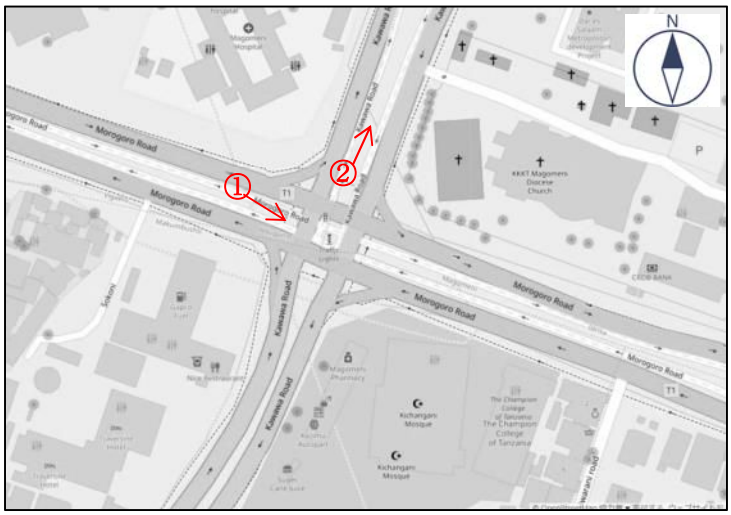
Crossing Road	A H. Mwinyi Rd.	United Nations Rd Barak Obama Rd.
BRT Project	Phase-4 (Design Stage)	-
Traffic Volume (2020)	6,443 PCU/Peak Hour	
Saturation Degree (2020)	1.09	
No of Heavy vehicle	71 Vehicle/ Peak Hour	

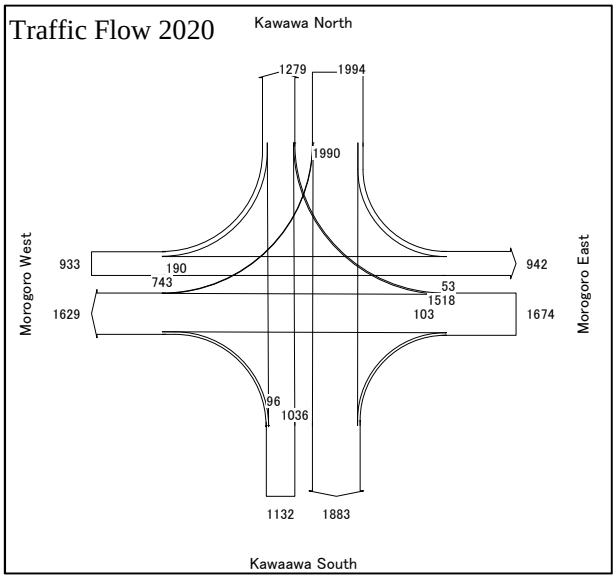




(5) **Magomeni Junction**

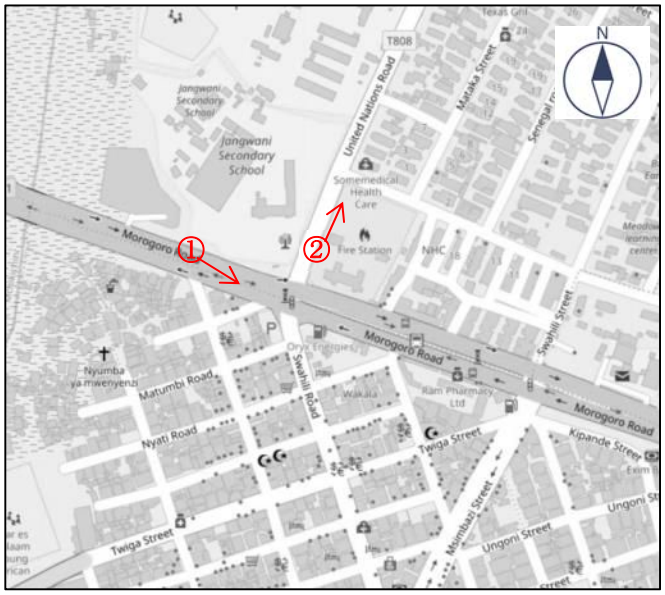
Crossing Road	Morogoro Rd.	Kawawa Rd.
BRT Project	Phase-1 (Operation)	-
Traffic Volume (2020)	5,900 PCU/Peak Hour	
Saturation Degree (2020)	0.97	
No of Heavy vehicle	154 Vehicle/ Peak Hour	

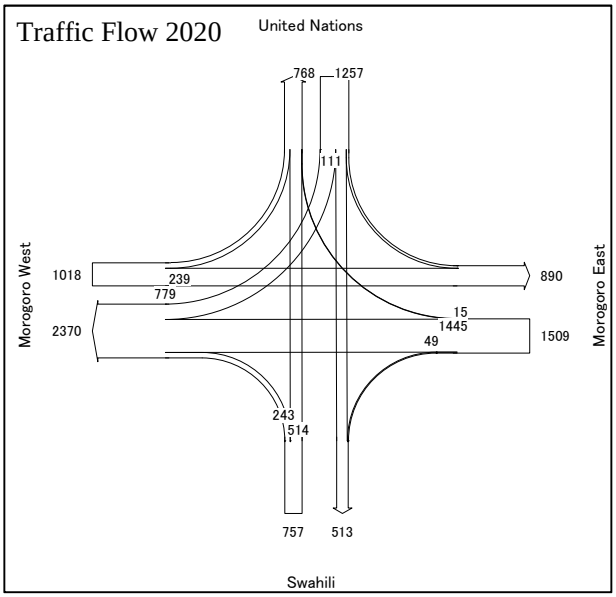




(6) **United Nations Junction**

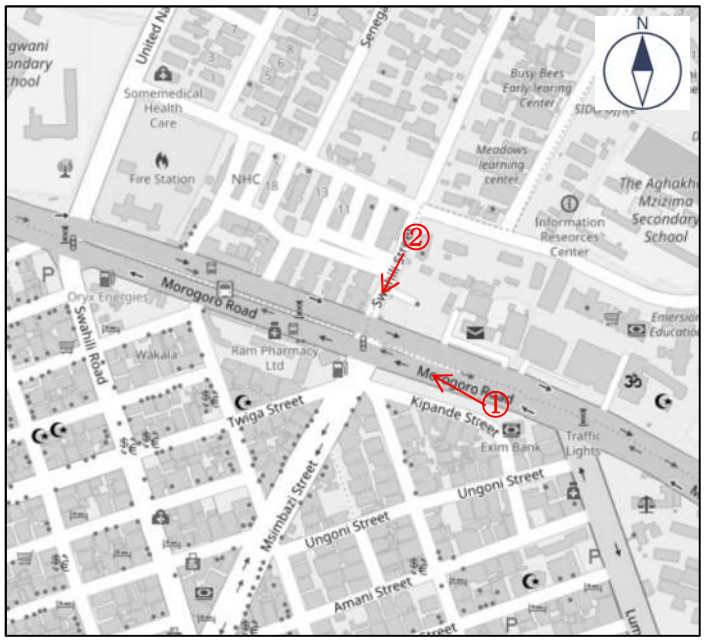
Crossing Road	Morogoro Rd.	United Nations Rd Swahili Rd
BRT Project	Phase-1 (Operation)	-
Traffic Volume (2020)	4,652 PCU/Peak Hour	
Saturation Degree (2020)	1.05	
No of Heavy vehicle	89 Vehicle/ Peak Hour	

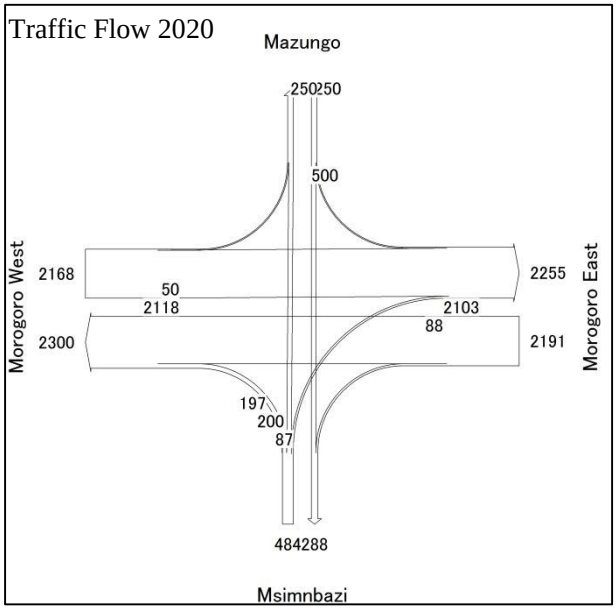




(7) **Fire (Msimnbazi) Junction**

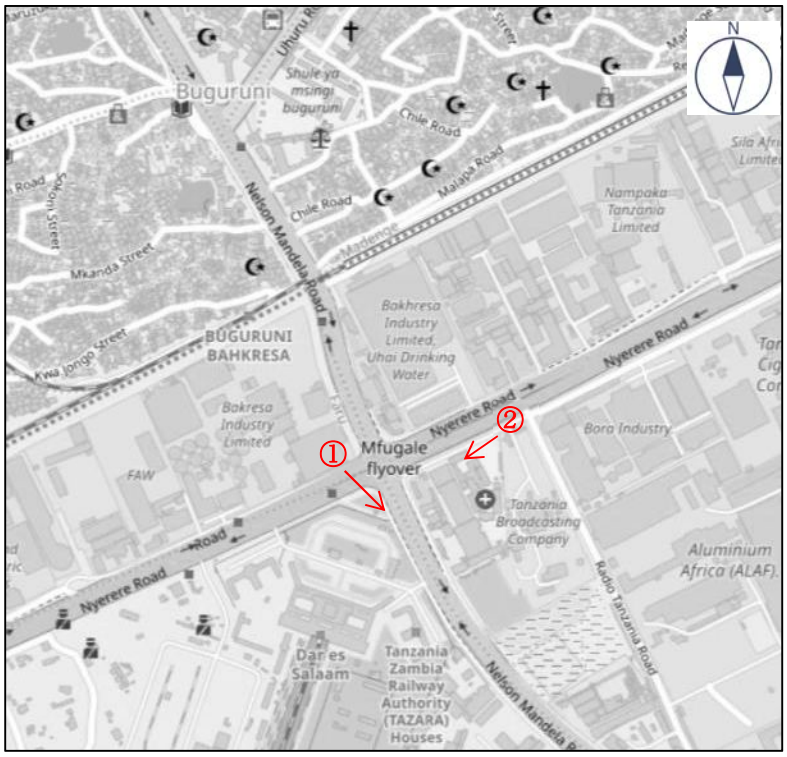
Crossing Road	Morogoro Rd.	Msimbazi St.
BRT Project	Phase-1 (Operation)	-
Traffic Volume (2020)	5,425 PCU/Peak Hour	
Saturation Degree (2020)	0.80	
No of Heavy vehicle	104 Vehicle/ Peak Hour	

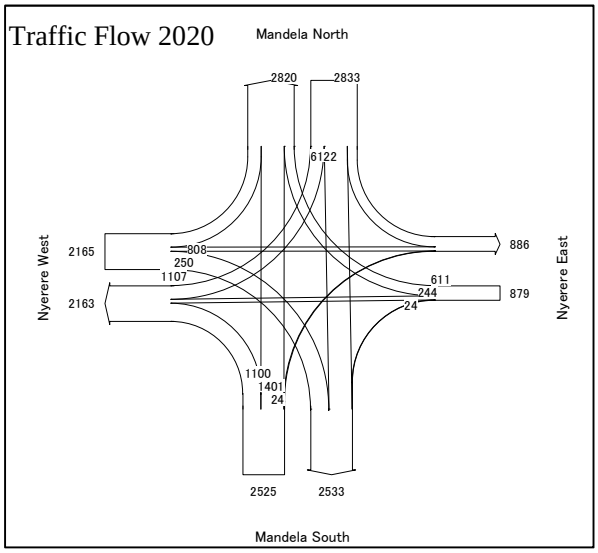




(8) **Tazara Junction**

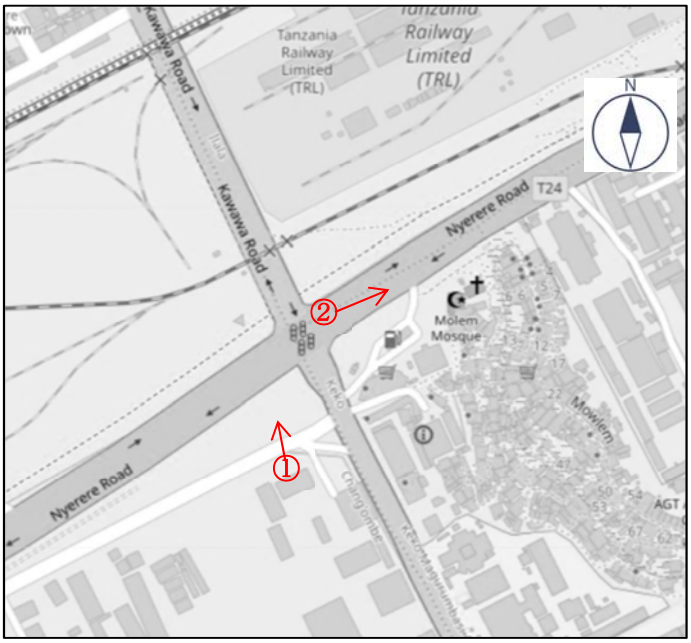
Crossing Road	Nyerere Rd.	Nelson Mandela Rd
BRT Project	Phase-3 (Design completed)	Phase-5 (Design Stage)
Traffic Volume (2020)	8,698 PCU/Peak Hour	
Saturation Degree (2020)	1.59	
No of Heavy vehicle	313 Vehicle/ Peak Hour	

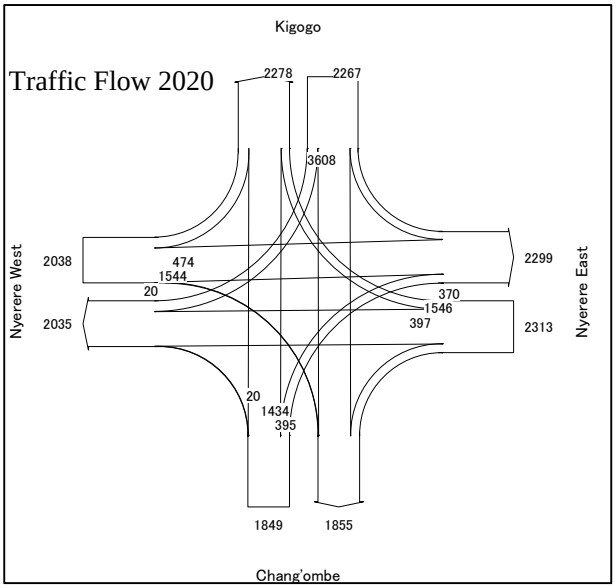


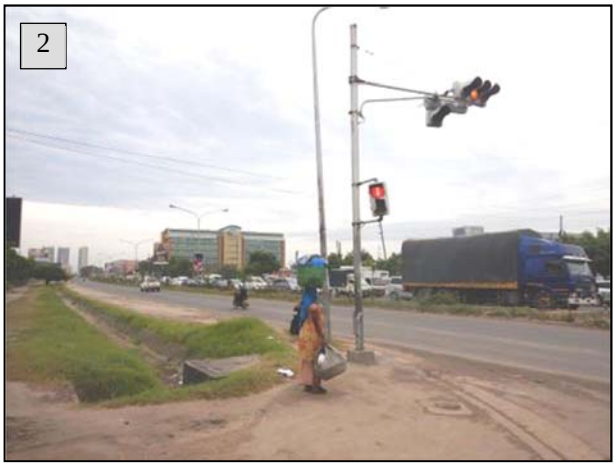


(9) **Chang'ombe Junction**

Crossing Road	Nyerere Rd.	Kawawa Rd
BRT Project	Phase-3 (Design completed)	Phase-2 (Design completed)
Traffic Volume (2020)	8,791 PCU/Peak Hour	
Saturation Degree (2020)	1.38	
No of Heavy vehicle	387 Vehicle/ Peak Hour	

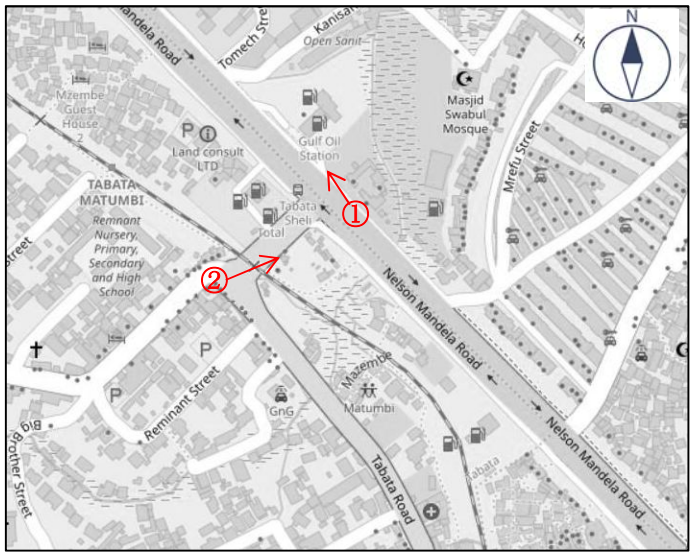


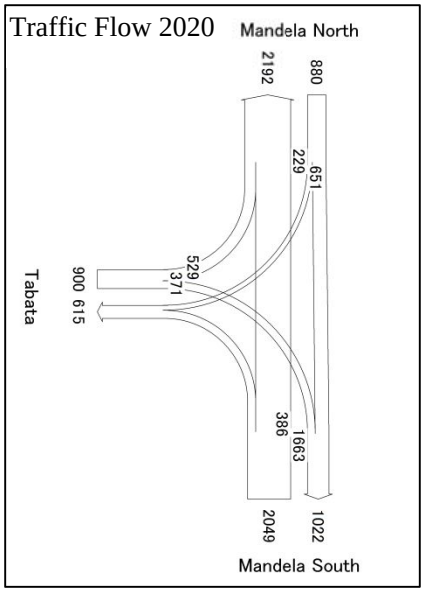




(10) **Tabata Junction**

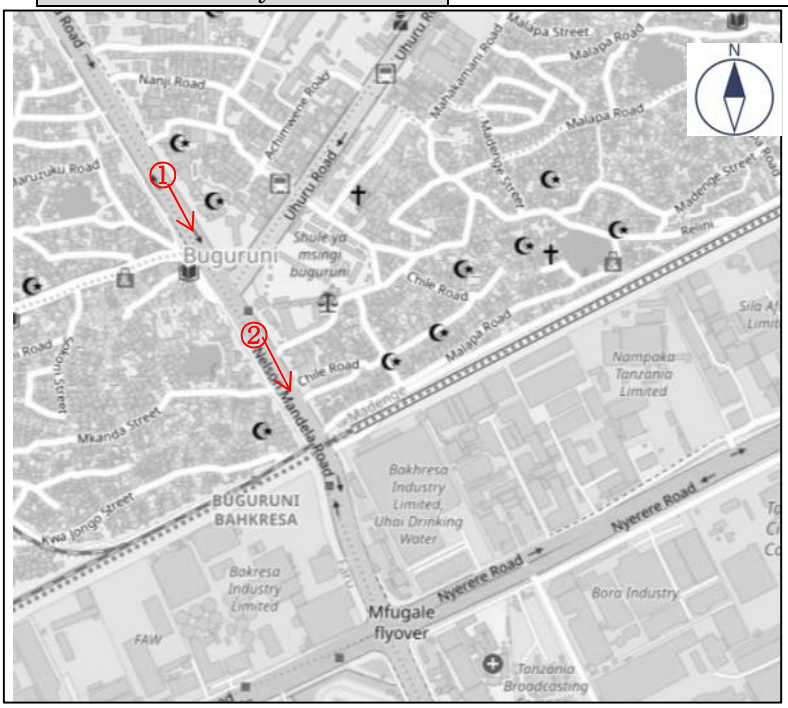
Crossing Road	Nelson Mandela Rd	Tabata Rd.
BRT Project	Phase-5	-
Traffic Volume (2020)	3,990 PCU/Peak Hour	
Saturation Degree (2020)	0.87	
No of Heavy vehicle	221 Vehicle/ Peak Hour	

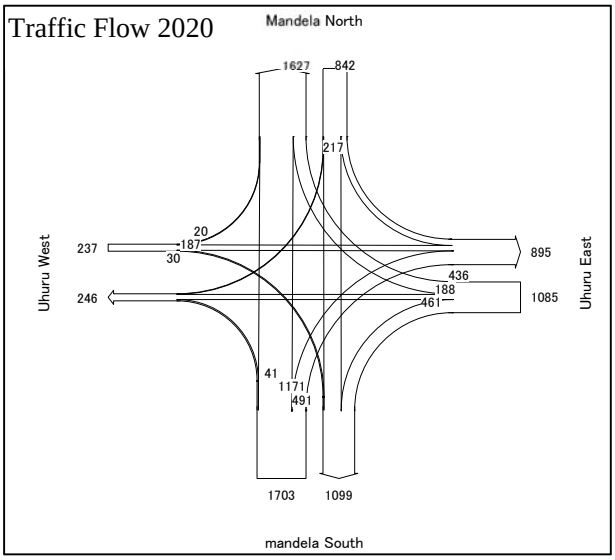




(11) **Buguruni Junction**

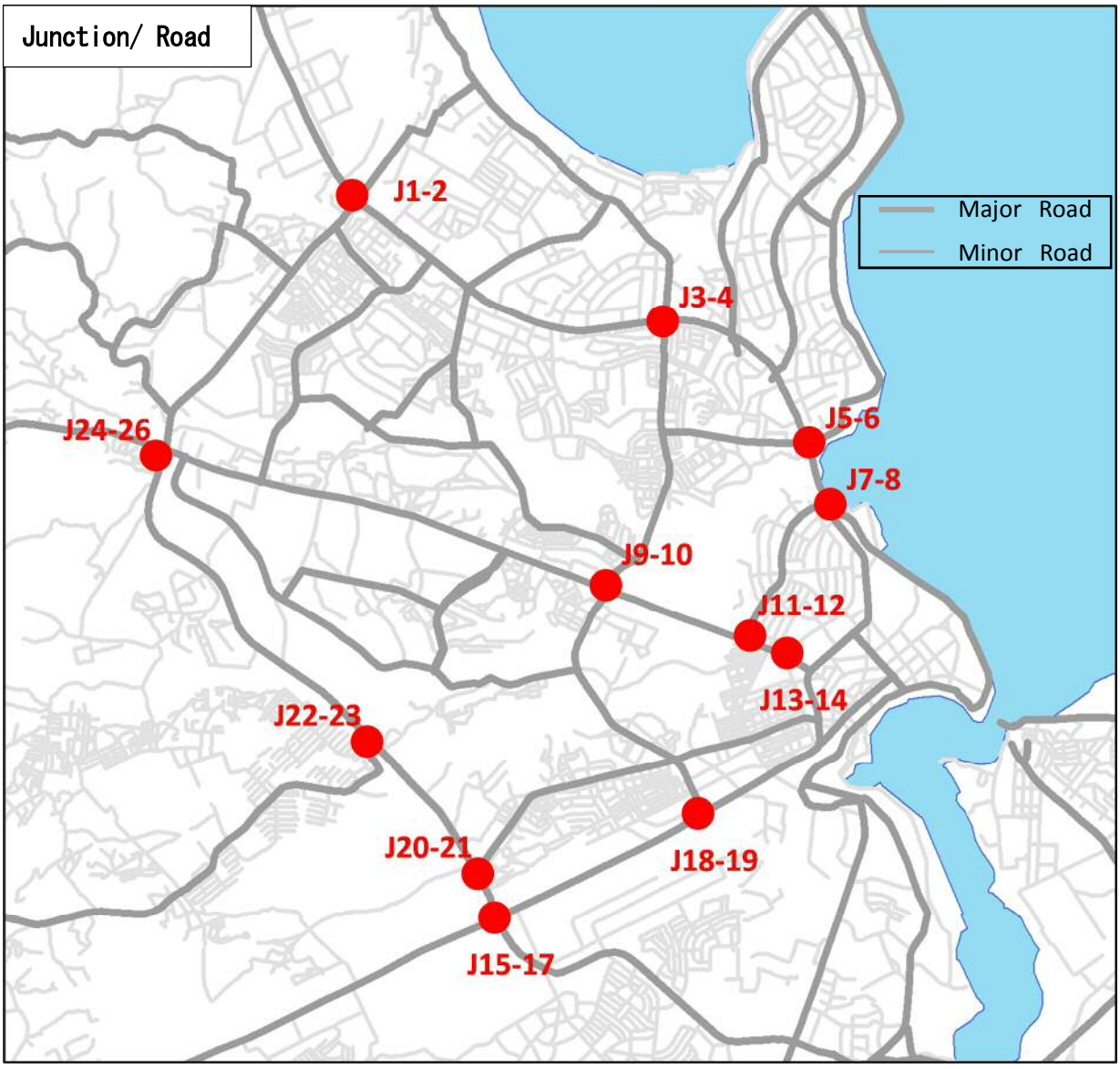
Crossing Road	Nelson Mandela Rd	Uhuru Rd.
BRT Project	Phase-5	Phase-3 (Design completed)
Traffic Volume (2020)	4,024 PCU/Peak Hour	
Saturation Degree (2020)	1.00	
No of Heavy vehicle	243 Vehicle/ Peak Hour	

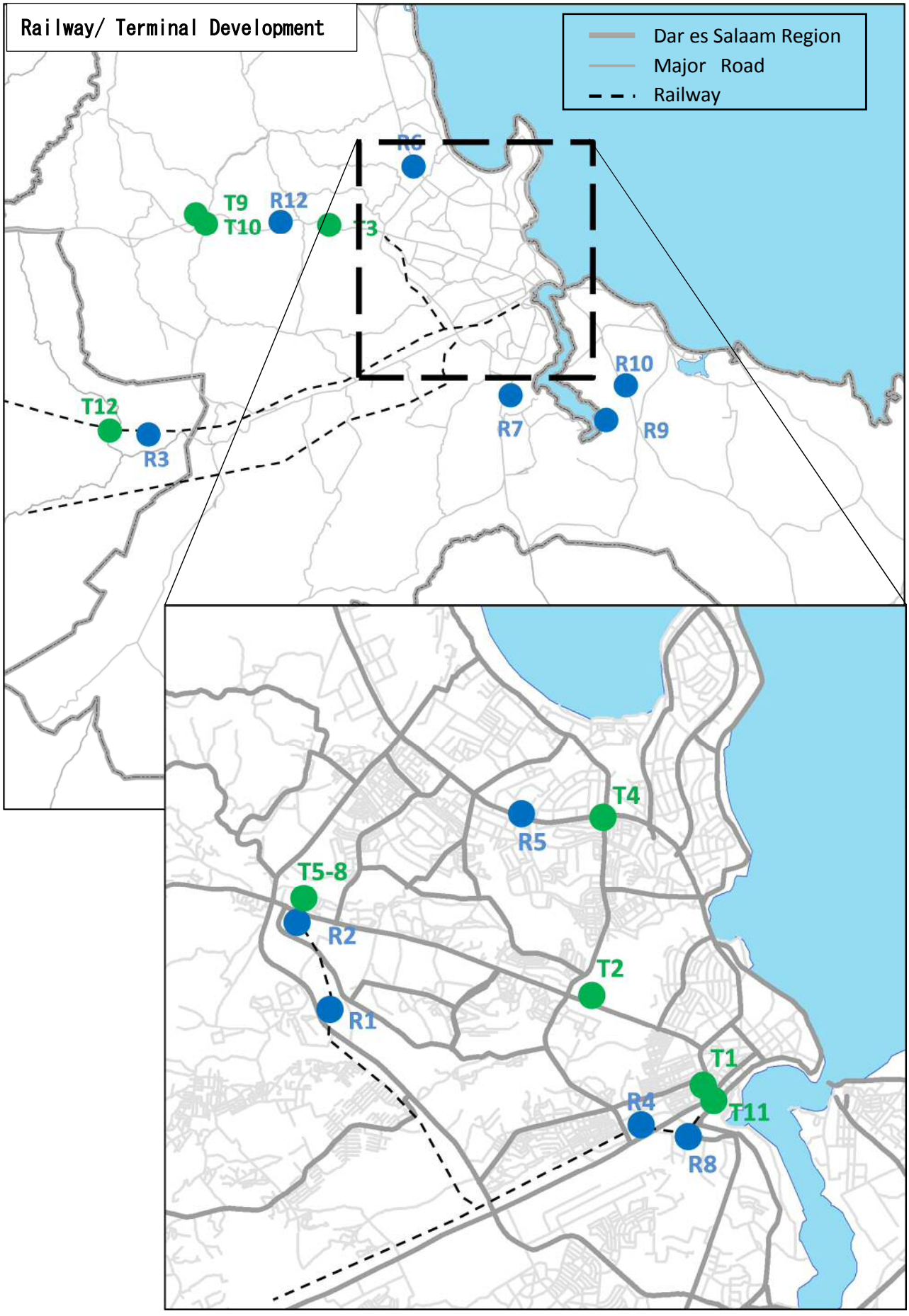




ANNEX-4 PHOTO

Location Map




Railway/ Terminal Development
Dar es Salaam Region
Major Road
Railway
R6
T9
T10
R12
T3
T12
R3
R7
R10
R9
T4
R5
T5-8
R2
T2
R1
T1
T11
R4
R8

Photo

J-01 Muwenge-1

J-02 Muwenge-2

J-03 Morocco-1

J-04 Morocco-2

J-05 Oysterbay-1

J-06 Oysterbay-2

Photo

J-07 Ali Hassan-1

J-08 Ali Hassan-2

J-09 Magomeni-1

J-10 Magomeni-2

J-11 UN-1

J-12 UN-2

Photo

J-13 Fire-1

J-14 Fire-2

J-15 Tazara -1

J-16 Tazara-2

J-17 Tazara-3

J-18 Chang'ombe -1

Photo

J-19 Chang'ombe-2

J-20 Bugruni-1

J-21 Bugruni-2

J-22 Tabata-1

J-23 Tabata-2

J-24 Ubungo-1

Photo

J-25 Ubungo-2

J-26 Ubungo-3

R-01 Route A Relini Station

R-02 Route A Ubungo Station

R-03 Route B Cut & Fill section

R-04 Route B SGR Viaduct construction

Photo

R-05 Route C Road under Widenning atrer Moroco

R-06 Route C Bagamoyo road after Mwenge

R-07 Route F Station F

R-08 Route F Terminal Stayion F1

R-09 Route G Near Station G2

R-10 Route G StationR-2 G3

Photo

R-11 Route H Mwembechai Station H1

R-12 Route H Road Widenning after Kimara

T-01 BRTKariako

T-02 BRT Phase-1

T-03 BRT Kimara Station

T-04 BRT Morocco Station

Photo

T-05 Ubungo Terminal 1

T-06 Ubungo Terminal 2

T-07 Ubungo Terminal 3

T-08 Ubungo Terminal 4

T-09 Mbezi Luis Bus Terminal

T-10 Mbezi Luis Terminal

Photo

T-11 SGR DSM Station 	T-12 SGR Pugu Station 

ANNEX-5 EXPLANATORY MATERIALS FOR WRAP UP MEETING

United Republic of Tanzania

Data Collection Survey for Dar es Salaam Urban Transport

Wrap up meeting
February 25th 2020

EIGHT-JAPAN ENGINEERING CONSULTANTS INC.
NIPPON KOEI CO., LTD.

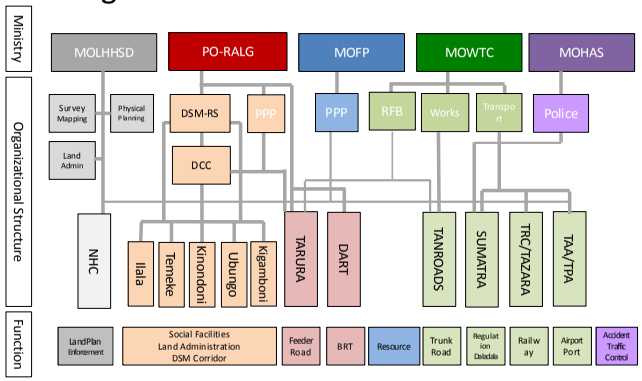
TABLE OF CONTENTS

1. INTRODUCTION

(1) Objectives of the Survey

To provide a comprehensive analysis and examination of the impact by on-going transport improvement projects for traffic decongestion in Dar es Salaam for formulation of JICA cooperation policy of next stage.

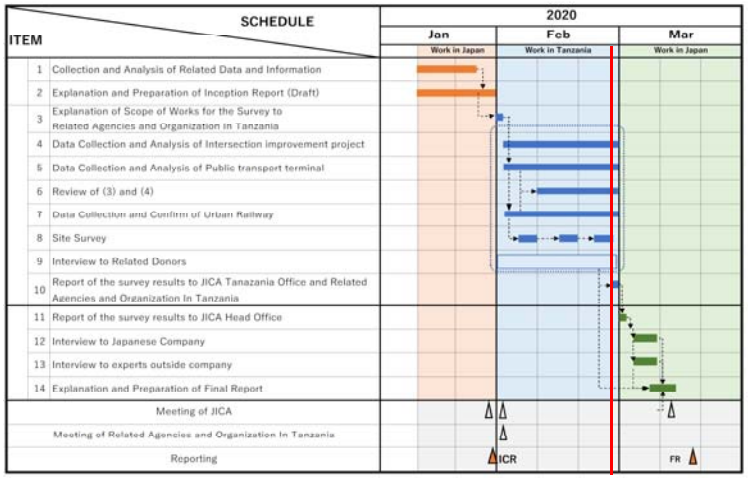
(2) Related Organization



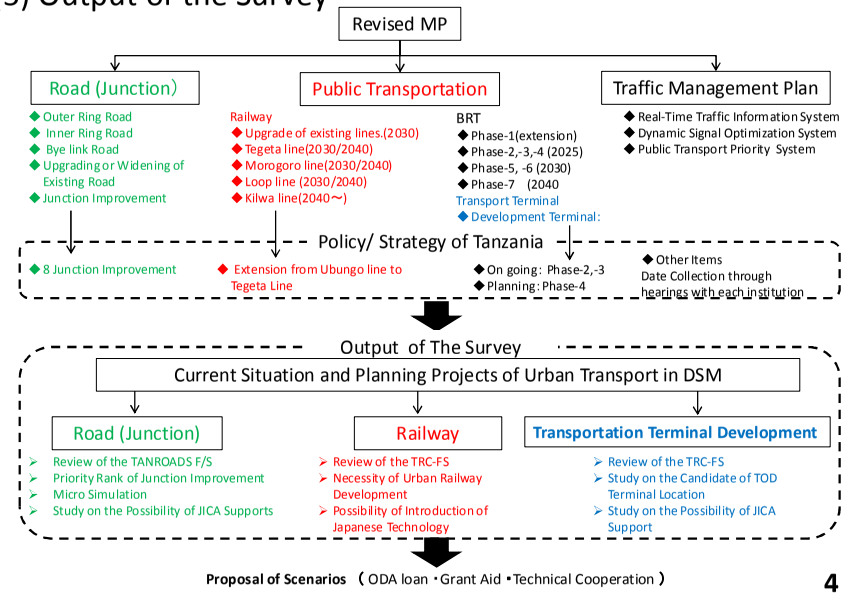
(3) Project Site

DSM City, particularly areas with chronic congestions.

(4) Work Schedule

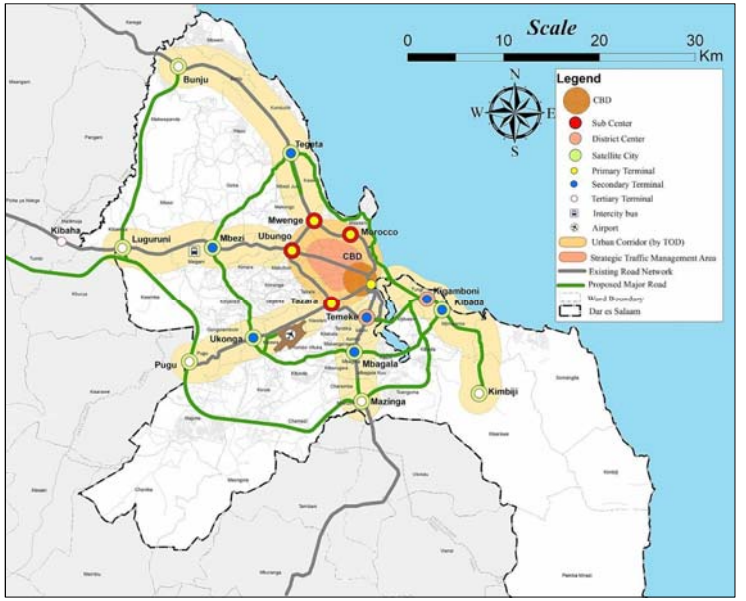


(5) Output of the Survey



4

◆ Future Urban Structure



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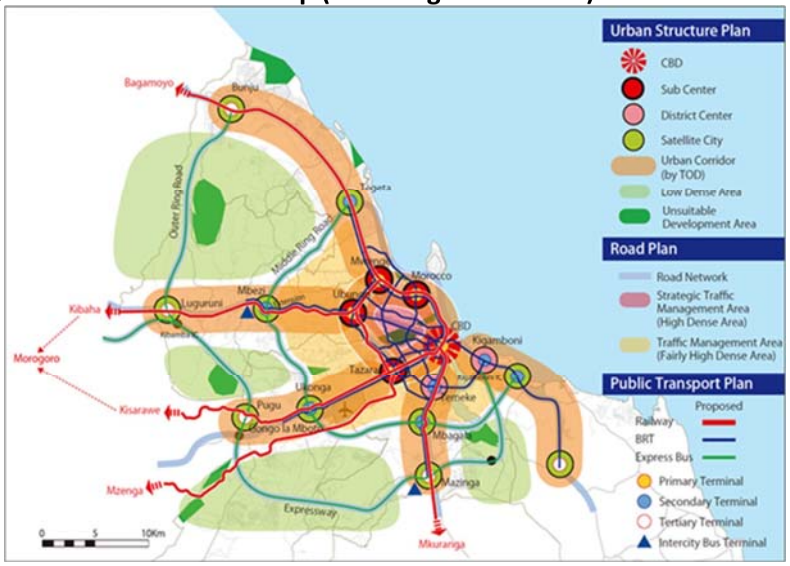
A5-2

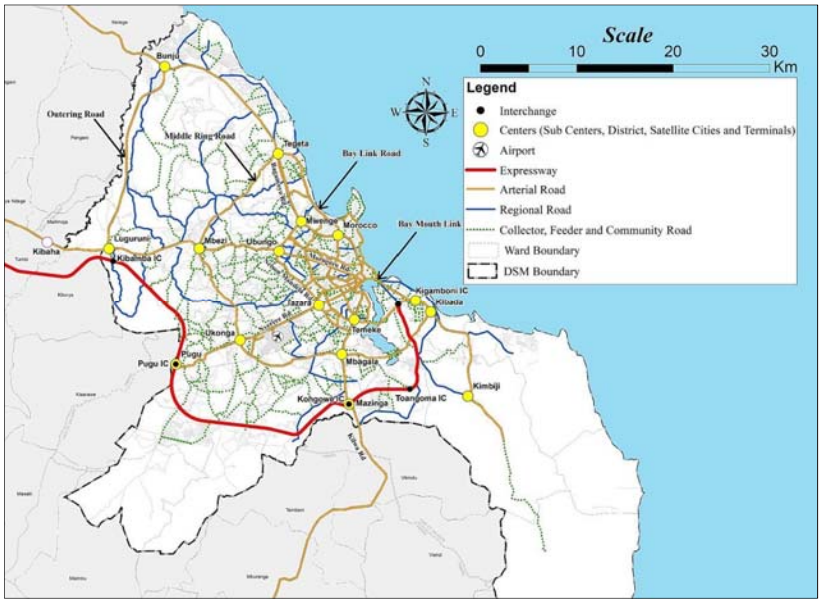
2. Outline of Revised MP

◆ **Revised MP Vision Map (including 'after 2040')**

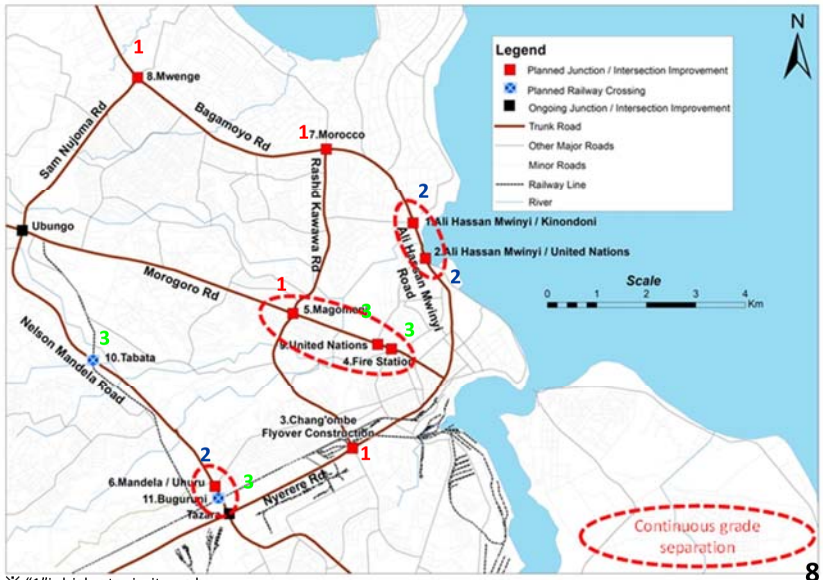


5

◆ Road Network Plan

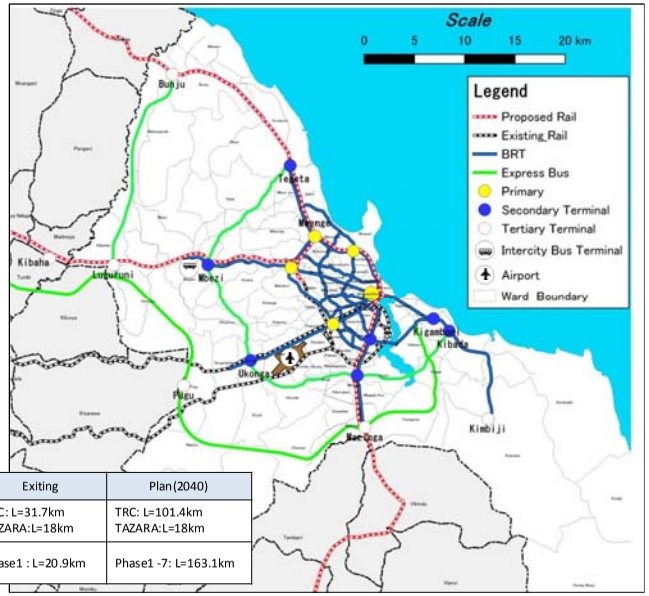


◆ Priority Rank of Junction Improvement



※ "1"is highest priority rank

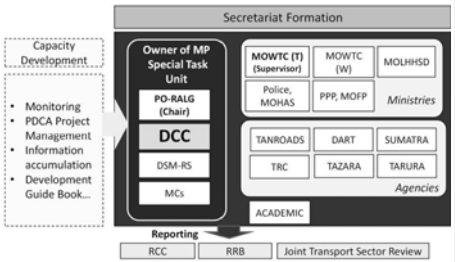
◆ Public Transport Plan



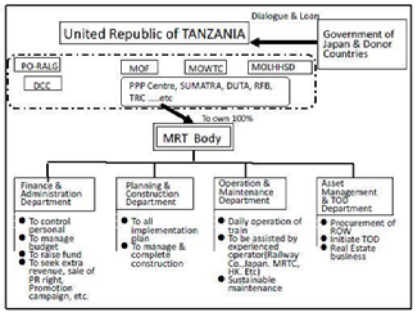
	Exiting	Plan(2040)
Railway	TRC: L=31.7km TAZARA:L=18km	TRC: L=101.4km TAZARA:L=18km
BRT	Phase1 : L=20.9km	Phase1 -7: L=163.1km

◆ Proposed Organization

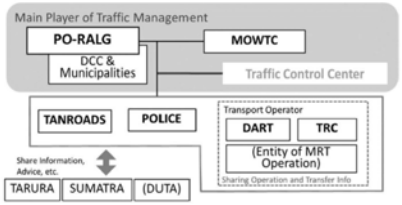
MP Task Unit



MRT

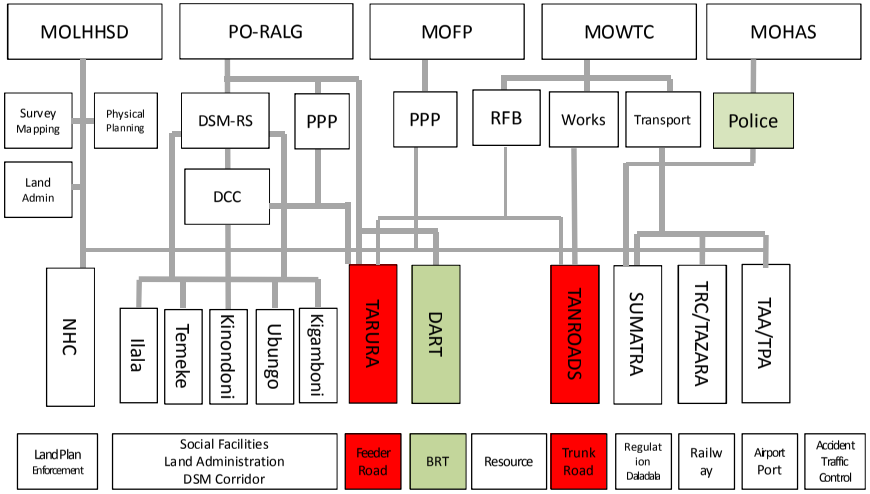


Traffic Management



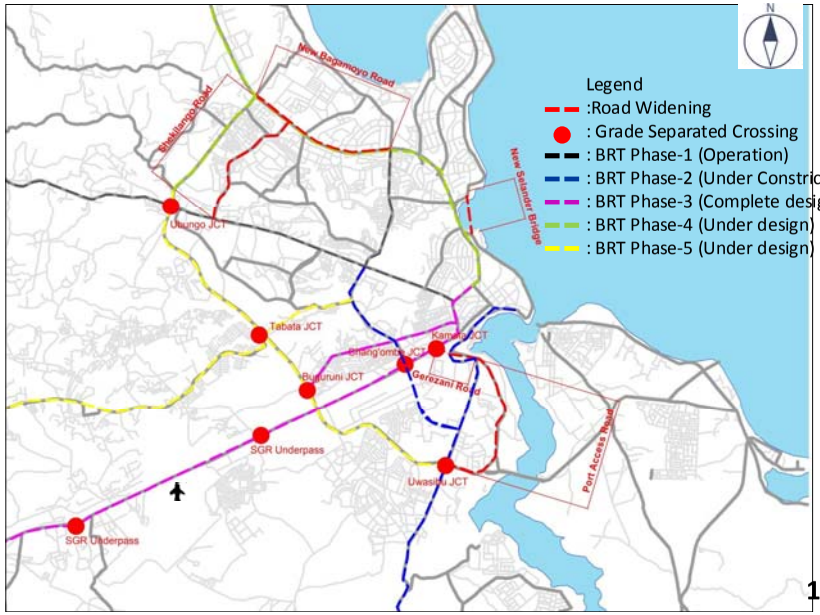
3. Road/Junction

◆ Responsible Organizations



Red: Design, Construction, Maintenance Green: Operation

◆ Ongoing Projects



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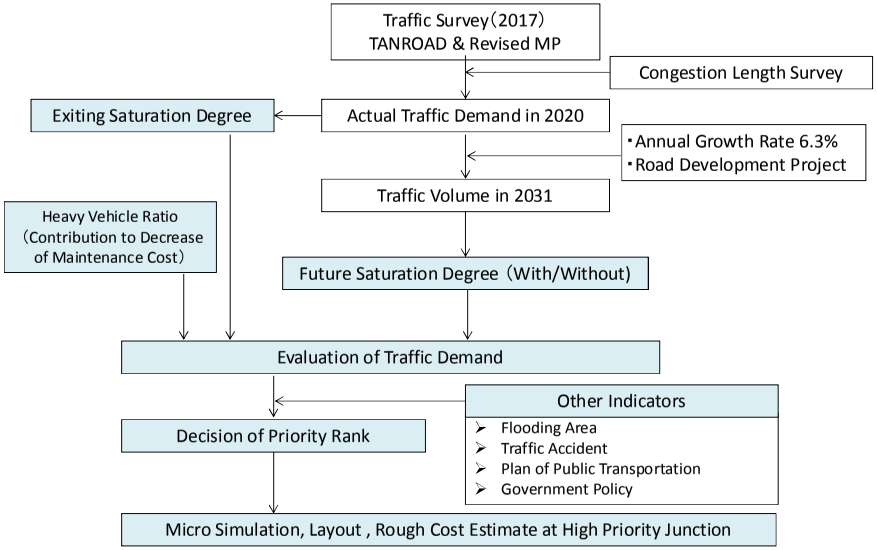
◆ Work Flow



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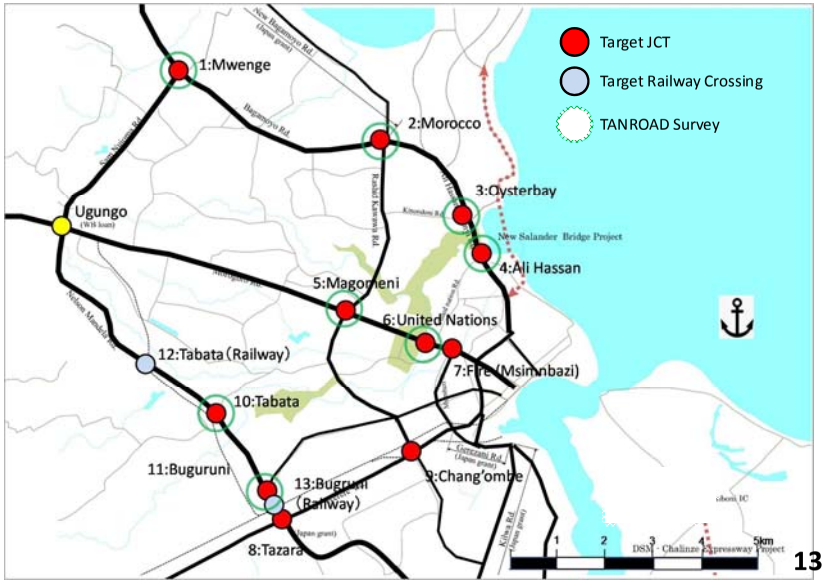
◆ Target Junctions in the Survey



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◆ Priority Rank Of Junction Improvement

No.	Name	Legs	Saturation degree (Volume/ Capacity)			No of Heavy vehicle (Veale/ Peak hour)	Flooding Risk	Accident Risk	Government Policy	Public Transportation Plan
			2020	2031 WO	2031 FO	2020				
1	Muwenge	4	1.15	2.25	0.92	180	Moderate	Moderate		Phase-4
2	Morocco	4	1.14	2.24	0.97	96	Moderate	High		Phase-4
3	Oysterbay	4	1.10	1.70	0.89	67	High	Moderate		Phase-4
4	Ali Hassan	4	1.09	1.68	1.20	71	High	Low		Phase-4
5	Magomeni	4	0.97	1.90	1.05	154	Low	Moderate		Completed
6	United Nations	4	1.05	2.06	0.99	89	Low	Low		Completed
7	Fire (Msimnbazi)	4	0.80	2.06	0.52	104	Low	Low		Completed
8	Tazara	4	1.59	3.11	1.47	313	Low	Moderate		Phase-3
9	Chang'ombe	4	1.38	2.70	1.58	387	Low	High		Phase-3
10	Tabata	3	0.88	1.71	1.28	250	Low	Low		Phase-5
11	Buguruni	4	1.00	1.96	0.83	243	Low	Low		Phase-5
※	Ubungo	4	1.45	1.65	1.37	422				Under Construction

* Saturation Degree is calculated by Inflow Volume dived by Road Capacity

Muwenge : Sam Nujoma Road North Direction

TAZARA : Nelson Mandela Road South Direction

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Evaluation Criteria

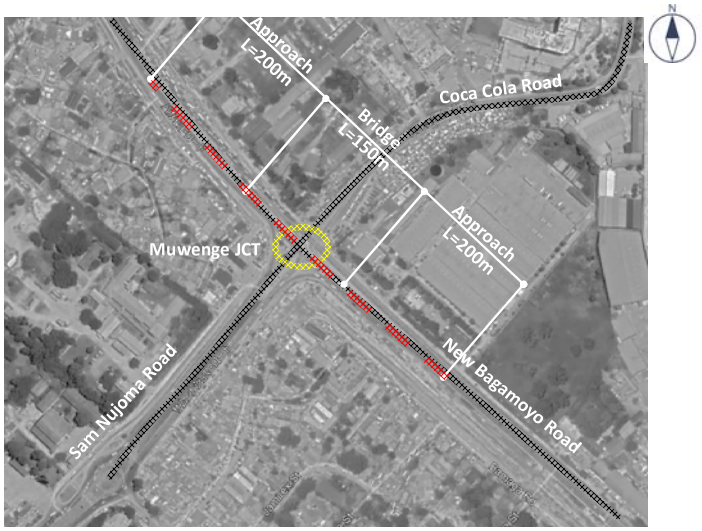
Evaluation Category	Item	Low	Middle	High
Congestion of Existing Junction	Saturation Degree (2031)	1.0<X	~	X>3.0
	Max Score: 50	0	~	50
Decrease of Maintenance Cost	No of Heavy vehicle (peak hour)	100<X	~	X>300
	Max Score: 20	0	~	20
Flooding Risk Max Score: 10		Low	Middle	High
		0	5	10
Accident Risk Max Score: 10		Low	Middle	High
		0	5	10
Government Policy Max Score: 10		Low	Middle	High
		0	5	10

Evaluation

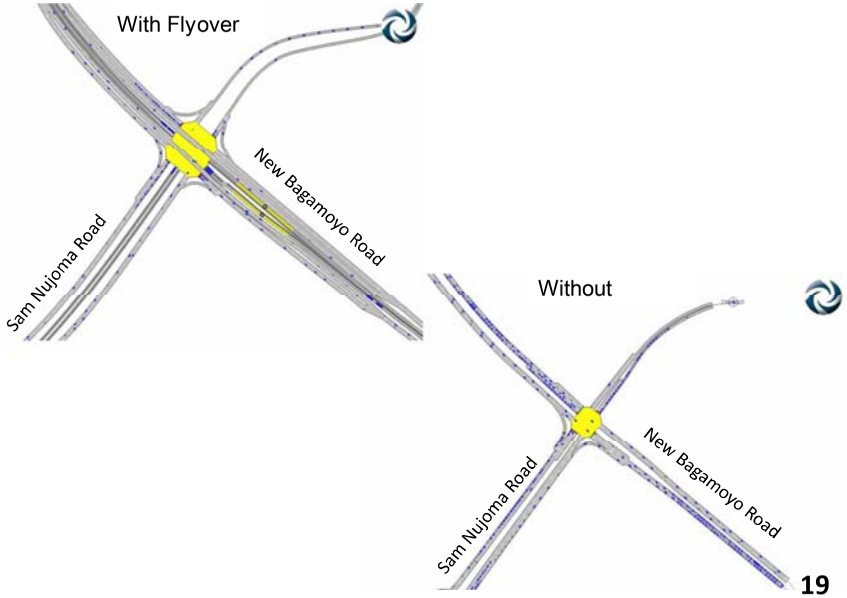
No.	Name	Saturation degree		No of Heavy vehicle (Peak hour)		Flooding Risk		Accident Risk		Government Policy		Total Score
		Number	Score	Number	Score		Score		Score		Score	
1	Muwenge	2.25	40	180	10	M	5	M	5			60
2	Morocco	2.24	40	96	5	M	5	H	10			60
3	Oysterbay	1.70	20	67	0	H	10	M	5			35
4	Ali Hassan	1.68	20	71	0	H	10	L	0			30
5	Magomeni	1.90	30	154	10	L	0	M	5			45
6	United Nations	2.06	30	89	5	L	0	L	0			35
7	Fire (Msimnbazi)	2.06	30	104	5	L	0	L	0			35
8	Tazara	3.11	50	313	20	L	0	M	5			75
9	Chang'ombe	2.70	50	387	20	L	0	H	10			80
10	Tabata	1.71	20	250	15	L	0	L	0			35
11	Buguruni	1.96	30	243	15	L	0	L	0			45

◆ Layout of Junction Improvement: Muwenge

Muwenge (W=10m,L=550m Both Direction)

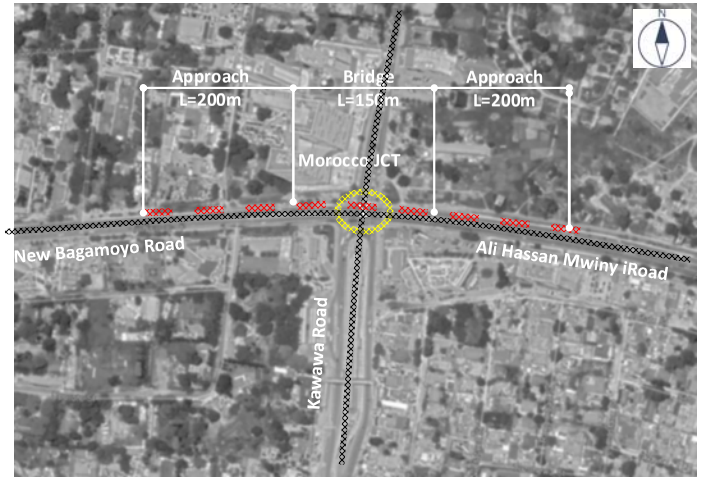


Microsimulation: Muwenge



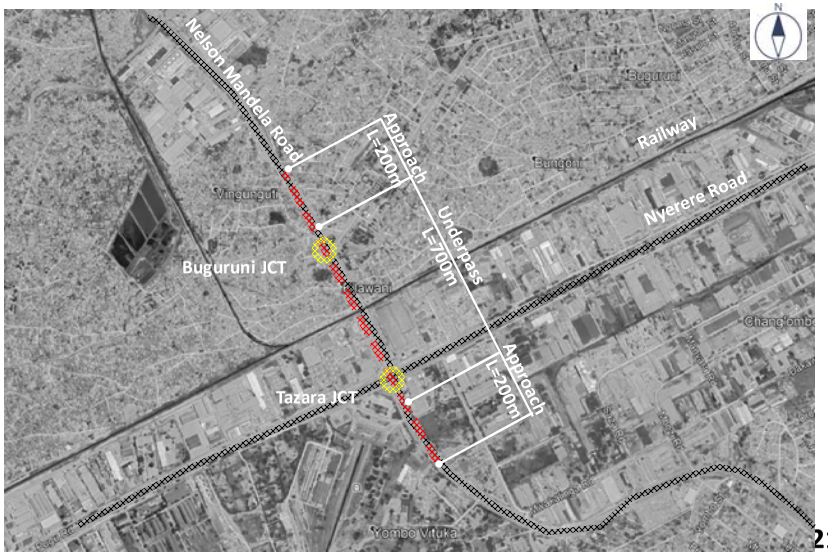
◆ Layout of Junction Improvement : Morocco

W=10m,L=550m Both Direction

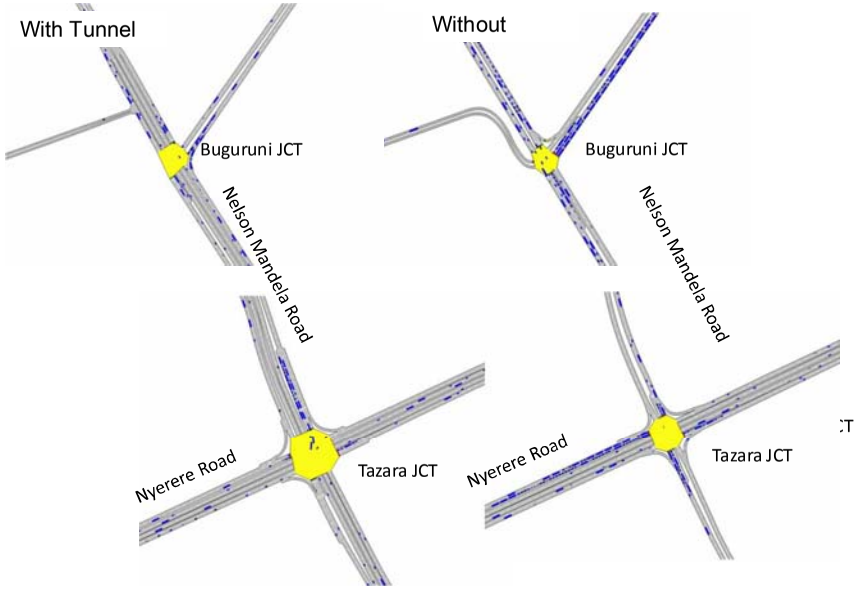


◆ Layout of Junction Improvement: Tazara

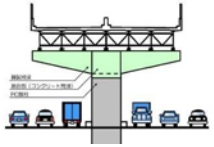
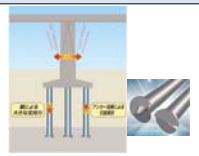
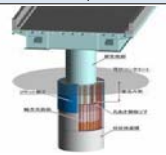
Underpass 4-lane (W=20m,L=1100m)



Microsimulation : Tazara-Buguruni Tunnel

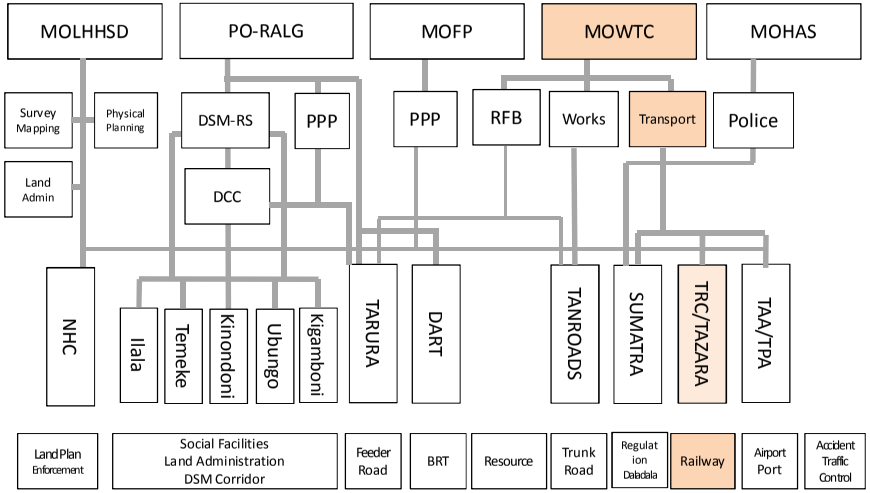


◆ Japanese technology

method	Construction of Piers at Narrow Space PC beams (Pierhead rotation method)	Construction of Piers at Narrow Space Steel beams pierhead (large block erection)
Image		
Description	A PC pierhead will be casted in parallel with the existing road at the median then be rotated 90 degrees using special hydraulic jack.	A prefabricated steel pierhead will be placed by a crane(s).
method	Reduction of the no. of piles PC beams Screwed steel pile	Elimination of Footing Integration of steel pier and large diameter bored pile
Image		
Description	・A special steel blade is welded which facilitates screw in the pile and provides larger end bearing capacity. ・No excavated soil is generated by piling works.	・A steel pier column and a large diameter bored pile are integrated. ・Construction period is reduced by eliminating a footing.

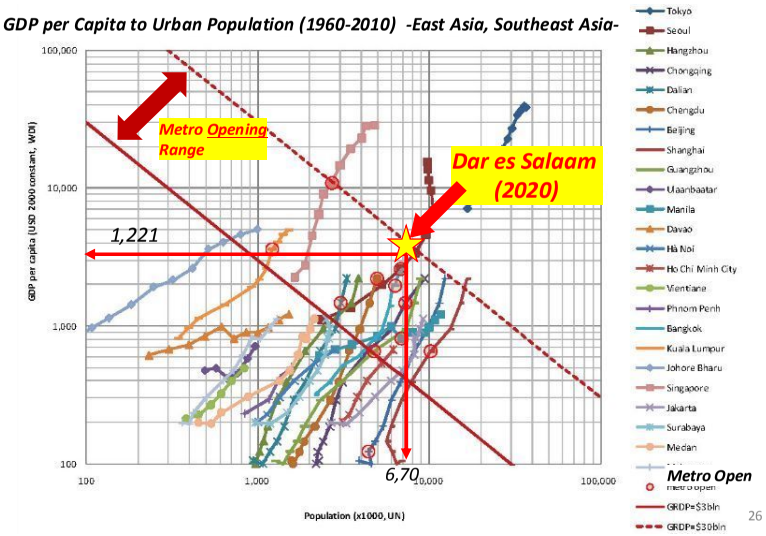
4. Railway

◆ Responsible Organizations



Analysis of the Timing for Metro Operation

The Research on Practical Approach for Urban Transport Planning (JICA, 2011)



Summary of Comments on TRC F/S

- Timing of the study is adequate. This is the time to start the detailed planning of urban railway in Dar es Salaam.
- Coverage of the study (area and time) is very wide, like a master plan level.
- Planning of at grade urban railway lines in a big city is very difficult due to land acquisition and resettlement.
- Transfer from BRT to MRT in future shall be considered where demand forecast exceed PHPDT 20,000 in future.
- It is strongly recommended to secure a space for future MRT construction along BRT corridor.
- Organization shall be set up to coordinate BRT and MRT construction.
- Dar es Salaam Metro may be required as an implementation Organization.

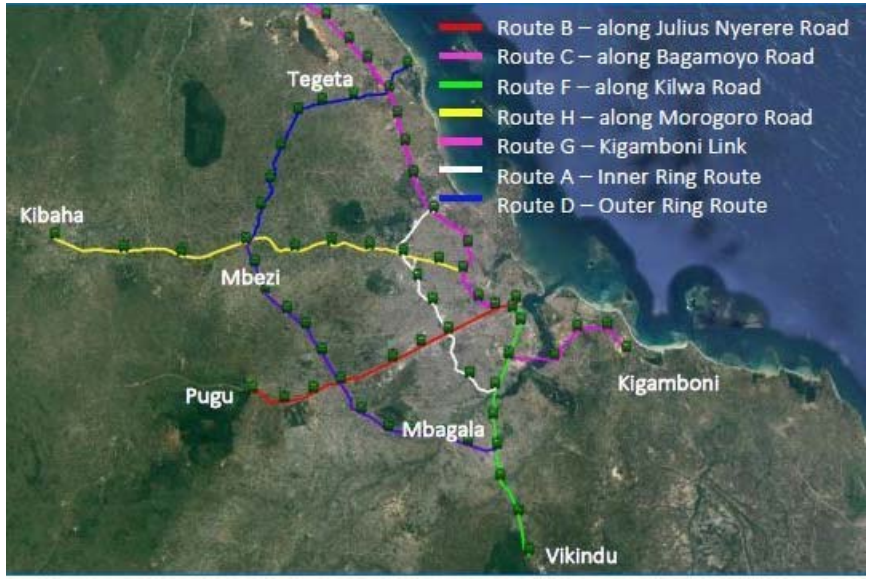
Prediction of Timing of Metro Opening (as of 2010)

Area	Cities having Metro already (as of 2010)	Metro Opening (as of 2010)		
		Cities reached time to have Metro	Cities reaching time to have Metro by 2025	Cities not reaching time to have Metro by 2025
South East Asia	・Bangkok ・Manila ・Kuala Lumpur ・Singapore	・Ho Chi Minh (U/C) ・Jakarta (U/C) ・Johor Bharu	・Davao ・Hanoi (U/C) ・Surabaya, Medan	・Ulaanbaatar ・Vientiane ・Phnom Penh ・Makassar
Central and South Asia	・Kolkata, Delhi ・Baku	・Dhaka (U/C), ・Mumbai, Hyderabad, Pune ・Lahor, Karachi	—	・Kathmandu
Middle East	・Tehran ・Cairo	・Baghdad ・Damascus	—	—
Middle & South America	・Mexico City ・Caracas ・Lima ・Santiago ・Sao Paulo, Rio de Janeiro ・Buenos Aires	・Guadarajara ・Panama City ・Barranquilla, Bogota ・Guayaquil ・Belem, Curitiba	・Cartagena ・Asuncion	・Guatemara City ・Managua
Africa	・Johanenesburg, Cape Town, Durban, Port Elizabeth	・Lagos	・Nairobi (2020) ・Dar es Salaam (2025)	・Kampala ・Lusaka ・Lilongwe

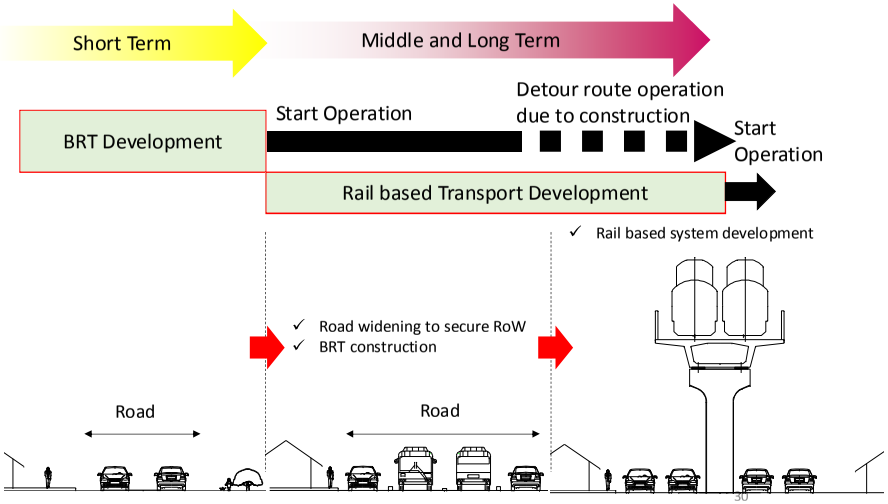
Note; 1. (U/C) means Under Construction as of 2017.

2. City name shown in Red means already operated as of 2017.

TRC F/S Dar es Salaam Commuter Rail Project



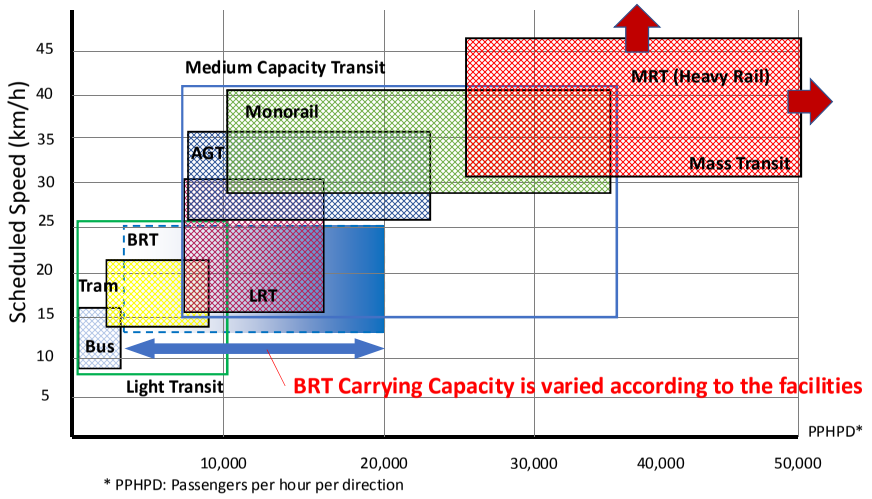
Transfer from BRT to MRT



Comments on Each Route

Phase	Route	Section (planned completion)	Route Length (km)	Const Period (month)	Land Ownership of Planned Alignment	Existing Condition of Planned Route and Parallel Road	Remarks	Evaluation
1	B	B1 - B9 (2024/06)	20.3	36	Within TRC R.O.W.	TRC R.O.W. is cleared. Rehabilitation project of MGR is also going on. Track work and electrification work for SGR is not started yet between Dr es Salaam and Pugu.	TRC decided to use SGR track for commuter train operation as Route B.	Exclusive F/S will be required for commuter train project on Route B.
	C	C2 - C11 (2025/05)	23.1	48	Land acquisition will be required at whole section	Road widening for BRT project is on-going between Moroco and Mwenge junctions. Existing Bagamoyo road after Mwenge has wide R.O.W. with wide median.	Elevated MRT can be accomodated on the widened Bagamoyo road.	Exclusive F/S is recommended on the alignment going on Bagamoyo road.
2	F	F1 - F6 (2029/03)	10.7	36	Partly using ROW of freight line, then go on existing road.	Road widening for BRT project has been completed up to km12+200 (Route F 1st phase) section.	Additional road widening may be required if MRT is going on Kilwa road.	Exclusive F/S is recommended on the alignment going on Kilwa road.
	H	H1 - H7 (2030/02)	16.0	24	On the Morogoro road	BRT is operating the section between H1 and H5 already.	Coordination shall be made with Tanroads how to construct on the road.	Exclusive F/S is required.
3	F	F6 - F9 (2033/12)	7.3	24	Go on existing road	Existing road is not wide enough for BRT /MRT.	Road widening will be required.	Future project
	A	A1 - A7 (2034/11)	17.4	36	A1 to A5: ROW of TRC	TRC is operating commuter train on this reoute.	Connection to Route B shall be considered.	Technically feasible at A1-A5 section.
					A5 to A7: Private/road	Crossing over TAZARA station is very difficult.	No consideration for crossing Neyerere road and Tazara station.	Re alignment is required between A5-A7 section.
4	G	G1 - G5 (2038/09)	10.5	60	Partly on existing road and partly on private land	There is no major roads at planned route. It is difficult to see site condition at present.	Demans seems too small. F/S is too early at this moment.	Future project
	C	C11 - C21 (2041/06)	39.3	24	Land acquisition will be required at whole section	There is no major roads at planned route. It is difficult to see site condition at present.	Demand will depend on Bagamoyo port project.	Future project
5	I	I1 -I3 (2045/04)	4.9	36	Go along existing road	Along small road.	This can be a branch line.	Future project
	H	H7 - H10 (2046/03)	14.0	24	On the Morogoro road	Road widening for BRT project has been completed up to Kibaha (H10).	Coordination shall be made with Tanroads how to construct on the road.	Exclusive F/S is required.
6	G	G5 -G2 (2050/06)	7.7	24	Partly on existing road and partly on private land	There is no major roads at planned route. It is difficult to see site condition at present.	Demans seems too small. F/S is too early at this moment.	Future project
	D	D9 - D21 (2051/11)	25.4	48	Mainly on private lands	There is no major roads at planned route. It is difficult to see site condition at present.	Demans seems too small. F/S is too early at this moment.	Future project
7	D	D1 - D9 (2056/08)	19.4	36	Mainly on private lands	There is no major roads at planned route. It is difficult to see site condition at present.	Demans seems too small. F/S is too early at this moment.	Future project

- **Quantitative and Objective Evaluation on Rail Based System**
  - Carrying Capacity by Mode in general

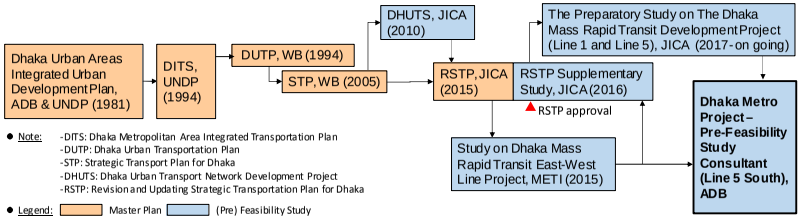


Required F/S for Phase 1 Projects

1. Route B (Dar es Salaam – Pugu: 20.3km)

- Condition 1: construction within TRC R.O.W.
- Condition 2: using SGR track structure
- Design of intermediate stations with loop structure
- Design of own depot and workshop with facilities
- Design of additional power supply system
- Prepare procurement plan of Rolling stock
- Demand forecast and train operation plan
- Detailed project implementation plan
- Detailed project cost estimate
- Economic and financial analyses
- Safeguard issues; social development, resettlement, environment

Reference Data: Dhaka Metro, Bangladesh



Line	Implementation Status	Operation Year	Length (km)	Pax/km	PPHPD
MRT Line 1	Under FS	2025	52	34,364	47,970
MRT Line 2	None	2035	40	31,959	30,810
BRT Line 3 North	Under Construction	2020	42	20,002	14,430
BRT Line 3 South	Complete DD	2020			
MRT Line 4	None	2035	12	37,924	27,430
MRT Line 5 North	Under FS	2028	29	47,072	28,600
MRT Line 5 South	This Study	2035	17		28,730
MRT Line 6	Under Construction	2021	41	37,717	45,110
BRT Line 7	None	2035	36	13,009	11,960

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Required Step for Other MRT Projects

2. Implementation of Route A, C, F and H

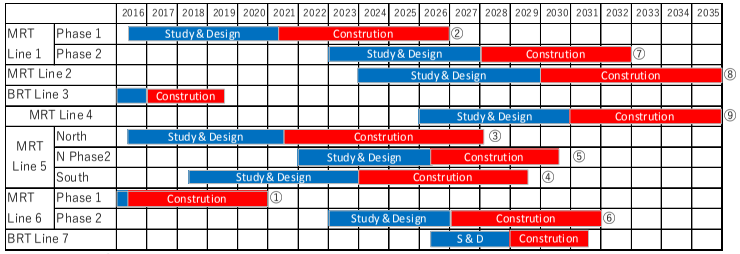
- These routes are overlapping with BRT corridors.
- Due to the limited transportation capacity of BRT system, these lines shall be replaced by MRT system in future. Timing of the replacement will be depending on the future passenger demands.
- Construction of MRT line in parallel with BRT line is an uneconomical way because once MRT is constructed, BRT will not be required to operate in same route.

Therefore,

- It is recommended to organize a Preparatory Bureau of Dar es Salaam Metro (say, PBDM) for planning of MRT lines incorporating with BRT projects.
- PBDM shall be formed under Ministry of Works, Transport and Communications. Staff shall be recruited from authorities concerned.

Ref. 1: Project Implementation Plan

Revised Implementation Plan (Updated RSTP)



Note: Number in ○ means the assumed priority.

- Line 1 D/D has started already.
- No study has been made for MRT Line 2. (by PPP? Schedule is not clear.)
- D/D of BRT Line 3 was completed, preparing for implementation.
- Because of small demand, no study has been made for MRT Line 4. (Lower priority)
- F/S for Line 5 North was completed on November 2017. (D/D was started in 2019.)
- Pre-FS for Line 5 South was completed in February 2019.
- Construction of MRT Line 6 is on-going.
- Because of small demand, no study has been made for BRT Line 7. (Lower priority)
- Consequently, higher priority shall be given to MRT Line 5 south.

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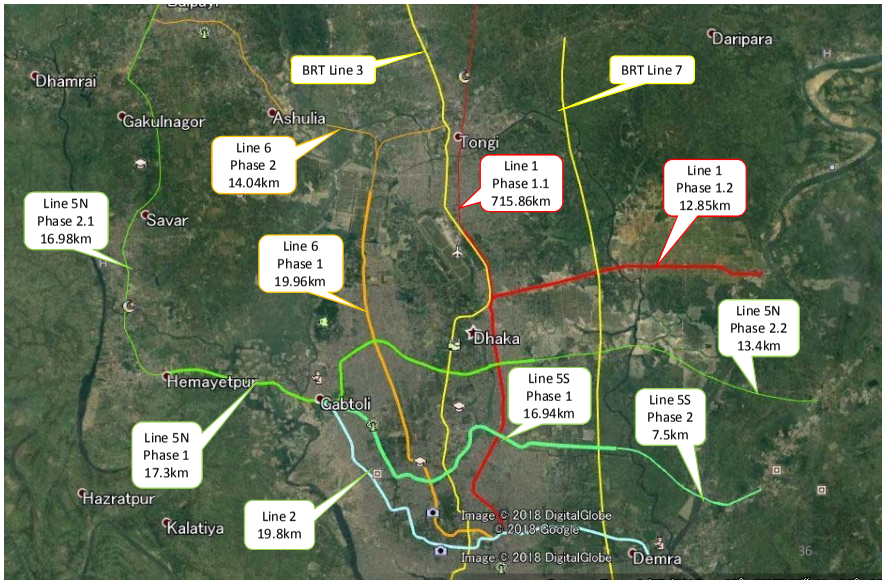
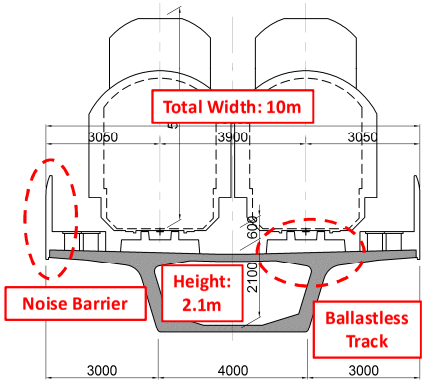
Ref. 2: MRT/BRT Network Plan



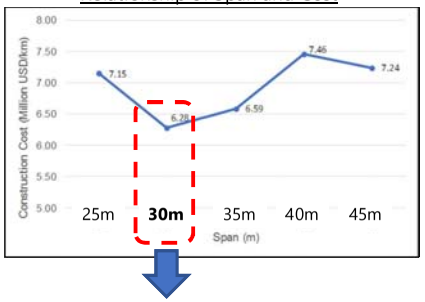
Ref. 3: Civil Structure – Viaduct Structure

Details of Superstructure

Cross Section



Relationship of Span and Cost

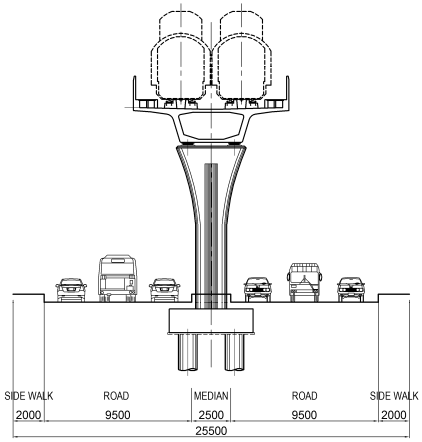


30m span is most economical

→Standard span is applied as 30m

Ref. 4: Civil Structure – Viaduct Structure

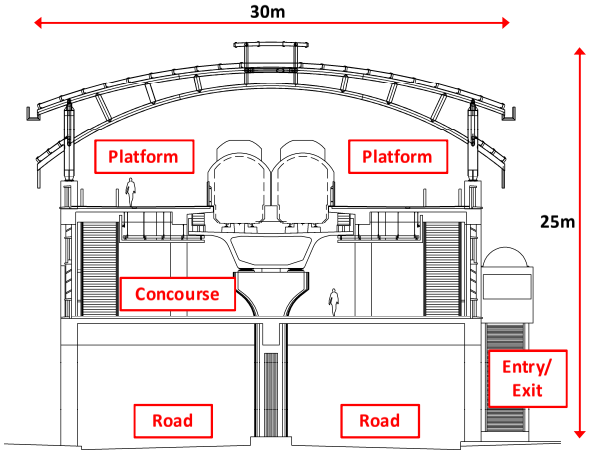
Details of Substructure



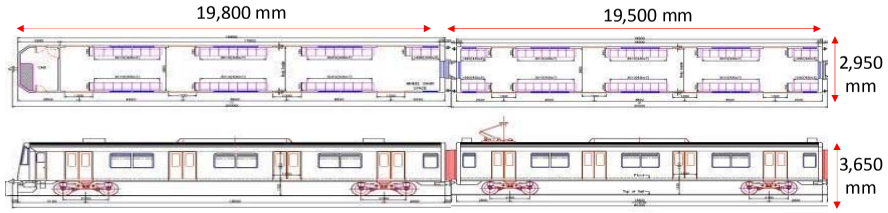
- Single column Structure for minimization of road occupancy.
- Cast-in-Situ pile for economical construction.
- Road can be ensured 2 or 3 lanes.
- Road will be occupied 10m width during construction work.

Ref. 5: Civil Structure – Elevated Station

Elevated Station Structure



Ref. 6: Rolling Stock



- Train Configuration will be of 2 types
  - ✓ 6 car: Tc – M – M – T– M – Tc
  - ✓ 8 car : Tc – M – M – T – T – M – M – Tc

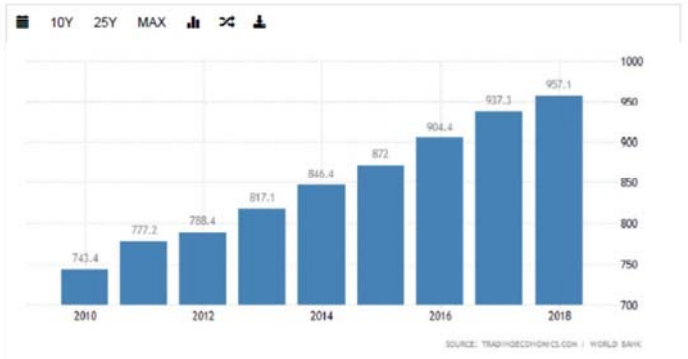
Passenger Capacity			
	6car	8 car	
AW0	306	414	only seated
AW1	968	1298	seated + 3.3 per m2
AW2	1742	2336	TPN 180% congestion ratio (8 per m2 approx.)
AW3	2311	3093	seated + 10 per m2

Ref. 8: GDP per Capita of Tanzania

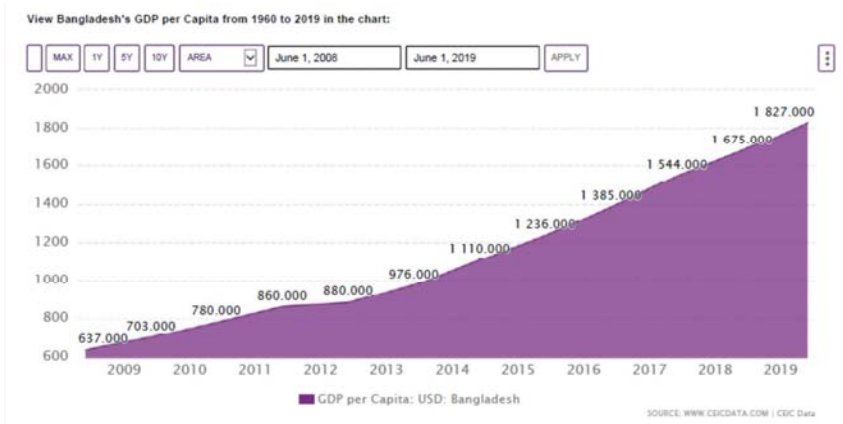
Tanzania GDP per capita

Summary | Stats | Forecast | Download

The Gross Domestic Product per capita in Tanzania was last recorded at 957.10 US dollars in 2018. The GDP per Capita in Tanzania is equivalent to 8 percent of the world's average. Tanzania GDP per capita - data, historical chart, and calendar of releases - was last updated on February of 2020 from its official source.



Ref. 7: GDP per Capita of Bangladesh

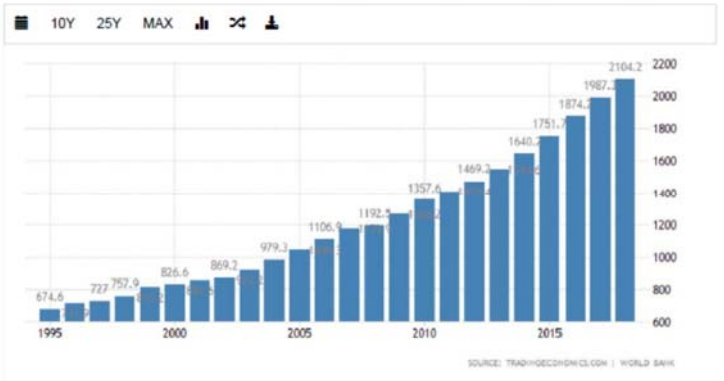


Ref 9.: GDP per Capita of India

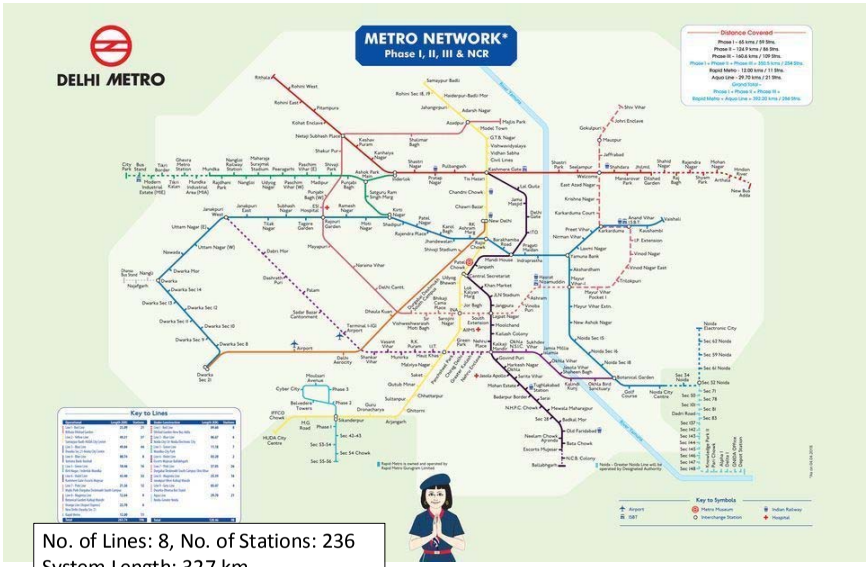
India GDP per capita

Summary | Stats | Forecast | Download

The Gross Domestic Product per capita in India was last recorded at 2104.20 US dollars in 2018. The GDP per Capita in India is equivalent to 17 percent of the world's average. India GDP per capita - data, historical chart, and calendar of releases - was last updated on February of 2020 from its official source.



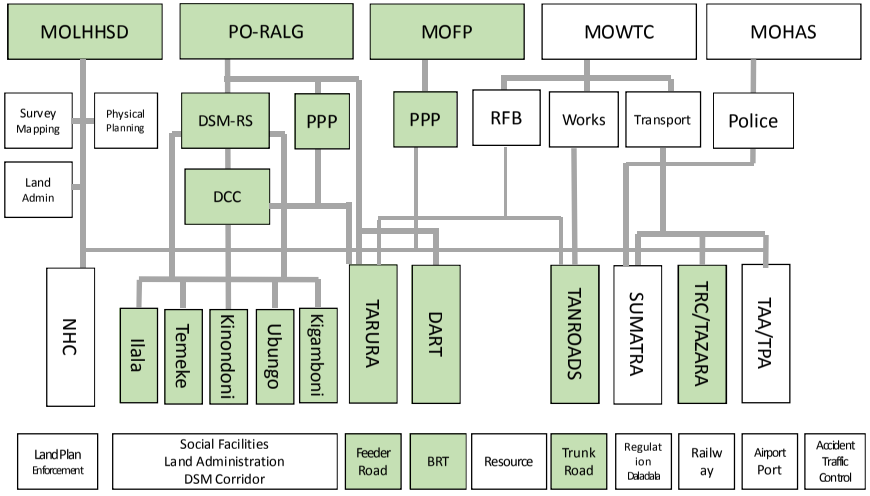
Ref. 10: Metro Network in Delhi, India



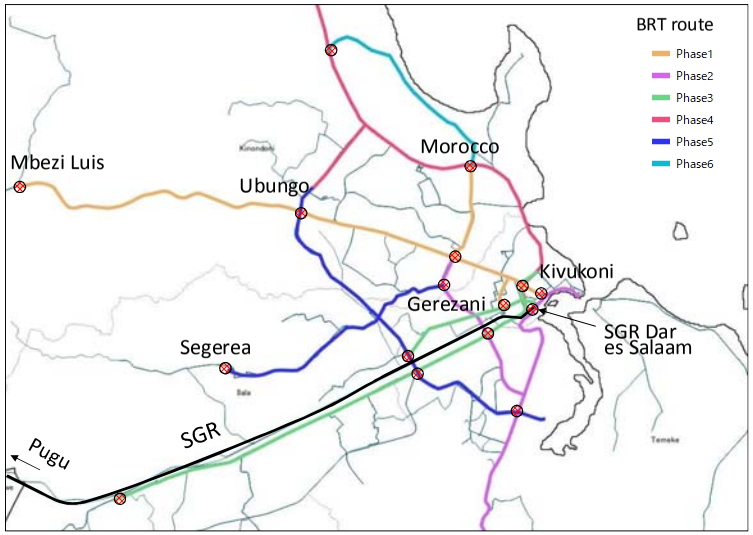
A5-12

5. Transportation Terminal Development

◆ Responsible Organizations

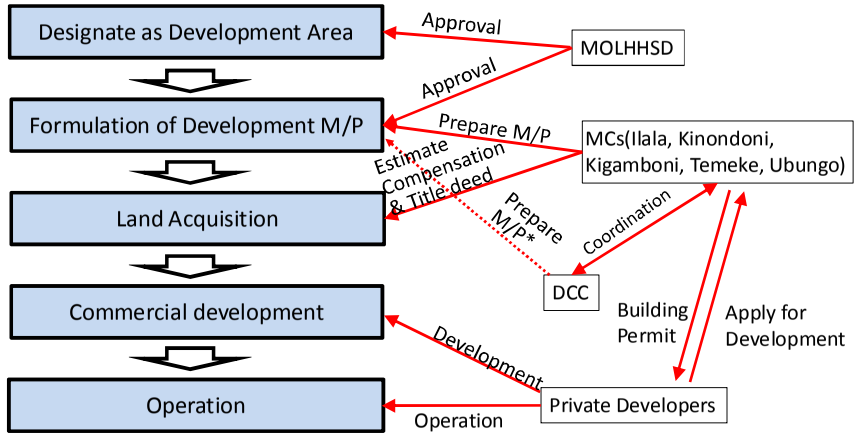


Current Project & Considerable Terminal Locations



Urban Development Scheme

Flow of Urban Development for Private Commercial Land Use



*If development area is wider & located in several MCs

Urban Development Scheme

✓Summarize spatial plan to show the land use policy

- General Planning Scheme
  Master Plan, Interim Land Use Plan
- Detailed Planning Scheme
  Redevelopment Plan, Layout Plan

Plan for TOD

Related Laws
- Urban Planning Act No.8 of 2007
- Guidelines for the Preparation of General Planning Schemes and Detailed Schemes for New Areas, Urban Renewal and Regularization

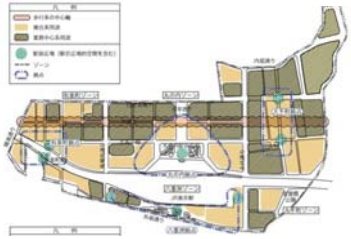
✓Building Permission

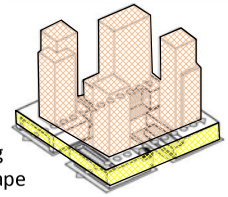
Related Laws
- Urban Planning Act No.8 of 2007
  - Urban Planning Regulations 2018

Urban Development Scheme

✓Summarize development guideline for TOD area
TOD Guideline is for integrated development within the TOD area, which includes future vision, policy, land use plan etc.

Components
1. Future Vision
2. Development Policy
3. Land Use Policy & Plan
4. Design Guideline
   (Spatial , Landscape design, Environmental Design)
5. Organization Structure



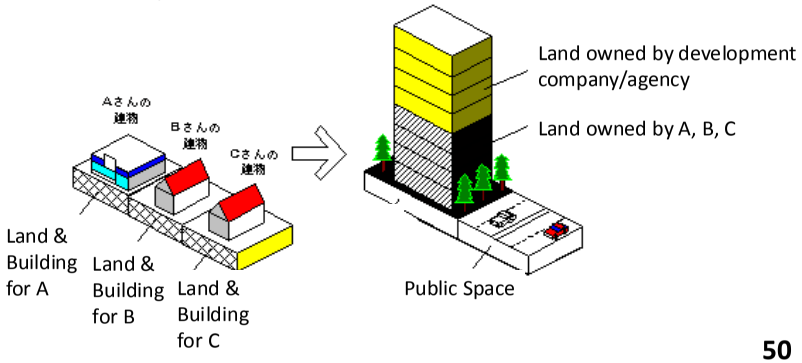


Unify the building height for landscape

Urban Development Scheme

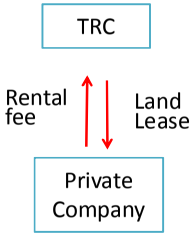
✓Consider land development scheme to correspond with unplanned Settlements
Land Readjustment Scheme for Urban Redevelopment

Reference in Japan



Urban Development Scheme

◆SGR Dar es Salaam Station
- Land Owner : TRC
- Development : TRC
- Operation : TRC (Railway), Private (Commercial)

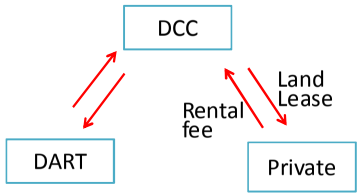


SGR Dar es Salaam Station & TRC office (Image)

Implementation Structure

◆Ubungo Bus Terminal

- Land Owner : DCC
- Development : TANROAD(BRT depot, station) , Private (Commercial)
- Operation : DART (BRT depot, station) , Private (Commercial)



East Africa Commercial and Logistic Centre at Ubungo (Image)

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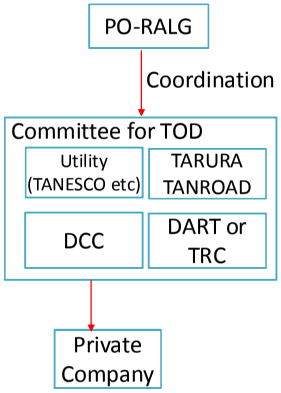
Implementation Structure

◆ Case-1 : Land Owned by Individuals

Concept : Land owned by individual authorities. PO-RALG organize the special committee for TOD and coordinate with related authorities



Land Owner:
BRT or Rail, Residence, Commercial: DART or TRC
Road : TANROAD & TARURA

Development:
1. Transportation : TANROAD, TARURA
2. Commercial, Residence, Office : Private
3. Public Space, Utility : DCC

Operation:
1. Transportation : DART
   Road: TANROAD, TARURA
2. Residence, Commercial : Private
3. Public Space : DCC

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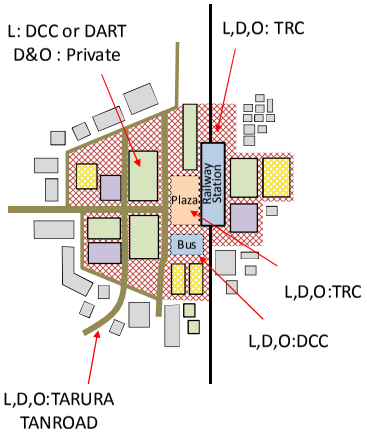
Implementation Structure

- ✓ DCC : City bus facilities
- ✓ TANROAD: Arterial road owner, development, maintenance, BRT facilities development
- ✓ TARURA: Road owner, development, maintenance
- ✓ DART: BRT operation, management
- ✓ TANESCO: Electricity
- ✓ TPDC: Gas
- ✓ TTCL: Telecommunication
- ✓ DAWASA: Water supply
- ✓ MC: Building permission
- ✓ MOLHHSD: Approval on the M/P

L: Land owner
D: Developer
O: Operator



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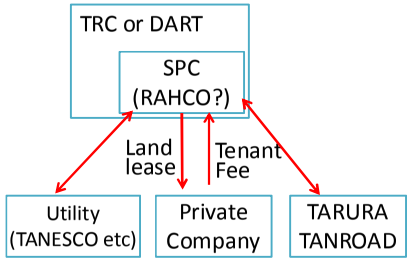
Implementation Structure

◆ Case-2 : Land Owned by Transportation Sector

Concept : Set the Special Purpose Company in the public transportation agency so that urban development can be lead by strong initiatives



Land Owner:
Railway: TRC
Commercial, Residence: SPC
Road : TANROAD & TARURA

Development:
1. Transportation : TRC, TARURA
2. Commercial, Residence, Office : Private
3. Public Space, Utility : SPC

Operation:
1. Transportation : TRC
   Road: TANROAD, TARURA
2. Residence, Commercial : Private
3. Public Space : SPC

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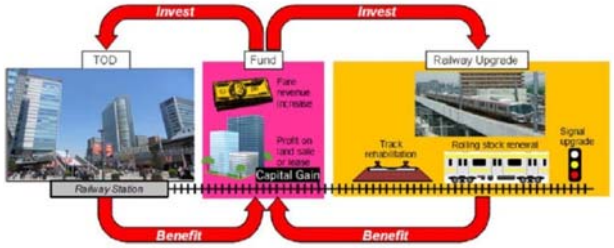
PPP

Current Situation

- A few cases are realized for PPP scheme
- Limited government support menu (Subsidiary, low interest loan, grace period..)

Recommendation

- Consider government support menu
- Pooling system which makes viable PPP.
  i.e. Coordinated project between railway and urban development



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