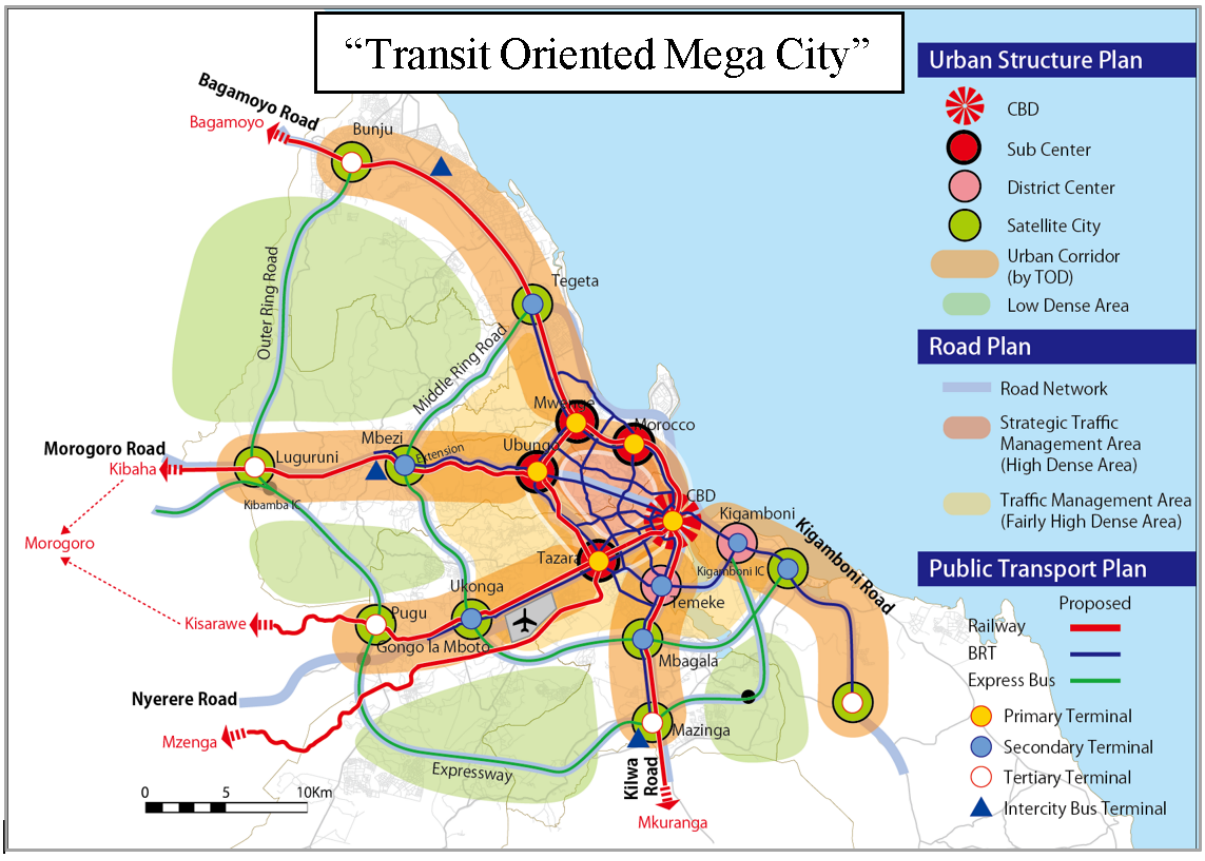
CHAPTER 11 IMPLEMENTATION PLAN

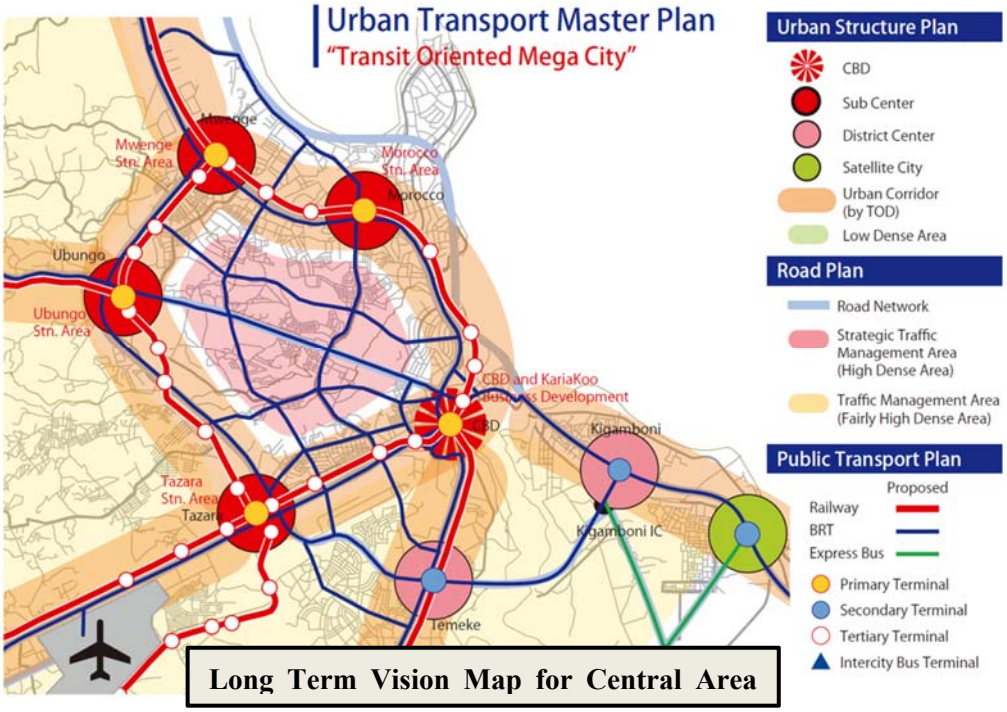
In this chapter, staging plan of the M/P by 2025, 2030, and 2040 or after 2040 is proposed. Regarding BRT plan, Phase 2 - 4 is set to be completed by 2025 and phase 5 and 6 by 2030 according to WB project information. Railway plan for 2030 has been most argued in TWGs and in the discussion of transport related organizations. In order to find out the better railway plan for 2025-2030 medium terms, a number of alternatives were analysed based on future transport demand forecast for 2030 and 2040, cost estimation, economic evaluation, financial evaluation, environmental impact and other practical matters. The analysis for that are included not only in this chapter but also in Chapter 13 as Pre-Feasibility Study. Road network plan for 2030 is also proposed mainly based on the traffic demand and supply balance.

Figure11.1.1 and 11.1.2 shows the M/P long term vision maps for the whole DSM and Central area. These are made by urban structure plan, road plan, public transport plan and traffic management plan. As the traffic management plan only strategic traffic management area and traffic management area is shown in road plan category.



Source: JST

Figure 11.1.1 Conceptual Map of Urban Transport Master Plan (Long-Term Vision)



Source: JST

Figure 11.1.2 Long Term Vision for Central Area

11.1 Implementation Plan for Urban Transport Master Plan

11.1.1 Staging Plan for All Sectors

Staging plans for 2025, 2030, 2040 and after-2040 are proposed as shown from Figure 11.1.3.to Figure 11.1 6. The staging plans are based on the following policy as shown in Table 11.1.1.

(Short Term Policy until 2025)

- The main policy of the short term target is to manage traffic movement in more efficient way under inadequate transport infrastructure provision.
- The key projects are BRT phase 2-4, traffic management and fly-over at trunk road intersections.

(Medium Term Policy until 2030)

- The main policy of the medium term target is to build the mass transit network consisting of BRT and railway in the area within 15-20 km away from the CBD in order to accommodate huge public transport demand generated by the population of approximately 10 million in DSM.
- The key projects are BRT phase 5-6, railway projects consisting of part of Bagamoyo line, Morogoro line and Loop line and Middle Ring Road project.
- The road congestion on trunk roads in high density area within 10km away from the CBD is expected to be relieved.

(Long Term Policy until 2040)

- The main policy of the long term target until 2040 is to complete the mass transit network for the whole area of DSM within 30km away from the CBD and build the Radial-Ring road network consisting of three major ring roads, Nelson Mandela, Middle Ring and Outer Ring road. The

strategic target of the long term policy is to have less than one hour commuting time from the whole area of the city to the CBD by efficient public transport services.

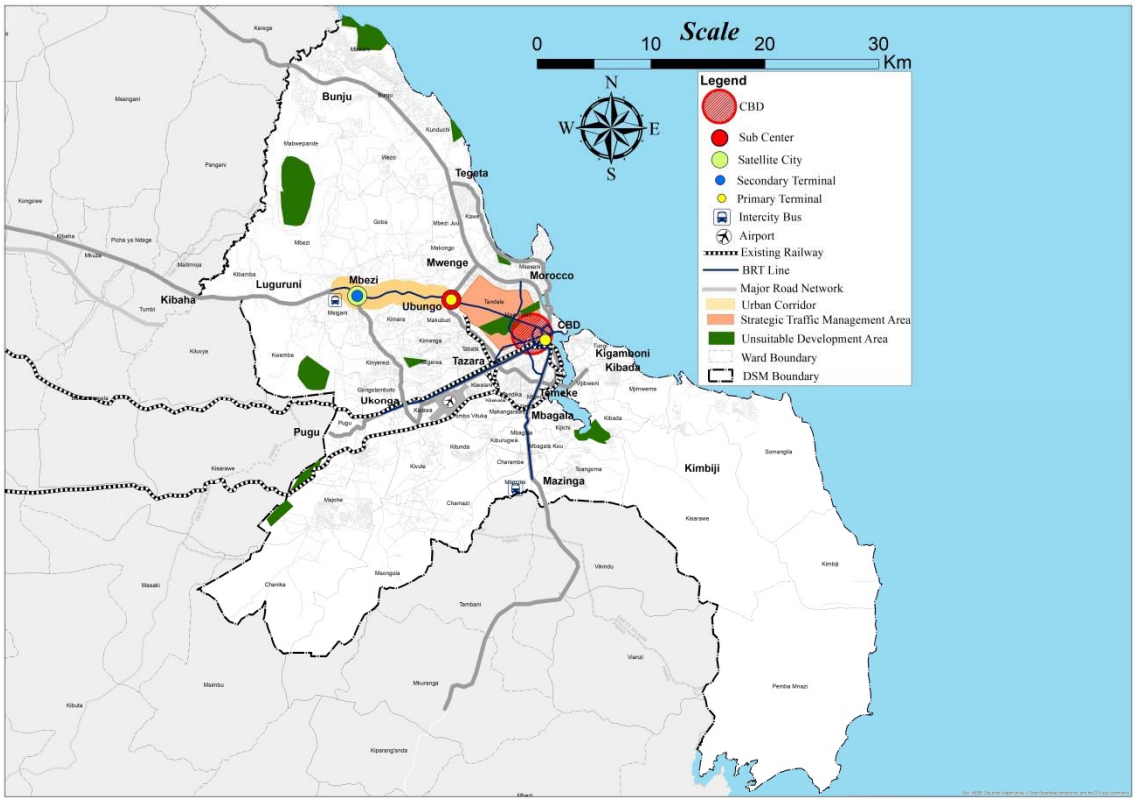
- The population is assumed to be 12million in the city and more than 3 million outside the city. The catchment area of commuting in DSM would expand to 50km away from the CBD. Therefore, medium and long trips will increase. In order to respond to such longer trip increase, extension of railway network and BRT phase-7 are suggested.
- Suggested four major measures in the M/P which are building of Palm and Finger urban structure, Railway and BRT collaboration network and Radial-Ring road network and installation of Traffic management system will contribute to become a sustainable city.
- For the period after 2040, it will be necessary to extend railway lines into the greater DSM which would expand 50km away from the CBD beyond the boundary of DSM city.

Table 11.1.1 Proposed Staging Plan of Transport System

Term	Policy, Sector Plans		
Short Term until 2025	● To improve road congestion in peak hours on Bagamoyo, Nyerere and Kilwa Roads, completion of BRT Phase 2 to 4, Fly-Over projects for Tazara and Ubungo intersections and introduction of Traffic Management system for the strategic traffic management area inside the Nelson Mandela road are suggested.		
	Urban Structure	**Road and Traffic Management**	**Public Transport**
	● Development Control for unsuitable development area ● Development of Ubungo as Sub-centre ● TOD between Ubungo and Mbezi	● Fly-Over projects for Tazara and Ubungo intersections ● Middle Ring Road between Morogoro and Nyerere road including airport link	● BRT Phase 2 to 4 ● Railway renewal for Ubungo branch line ● Ubungo Terminal
Medium Term until 2030	● To build public transport network consisting of railway, BRT and Feeder bus service for the area inside the middle ring road are suggested. ● To build a new ring road consisting of the northern part of Middle Ring Road and the southern part of Outer Ring Road are suggested.		
	Urban Structure	**Road and Traffic Management**	**Public Transport**
	● Development of Mwenge and Tazara as Sub-centre ● Development of Tegeta and Ukonga as Satellite-City ● TOD between Mwenge and Tegeta	● Middle Ring Road between Morogoro and Bagamoyo road ● Outer Ring Road between Kigamboni and Morogoro road	● BRT Phase 5 and 6 ● Bagamoyo New Railway Line between Tegeta and Aga Khan ● Morogoro New Railway Line between Mbezi and Ubungo ● Loop New Line between Ubungo and Mwenge ● Mwenge Terminal
Long Term until 2040	● To build public transport network consisting of railway extension, additional BRT route and Feeder bus service enforcement for the whole area of Dar es Salaam are suggested. ● To build radial and ring road network in addition to feeder road network in suburb are suggested. ● To complete Traffic Management system for the traffic management area inside the Middle Ring road and along five urban corridors are suggested.		

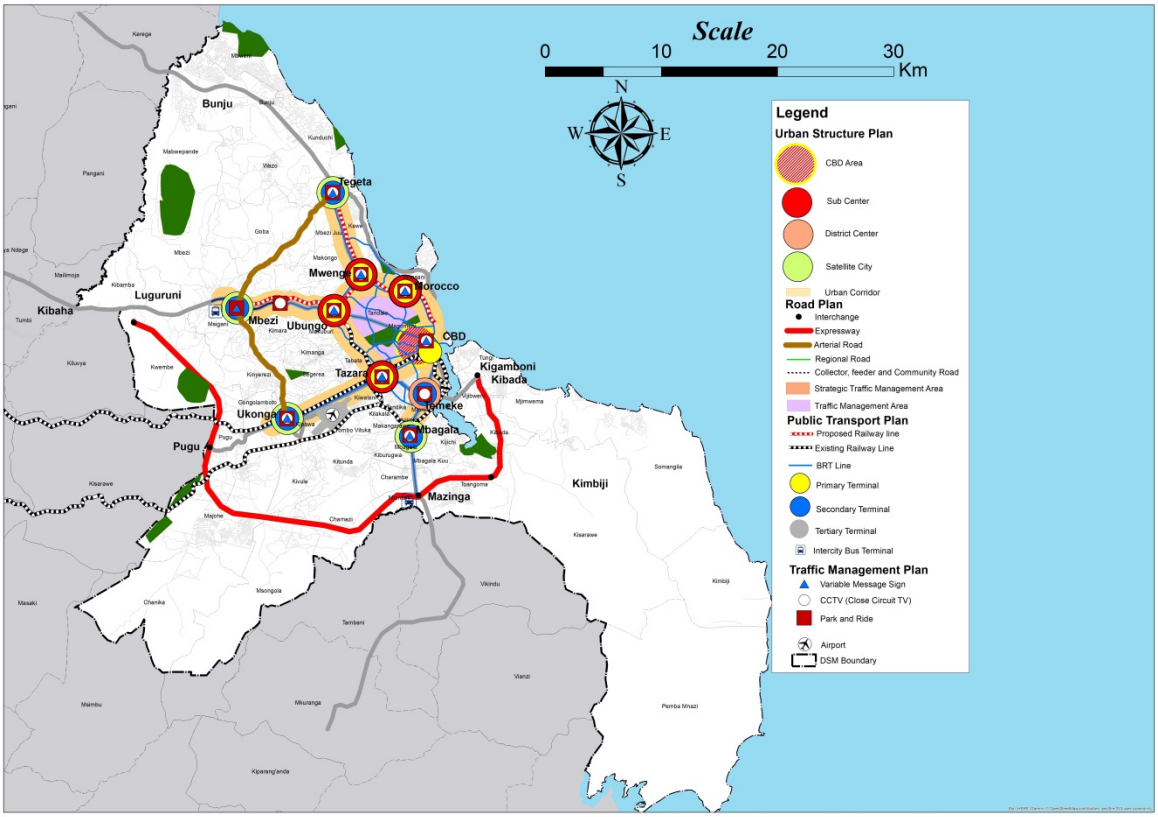
	Urban Structure	Road and Traffic Management	Public Transport
	● Development of all Sub-centres and Satellite-Cities	● Completion of Middle Ring Road and Outer Ring Road ● Completion of Bay Mouth Link between CBD and Kigamboni	● BRT introduction in Kigamboni areas ● Completion of Loop line connecting to Aga Khan station ● Railway Extension of Bagamoyo line and Morogoro line
After 2040	● To extend public transport network consisting of Kilwa railway line and extension of Morogoro line and Bagamoyo line beyond DSM city area are suggested.		
	Urban Structure	**Road and Traffic Management**	**Public Transport**
	● Development of all Sub-centres and Satellite-Cities	● Extension of Expressway	● Railway of Kilwa New line ● Extension of Morogoro line and Bagamoyo line

Source: JST



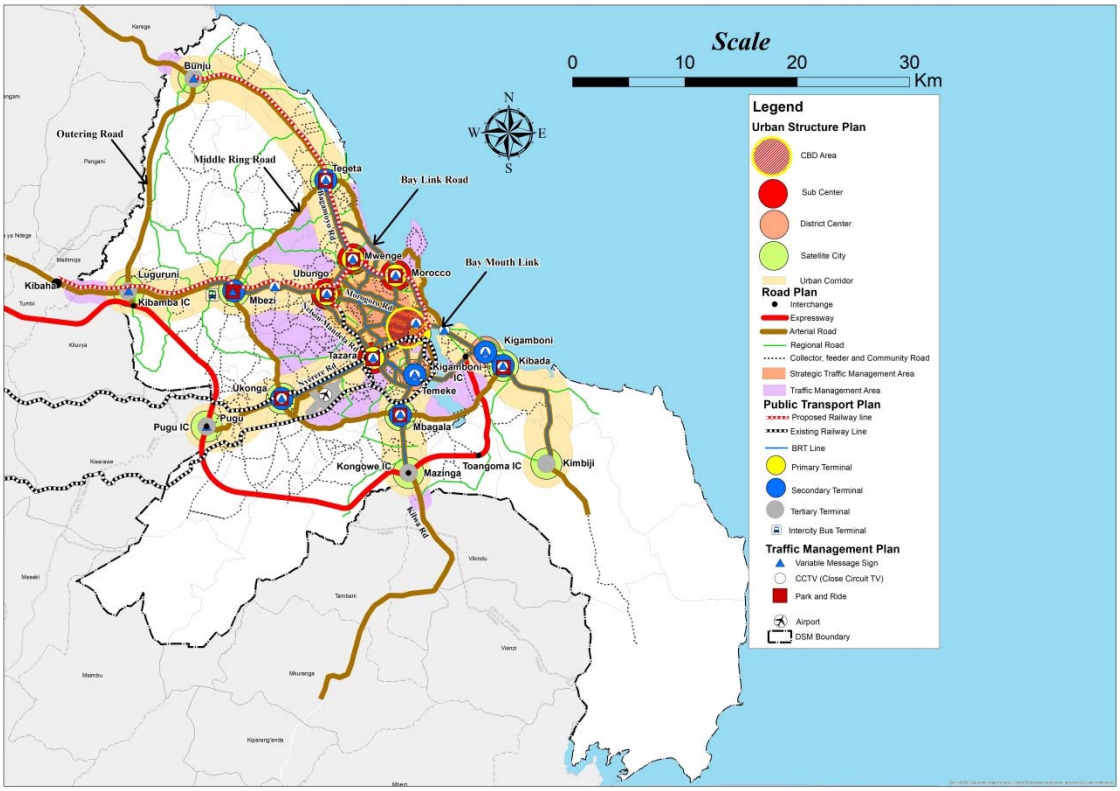
Source: JST

Figure 11.1.3 Staging Plan (2020-2025)



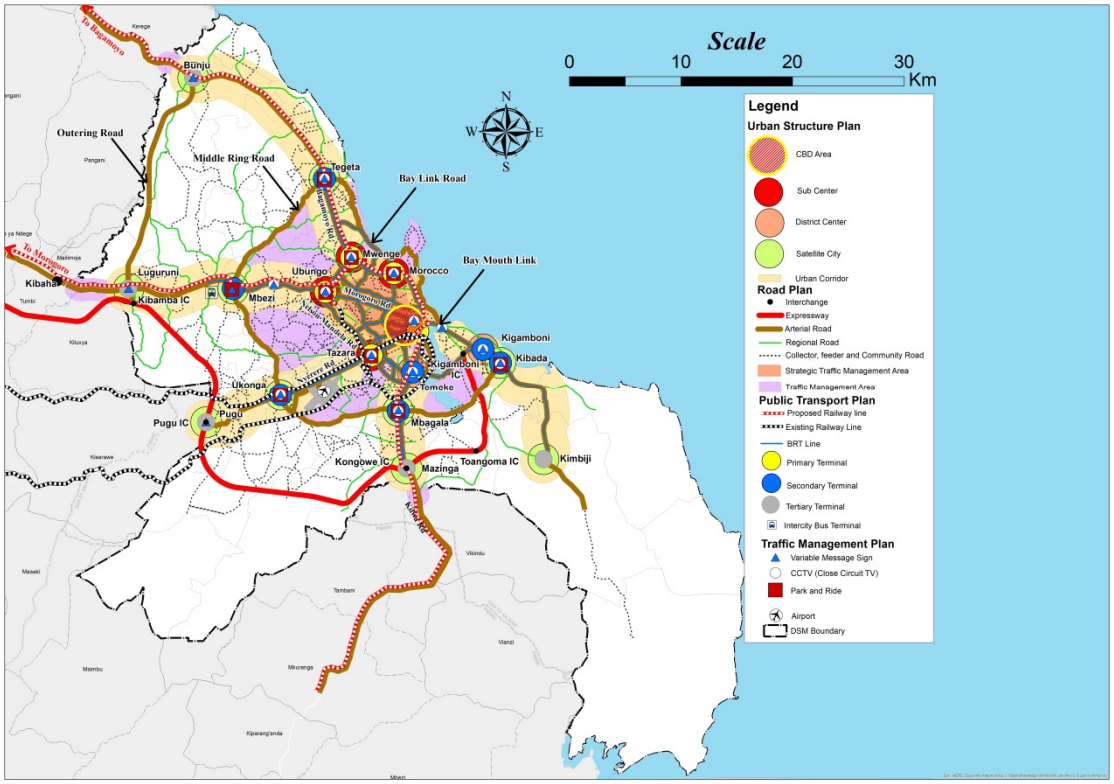
Source: JST

Figure 11.1.4 Staging Plan (2025-2030)



Source: JST

Figure 11.1.5 Staging Plan (2030-2040)



Source: JST

Figure 11.1.6 Staging Plan (after 2040 Long Term Vision)

11.1.2 Staging Plan for Road Sector

Milestones for commencement of the road projects are summarized in Table 11.1.2.

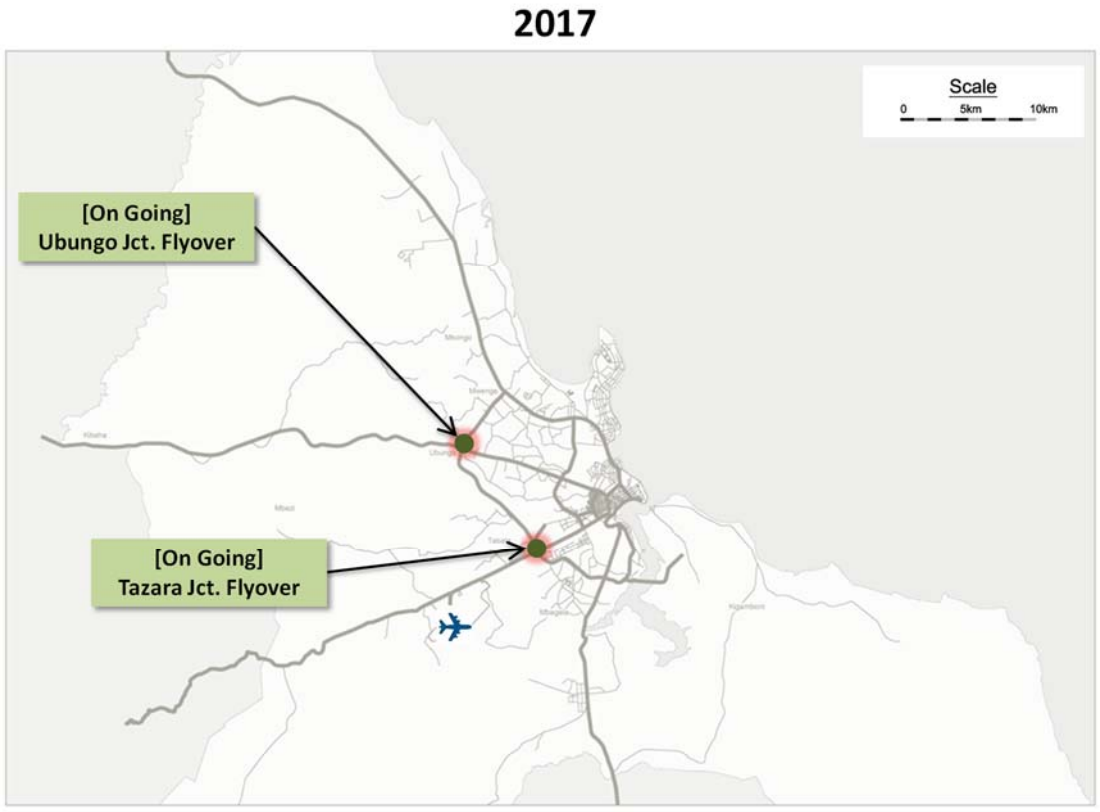
Table 11.1.2 Milestones for Commencement of the Road Projects

Type	Road / Bridge Name		Until 2025 (Short term)	Until 2030 (Medium term)	Until 2040 (Long term)
Road / Bridge	Middle Ring Road	Bagamoyo Rd - Morogoro Rd		O	
		Morogoro Rd - Nyerere Rd	O		
		Nyerere Rd - Kilwa Rd			O
		Kilwa Rd – Bay Link Road			O
		Second Kigamboni Bridge			O
	Airport Access Road		O		
	Outer Ring Road	Kigamboni IC to Kibamba IC (Expressway Section)		O	
		Kibamba IC to Bunju IC			O
	Old Bagamoyo Road		O		
	Bay Link Road	New Selander Bridge	O		
		Old Bagamoyo Road	O		
		Undersea Tunnel			O

		Kigamboni Road			O
Intersection	1	Ali Hassan Mwinyi / Kinondoni		O (C3)	
	2	Ali Hassan Mwinyi / United Nations		O (C3)	
	3	Chang'ombe Fly over Construction	O (C1)*		
	4	Fire Station		O (C2)	
	5	Magomeni	O (C2)		
	6	Uhuru			O (C4)
	7	Morocco	O		
	8	Mwenge	O (C1)		
	9	United Nations		O (C2)	
	10	Tabata			O
	11	Buguruni			O (C4)
Traffic Management	Inside Nelson Mandela Rd			O	
	Nelson Mandela Rd - Middle Ring Road				O

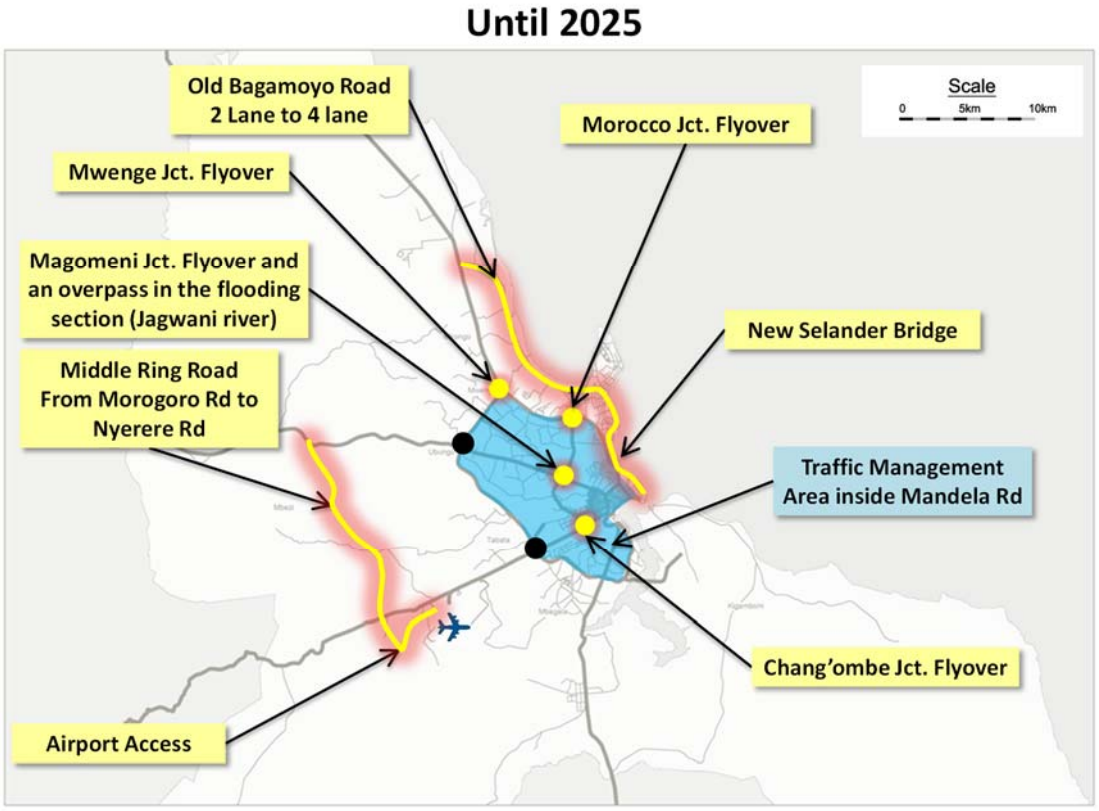
*(C1): Continuous grade separation. An attached umber means combined intersection as 1 structure.
*Regarding the priority rank of intersection improvement, refer to Chapter 10.

Figure 11.1.7 to Figure 11.1.10 show that current situation (2017), the staging plans for the short term (2025), medium term (2030) and long term (2040) of the arterial road network.



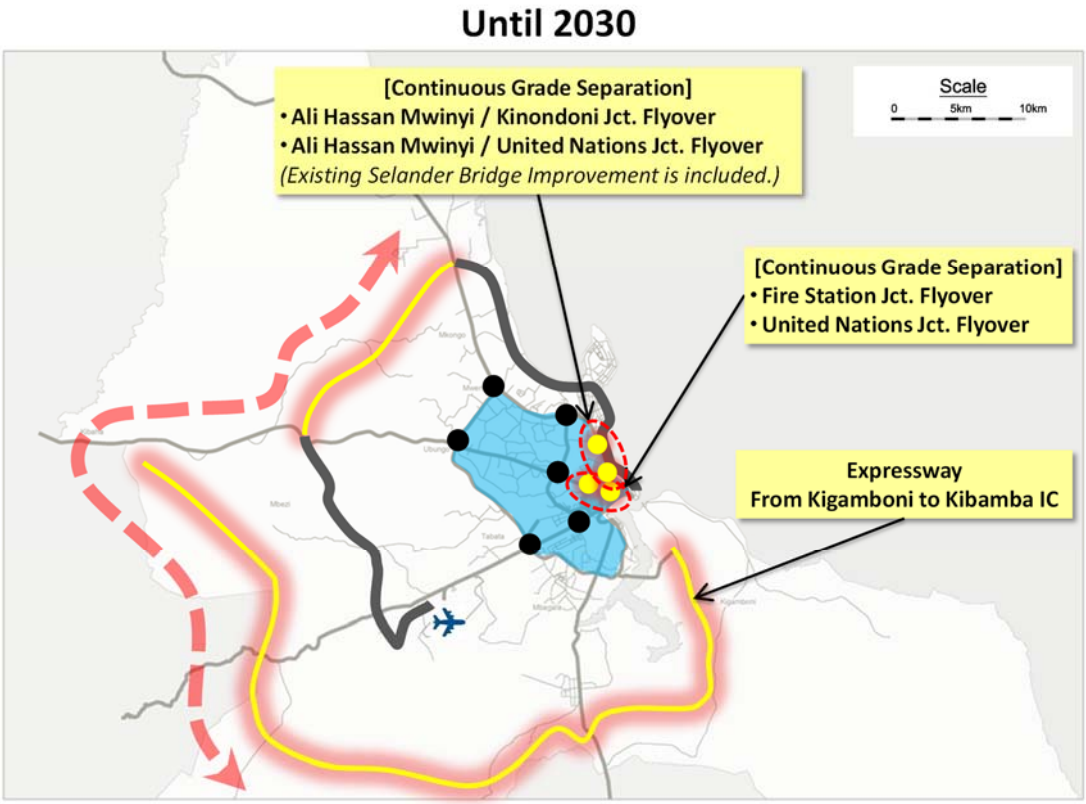
Source: JST

Figure 11.1.7 Current Situation in 2017



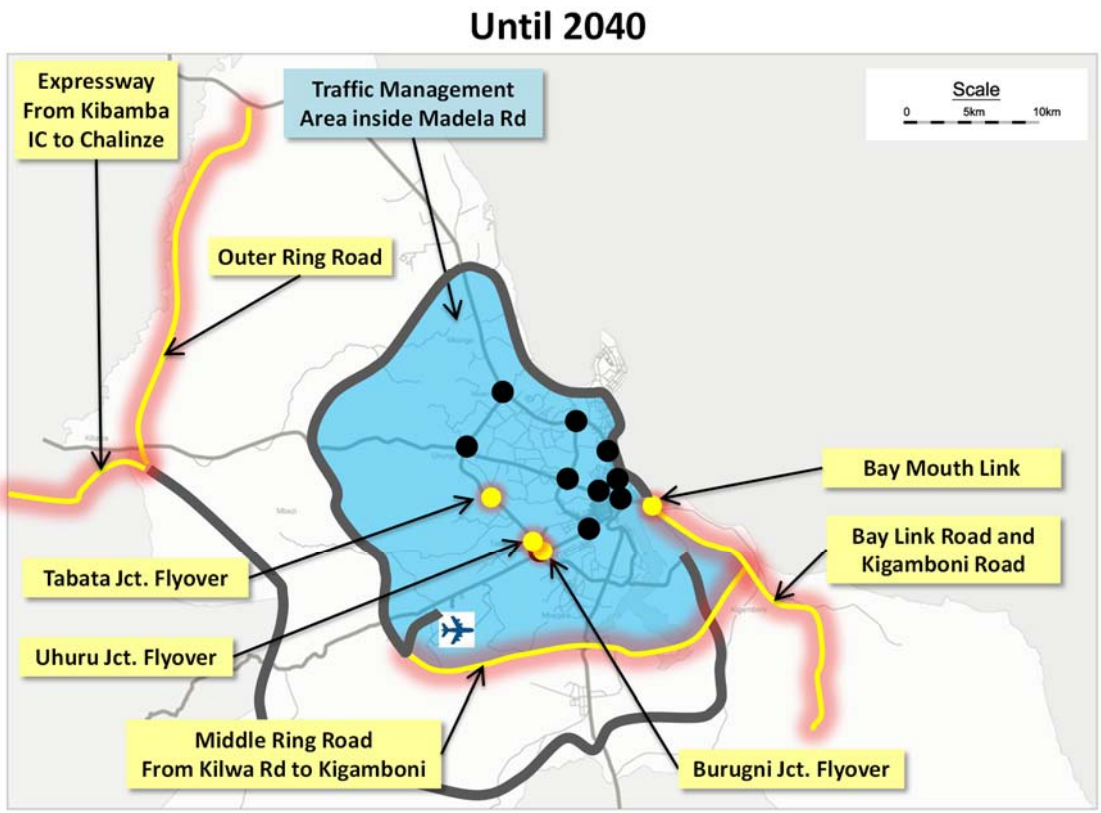
Source: JST

Figure 11.1.8 Plan to be Commenced until 2025



Source: JST

Figure 11.1.9 Plan to be Commenced until 2030



Source: JST

Figure 11.1.10 Plan to be Commenced until 2040

11.1.3 Transport Demand Forecast for Railway Project in 2030

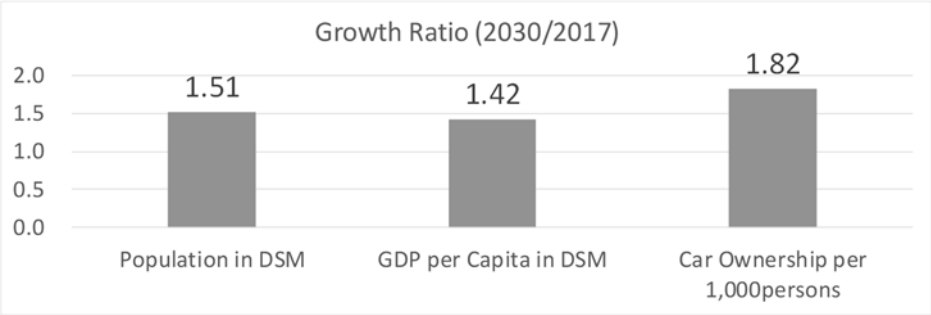
(1) Framework of Transport Demand Forecast in 2030

Framework of future demand forecast in 2030 is shown in Table 11.1.3. The population will become almost 9 million and based on it, car ownership in 2030 is estimated to be 60 vehicles per 1,000persons, which is about 1.82 times of 2017 and the growth is highly expected. Methodology of forecasting is almost the same as the one in 2040. Level of services is also the same as the one in 2040. These data, which are road capacity and maximum speed of road, velocities and others related operation of public transit, are shown in Chapter 8.2.1.

Table 11.1.3 Summary of Framework for Future Transport Demand Forecast in 2030

Item	2017	2030	Growth Rate (2030/2017)
Population	5.8million in DSM	9million in DSM*	1.55 times
GDP Growth Rate in TZ	7%	6%	2.13 times
GDP per capita in DSM	3.4million TZS	4.8million TZS	1.42 times
Average Monthly Income of Household	847,396 TZS	1,203,302 TZS	1.42times
Car ownership per 1,000pesons	33 vehicles per 1,000persons	60 vehicles per 1,000persons	1.82 times

* excluding 1.5 million in the neighbouring area outside DSM
Source: JST



Source: JST

Figure 11.1.11 Growth Ratio of Population, GDP per Capita and Car Ownership in 2030

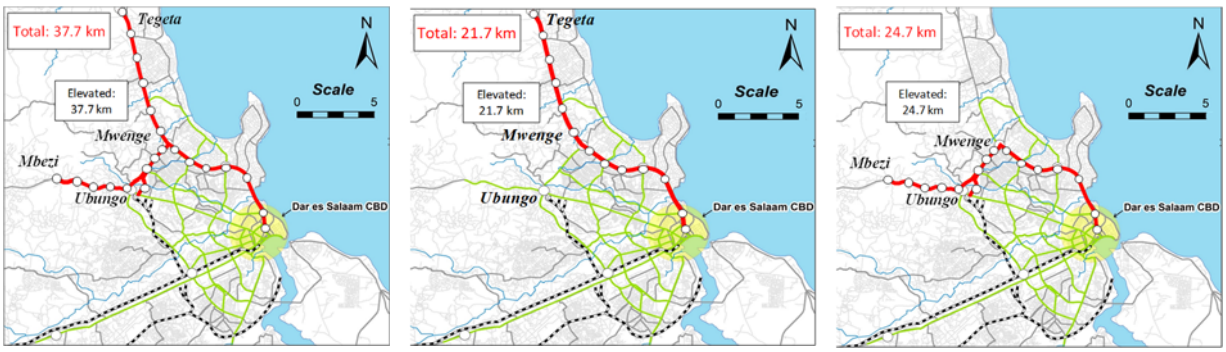
(2) Case Setting

In order to measure the transport effectiveness of Railway Projects, five simulation cases are set up as shown in Table 11.1.4. On Case 2, 3, 4 and 5, BRT development and Road network are the same and the difference comes from the railway development. Railway and road network are shown in Figure 11.1.12 and 11.1.13 respectively. As shown in Figure 11.1.13, the northern half section of Middle Ring road is completed, although the southern section is not. Expressway is completed from Kigamboni to Kibamba. Outer Ring road and Bay Link road are not completed.

Table 11.1.4 Simulation Cases for Demand Forecast in 2030

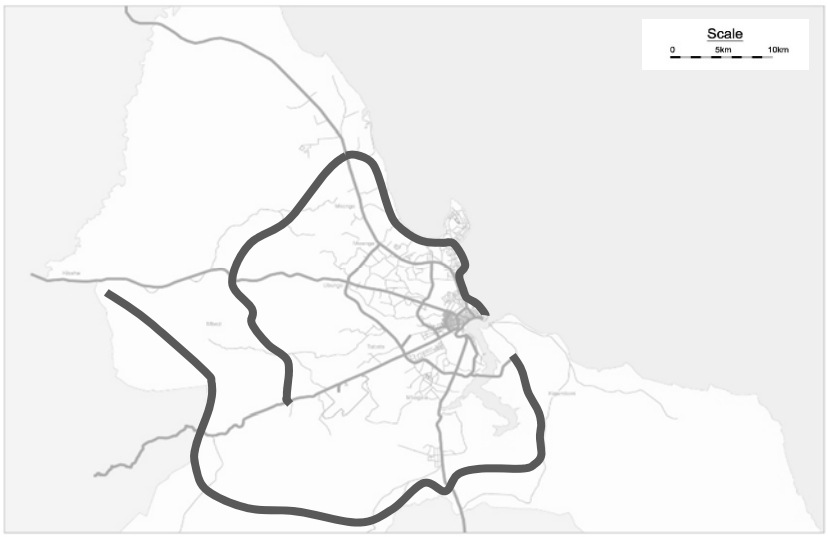
	Case Name	Forecast Year	Urban Structure	BRT	Rail	Road Network
1	Do-nothing Case	2030	Trend	Phase1-4	Current Service (Pugu, Ubungo, TAZARA lines)	Current Network
2	BRT-only Case		Balanced Structure with Satellite Cities & Sub centres	Phase1-6		Current Network + Expressway (from Kigamboni to Kibamba) +Middle Ring (from Tegeta to Ukonga) etc.
3	Master Plan Case				Current + New lines (Tegeta, Morogoro)	
4	Tegeta line Case				Current + New lines (Tegeta)	
5	Morogoro line Case				Current + New lines (Morogoro, Loop)	

Case 3: Master Plan Case **Case 4: Tegeta line Case** **Case 5: Morogoro line Case**



Source: JST

Figure 11.1.12 Railway Network for Demand Forecast of Case 3,4,5 in 2030



Source: JST

Figure 11.1.13 Major Road Network for Demand Forecast of Case 2-5 in 2030

(3) Transport Demand Forecast in 2030

a) Future Trip Generation/Attraction and Distribution

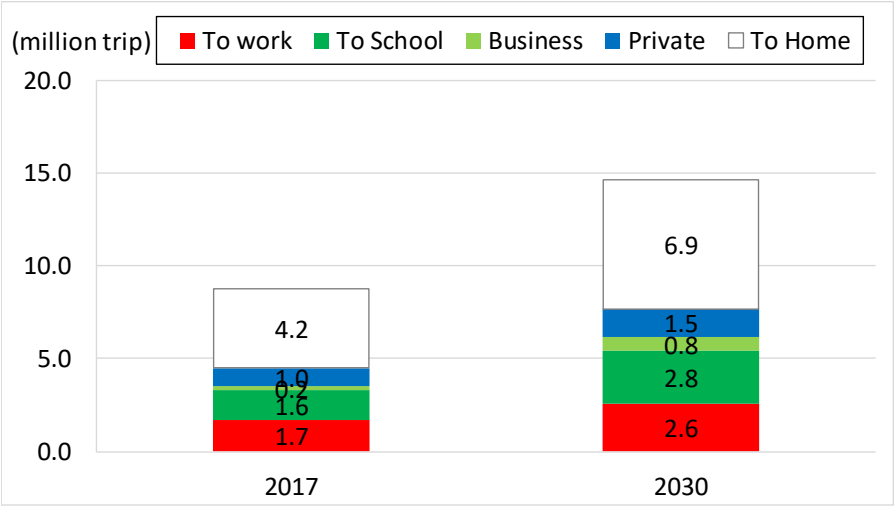
Future trip generation and attraction by trip purpose and by zone in 2040 are estimated by using the models as mentioned in Chapter 8.2.2. The transport demand in 2030 is expected within the range of 2017 and 2040. Therefore, it can be calculated by linear interpolation between 2017 and 2040 and the demand by trip purpose is shown in Table 11.1.5. Number of trips generated in 2030 is estimated at 14.6 million, which is approximately 1.7 times of trips in 2017.
Regarding the trip distribution in 2030, it is also estimated by linear interpolation between 2017 and 2040.

Table 11.1.5 Future Trip Generation in 2030

(Unit: million person trips/day)

Purpose	2030	2017	2040
To work	2.6	1.7	3.3
To School	2.8	1.6	3.7
Business	0.8	0.2	1.3
To Home	6.9	4.2	8.9
Private/Others	1.5	1.0	1.9
Total	14.6	8.8	19.2

Source: JST

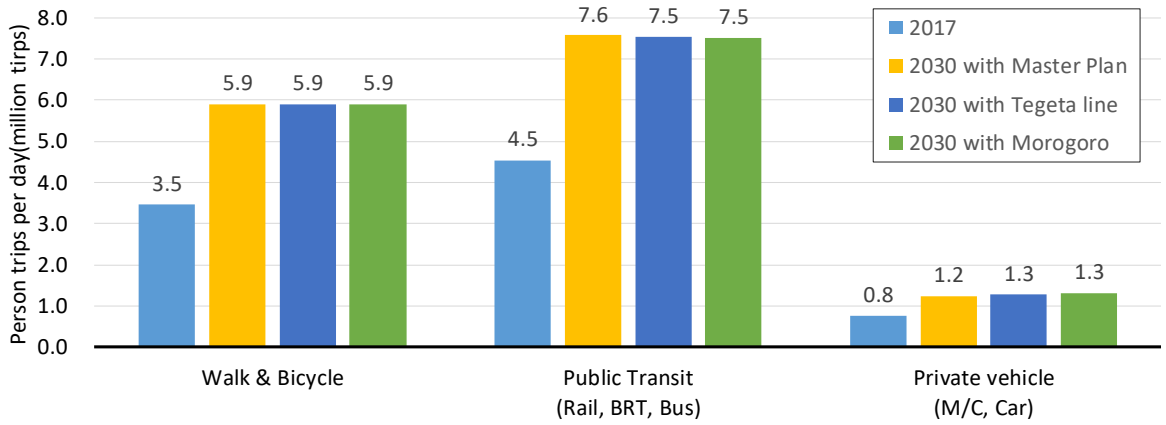


Source: JST

Figure 11.1.14 Estimated Trip Generation Total in 2030

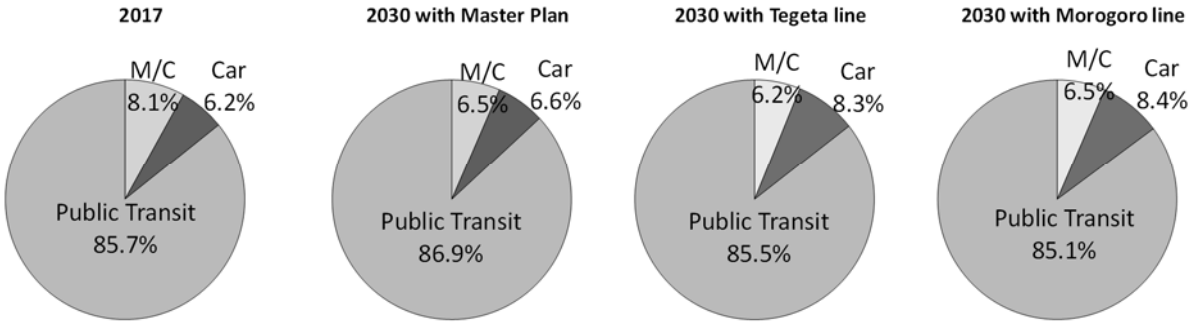
b) Future Modal Split

For the modal split, the same model and parameters are used as shown in Chapter 8.2.2. Figure 11.1.15 shows the number of trips of 3 cases including railway development and 2017 case. In all cases, the trips increase in every mode of transport when compared to 2017. Figure 11.1.16 shows the share. "Public Transit" occupies 85.7% and 86.9% in 2017, Master Plan Case respectively. But in Tegeta line case and Morogoro line case, the shares of public transit are 85.5% and 85.1%, and will decrease compared to 2017.



Source: JST

Figure 11.1.15 Comparison of Person Trips by Mode and by Case



(Exclude NMT trips)

Source: JST

Figure 11.1.16 Share of Person Trips by Mode and by Case

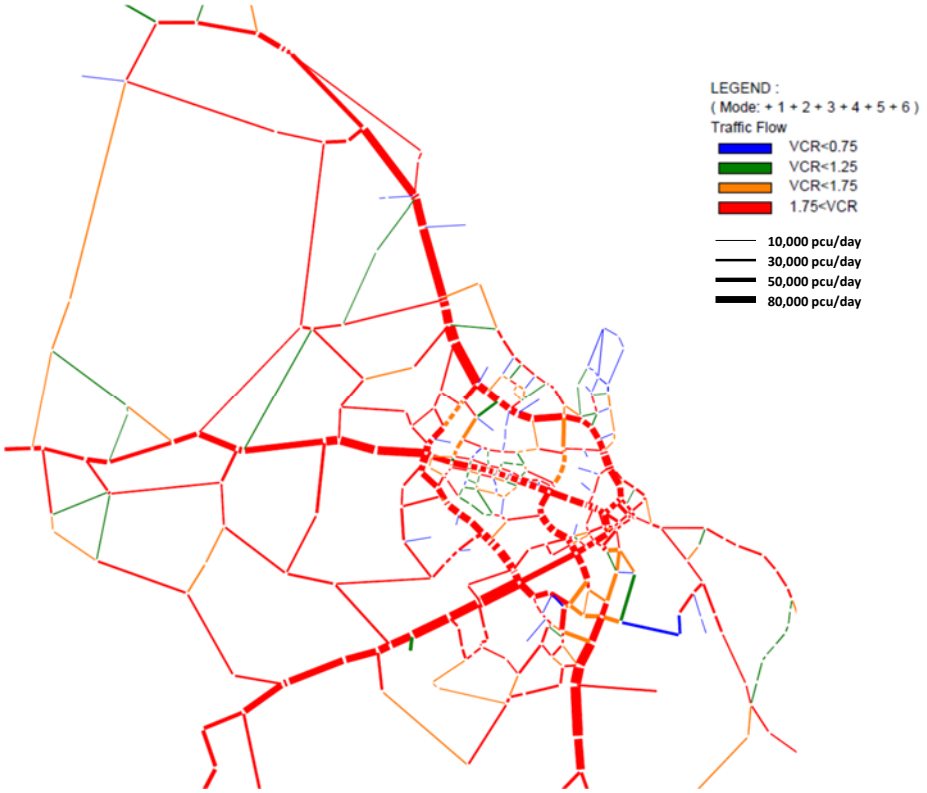
c) Traffic Assignment

The Study Team uses the JICA STRADA model for the road vehicle traffic assignment. The User Equilibrium Traffic Assignment 3.5 of the model is used for this Study. The traffic assignment procedure is done by using future Vehicle OD tables and planned development in the target years. Results of the Assignment in cases on road network in 2030 are shown in Table 11.1.6 and from Figure 11.1.17 to Figure 11.1.21.

Regarding the average travel speed of the road network in the study area, it is estimated as 12.9 km/h in Case1 Do-nothing, on the other hands, over 30 km/h in other cases. The difference between case1 and others can also be seen as the congestion distribution on the road network.

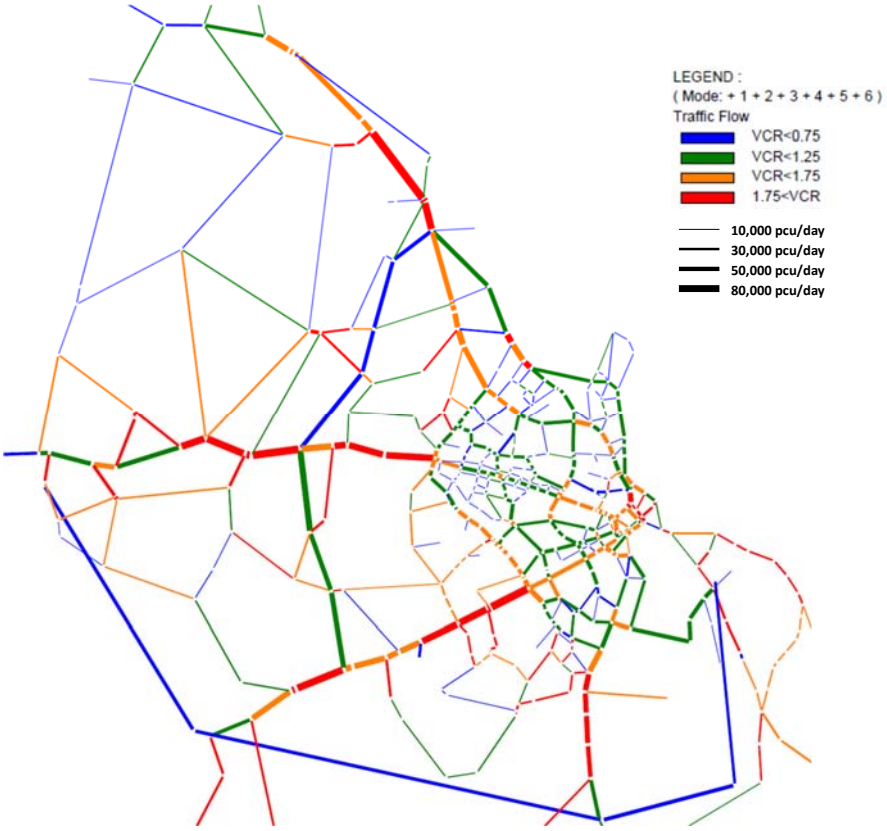
Table 11.1.6 Comparison of Congestion Ratio

	Case 1 Do-nothing		Case 2 BRT-only		Case 3 Master Plan		Case 4 Tegeta line		Case 5 Morogoro line	
Total vehicle kilometer	19,686,218		19,799,176		18,187,184		18,804,831		18,964,809	
Total vehicle time	1,525,860		587,016		528,881		550,891		554,779	
Average Congestion Ratio	1.99		0.83		0.76		0.79		0.79	
Average Speed (km/h)	12.9		33.7		34.4		34.1		34.2	
Road Length by Congestion Rank	Length (km)	Ratio	Length (km)	Length (km)	Ratio	Ratio	Length (km)	Ratio	Length (km)	Ratio
Less than 0.75	163	0.20	440	0.45	461	0.47	455	0.46	444	0.45
0.75 - 1.25	99	0.12	240	0.24	257	0.26	255	0.26	254	0.26
1.25 - 1.75	141	0.17	168	0.17	154	0.16	154	0.16	165	0.17
Over 1.75	414	0.51	133	0.14	109	0.11	117	0.12	118	0.12



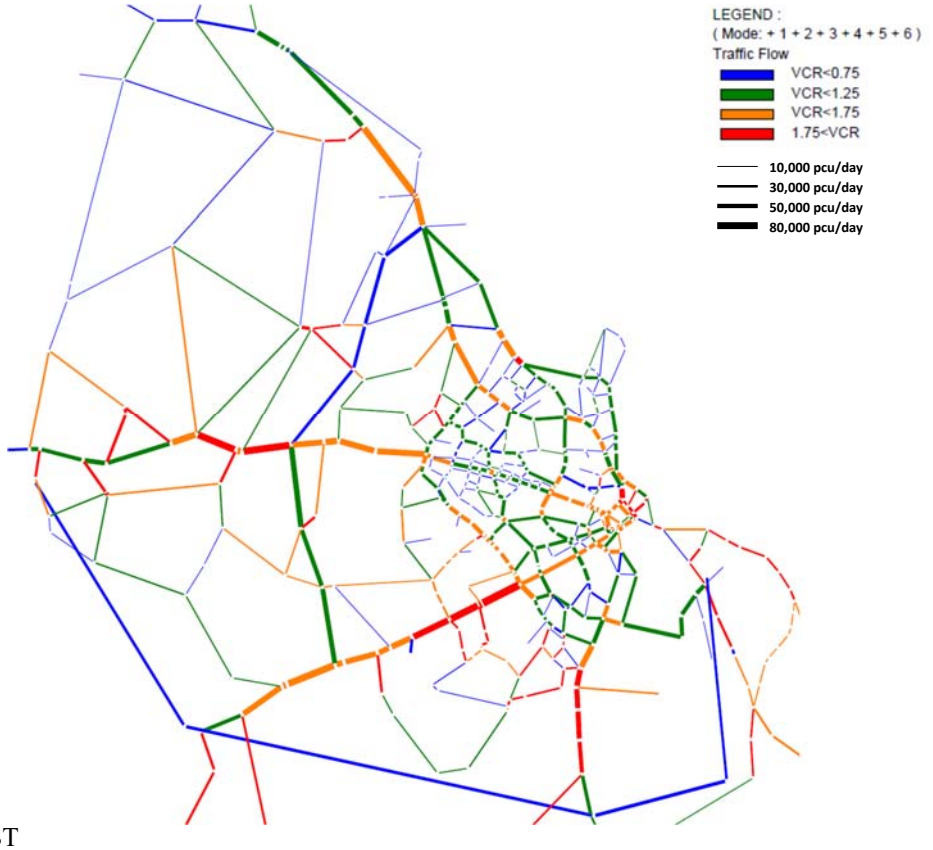
Source: JST

Figure 11.1.17 Traffic Volume in 2030 Case1, Do-nothing Case



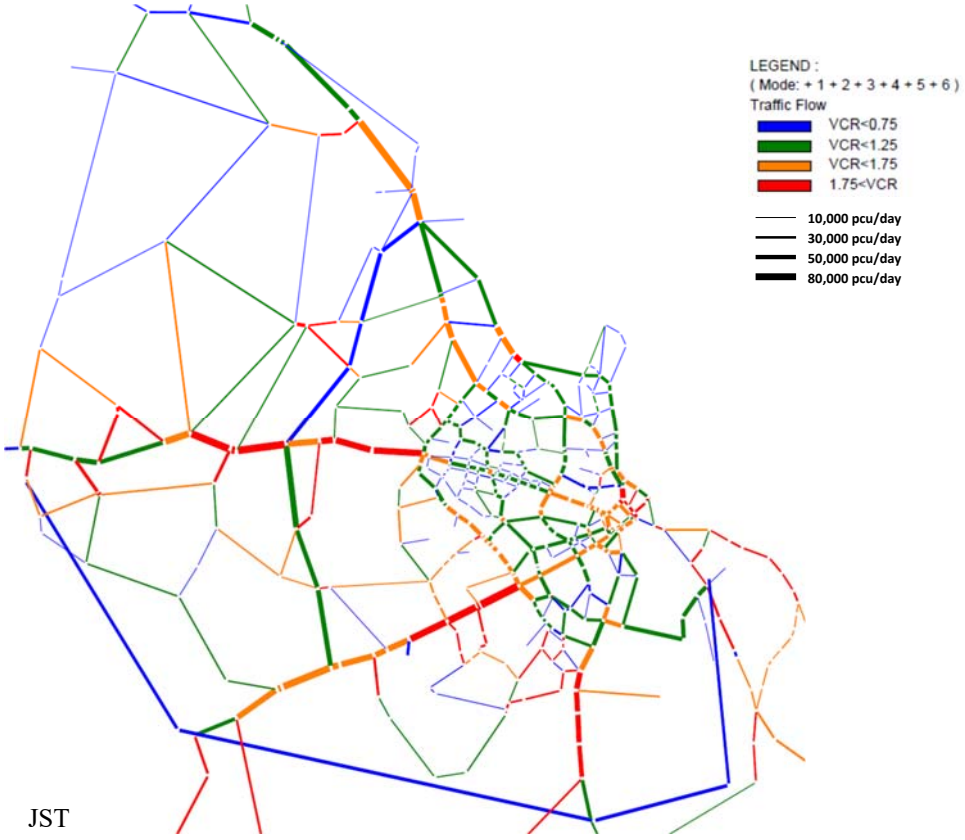
Source: JST

Figure 11.1.18 Traffic Volume in 2030 Case2, BRT-only Case



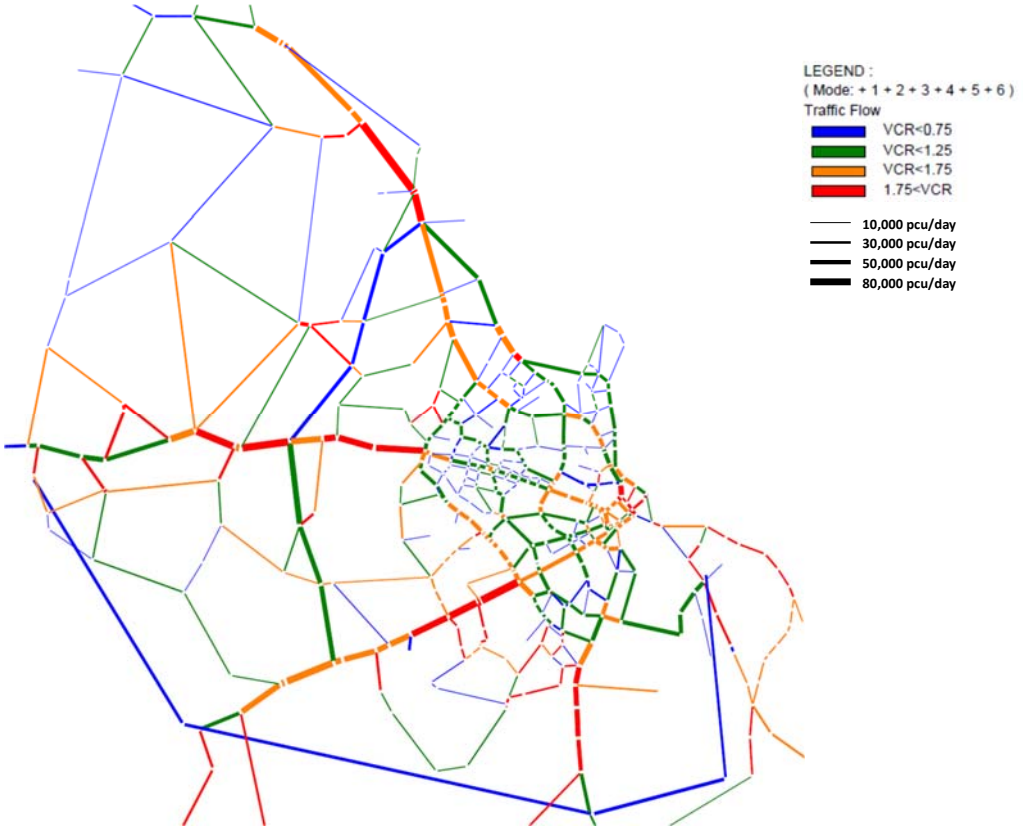
Source: JST

Figure 11.1.19 Traffic Volume in 2030 Case 3, Master Plan Case



Source: JST

Figure 11.1.20 Traffic Volume in 2030 Case 4, Tegeta Line Case



Source: JST

Figure 11.1.21 Traffic Volume in 2030 Case 5, Morogoro Line Case

Transport assignment of the public transit is conducted by an all or nothing method based on the shortest path procedure by using the software developed by the Study Team. The assignment procedure is explained in Chapter 8.2.2. Table 11.1.7 shows the daily passenger section volume of railway and BRT. Both MRT and BRT are expected high demand. Even though both lines run side by side, BRT volume is still high.

Table 11.1.7 Section Volume (No. of Passenger) in 2030

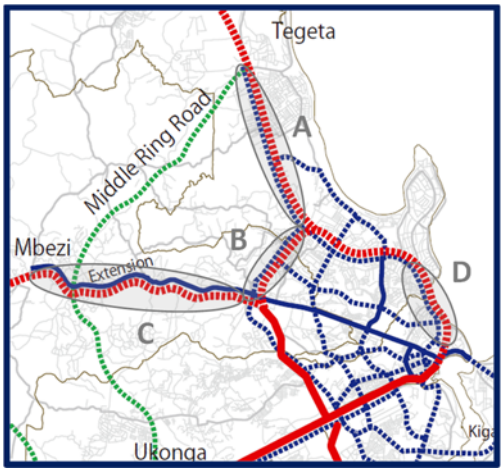
MRT Unit: PHPDT*

Section	Case 1	Case 2	Case 3	Case 4	Case 5
A	-	-	33,000	33,000	-
B	-	-	33,000	-	30,000
C	-	-	43,000	-	43,000
D	-	-	19,000	20,000	18,000

BRT

Section	Case 1	Case 2	Case 3	Case 4	Case 5
A	19,000	19,000	11,000	10,000	21,000
B	15,000	16,000	8,000	16,000	7,000
C	20,000	15,000	13,000	15,000	13,000
D	17,000	18,000	17,000	17,000	16,000

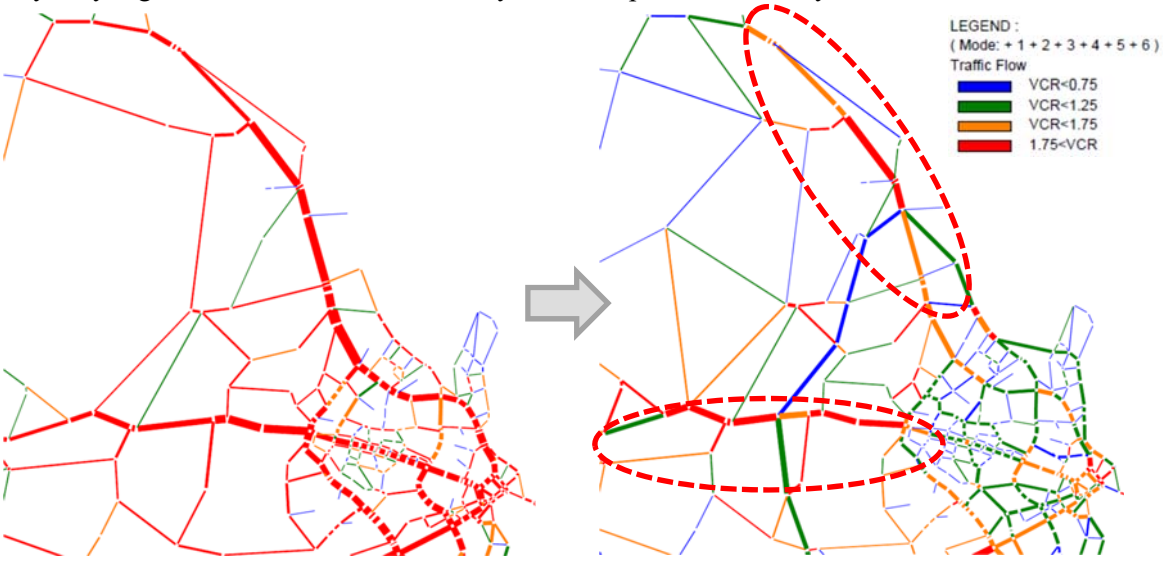
*PHPDT: Peak Hour Peak Direction Traffic



Source: JST

(4) Evaluation

Case 1 shows heavy traffic congestion, but it will be much improved in Case 2, as mentioned in previous section. This is effect of BRT development. But even Case 2 still has congestion in major arterial road such as Bagamoyo and Morogoro road, as shown in Fig 11.1.22. Arterial road will play important role for urban development, so congestion on arterial should be relieved as much as possible. The PHPDT of section A and C in Case 2 are 19,000 and 15,000 respectively and they are already very high. This fact indicates necessity of development of railways.

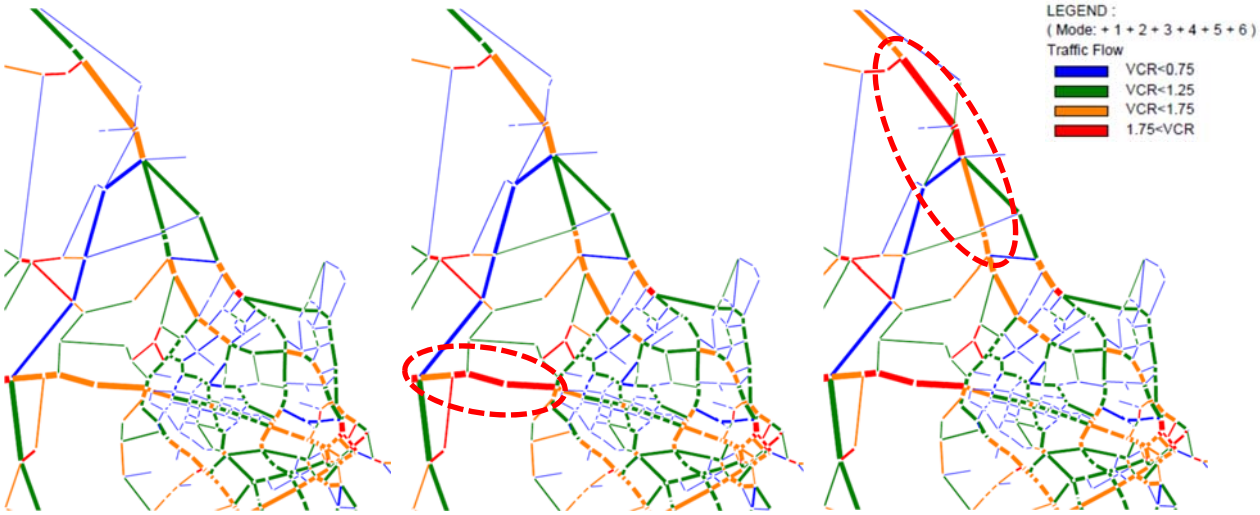


Case 1 Do-nothing **Case 2 BRT-only**

Source: JST

Figure 11.1.22 Comparison of Road Congestion between Case 1 and Case 2

Figure 11.1.23 shows the road traffic situation of 3 cases including rail development, which are Case 4, 5, 6. In Case 4 and 5, congested sections still remain along arterial inside of the Middle ring road, although they are improved in Case 3. Even in Case 3, demand of BRT at the section A and C are 11,000 and 13,000 respectively and they are very high. Therefore, the railway development of Case 3 is preferable.



Case3: Master Plan Case **Case4 : Tegeta Line Case** **Case5: Morogoro Line Case**

Source: JST

Figure 11.1.23 Comparison of Road Congestion among Case 3, Case 4 and Case 5

11.1.4 Project Implementation Plan

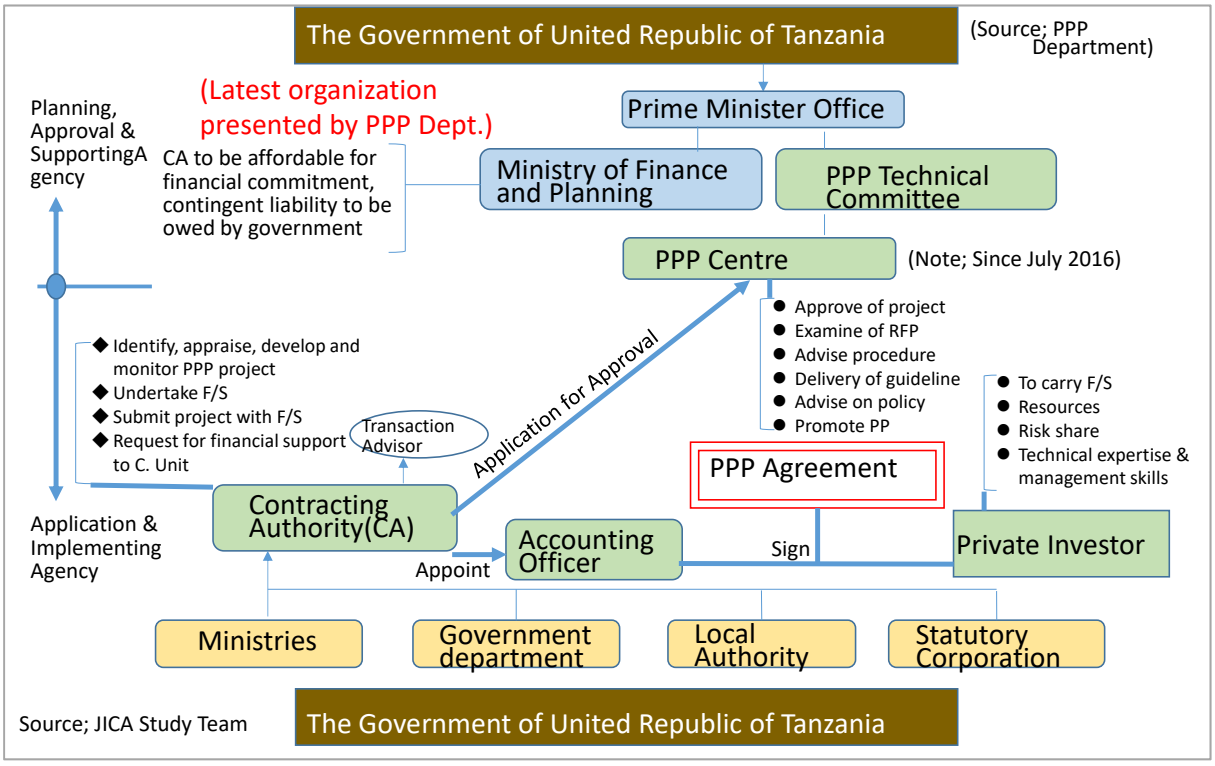
(1) Verification for the Implementation of Public Private Partnerships (PPPs) Project

a) Legal Act and Regulations for PPPs Project

In case of conventional public works including fiscal budget of the government of Tanzania and grant/loan of ODA, implementation and procurement system has been established in Tanzania already. Therefore, this Chapter describes on the PPP project.

i) PPP Act and PPP Regulation
PPP Act 2010 and its Amendment 2014, PPP Regulation 2011and its Amendment 2015 (collectively Laws) shall be governing law for the implementation of PPP projects. Some extractions of contents are shown hereafter.

ii) Co-relations of relevant Ministries, Agency, Departments
Laws classify the application body and the recipients/approval body within the government which describes detail of functions. Those functions are shown in the Figure11.1.24 below.



Source: JST

Figure 11.1.24 Procedure of Implementation of Infrastructure Projects by PPP Scheme based on Public Private Partnerships Act 2015

iii) Major scope of works of Contracting Authority
Figure11.1.24 explains the flow of application and approval of PPP Project. Contracting Authority is the front recipient of the application of PPP Project of private sector.

1) PPP Agreement contained the following:

Contracting authority enter into the PPP Agreement by the fulfilment of following items with the Private sector;

These items are, but not limited to, in writing, responsibility between contracting authority and private sector, financial terms, management of private party, license and permit for private, return of assets at the termination, sharing of risks, the payment to the private party, remedies in case of default, financial management duties for private, conditions for services, execution period, by the laws of Mainland Tanzania, no transfer to third parties without prior consent of contracting authority, dispute shall be resolved mediation or arbitration and other items. Detail shall refer to PPP Act.

2) CA (Contracting authority) shall undertake F/S whether proposed project is feasible as PPP, for instance;
   (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

3) Principal contents of PPP Amendment Act

PPP Amendment Act（promulgated on 27 November 2015）added the following contents.

【Amendments to Tanzanian PPP Laws】

- Competitive Tendering for Unsolicited PPP Projects

Both solicited and unsolicited proposals are governed by the Public Private Partnership Act 2010 (the PPP Act) and the Public Procurement Act 2011 (the PP Act). A solicited proposal is one initiated by the public sector. An unsolicited proposal is one initiated by the private sector.

The Amendment Act provides that all PPP projects (both solicited and unsolicited) must be procured through an open and competitive bidding process. The Amendment Act further removes the ability of a procuring entity to give an advantage to an unsolicited proposal.

- New PPP Authorities Established

（A）The PPP Centre（after July 2016 named as PPP Department)
（B） The PPP Technical Committee
（C）The Facilitation Fund;
   - Upon approval by the PPP Technical Committee, the Facilitation Fund shall be used to:
      a) Finance feasibility studies and other project preparation costs as may be required by the contracting authority; and
      b) Provide resources to assist projects with limited financial viability and high economic benefit.

b) Issues on PPP Act

The following issues are to be considered in conjunction with the international practice and the local circumstances;

- Evaluation category for the proposal of private investors are not shown
- Menu of the support of the Government of the United Republic of Tanzania is not clearly stated
- Menu of the support of the local government is not clearly stated
- Hybrid financial support including ODA is not indicated
- Eligibility of private sector are not mentioned
- In procurement procedure for PPP project, investors are not stated.
- More clear criteria for PPP project shall be indicated for a fair and impartial evaluation in order to avoid any objection from the lost tenderer than the evaluation criteria contained in Procurement Act cl.72 (2).

(2) Consideration of Project Implementation Structure

a) Classification of Public Private Partnerships

The classification of PPPs shall be verified by the provability of the participation of the private sector into the project. Particularly the participation of the public sector is indispensable case as the Hybrid PPPs, the intension of the government body（relevant ministries, local government as Contracting Authority and PPP Department under MOFP） shall be confirmed in advance. The investment cost of public side shall be confirmed for its resource of fund. However, since the figures under the Master Plan stage are not concrete yet, study will be limited to scenario stage. Detailed Feasibility Study is definitely necessary before the decision of the implementation of any projects.

Classifications of the Category were developed as the following charts.

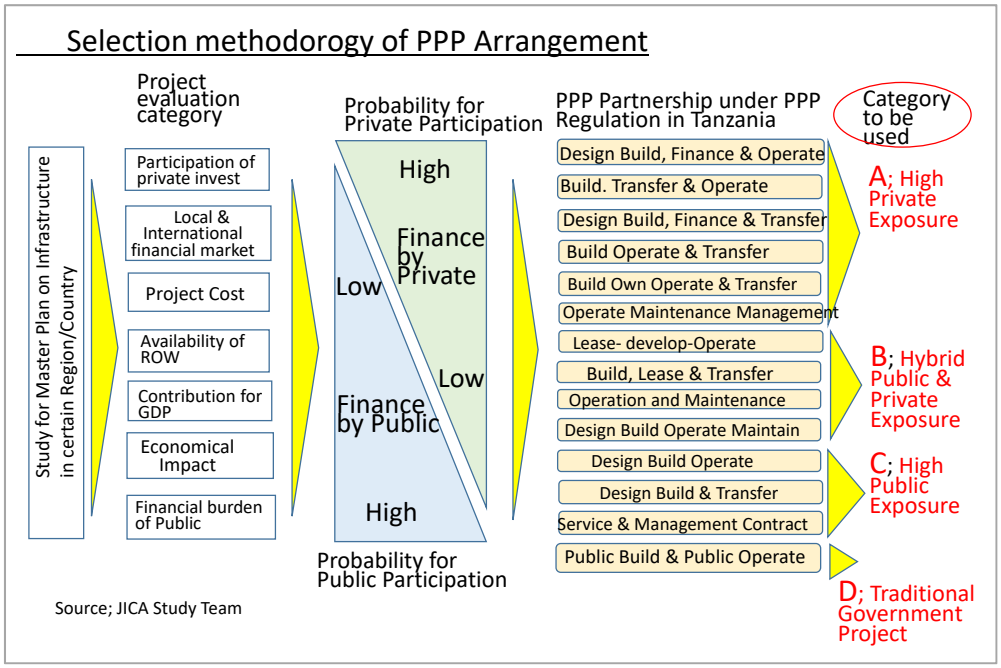


Figure 11.1.25 Typical Classification of PPP Arrangements by International PPP Business Field

Laws specify the 13 numbers of PPPs Partnership Model. Category A to D has been classified as common evaluation since the Laws has not specified the description of each model.

Table 11.1.8 "Category and PPP Model" describe the classification of categories, PPPs Model and risk share between the public and private. Particularly the risk share between public and private of the Hybrid PPPs will be varied depending on the result of financial analysis. The target of the ratio of the risk share will be determined by the threshold which private sector can be financially feasible. Contrary to that, Contracting Authority may invite the investor based on the fixed amount of financial support to the private sector.

Table 11.1.8 Category and PPP Model

Type	Name of PPP Modality	PPP Partnership Model under PPP Regulation dated 27/November/2015	Approximately Share between Public and Private	
			Share of Public	Share of Private
A	High Private Exposure	Design Build Finance & Operate, Build Transfer & Operate, Design Build Finance & Maintain, Build Operate & Transfer, Build Own Operate & Transfer, Lease Operate & Transfer,	Nominal. ROW to be delivered by Public	100%(Capex & Opex) except ROW acquisition cost
B	Hybrid Public Private Partnership	Build Lease & Transfer, Design Build Operate Maintain, Design Build & Operate	20% to 80% of CAPEX and ROW cost	80% to 20% of CAPEX +100% of OPEX
C	High Public Exposure	Operation Maintenance & Management, Operation & Maintenance, Design Build & Transfer, Service & Management Contract	Basically 100% of CAPEX and ROW cost	0% of CAPEX +100% of OPEX
D	Traditional Government Project	Public Build And Public Operate	100% of CAPEX and OPEX and ROW cost	None

Source: JST

b) The Qualitative Evaluation of the Project

The infrastructure projects in Master Plan will be usually conceptual design stage, thus the detailed demand forecast and the cost will not be accurately indicated. Therefore, qualitative evaluation methodology will be adopted in order to judge the approximate PPPs Model for the implementation of the projects. Table 11.1.9 "Qualitative Evaluation methodology" describes the example.

Table 11.1.9 Qualitative Evaluation Methodology

Qualitative evaluation methodorogy will be applied to the project cfor the up-stream study to judge appropriate responsibilities between the public sector and the private sector in order to determine the subsequent activities.

Project Name	Evaluation Criteria								Score (SUM(1:6))	Result	
	1.Provability of participation of Private Investor	2.Availability of International and Local Financial Market	3.Provability of Beneficiary Payment	4.Level of Contribution to GDP	5.Level of impotance of Economic Impact	6.Level of Financial Burden to Public Sector	.7.CAPEX	8.Amount of ROW		Suggested Category for PPP Arrangement	Private sector's share in Corporation
A	3	3	5	5	5	-5	-5	-1	10	B	±30%
B	1	3	5	5	5	-5	-5	-1	8	C	±20%
C	0	1	1	5	5	-5	-5	-5	-3	D	0%
D	3	3	5	3	3	-3	-3	-1	10	B	±50%
E	0	1	5	5	5	-5	-5	-5	1	D	0%
F	3	3	5	5	5	-3	-3	0	15	A	±70%
G	0	1	1	5	5	-5	-5	-5	-3	D	0%
H	3	3	3	3	3	-3	-3	0	9	B	±50%

Evaluation score result		Result
Category A	HIGH Private Exposure	SUM≧16
Category B	Hybrid Public and Private Exposure	SUM≧9
Category C	High Public Exposure	SUM≧2
Category D	Conventional Government Project	SUM<1

Score allotment(1-5)	Score
Satisfied	5
Midium	3
Minimal	1
None	0

Score allotment(6-8)	Score
Huge	-5
Midium	-3
Minimal	-1
None	0

Source：JST

c) The Quantitative Evaluation of Project

The implementation plan of the project in Master Plan stage is highly useful for the subsequent detailed feasibility study based on the conceptual demand forecast and cost. The purpose of the quantitative evaluation is to identify the provability of the participation of the private sector for the project. Namely the degree of the financial burden of the public side can be foreseen. The computation of "Project Internal Rate of Return (PIRR)" has been adopted as the major indicator for assessing the financial viability of the project.

i) What is PIRR

- PIRR shall be the major indicator for the private sector to determine the investment to the project by the comparison with the return of Treasury bond or Time certified deposit. Public side also can judge the merit of the project in comparison with the cost of financial resources. The Economic Internal Rate of Return (EIRR) shall be also computed to evaluate the merit to the society.

ii) The threshold of PIRR

- Although there has been no clear definition of the threshold of PIRR in the example and/or literature, it is said that PIRR shall be more than the ratio of the capital cost. The threshold of PIRR will be the composition of the cost of debt, expected return on investment and associated risks. OECD has released the Country Risk Rank and subsequent Country Risk Insurance Premium (CRIP). Tanzania is ranked as "6" for country risk and premium is set 10% to 15%. Tanzania Investment Bank has set the premium as "7%" according to the TIB. Based on the foregoing, the threshold of PIRR for the private sector can be calculated.

  1) Case A;

  PIRR≧(Debt Ratio)x(Interest)+(Equity Ratio)x(Expected Equity IRR)+ CRI Premium

  CRI Premium to be replaced by Tanzania Investment Bank (TIB) Premium as comparison.

  2) Case B;

PIRR≧Treasury Bond Rate (10 years)+CRI Premium or TIB Premium

3) Case C;

PIRR≧Deposit Rate + CRI Premium or TIB Premium

Table 11.1.10 Financial Record of Tanzania

Item (%)	Deposit Rate	Treasury Bond		Interest Rate
Rate of Items (%)	2007 (8.68) to 2015 (9.89) Average of 9 years=8.59	1 year	2.0	1972 to 2017 Average=12.18
		5 years	9.2	
		10 years	16.7	
		15 years	18.9	

Source; WB, Trade Economic, com

The threshold of PIRR for the participation of the private sector will be varied between 15.6%～28.0% following the CRIP, TIB Premium and Deposit rate. However, the risks of the PPPs project will largely depend on the sustainability of the revenue, expected PIRR can be lowered by the guarantee of revenue by the government and/or to utilise the low cost ODA, thus the barrier of the participation of the private sector will be relaxed.

Table 11.1.11 Threshold of Expected PIRR of Private Sector

Item	Case A	Case B	Case C
Debt: Equity Ratio	0.7 : 0.3		
Debt Interest Rate	12.18%		
Expected Equity IRR	15.0 %		
Treasury Bond Rate		16.7% (10 yrs)	
Deposit Rate			8.59%
CRI Premium *Note 1	10.0~15.0%		
PIRR (CRI Premium)	23.0~28.0%		
TIB Premium *Note 2	7.0%		
PIRR (TIB Premium)	20.0%	23.7%	15.6%

*Note 1: OECD rank for CRI of Tanzania as 6 which generally adopt 10~15% Premium

*Note 2: Tanzania Investment Bank (TIB) use 7.0% Premium as the Hearing by JST

Source: JST

iii) Consideration of the participation of the private sector

The indicative PIRR that the private sector can participate are described in item 2) above. However, the projects which achieve such PIRR will be little in the study projects due to the following points.

1) PIRR will be a little low due to the huge amount of investment.
2) It will be difficult for the government to support the private sector financially.
3) Rationally, high level of tariff will be difficult to impose as the beneficial payment based on the level of the income of the citizen.
4) If higher level of tariff is imposed, the number of ridership shall be dropped, then the project will become unfeasible.

In order to plan the provability of participation of private sector for the railway projects, the following conditions shall be considered according to the financial analysis in Chapter 12.

A. Hybrid PPPs model to be adopted（Unbundle）

B. Concession type PPPs（Public build and Private operate）

C. Low cost and long maturity of finance
D. Maximum tariff acceptable for political and economic circumstances
E. Any menu to support the private sector by the government

It may be highly difficult to obtain the expected PIRR for the transportation projects as shown in Table 11.1.11 due to the reasons described and the social and economic situation in the Dar es Salaam. For example, it is still rather high rate internationally that PIRR become 11.5% ~19.5% in case to utilise the ODA of JICA of Government of Japan. Therefore, optimum implementation plan shall be considered in conjunction of Category A to D of PPPs model.

d) Financial Procurement Plan

i) Financial Gap in Tanzania 2018～2040

It is assumed that there exist the negative financial gaps between the total Fiscal Budget and the required investment amount for the investment of future infrastructure. In order to fill the gap, the finance support by Donors and the encouragement participation. The beneficiary payment system, any incentives to private sector, the relaxation for the rules and regulations and the government guarantee shall be indispensable policy to consider in the future.

ii) Government support menu of PPP Act Amendment 2014

PPP Act Amended 2014 & Regulations dated 27/11/2015 does not concretely specify the support of Contracting Authority and government. It is, however, envisaged that Contracting Authority and Government will look into any support if the private sector propose its necessary support in the proposal.

1) No definite items in PPP Act and Regulations for Government Support
2) Definition in Act, “Contingent liability” means a legal or contractual obligation to make payment depending on the occurrence of uncertain future event arising from project transaction including all other contingent liabilities that may be borne by the Government in relation to or associated with public private partnership projects.
3) Clause 98 state “Any guarantee or fiscal obligations for PPP Projects shall be subject to the relevant laws relating to loans, guarantees and grants.”
4) In definition, “affordability” means the ability and willingness of the general public to pay for the general service rendered and evidence of the contracting authority to meet financial commitments by using fund-
    (a) Designated within the contracting authority’s existing budget for the institutional function to which the agreement relates; or
    (b) Designated for the institution in accordance with the government’s future budgetary allocations for the contracting authority
5) In definition, “Government support” means the various forms of participation by the government in the planning, procurement, implementation, monitoring and evaluation of projects

iii) The support menu of Donor

Ministry of Economic Trade and Industry and JICA of Government of Japan had announced the Supporting menu for PPP project in 2015.
The menu, however, is limited to the case that Japanese corporation shall take the shares in SPV.

Support facilities of METI/JICA for overseas

Comprehensive support measure for PPP（Public Private Partnership) was announced on 9th December 2014 as accelerator.

●Government provide comprehensive support measures for facilities for infrastructure of underdevelopment country by PPP scheme which will be classified depend on demand and needs.

●In addition to the support to the underdevelopment country, the loan/guarantee of JBIC, insurance of NEXI and overseas investment fund of JICA will be allocated.

- Viability Gap Funding（VGF）
- Equity Back Finance (EBF)
- Two Step Loan
- Contingent Credit Enhancement Facility for PPP Infrastr-ucture Development

Source; METI/JICA & Study Team

Figure 11.1.26 Supporting Menu of Japanese Government/JICA for PPP Project

iv) The recommendation to innovate the resource

Projects suggested in Master Plan shall be indispensable for the steady growth and prosperity of not only Dar es Salaam but also for the whole Tanzania. In order to realize these projects, there have been allocated the fund such as Government fiscal budget, budget to support PPP Project, ODA(s) from donors, Road Fund, etc., which are far below the required project investment. Although there is very tight financial situation in Tanzania, these transport projects shall be implemented for the economic improvement for the people and country. The new source of finance suggested below may cause burden on the people and the society, however, is really significant at present, namely 2018 way forward.

- Suggestion 1. Aggressive implementation of Beneficiary Payment Policy
- Suggestion 2. to impose Traffic Tax
- Suggestion 3. To impose/ strengthen Development Tax, particularly for TOD (Property and Development Right (suggested in 2008)
- Suggestion 4. To increase the ratio of Road Fund Tax.
- Suggestion 5. TIF (Tax Increment Financing) (suggested in MP 2008)
- Suggestion 6. Property and Land Taxation (suggested in 2008)

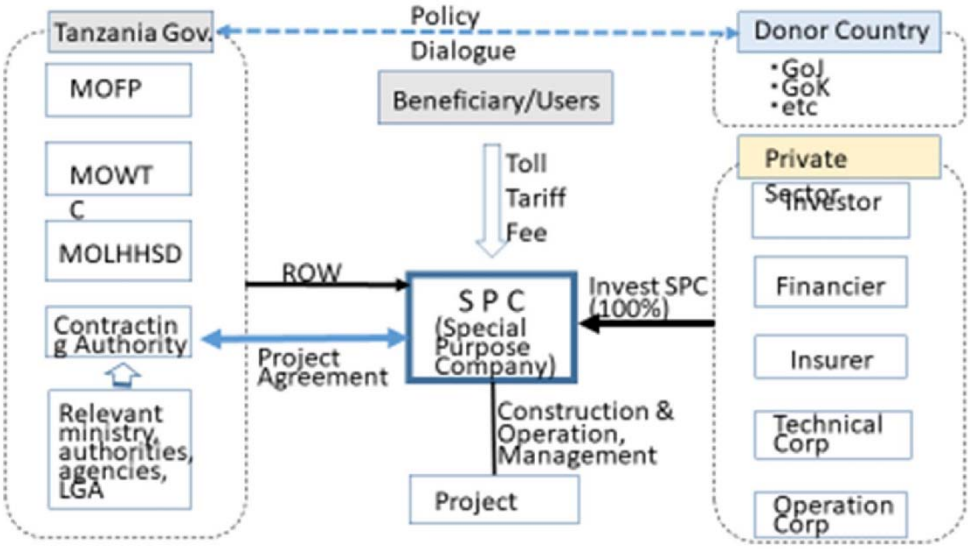
(3) Implementation Plan for Road Project

a) Qualitative evaluation of road project

Except for the "Dar es Salaam—Chalinze Expressway" the road projects are general road in master plan. Namely there is little possibility of the participation of the private sector to invest due to the conventional public work. It is assumed that Concession model PPPs (Category C) may be implemented as economy has grown in future.

b) Envisaged structure of PPPs

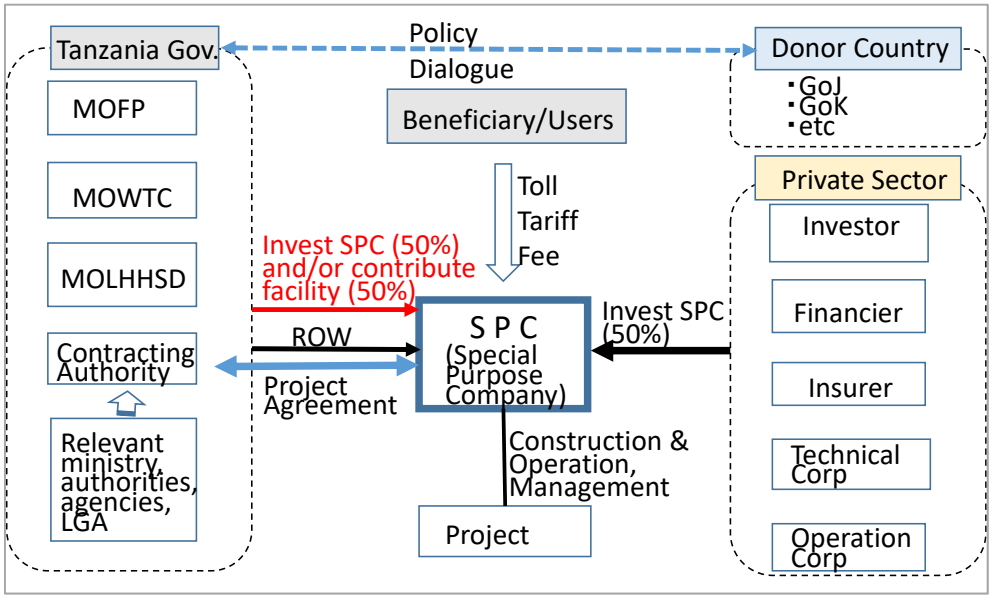
i) Typical structure of Category A



Source: JST

Figure 11.1.27 Project Implementation Scheme-Category A

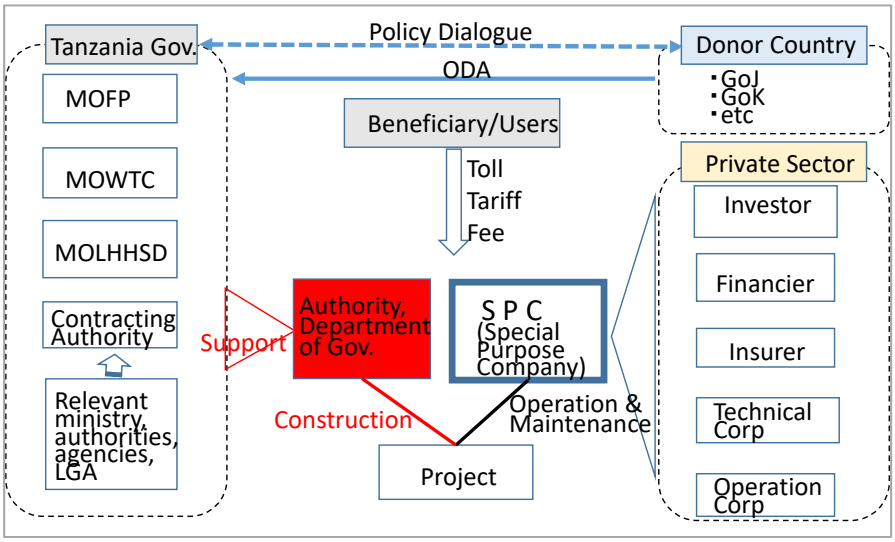
ii) Typical structure of Category B



Source: JST

Figure 11.1.28 Project Implementation Scheme-Category B

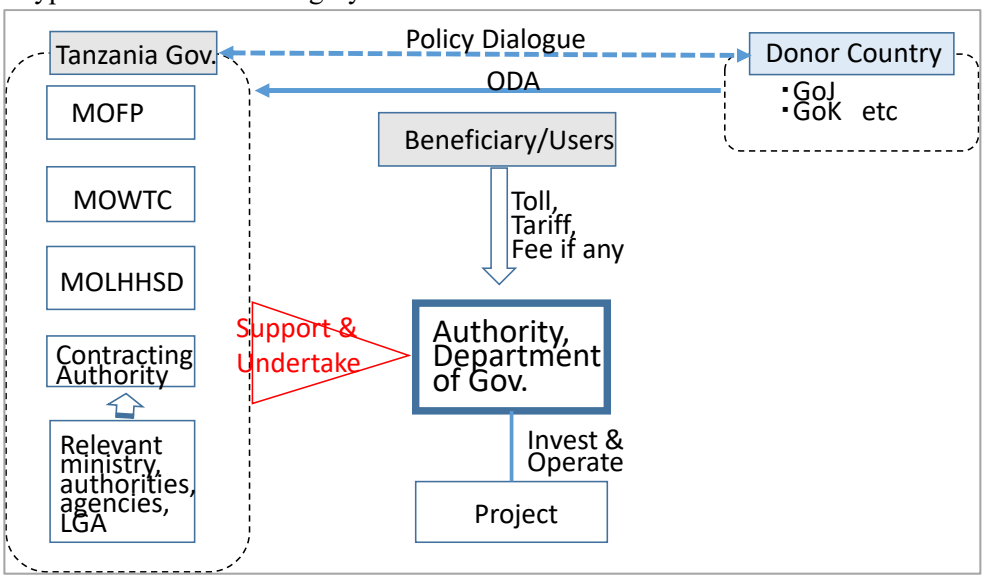
iii) 2 Typical Structure of Category C



Source: JST

Figure 11.1.29 Project Implementation Scheme-Category C

iv) Typical structure of Category D



Source: JST

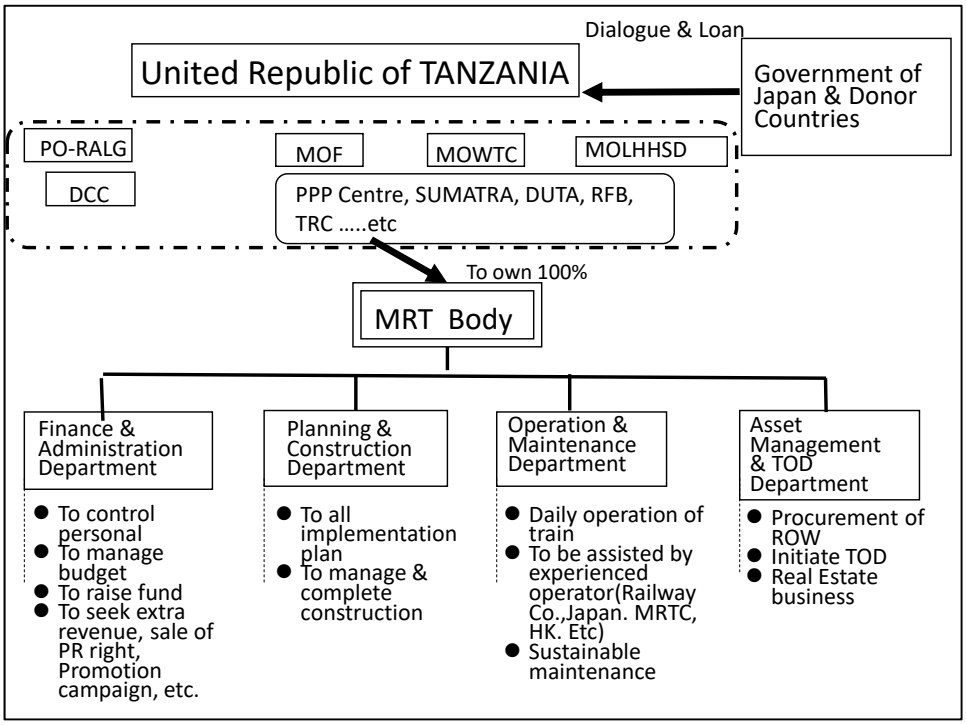
Figure 11.1.30 Project Implementation Scheme-Category D

(4) Implementation Plan for Railway Project

a) Implementation Body

New Mass Rapid Transit body

It is assumed that implementation body will be established among the government bodies which will be most suitable to undertake the risks in parallel to the progress of planning of the railway project in future.



Source: JST

Figure 11.1.31 Proposed Organization of Tentative Body (Mass Rapid Transit Body)（Provisional)

b) Project Feasibility and Implementation Plan

In railway project, there is the trend that the tariff is usually set at lower level despite the huge amount of investment. The tariff of railway project may be influenced by the existing tariff of BRT in Dar es Salaam. Consequently, category A of PPP model will not be feasible for the proposed railway project. Only possible model will be the unbundle of the project which the ROW＆Civil Work & Electrical / Mechanical work） will be procured and constructed by the public body and assign the concession to the private sector for the operation and maintenance of the railway system, subject to the PIRR.

i) Financial feasibility of the suggested railway project

- Chapter 12 describe the financial feasibility of the projects. The public work financed by low finance cost (i.e., ODA) will only be eligible to implement.

ii) Verification of the Un-bundle

- For the saving of the initial investment of the government, unbundle of the project will be efficient. Conceptual idea is described in 3) below.

iii)-a Outsourcing of Operation & Maintenance (O&M)

- Investment burden of MRT body will be decreased by the assignment of O&M division to the private sector including the cost of Rolling Stocks and all operational expenses (personnel, equipment, etc.). The financial situation of MRT body can be established by the contribution of Revenue Share between the MRT body and the private sector.

iii)-b Traffic Oriented Development (TOD)

- TOD will be implemented at the various Sub Centre, District Centre and/or Satellite City. TOD will contribute the additional revenue to the MRT body so that MRT body is able to re-invest to the remaining phase of the projects. The magnitude of financial contribution of TOD will become clear in the detailed feasibility study in future.

(5) Example of Unsuccessful PPP Implementation Plan in Uganda

The Hidden Government's Risk on contingent liabilities has been raised and the procurement of investor for PPP project has been suspended. Namely Availability Payment scheme or Toll Pass Through to Government scheme was questioned by the Parliament of Uganda. The magnitude of the project is shown below.

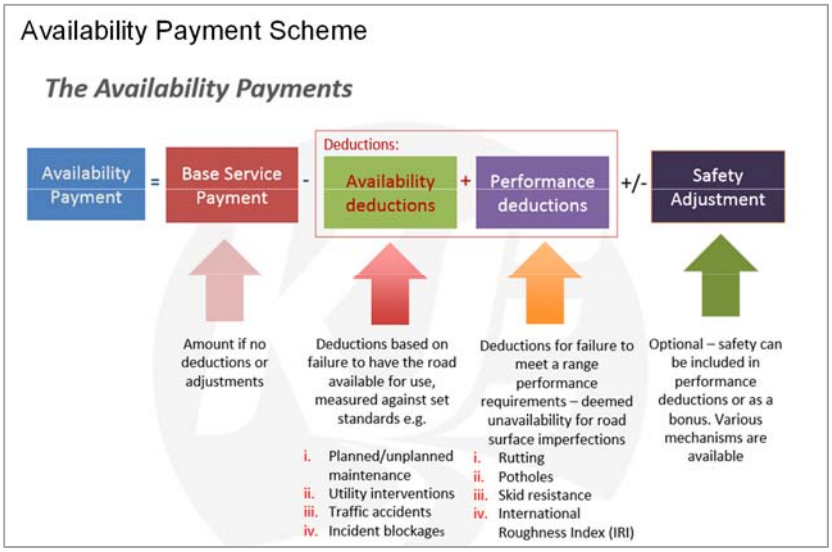
	Phase I	Phase II
Distance	77 km	18 km
Construction Cost	USD 800 mil	USD 300 mil
Government bear	USD 800 million	
Private bear	USD 300 million	
Recover-Government	Toll Revenue-Availability Payment	
Recover-Private	Availability Payment	

"Kampala-Jinja Expressway Project" has been planned by the IFC of World Bank as Transaction Advisor. Although Contracting Authority approved to procure the investor, the project is halted during the procurement.

The implementation plan of the Kampala-Jinja Expressway was renewed to hedge the demand risk from private sector to public body in order to create the participation of the private sector.

Consequently, the contingent liability of the public body may increase indefinitely. This example has indicated that the reduction of the initial investment of public body will not mean the comprehensive benefit to the country.

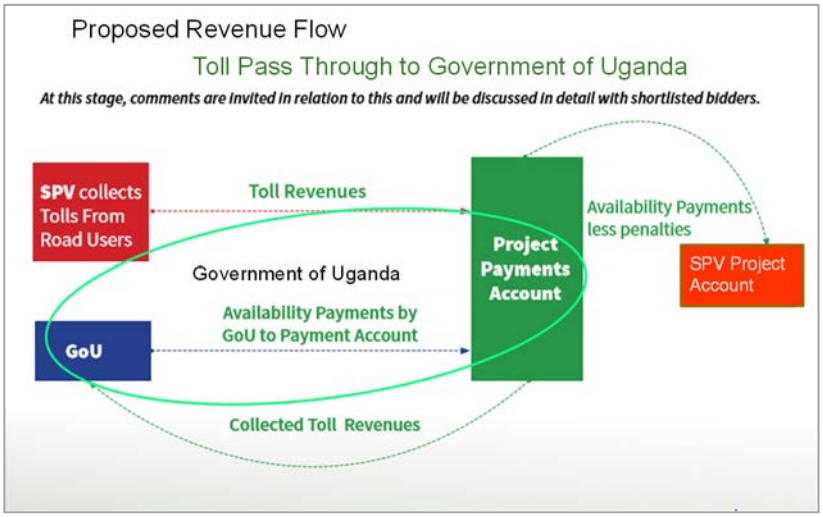
The mechanism of the monetary flow is shown on Figure 11.1.32 and 11.1.33. SPV will collect the Toll Revenue that shall be transferred into Project Payment Account. SPV does not take the responsibility of neither traffic volume nor toll revenue. The payment to the private sector will be made based on the calculation as shown on Figure 11.1.33. In case of the shortage of Project Payment Account with Availability Payment, the Contracting Authority and/or government shall pay in insufficient amount into that Account. This represents the issues of PPPs project which the PIRR is insufficient for the private investor but insisted by government.



Source: UNRA PIM

Figure 11.1.32 Example of the Road PPP Project in Uganda

On the other hand, the Availability Payment Scheme has merit to the users based on the affordable toll and guaranteed quality of expressway operation and maintenance based on the system as shown Figure 11.1.33.



Source: UNRA PIM

Figure 11.1.33 Example of the Road PPP Project (Availability Payment Scheme)

11.2 Capacity Development Plan

11.2.1 Key Issues

(1) Approach for the Capacity Development

Capacity development is essential for making a sustainable implantation of M/P. This project applies the "programme approach", beyond the individual projects level, to review the current M/P and analyse the capacity gap. This approach is aiming:

- To deal with the complex and diverse needs of urban transport at the program level planning
- To propose the appropriate framework and systems of capacity building

(2) Review of the Capacity Development Plan

- **Institutional Strength: Establishment of DUTA**

The concept of DUTA (DSM Urban Transport Authority) was proposed by JICA DSM Transport Policy and Systems Development Master Plan in 2008. The initial objective of the establishment of DUTA is to develop a coherent and independent platform with the legal power to coordinate the policy and planning for urban transport. Through the Feasibility study conducted by EU in 2009, it had been consulted under PO-RALG, stakeholders and development partners for nearly 10 years. JICA CUPID project has supported the clarification of its function, organizational arrangement among the stakeholders, responsible Ministries, drafting the Act, and estimating the financial plan for the operation throughout the project activities.

As the result of series of discussion and efforts, the need for the "effective sector coordination" was mentioned in the draft National Transport Policy in 2016. In the end of October 2017, the exit strategy of DUTA was proposed at the final JCC meeting of JICA CUPID project, to accommodate either under MOWTC (Transport) or RRB. The discussion had been extended to the support from the development partners, since JICA CUPID has concluded its local activities in the end of October 2017. World Bank is one of the supportive development partners to take over the JICA CUPID activities for further discussion and consultation among the stakeholders.

- **Technical Development: Stakeholder Training**

Numbers of transport technical training has been provided as shown in the table below. Mainly those training were financially supported by the development partners. The topic of the training covers investment, TOD management, project management, public transport planning, railway planning and operation, transport data analysis and management, GIS, and demand forecast. Though the objective of all the technical training is to improve the knowledge and skills to manage the transport sector, there is not a clear planned correlation between trainings programme.

The case of technical training provided by JICA CUPID project, total number of 112 stakeholders attended the series of technical courses, 89% of the total attendance achieved the score for the sufficient level or advanced level for the urban transport issue.

Recently, the technical study tour is also commonly conducted by the development partners; to Germany, England and Vietnam supported by World Bank, to Indonesia and South Africa by JICA CUPID, to Japan by JST. The findings and lessons learned from the technical study tour is recommended to be opened and shared to the organization or stakeholders, however, it is generally

internalized in the personal level.

Table 11.2.1 Major Technical Training Provided by the Development Partners

Programme/Project	Target	DPs
Capacity Building of Transport Sector in Tanzania (CBTST) -TSIP II (Transport Sector Investment Programme)	MOT, MOW, PO-RALG,TANROADS, RFB	EU
DSM Corridor Programme	Senior Staff, MOW, MOT	WB
DMDP(DSM Metropolitan Development Programme)	Senior Staff, PO-RALG	WB
TIRP (Transport Intermodal Rail Project)	Institutional Strengthen, RAHCO	WB
Southern Africa Trade and Transport Facilitation Project (SATTF)	Management of DSM Corridor Committee, DCC	WB
Capacity Development Project for the Improvement of Dar es Salaam Transport (CUPID)	Institutional Strengthen, PO-RALG, DSM-RS, DCC	JICA

Source: Joint Transport Sector Review 2016, MOWTC

Table 11.2.2 Series of Technical Training Provided by JICA CUPID

No	Contents	Result		
		Trainer	Date	Attendants
1	Basic Knowledge of GIS	Ardhi	9-10 July 2015	16
2	Master plan development and transport surveys training.	NIT	16-17 Sept 2015	15
3	Situation Analysis using GIS (1)	Ardhi	29-30 Sept 2015	11
4	Demand Forecast and Project Evaluation (1)	NIT	2-3 Dec. 2015	13
5	GIS data editing	Ardhi	14-15 Dec. 2015	11
6	Demand Forecast and Project Evaluation (2)	NIT	2-3 March 2016	11
7	Situation Analysis using GIS (2)	Ardhi	9-10 May 2016	11
8	Demand Forecast and Project Evaluation (3)	NIT	4-5 July 2016	14
9	GIS Analysis and Demand forecast model development	Ardhi/NIT	6-7 Dec 2016	10

Source: JICA CUPID, JCC-4, October 2017

- **Human Resources Development: Transport Training Centre**

The current M/P of 2008 also proposed the establishment of the transport training centre to sustain the qualified human resources for the urban transport sector. The proposed road map was composed of the following 3 phases:

Table 11.2.3 Proposed Capacity Development Plan (2008 M/P)

Proposed Plan	Outline
Phase-1	Create the **Transport Training Centre** for strengthening the administrative / technical capacity through practical training for transport engineering, planning and management
Phase-2	Create the **Department of Transport Planning** in the Centre with the function of research
Phase-3	Develop the **National Centre for Transport Study**

The progress mentioned above remains slow. JICA CUPID Phase-2 assists the technical training by TOT (training for trainers) to encourage the academic involvement of NIT and Ardhi University as the tutor and facilitator. Under the TOT training system, both academic institutions acquired sufficient data and training materials, however, it has not reached up to the formation of the transport department or the transport training centre. NIT submitted the plan of new department of transport; including the space for the basis of transport training centre, however, there was no further action to attain the goal.

Moreover, the transport related data which is required to be updated regularly, is not officially appointed where to be accommodated. With the suggestion from JICA CUPID, all the data collected and utilized by the training courses are currently stored by NIT and Ardhi University.

(3) Assessment of Organizational / Institutional Functions

Based on the current status and review of the progress, JST assess the organisational /institutional functions of 17 stakeholders to find out the constraints and the scope for the further needs of the capacity development. The assessment measure is undertaken by the following six criteria;

- Strategic Policy Directive
- Vision and Scenario, Alternative Plan
- Administrative Management
- Financial Planning and Fiscal Constraint
- Operations, Implementations
- Performance Measures

Table 11.2.4 Assessment of Organizational/Institutional Function

No.	Assessment Criteria	Responsible	Description
1	Strategic Policy Directive	PO-RALG (MOWTC(T)) (MOLHHSD)	- Measures and Specific action had not been taken for the integrating policy and strategies to attain the proposal of 2008 M/P. - The coherent platform to be developed for the discussion among the stakeholders was not reached. - There was lack of further discussion for the details of strategies and actions to facilitate DSM Urban Transport M/P. - National Transport Policy is prepared in 2016, however still under approval - DSM Land Use Plan was not ready at the end of 2017.
2	Vision and Scenario, Alternative Plan	PO-RALG DSM-RS DCC (MOWTC(T)) (RRB)	- There was no opportunity to develop and analyse the multiple scenarios including alternatives, apart from proposal of 2008 M/P. - Demonstration was insufficient to show the strong correlation between capacity development and M/P projects. - Scenario for establishing DUTA and its function had been prepared and discussed with the support of JICA CUPID.

No.	Assessment Criteria	Responsible	Description
3	Administrative Management	PO-RALG DSM-RS DCC (MOWTC(T)) Academic	- Administrative management including mandate, organizational arrangement, human resources, and financial resources had not arranged collaboratively among the stakeholders. - No Integrated and harmonized system to adjust and arrange among the stakeholders. - Joint Transport Sector Review (conducted by MOWTC) is the annual occasion for the transport stakeholders. - Regional Road Board Meeting (conducted by Regional Commission, secretariat by DSM-RS) is the quarterly occasion for the DSM regional members. - There lacks the opportunity of harmonization of urban land use/management and transport development. - NIT submitted the plan of new department of transport; including the space for the base of transport training centre, however no further action to attain the goal.
4	Financial Planning and Fiscal Constraint	PO-RALG DSM-RS DCC MOWTC(T) MOFP Agencies	- The practical approach to lead clear, realistic, and staging of financial / budget plan including funding sources, initial and operational costs, proposed expenditures was missing. - Clarification of the responsible organization for financial planning, monitoring budget allocation was not identified. - Financial planning and budget allocation depend on the Ministries and agencies, not shared among the stakeholders.
5	Operations Implementations	MOWTC(T) Agencies	- Transport projects planned and implemented by each transport agencies. - Implementation plan including operation and development of infrastructure plan is generally internalised in the transport agencies. - Technical training for the transport operation is not too often provided. - The transport agencies lack of qualified human resources for the operation to meet the increasing needs for the transport.
6	Performance Measures	All	- Integrated Monitoring System had not been developed - Transport Agencies assess their performance by their own measurement.

Source: Interviewed and discussed with the stakeholders by JST

(4) Identified Major Issues

Most of counterpart organizations, institutions and agencies in Tanzania suffer capacity problems, the gap between the capacity required to plan, implement, monitor, and the capacity available within the stakeholders. This capacity gap includes the organizational capacity, technical capacity, procedural capacity, and networking capacity as well as their financial resources. Due to problems caused by any one of these factors; the projects are not effectively implemented. Many of these, but not all, are related to the financial bottleneck. The major issues identified as the lessons learned from the review

of current M/P, and the assessment of organizational functions are the following:

- **Lack of Financial Disbursement**

The projects that are actually implemented or ongoing remains few, although the current M/P proposes the numbers of projects. The reason is simple, lack of financial resources. For more than a decade, transport and infrastructure sector has been the highest priority in the national policy and development plan in Tanzania, since its impact affects significantly on the economic environment and the way of life. However, it has failed considerably due to political will, or inadequate prioritization of the projects. Now the Government of Tanzania is changing, more to be practical to make the steady progress of the National Development. In this project, the review of the financial plan, as the package of the priority projects with the practical financial milestones, is required to fulfil the financial gap.

- **Lack of Consensus Building directing the Flagship Project**

Among the proposed projects of 70 in the current Master Plan, many projects are left uncontrolled. Due to the rapid growth of DSM City, the priority to meet the increasing transport needs also changed. While the stakeholders struggle to catch up with the dynamics and transformation of transport needs, numbers of the proposed projects are left behind. It is implicated that the cause is lack of consensus building in the selection of the projects. In addition, it is suggested by the interview of MOFP that the creation of the Flagship Project as the symbol of the Master Plan shall enable the stakeholders to focus on the same direction.

- **Inadequate Physical Resources**

The sufficient physical resources, such as equipment or database system, shall strengthen the management capacity of the transport sector. The trunk road network maps in DSM City have been updated by TANROADS, but not the feeder roads network maps in the municipal level. The route map has been prepared by DART and TRL, but not the Daladala network in SUMATRA. There is no data acculturation system or updating the maps in the GIS laboratory managed by the Institute of Resource Assessment (IRA) accommodating within the University of DSM. Without appropriate data management, the projects of road, railway, and BRT face challenges to create the practical plan. It is required to develop the data accumulation and utility system in order to simplify the interface to be functional for all the transport stakeholders.

- **Absence of Championship / Ownership**

The question of who is the champion in the current M/P, the answer is not clear. During the previous Study Team survey, DUTA establishment was proposed to coordinate the various transport projects. Ten years after the initial discussion, PO-RALG, Transport-MOWTC, Works-MOTWC have made efforts to formulate the DUTA structure, however, it is still under preparation. Unless and until DUTA has established and led the transport sector projects, clarifying the mandate and responsibility of the ownership is required.

- **Lack of Harmonization among the M/P stakeholders**

Due to lack of ownership of the M/P, there is no common and unified platform for the stakeholders to communicate and harmonize the numbers of projects. It results in the reluctant progress of implementing the projects. Harmonization between main stakeholders enables to monitor the progress

of each organization and invites positive competitiveness.

- **Lack of Visible Road Map for the mobilization**

PO-RALG pointed out the lack of visible and practical road map for the implementation of the M/P. Thus, the plan remains as the plan, not going further for implementation. The road map shall be simple, manageable, and visible for all the transport stakeholders, so as to easily monitor the progress, and identify the scope left behind.

- **Needs for the integration of Urban Land Management into Urban Transport**

DSM Urban Land Use Plan provides the basic information for the future urban development including transport in DSM. It shall contribute more to invite the investment from the private sector. In fact, it is still under revision at the end of November 2017. The reason of the delay of finalizing DSM land use plan is caused by the rapid growth of the city population, traffic volume, and various on-going projects. The transport projects in DSM are currently planned and implemented without the compliancy to the DSM land use plan. The issue behind is the isolation of urban land use plan from the urban transport sector. As long as the urban land use is under the responsible for MOLHHSD, there is need for the interface between land use and transport management.

(5) Capacity Gap

From the assessment of organizational function and key issues, JST conducted the institutional interview to identify the capacity gap between the target to be attained and the actual situation. The major capacity gap pointed through the institutional interview is summarized as follows.

Table 11.2.5 Capacity Gap Identified from the interview

	Governmental Institutions				
	PO-RALG	MOWTC (W)	MOWTC (T)	MOLHHDS	MOFP
Lack of Financial Disbursement	✔	✔	✔	✔	✔
Lack of Consensus Building directing the Flagship Project		✔			✔
Inadequate Physical Resources: Equipment, Database etc.		✔	✔	✔	
Absence of Championship / Ownership	✔		✔		✔
Lack of Harmonization among the M/P stakeholders			✔		
Lack of Visible Road Map for the mobilization	✔				✔

Source: JST

11.2.2 Policy and Strategy

(1) Basic Policy

In order to sustain and activate the practical implementation of the M/P, JST set the key words of the policies specified for the implementation; management, integration, and flexibility. With these key words, the policy directive of the operation is “To Create Attractive City through M/P Implementation”.

Source: JST

Figure 11.2.1 Basic Policy on Implementation

(2) Objectives and strategies

To achieve the policy directive "to create attractive City through M/P implementation", strong commitment is required from the top level of the Ministries to each responsible agency. In this regard, the mission is stated as "To Secure Steady Implementation of the DSM Urban Transport Master Plan". With the basic policy and issues identified, JST has developed the following set of objectives to be achieved;

A. **Ownership** of the M/P is clearly identified and mandated to contribute the management enhancement so as to sustain the implementation of the M/P;

B. Unified mechanism is formulated to create the **harmonization and integration** among the stakeholders;

C. Land use and urban development control are **flexibly collaborating** with urban transport sector.

The details of each objective to be targeted are described as follows.

A. **Ownership** of the M/P is clearly identified and mandated to contribute the management enhancement so as to sustain the implementation of the M/P;

- **Background**

  Strong leadership is crucial for the efficient and effective implementation of the M/P. The lessons learned from the review and issues show the need for clarification of the ownership. Institutional arrangement should be enhanced by clarification of the responsible Ministries, defined responsibilities of the stakeholders, strengthened management and coordination capacity with the monitoring skills.

- **Strategies**

  - Clarify and mandate the responsible Ministries as the owner of the M/P;
  - Improve coordination and management capacity of the ownership structure;
  - Strengthen monitoring capacity of the ownership structure;
  - Establish the technical supportive framework for the ownership structure with the stakeholders.

B. Unified mechanism is formulated to create the **harmonization and integration** among the stakeholders;

- **Background**

Master plan targeting more than 20 years requires the securement of the fund allocation. Encouraging private investment is essential for the steady implementation of the M/P. Currently, the development of DSM, either in land development or in transport development, proceeds with independent direction undertaken by each agency. It has more potential to be enhanced through the harmonization of the various development plans to invite investment from the private sector for the DSM Mega Projects. Under the uncertainness of DUTA establishment, the practical progress shall be recommended, such as information integration.

- **Strategies**

  - Strengthen the articulation of DSM development orientation;
  - Improve information sharing capacity among the stakeholders;
  - Encourage private investment for DSM urban development and transport.

C. Land use and urban development control are **flexibly collaborating** with urban transport sector.

- **Background**

The isolation of DSM land use plan from the transport development shall lead to the inappropriate urban development of the DSM. Since the transport projects such as BRT, SGR, hub station, development of road network etc. come ahead of DSM land use plan, the design of the appropriate route or station becomes difficult for the transport agencies. It also affects the volume of compensations. To avoid the complication caused by the land use plan coming after the transport plan, the flexible collaboration between the land use and transport plan shall be required.

- **Strategies**

  - Uniform the harmonization of urban land use and transport plan;
  - Improve the understanding of the components of urban development;
  - Enhance the quality of public service delivery for urban development.

11.2.3 Ownership of DSM Urban Transport Master Plan

One of the lessons learned from the review and discussion to all stakeholders, the ownership of DSM Urban Transport Master Plan was not clarified in the previous M/P. Through the workshop, interview to the major stakeholders, ownership of the M/P is recommended to accommodate under the responsibility of LGAs; DCC. To secure the steady progress of M/P, it should be mentioned who should be the champion. DCC, with the support from DSM-RS and PO-RALG, shall be the one that is responsible for the control and leading the appropriate approach for the Urban Transport in DSM.

The responsibility of the owner of the M/P is more to be administrative than technical implementation. JST proposes the demarcation among the stakeholders as follows;

Table 11.2.6 Responsibilities of Actors

Actor	Responsibility
DCC (with the support from DSM-RS, PO-RALG and MCs)	・ Owner of DSM Urban Transport M/P ・ Create Monitoring tools for the M/P ・ Monitor the Progress of the Major Projects ・ Conduct regular Meeting (Secretariat and Steering Committee) ・ Review the Plan, if required

	・ Report the Progress of M/P occasionally, including RCC, RRB, JTSR, and Public relations.
MOWTC	・ Technical Supervisor and member of the Secretariat and Steering Committee Meeting of the MP ・ Monitor the progress of the Projects ・ Share the latest information to the owner, including the progress and review of the Projects Plan, financial resources, new policy directives and strategies ・ Invite the owner of MP to JTSR
MOLHHSD MOFP MOHAS	・ Member of the Secretariat and Steering Committee Meeting of the MP ・ Share the latest information to the owner, including the progress and review of the Projects Plan, financial resources, new policy directives and strategies
Transport Agencies (TANROADS, TRC, DART, SUMATRA, TARURA)	・ Member of the Secretariat and Steering Committee Meeting ・ Main actors of Projects Implementation, Monitor the Progress, review the plans if required ・ Share the latest information to the owner

Source: JST Discussed with the Stakeholders

11.2.4 Proposal Projects

Base on the objectives and strategies to be achieved, JST propose the projects as follows;

Project-1: Establish the Simple Coherent Management Mechanism
Project-2: Establish the DSM Development Information Centre
Project-3: Promote TOD Approach
Project-4: Technical Development for the Implementation

Project-1: Establish the Simple Coherent Management Mechanism

This project is aiming at the clarification of the ownership of the M/P and supportive structure. The M/P management mechanism should be simple, manageable, and functional by utilizing the current organizational structure.

JICA CUPID Project had supported to establish DUTA in order to create simple mechanism for the implementation of M/P projects. However, it had not been out yet until now. To create the new mechanism or system requires time for the series of discussions among the stakeholders. Implementation of the proposed projects by this M/P cannot pend until the time of DUTA is successfully established. It is because the traffic demand is increasing monthly or yearly, and they seriously affect the economic growth and social movement in DSM.

Thus, JST proposes to assist the establishment of simple management mechanism; formulation of M/P special task unit, secretariat and steering committee, which is simply formulated by the existing organizations. Targeting at M/P special task unit, capacity development for the coordination, management, information accumulation, monitoring and public relation is required.

- Objectives: Strengthen the Organizational Capacity of Management of the M/P
- Target: DCC, DSM-RS, PO-RALG and Secretariat Members

- Action Plan (M/P Task Unit):

  Formulate M/P task Unit; assign sufficient and qualified officials;
  Secure the Budget for the Management of M/P;
  Create M/P Monitoring tools with indicator, mile stones;
  Collect latest M/P information from the implementation agencies;
  Monitor and Evaluate the Progress of M/P by utilizing Indicator;
  Conduct Regular Secretariat Meeting;
  Report on RRB, and Joint Transport Sector Review;
  Publicity in News Letters, Web site;
  Revise the M/P if necessary.

- Action Plan (Secretariat):

  Provide technical support and supervision for the M/P Mission Team
  Share the latest Information among the stakeholders
  Discuss the Issues, development orientation, or policy

- Action Plan (Steering Committee):

  Decision making at the higher level
  Share the latest Information among the stakeholders
  Discuss the Issues, development orientation, or policy

- Duration: Immediate Action (2018/2019)

- Notes: The responsible demarcation between the proposed M/P Special Task Unit and DUTA shall be carefully discussed among the stakeholders when DUTA is established. As of February 2018, the owner of this M/P is confirmed and approved as DCC in JCC-4. JST is proposing the creation of M/P Special Task Unit accordingly the confirmation of M/P ownership, and strongly request the immediate formulation of the Unit for the practical and functional body for the monitoring and management of the M/P. The responsible demarcation based on the PDCA cycle between M/P Special Task Unit and DUTA shall be distinguished as follows.

Table 11.2.7 Responsible Demarcation between DUTA and M/P Task Unit (suggestion)

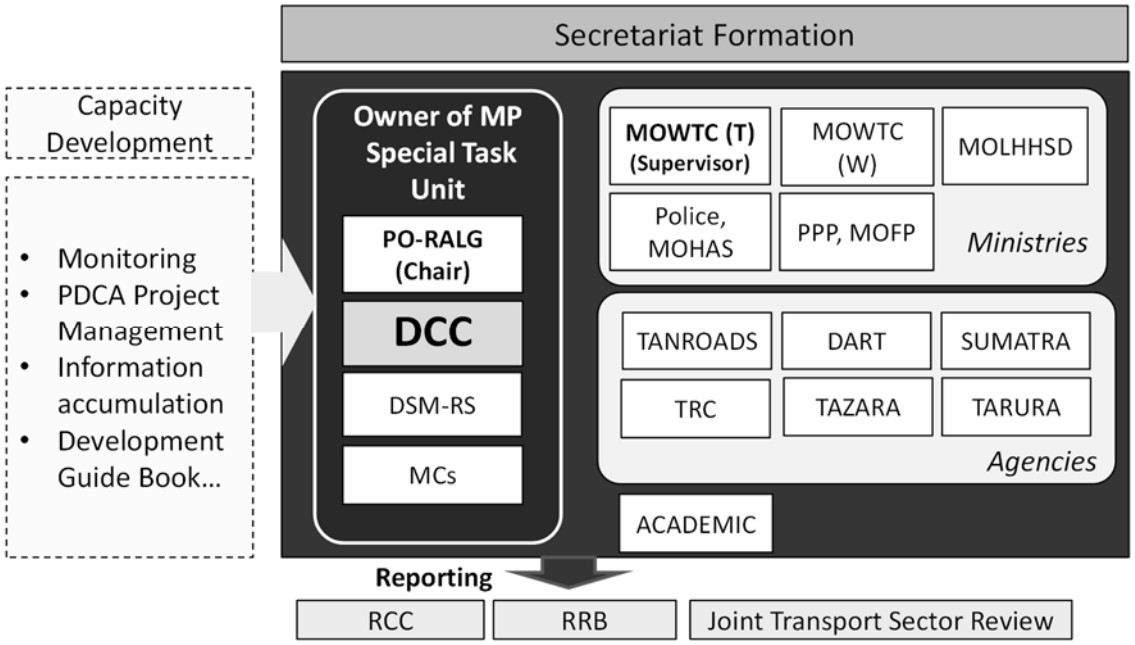
Cycle	Until DUTA establishment	After DUTA establishment
P (Plan)	・ Projects plan shall be handled by the transport agencies or relative stakeholders ・ Latest Project Plans shall be collected to the M/P owner, i.e. M/P Special Task Unit through the secretariat or Information centre ・ M/P Special Task Unit shall disclose the latest projects plan through Information Centre, Web site, and newsletter to inform the public and to invite private investment.	・ Project plan shall be handled by the transport agencies or relative stakeholders ・ Latest Project Plans shall be collected to the DUTA. ・ DUTA shall share the latest project plans to stakeholders. ・ M/P Special Task Unit shall disclose the latest project plans to the public and private investors through the Information Centre, Web site, and newsletter. ・ The function of Ownership of M/P shall remain at the hand of DCC, Secretariat function shall be shifted to DUTA.

Cycle	Until DUTA establishment	After DUTA establishment
D (Implementation)	・ Implementation of M/P projects shall be undertaken by each transport agencies ・ Progress of the Implemented projects shall be shared to M/P Special Task Unit, and to all stakeholders through the secretariat and steering committee	・ Implementation of M/P projects shall be undertaken by each transport agencies ・ Progress of the Implemented projects shall be informed to DUTA, and DUTA share to stakeholders. ・ The secretariat function shall be shifted to DUTA.
C (Check)	・ Issues and progress of the project implementation shall be monitored by each executive agency ・ M/P Special Task Unit shall be shared the latest information of the progress and issues, summarize by utilizing the M/P monitoring sheet	・ Issues and progress of the project implementation shall be monitored by each executive agency ・ DUTA shall be shared the latest information of the progress and issues ・ M/P Special Task Unit summarize the progress of the project implementation by utilizing the M/P monitoring sheet, share to DUTA.
A (Action)	・ Projects plans shall be revised accordingly either the required demands or economic and social environment by each executive agency ・ The revised project plans and targets shall be shared to M/P Special Task Unit, and shared to stakeholders through secretariat and steering committee ・ M/P Special Task Unit shall response to inform the revised plans for the public and private investor through Information Centre, Web site and newsletter.	・ Projects plans shall be revised accordingly either the required demands or economic and social environment by each executive agency ・ The revised project plans and targets shall be shared to DUTA. ・ The responsibility of secretariat shall be shifted to DUTA. ・ M/P Special Task Unit shall response to inform the revised plans for the public and private investor through Information Centre, Web site and newsletter.

Source：JST

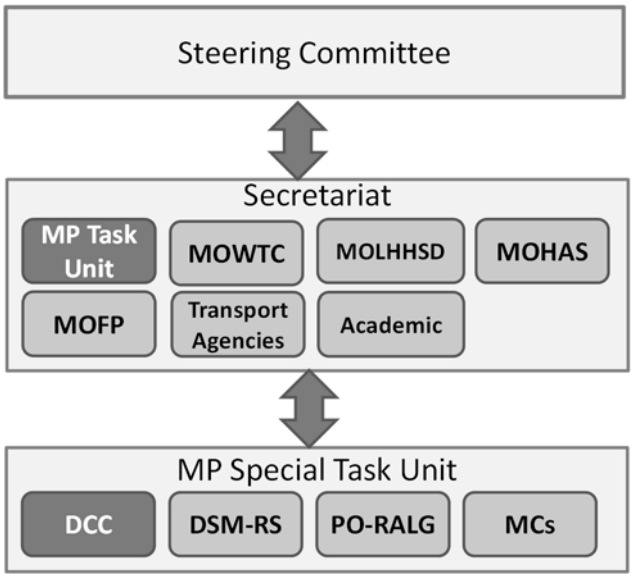
Source：JST

Figure 11.2.2 Formulation of the M/P Task Unit (proposal)



Source：JST

Figure 11.2.3 M/P Task Unit and Secretariat Formation (proposal)



Source：JST

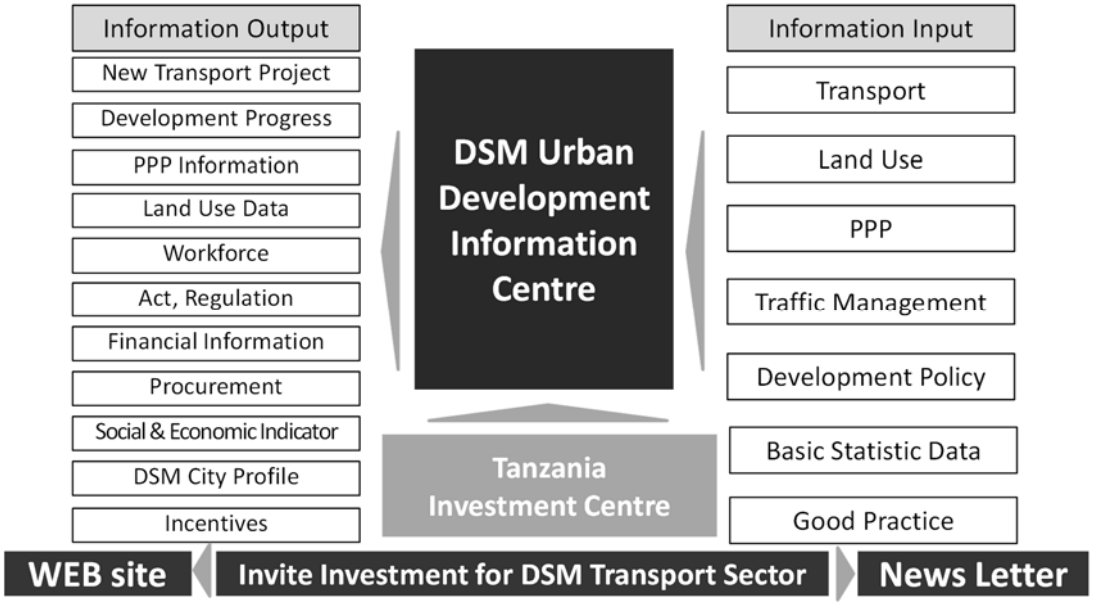
Figure 11.2.4 M/P Task Unit and Meeting Structure (proposal)

Project-2: Establish the DSM Development Information Centre

The purpose of the project is to harmonize and integrate the DSM development. Apart from the fact that the current information availability depend on the stakeholder; it is strongly required to improve information sharing capacity among the stakeholders, so as to invite more private investment for DSM urban development and transport. In addition to the project proposed mentioned above, the project that leads to all stakeholders to participate into one activity is recommended. To achieve the objectives, JST propose the establishment of the development information centre, starting from the database in DSM City.

In special task unit, data and information of DSM land use, including GIS layer, and traffic survey shall invite the effective utilization not only for the private investors, but also for the transport stakeholders. To coordinate various data collection, utilization, and update, DCC and M/P special task unit is proposed to be the one responsible to undertake the establishment of the Centre.

- Objective: Strengthen the Organizational Capacity for the coordination and harmonization across the urban development
- Target: DCC, DSM-RS, PO-RALG, related transport agencies
- Action Plan: Utilize the current framework of Secretariat and Technical Working Group;
  Assign the member of information officer in each organization and agencies from the TWG members;
  Create the standard format to collect the latest information, both financial progress and physical progress;
  Collect latest information from the assigned information officer;
  Disclose the information to the public through the WEB site or News letter
- Duration: Short Term Action (2018/2019 – 2024/2025)



Source：JST

Figure 11.2.5 Image of DSM Urban Development Information Centre (proposal)

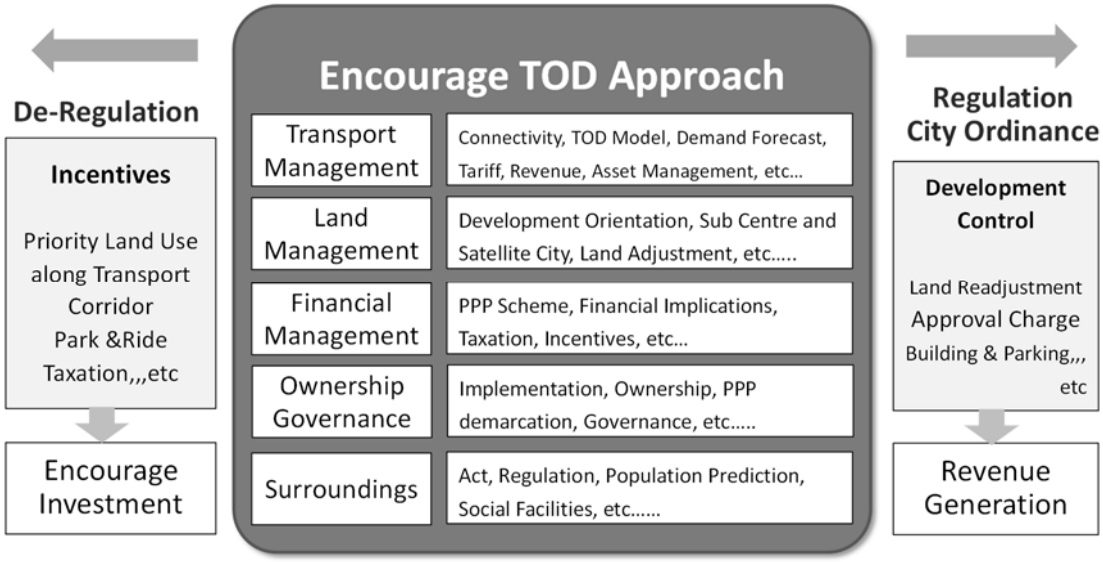
Project-3: Promote TOD Approach

The project is proposed to enhance the harmonization of urban land use and transport plan. Both JICA revision of M/P and DMDP project supported by Wold Bank, propose TOD approach to manage the urban development of DSM City. Conceptually TOD is well known among the government officials; however, it has not yet penetrated into practice.

JST propose to extend further practical study for the effective management through TOD approach. It shall require the study of (i) Urban land management including land use regulation, land readjustment, incentives and priority land use along the transport corridor; (ii) Transport management includes connectivity, TOD business model, tariff and revenue management, asset management, regular

demand forecast; (iii) Financial management with PPP scheme, financial implications, taxation and incentives, service charge for the urban development approval; and (iv) Surroundings including Act, regulation, population prediction, or economic and social indicators. Those studies shall contribute to the attractiveness of the city through the encouragement of investment, and optimistically result in revenue generation of the city and stakeholders.

- Objective: Improve the Organizational Capacity to Control City Development through TOD Approach
- Target: DCC, DSM-RS, PO-RALG, related transport agencies
- Action Plan: Utilize the current framework of Secretariat and Technical Working Group;
  Provide TOD Training Programme;
- Duration: Mid Term Action (2018/2019 – 2029/2030)



Source：JST

Figure 11.2.6 Issues to be Studied in TOD Approach (proposal)

Project-4: Technical Development for the Implementation

The priority components for technical development should be carefully examined with the proposed transport plan. As of draft final report, the following scope shall be identified as the priorities for the technical development.

Technical Development 4-1:	Monitoring System Development
Technical Development 4-2:	Mass Rapid Transit Operation and Maintenance (Railway)
Technical Development 4-3:	Road Management and Maintenance
Technical Development 4-4:	Traffic Management

Technical Development 4-1: Monitoring System Development

Monitoring shall be crucial to make M/P implementation to be effective and efficient. Before the proposed project is implemented, monitoring system is required to be developed. The capacity development for monitoring system includes; Creation of monitoring criteria and mile stones, preparation of monitoring tools, and development of monitoring guidelines. As commented at JCC

meeting, monitoring indicator is recommended to include environment and social factors, economic growth and population projections. The target of this technical development is the Owner of the M/P; DCC, MCs, DSM-RAS, and PO-RALG.

Technical Development 4-2: Mass Rapid Transit Operation and Maintenance (Railway)

MRT, in special commuter train, is newly proposed in this revision of M/P. Technical development for the operation and maintenance of MRT is essential and key to success for smooth implementation. The technical enhancement in the issue of MRT System Management, MRT Operation, MRT Maintenance, and MRT Service Management are proposed. The target of the technical training shall be mainly railway agencies, TRC. To ensure the safety of the railway service delivery, JST propose the medium term of the staging plan, before the first term railway construction ends.

Technical Development 4-3: Road Management and Maintenance

Middle Ring Road, Bay Link Road, Outer Ring Road, Flyover, and Connectivity of Collect Road are the major proposed projects for road plan. New road system of the Smart Way and new facilities are proposed, such as multipurpose lanes, dynamic lane management, service area, the technical improvement is proposed to strengthen the new road management and maintenance. It includes; management of flexible lanes, maintenance of road facilities, road service management. Sustainable planning for improving the road bottleneck due to flood, alignment, and intersection is also considered. The main target of the road management and maintenance is TANROADS, MOWTC (W), and TARURA. The schedule of the technical development is suggested accordingly the Road Project Implementation; the medium term.

Technical Development 4-4: Traffic Management

Traffic management is focusing on optimal traffic control in DSM. To attain the objective, JST propose modal shift enhancement, parking management, traffic centre operation and management and traffic safety to be strengthened. Stakeholders in traffic management include DCC, DSM-RS, PO-RALG, Regional Police, MOHA, TANROADS, MOWTC (T), SUMATRA and DART. Demarcation and harmonization among

the stakeholders are required to systemize the traffic management in DSM. The projects are recommended to start at the short term, before the traffic control system is introduced in DSM.

Table 11.2.8 Proposed Projects and Time Frame of the Capacity Development

No.	Name of Project	Length Area	Section Place	Term	Project Cost (Bill TZS)	Executing Agency	Notes
1	Management Mechanism Project	-		Short	-	DCC,MCs, DSM-RS, PO-RALG	M/P special unit Secretariat Steering Committee
2	DSM Information Centre Project	-		Short-Medium	-	DCC,MCs, DSM-RS, PO-RALG	PC and network server procurement

No.	Name of Project		Length Area	Section Place	Term	Project Cost (Bill TZS)	Executing Agency	Notes
3	Promote TOD Approach Project		-	21.7 Case study at Kinondoni MC	Short-Medium	-	DCC, MCs, TRC, PO-RALG, MOWTC	TOD Guidelines Urban Control PPP development
4	Technical Development							
	4-1	Monitoring System Development Project			Short-Medium-Long	-	DCC, MCs, DSM-RS, PO-RALG	Monitoring tools Monitoring Guidelines
	4-2	MRT Operation and Maintenance Project	Specified in Public Transport		Medium-Long	-	TRC, MOWTC (T)	
	4-3	Road Management and Maintenance Project	Specified in Road Plan		Short-Medium-Long	-	TANROADS, MOWTC (W), TARURA	
	4-4	Traffic Management Project	Specified in Traffic Management		Short-Medium-Long	-	TANROADS, MOWTC (W-T), TARURA, Police, DCC	

11.3 Urban Management Plan

For efficient implementation of Dar es Salaam Urban Transport Master Plan realizing the urban structure strategy, road plan, public transport plan, and traffic management plan, urban management has to be strengthened. The following management needs to be executed, to shape palm and finger urban structure with development of sub-centres and satellite cities along urban corridors linkage with ring roads. Urban Planning Act 2007 is a basic instrument for the urban management.

- ✓ Integrated urban development mainly realizing coordination among the concerned sectors
- ✓ Urban management for land use control, including development control measures and development promotion measures
- ✓ Urban management for TOD, to encourage modal shift from vehicle users to public transport use by enhancing attractiveness and convenience for citizens

11.3.1 Integrated Urban Development

Urban Transport is one of the key sectors of urban development of DSM. Dar es Salaam Master Plan, which is an integrated urban development plan, needs to be formulated. DCC is expected to be a planning authority based on Urban Planning Act 2007 and coordinate with other concerned stakeholders. The core of the Dar es Salaam Master Plan is future land use plan as required in general planning scheme of Urban Planning Act 2007. The Dar es Salaam Master Plan will be a guide of urban development of DSM as a superior plan of this Urban Transport Master Plan. The following outputs of this urban transport master plan are required to be reflected to future land use plan Dar es Salaam Master Plan.

Table 11.3.1 Outputs of UTMP to be reflected to Dar es Salaam Master Plan

No	Outputs of UTMP	Detail Items
1	Concept, Vision, Policy	➢ "Transit Oriented Mega City"
2	Urban Structure Plan	➢ Palm and finger shape urban structure ➢ Development of sub-centres and satellite cities, decentralization of urban functions to the sub-centres and satellite cities along urban corridors linkage with ring road, ➢ TOD at urban cores
3	Road Plan	➢ Road network plan (middle ring road, bay link road, outer ring road) ➢ Road density plan
4	Public Transport Plan	➢ MRT (Railway) Plan ➢ BRT Plan ➢ Feeder Bus Plan ➢ Transport Terminal/Station Plan
5	Traffic Management Plan	➢ Traffic Management Plan ➢ Mobility Management Plan (parking, park & ride)

Source: JST

In addition to transport and road sectors, urban development in DSM is required to integrated with other sectors such as water supply, sewerage, solid waste management, power supply, tele-communication, industry, health, and education. In this sense, formulation of Dar es Salaam Master Plan integrating and coordinating the sectors is important for sustainable development.

In the planning process of Dar es Salaam Master Plan, the coordination among the concerned organizations regarding their mandates and necessary actions shall be made.

11.3.2 Urban Management Measures for Land Use Control

Urban Management Measures for Land Use Control is composed of (i) development control measures and (ii) development promotion measures. Development control measures cover land development permit and building permit which are being regulated. Palm and finger structure will be shaped through both measures.

(1) Development Control Measures

Avoidance of development at unsuitable area

Development at unsuitable areas for development such as flood prone area, steep slope area, and protected area shall be avoided as land use policy states. According to Article 50 of Urban Planning Act 2007, a planning authority may designate a conservation area. Without the consent of the planning authority, no person shall carry out any works within a conservation area.

Historic Preservation

CBD has some historic sites to be preserved. Urban Planning Act 2007 specifies list of areas and buildings of historic or architectural interest in Article 58 and effect of inclusion of an area or a building in a list in Article 59. For the preservation of historic sites in CBD, Ilala Municipal Council as a planning authority for developments in Ilala Municipal Council is required to prepare a list of areas, buildings or groups of buildings of special architectural or historic interest.

(2) Development Promotion Measures

Together with development control measures, development promotion measures had to be implemented. Development promotion measures aim to accelerate urban development and to guide development to realize the palm and finger shape urban structure. Development promotion measures can be applied at the areas as shown below.

- ✓ Urban cores such as district centres, sub-centres, and satellite cities
- ✓ Any area along main roads
- ✓ Any area where land use efficiency will be improved

Preparing detailed planning scheme for the above areas based on "Urban Planning Act 2007" and "Guidelines for the Preparation of General Planning Schemes and Detailed Schemes for New Areas, Urban Renewal and Regularization" is the first step of the legal process for promoting urban development. The process is largely divided into preparation process and implementation process.
The following are the outputs of the detailed planning process.

Table 11.3.2 Outputs of Detailed Planning Scheme

Outputs
➢ A report of existing situation and planning program; ➢ Location plan in appropriate scale, ➢ Conceptual plan, ➢ A plan/scheme in scale 1:2500, ➢ Infrastructure supplement plans in appropriate scale, ➢ Cluster plan in scale 1:1000/500 ➢ Illustrative 3D-model of a part or whole scheme in appropriate scale, where applicable a plot site plan in scale 1:200/1:100, ➢ Action plan and budget (implementation schedule/plan)

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

The measures for TOD at the MRT stations and those surrounding areas are mentioned in 11.3.3.

11.3.3 Urban Management Measures for TOD

TOD is one of the development promotion measures. The process of the detailed planning scheme is applied for TOD. According to the experiences of other countries such as US and Japan, the following points are the key for TOD and shall be addressed in the planning process.

(1) Maintaining High-level of Population Density

High population density at urban cores is beneficial for maximum use of public transportation (mass rapid transit).

(2) Diversification of Land Use

Convenience for MRT users can be achieved through mixed land use which has business, commerce, health and social welfare as administrative functions as well as basic functions for residents.

(3) High-quality Urban Design

Attractive urban design (land scape/city scape etc.) at urban cores is important to encourage MRT users to visit the cores.

The process of urban renewal scheme mentioned in "Guidelines for the Preparation of General Planning Schemes and Detailed Schemes for New Areas, Urban Renewal and Regularization" is also largely divided into preparation process and implementation process. The followings are the outputs of the urban renewal process.

Table 11.3.3 Outputs of Urban Renewal Scheme

Outputs
✓ Plans showing declared renewal area boundary map, site location characteristics in relation to the CBD
✓ Infrastructure Maps
✓ Plans on transport and traffic
✓ Plans on community facilities
✓ Plans on landscape/town scape
✓ Plans on Socio-economy
✓ Plans on security and safety
✓ Development concept
✓ Redevelopment proposals such as future land use, building types, floor area ratio, etc.
✓ Implementation plan
✓ Monitoring and Evaluation

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

11.3.4 Proposal of Programs and Projects for Urban Management

Dar es Salaam Urban Transport M/P aims to form palm and finger shape urban structure with development of sub-centres and satellite cities by decentralizing urban functions of CBD to sub-centres and satellite cities along urban corridors linkage with ring roads. First of all, developing Dar es Salaam Master Plan, which will be the guide for future land use and urban development, is crucial for realizing the proposed urban structure and proposed urban transport projects in this master plan. Development of sub-centres and satellite cities shall be also implemented. In addition, capacity development to implement TOD is also proposed for realizing TOD along the proposed MRT line. Table 11.3.6 shows the list of the suggested project for urban management.

(1) Dar es Salaam Master Plan

Tanzania government awaits new Dar es Salaam Master Plan, which was previously formulated in 1979. DCC will develop the Dar es Salaam Master Plan based on urban structure and projects proposed in this Urban Transport Master Plan. The new Dar es Salaam Master Plan is the foundation for integrated urban development of DSM not only transport sector but also other infrastructure sectors. It will also be superior plan of the Urban Transport Master Plan.

The outputs of the Urban Transport Master Plan shall be reflected in the Dar es Salaam Master Plan. The planning shall start after 2022, when the preliminary results of the next National Population and Housing Census are available. General planning scheme in Urban Planning Act 2007 shall be followed.

(2) Sub-Centre Development Projects

To decentralize urban functions from CBD, sub-centres will be developed in short to medium term at Ubungo, Mwenge, Tazara, and Morocco. The concept of TOD is introduced in the projects such as easy and direct pedestrian and MRT access for convenience and mixed use development for attractiveness. The area within 500 m radius or about 0.75 ha is project area for each urban core.

Table 11.3.4 Project Outline of Proposed Sub-Centre Projects

No.	Name of Project	Area	Project Outline
2	Ubungo Sub-centre Development Project	75 ha	Sub-Centre development to have functions of academy, administration, and business, transportation hub for land transport, hospital and health industry. Development of station plaza, pedestrian bridge/deck, road, parks, buildings, utilities, etc. will be implemented.
3	Mwenge Sub-centre Development Project	75 ha	Sub-Centre development to have functions of IT industry, venture business, culture, entertainment, theatre, hotel, high-rise apartment. Development of station plaza, pedestrian bridge/deck, road, parks, buildings, utilities, etc. will be implemented.
4	Tazara Sub-centre Development Project	75 ha	Sub-Centre development to have functions of international enterprises for manufacture, logistics, and trade. Gateway function to Airport will be strengthened. Development of station plaza, pedestrian bridge/deck, road, parks, buildings, utilities, etc. will be implemented.
5	Morocco Sub-centre Development Project	75 ha	Sub-Centre development to have functions of business, expert offices, faction, restaurant, café, TV/Radio studio, high quality residence. Development of station plaza, pedestrian bridge/deck, road, parks, buildings, utilities, etc. will be implemented.

*Note: No. is co-relating the number of the Proposed Projects in Table 11.3.6 "List of Proposed Projects".
Source: JST

The project cost depends on the share of land use category, volume of buildings (floor area), and topography. The specific project component shall be developed in the planning process of Dar es Salaam Master Plan, to estimate the project cost.
NHC has a development plan for Morocco square, which is about 1.0ha portion of Morocco area and developing 110,000m^2 total floor areas. The project cost is 156 billion TZS, so the project cost per square meter is about 1.4 million TZS/m^2.

(3) Satellite City Development Projects

To decentralize urban functions from CBD, satellite cities will be developed in short to long term at cores of sub-urban areas as shown in Table 11.3.5. The concept of TOD is introduced in the projects such as easy and direct pedestrian and MRT access as well as park and ride system for convenience and mixed use sub-urban development for attractiveness. The size of the development area is 500ha for inner satellite cities along middle ring road and is 1,000 ha for outer satellite cities along outer ring road.

Table 11.3.5 Project Outline of Proposed Satellite City Projects

No.	Name of Project	Area	Project Outline
6	Mbezi Satellite City Development Project	500 ha	Development by utilizing the locational advantage of Mbezi BRT terminal and future MRT station - Residential, Commercial and Business Areas - Administration, education areas - Road, Parks, Green Areas - Station Plaza
7	Tegeta Satellite City Development Project	1,000 ha	Development by utilizing the locational advantage of future MRT station - Residential, Commercial and Business Areas - Administration, education areas - Road, Parks, Green Areas - Station Plaza
8	Kawe Satellite City Development Project	75 ha	NHC development for harmonizing with beach area - Residential, Commercial and Business Areas

			- Administration - Road, Parks, Green Areas - Hotels
9	Ukonga Satellite City Development Project	500 ha	Development by utilizing the locational advantage of proximity to international airport and TRL station - Residential, Commercial and Business Areas - Administration, education areas - Road, Parks, Green Areas - Station Plaza
10	Mbagala Satellite City Development Project	1,000 ha	Development by utilizing future MRT and BRT station - Residential, Commercial and Business Areas - Administration, education areas - Road, Parks, Green Areas - Station Plaza
11	Bunju Satellite City Development Project	1,000 ha	Development by utilizing the locational advantage of future MRT station - Residential, Commercial and Business Areas - Administration, education areas - Road, Parks, Green Areas
12	Luguruni Satellite City Development Project	1,000 ha	Development by utilizing the locational advantage of future MRT station - Residential, Commercial and Business Areas - Administration, education areas - Road, Parks, Green Areas - Station Plaza
13	Pugu Satellite City Development Project	1,000 ha	Development which harmonize with the natural environment at periphery of DSM and topography of Pugu hill - Residential, Commercial and Business Areas - Administration, education areas - Road, Parks, Green Areas
14	Mzinga Satellite City Development Project	500 ha	Development by utilizing future MRT and BRT station - Residential, Commercial and Business Areas - Administration, education areas - Road, Parks, Green Areas - Station Plaza
15	Kisarawe-2 Satellite City Development Project	500 ha	Satellite city development which harmonize with the natural environment in Kigamboni - Residential, Commercial and Business Areas - Administration, education areas - Road, Parks, Green Areas
16	Somangila Satellite City Development Project	1,000 ha	Satellite city development which harmonize with the natural environment in Kigamboni - Residential, Commercial and Business Areas - Administration, education areas - Road, Parks, Green Areas
17	Pemba Mnazi Satellite City Development Project	1,000 ha	Development by utilizing the locational advantage of future MRT station - Residential, Commercial and Business Areas - Administration, education areas - Road, Parks, Green Areas

*Note: No. is co-relating the number of the Proposed Projects in Table 11.3.6 “List of Proposed Projects”
Source: JST

The project cost depends on share of land use category, volume of buildings (floor area), and topography for each satellite city. The specific project component shall be developed in the planning process of Dar es Salaam Master Plan, to estimate the project cost.

NHC already developed the development plan for Kawe Satellite city. The estimated project cost is 4.9 trillion TZS for 107 ha, so the project cost per square meter is about 4.6 million TZS/m^2.

(4) Capacity Development Project for Implementation of TOD

Capacity development project for implementation of TOD is proposed to improve organizational capacity to control city development through TOD approach. The target group of the project will be DCC, DSM-RAS, PO-RALG and related transport agencies. Tegeta Line of MRT between Tegeta and Aga Khan is proposed, so TOD approach is to be firstly introduced to the planned stations and those surrounding areas along Tegeta Line of MRT. Establishment of implementation and coordination mechanism, obtaining planning TOD related knowledge and skills, formulation of project funding scheme, and establishing partnership with the concerned stakeholders towards implementation is the main outputs of the project.

Table 11.3.6 List of Proposed Projects

No.	Name of Project	Length Area	Section Place	Term	Project Cost (Bill TZS)	Executing Agency	Notes
Palm and Finger Plan (Urban Corridor)							
1	Dar es Salaam Master Plan	1,393 km^2	Whole Area of DSM	Short	9.0	DCC	Start after Housing and Population Census 2022
Sub-Centres							
2	Ubungo Sub-centre Development Project	75 ha	Ubungo	Short	-	Ubungo MC	
3	Mwenge Sub-centre Development Project	75 ha	Mwenge	Medium	-	Kinondoni MC	
4	Tazara Sub-centre Development Project	75 ha	Tazara	Medium	-	Ilala MC	
5	Morocco Sub-centre Development Project	75 ha	Morocco	Medium	-	Kinondoni MC	
Satellite Cities							
6	Mbezi Satellite City Development Project	500 ha	Mbezi	Short	-	Ubungo MC	
7	Tegeta Satellite City Development Project	500 ha	Tegeta	Medium	-	Kinondoni MC	
8	Kawe Satellite City Development Project	107 ha	-	Short-Medium	4,900	NHC	
9	Ukonga Satellite City Development Project	500 ha	Ukonga	Medium	-	Ilala MC	
10	Mbagala Satellite City Development Project	1,000 ha	Mbagala	Medium	-	Temeke MC	
11	Bunju Satellite City Development Project	1,000 ha	Bunju	Long	-	Kinondoni MC	
12	Luguruni Satellite City Development Project	1,000 ha	Luguruni	Long	-	Ubungo MC	
13	Pugu Satellite City Development Project	1,000 ha	Pugu	Long	-	Ilala MC	
14	Mzinga Satellite City Development Project	500 ha	Mzinga	Long	-	Temeke MC	
15	Kisarawe-2 Satellite City Development Project	500 ha	Kisarawe 2	Long	-	Kigamboni MC	
16	Somangila Satellite City Development Project	1,000 ha	Somangila	After 2040	-	Kigamboni MC	
17	Pemba Mnazi Satellite City Development Project	1,000 ha	Pemba Mnazi	After 2040	-	Kigamboni MC	
TOD (Transit Oriented Development) Promotion							

18	Capacity Development for Implementation of TOD	21.7 km	Kinondoni	Short-Medium	4.5	PO-RALG	From Aga Khan to Tegeta

Note: -: Project costs for sub-centres and satellite cities depend on volume of buildings and topography, so the project costs are not estimated in this study.

11.4 Priority Projects

11.4.1 Summary of Proposed Projects

There are 38 proposed components and 79 details projects in this M/P. Among the detailed projects, 29 are for the road development, 28 for the public transport, 7 for the traffic management, 8 for the urban management, and 7 for the capacity development. By the terms of the implementation, 21 details projects are proposed for the short term until 2025, 17 projects for the medium term until 2030, 16 projects for the long term until 2040, 23 projects for the across the terms, and 2 projects for even after the target year of 2040.

Table 11.4.1 Summary of Proposed Projects

Category		Number of Proposed Components	Number of Projects	Short term until 2025	Medium term until 2030	Long term until 2040	Across the term	After 2040
Road Plan		5	29	7	8	9	5	0
Public Transport	Railway (MRT)	6	8	2	3	2	0	1
	BRT	7	7	4	2	1	0	0
	Transport Terminal	3	7	2	2	3	0	0
	Feeder Bus	5	5	-	-	-	5	0
	Waterway	1	1	1	0	0	0	0
Traffic Management		3	7	1	-	-	6	0
Urban Management		3	8	3	2	1	1	1
Capacity Development		4	7	1	-	-	6	0
Total		**37**	**79**	**21**	**17**	**16**	**23**	**2**

Source: JST

11.4.2 Proposed Components and Details Projects

The proposed components and details of the projects, together with the estimated project costs, and suggested executive agencies are as follows.

Table 11.4.2 List of Proposed Projects for Road Development

1. Road Development Project											
Components	Project Name	Project No.	Length (km)	Location / Road Name	Term	Short	Medium	Long	after 2040	Construction Cost (Billion TZS)	Executive Agencies
1	Middle Ring Road (incl. Airport Access Road)	1-1-1	13.2	Morogoro Rd - Nyerere Rd	Short	■				435	TANROADS
		1-1-2	13.6	Bagamoyo Rd - Morogoro Rd	Medium		■			449	TANROADS
		1-1-3	10.3	Nyerere Rd - Kilwa Rd	Long			■		340	TANROADS
		1-1-4	9.8	Kilwa Rd – Bay Link Road	Long			■		323	TANROADS
		1-1-5	1.5	Second Kigamboni Bridge	Long			■		341	TANROADS
		1-1-6	2.5	Middle Ring Road - JNIA	Short	■				122	TANROADS
2	Outer Ring Road	1-2-1	22.2	Bunju - Kibamba IC	Long			■		424	TANROADS
		1-2-2	55.3	Dar Es Salaam - Chalinze Expressway	Medium		■			1,054	TANROADS
3	Bay Link Road	1-3-1	6.23	New Selander Bridge	Short	■				234	TANROADS
		1-3-2	1.7	Undersea Tunnel (New Selander Bridge - Kigamboni)	Long			■		1,064	TANROADS
		1-3-3	6.5	Widening of Old Bagamoyo Road (North)	Short	■				8	TANROADS
		1-3-4	3.4	Widening of Old Bagamoyo Road (South)	Short	■				5	TANROADS
		1-3-5	28.9	Kigamboni	Long			■		263	TANROADS
4	Flyover	1-4-1	-	Ali Hassan Mwinyi / Kinondoni	Long			■		187	TANROADS
		1-4-2	-	Ali Hassan Mwinyi / United Nations	Medium		■			187	TANROADS
		1-4-3	-	Chang'ombe Fly over Construction	Short	■				141	TANROADS
		1-4-4	-	Fire Station	Medium		■			270	TANROADS
		1-4-5	-	Magomeni	Medium		■			270	TANROADS
		1-4-6	-	Mandela / Uhuru	Long			■		109	TANROADS
		1-4-7	-	Morocco	Long			■		218	TANROADS
		1-4-8	-	Mwenge	Short	■				218	TANROADS
		1-4-9	-	United Nations	Medium		■			270	TANROADS
		1-4-10	-	Tabata	Medium		■			218	TANROADS
		1-4-11	-	Buguruni	Medium		■			109	TANROADS

1. Road Development Project contd.												
Components	Project Name		Project No.	Length (km)	Location / Road Name	Term	Short	Medium	Long	after 2040	Construction Cost (Billion TZS)	Executive Agencies
5	Widening Trunk/Collector Road	Ilala Municipality Project	1-5-1	-	Ilala MC Area	Short- Medium-Long					1,024	TANROADS
		Temeke Municipality Project	1-5-2	-	Temeke MC Area	Short- Medium-Long						TANROADS
		Kinondoni Municipality Project	1-5-3	-	Kinondoni MC Area	Short- Medium-Long						TANROADS
		Ubungo Municipality Project	1-5-4	-	Ubungo MC Area	Short- Medium-Long						TANROADS
		Kigamboni Municipality Project	1-5-5	-	Kigamboni MC Area	Short- Medium-Long						TANROADS
Total Cost for Road Development (billion TZS)											**8,283**	

Table 11.4.3 List of Proposed Projects for Public Transport

2. Public Transport Project (Railway Project)												
Components	Project Name		Project No.	Length (km)	Location / Road Name	Term	Short	Medium	Long	after 2040	Construction Cost (Billion TZS)	Executive Agencies
1	Ubungo Line	Upgrade of Ubungo line Project	2-1-1	11.7 km	Ubungo Line(CBD-Ubungo)	Short	■				461	TRC
2	Pugu Line	Track doubling of Pugu line Project	2-2-1	20 km	Pugu Line(CBD-Pugu)	Short	■				514	TRC
3	Bagamoyo Line	Tegeta line Project	2-3-1	21.7 km	Tegeta Line(Aga Khan-Tegeta)	Medium		■			2,662	TRC
		Extension line between Tegeta and Bunju Project	2-3-2	13 km	Tegeta line(Tegeta-Bunju)	Long			■		1,151	TRC
4	Loop Line	Extension between Mwenge and Ubungo Project	2-4-1	4.5 km	Loop Line(Mwenge-Ubungo)	Medium		■			336	TRC
		Extension between Aga Khan and Central Project	2-4-2	4.7 km	Loop Line(Aga Khan-CBD)	Long			■		2,224	TRC
5	Morogoro Line	Morogoro lineProject	2-5-1	26 km	Morogoro Line(Kibaha-Ubungo)	Medium		■			2,707	TRC
6	Kilwa Line	Kilwa line Project	2-6-1	15 km	Kilwa Line(CBD-Vikindu)	After 2040				■	1,685	TRC
Total Cost for Railway Projects (billion TZS)											**11,740**	

3. Public Transport Project (BRT)											
Components	Project Name	Project No.	Length (km)	Location / Road Name	Term	Short	Medium	Long	after 2040	Construction Cost (Billion TZS)	Executive Agencies
1	BRT Phase-1	3-1-1	6.5km	Morogoro Road	Short	■				53	DART
2	BRT Phase-2	3-2-1	20.1km	Kilwa Road	Short	■				158	DART
3	BRT Phase-3	3-3-1	22.6 km	Nyerere Road	Short	■				174	DART
4	BRT Phase-4	3-4-1	20.8km	Bagamoyo Road, Sam Nujoma Road	Short	■				171	DART
5	BRT Phase-5	3-5-1	24.3km	Nelson Mandera Road etc.	Medium		■			178	DART
6	BRT Phase-6	3-6-1	30.2km	Old Bagamoyo Road	Mesium		■			223	DART
7	BRT Phase-7	3-7-1	17.7km	Kigamboni Area	Long			■		154	DART
Total Cost for BRT Projects (billion TZS)										**1,111**	

4. Public Transport Project (Transport Terminal)

Components	Project Name		Project No.	Length (km)	Location / Road Name	Term	Short	Medium	Long	after 2040	Construction Cost (Billion TZS)	Executive Agencies
1	Terminal (Primary)	T-1(CBD), T-3(Ubungo)	4-1-1	10,000m2	CDB	Short	▬				5.0	TBD
		T-2(Tazara), T4(Mwenge)	4-1-2	10,000m2	Tazara	Medium		▬			5.0	TBD
		T-5(Morocco)	4-1-3	10,000m2	Morocco	Long			▬		2.5	TBD
2	Terminal (Seondary)	T-1(tegeta), T-3(Ukonga), T-4(Temeke), T-6(Mbagla)	4-2-1	80,000m2	Tegeta	Medium		▬			20.0	TBD
		T-2(Mbezi)	4-2-2	20,000m2	Mbezi	Short	▬				5.0	TBD
		T-5(Kigamboni1), T-7(Kigamboni2)	4-2-3	40,000m2	Kigamboni1	Long			▬		10.0	TBD
3	Terminal (Tertiary)	T-1(Bunju), T2(Luguruni), T3(Pugu), T4(Kigamboni), T-5(Mazinga)	4-3-1	100,000m2	Bunju	Long			▬		25.5	TBD
Total Cost for Transport Terminal Projects (billion TZS)											**73**	

5. Public Transport Project (Feeder Bus)

Components	Project Name	Project No.	Length (km)	Location / Road Name	Term	Short	Medium	Long	after 2040	Construction Cost (Billion TZS)	Executive Agencies
1	Bagamoyo Line	5-1-1	-	Bagamoyo Road's Suburb Area	Short- Long	▬	▬	▬		-	Private Bus Operator
2	Morogoro Line	5-2-1	-	Morogoro Road Road's Suburb Area							
3	Nyerere Line	5-3-1	-	Nyerere Road's Suburb Area							
4	Kilwa Line	5-4-1	-	Kilwa Road's Suburb Area							
5	Kigamboni Line	5-5-1	-	Kigamboni Road's Suburb Area							
Total Cost for Feeder Bus Routes Projects (billion TZS)										-	

6. Public Transport Project (Waterway)

Components	Project Name	Project No.	Length (km)	Location / Road Name	Term	Short	Medium	Long	after 2040	Construction Cost (Billion TZS)	Executive Agencies
1	Piers Construction	6-1-1	1 Pier Construction	CBD-Bahari	Short	▬				51	TBD
			2 Boats Purchase								
Total Cost for Waterway Projects (billion TZS)										**51**	

Table 11.4.4 List of Proposed Projects for Traffic Management

7. Traffic Management Project												
Components	Project Name		Project No.	Length (km)	Location / Road Name	Term	Short	Medium	Long	after 2040	Construction Cost (Billion TZS)	Executive Agencies
1	Mobility Management	Promoting Modal Shift	7-1-1	-	Whole City	Short- Long (Perioadically)	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	6.5	DCC, MCs
		Parking Management: Study for parking management	7-1-2	-	CBD, Sub Center, District Center, Satellite City	Short	■				1	DCC, MCs
		Parking Management: Implementation				Medium	■	■	■		2.5	DCC, MCs
		Event for promoting NMT	7-1-3	-	Whole City	Short-Long (Periodically)	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	0.4	DCC, MCs
2	Improvement of Traffic Circulation	Traffic Signal Optimization: Construction and Instillation	7-2-1	-	Strategic Traffic Management Area	Short	■				28	PO-RALG, MOWTC, DCC, MCs
				-	Traffic Management Area (Inside Middle Ring Road)	Medium		■			20	PO-RALG, MOWTC, DCC, MCs
				-	Traffic Management Area (Outside Middle Ring Road)	Long			■		18	PO-RALG, MOWTC, DCC, MCs
		Intersection Improvement	1-5	-	Mentioned in the Road Development Plan (Flyover Project)	-	■	■	■		-	-
		Area Restriction for Truck and Car	7-2-2	-	Whole City	Short	■				1	MOWTC, DCC, MCs
		Real-time Traffic Information Provision: ITS Study, Installation	7-2-3	-	Strategic Traffic Management Area	Short	■				48	PO-RALG, MOWTC, DCC, MCs
				-	Traffic Management Area	Medium-Long		■	■		32	PO-RALG, MOWTC, DCC, MCs
3	Traffic Safety Program: Action Plan, Construction, Installation, Publication		7-3-1	-	Morogoro, Bagamoyo, Nyerere road.	Short	■				8.13	MOWTC, DCC, MCs, TANROADS
						Medium-Long		■	■		8.1	DCC, MCs, TANROADS
Total Cost for Traffic Management Projects (billion TZS)											**174**	

Table 11.4.5 List of Proposed Projects for Urban Management

8. Urban Management Projects												
Components	Project Name		Project No.	Length (km)	Location / Road Name	Term	Short	Medium	Long	after 2040	Project Cost (Billion TZS)	Executive Agencies
1	Palm and Finger Plan (Urban Corridor)	Dar es Salaam Master Plan	8-1-1	1,393 km^2	Whole Area of DSM	Short	▬				-	DCC
2	Sub-Centers	Ubungo Sub-center Development Project	8-2-1	75ha	Ubungo,	Short	▬				-	Ubungo MC
		Mwenge, Tazara, Morocco Sub-center Development Project	8-2-2	225 ha	Mwenge, Tazara, Morocco	Medium		▬			-	Kinondoni MC, Ilala MC
3	Satellite Cities	Mbezi Satellite City Development Project	8-3-1	500 ha	Mbezi	Short	▬				-	Ubungo MC
		Kawe Satellite City Development Project	8-3-2	75 ha	Kawe	Short-Medium	▬	▬			-	NHC
		Tegeta, Ukonga, Mgbagala Satellite City Development Project	8-3-3	2,500 ha	Tegeta, Ukonga, Mbagala	Medium		▬			-	Kinondoni MC, Temeke MC, Ilala MC
		Bunju, Luguruni, Pugu, Mzinga, Kisarawe2 Satellite City Development Project	8-3-4	4,000 ha	Bunju, Luguruni, Pugu, Mzinga, Kisarawe2	Long			▬		-	Kinondoni MC, Ubungo MC, Ilala MC, Temeke MC, Kigambini MC
		Somangila, Pemba Mnazi Satellite City Development Project	8-3-5	2,000 ha	Somangila, Pemba Mnazi	After 2040				▬	-	Kigamboni MC

Table 11.4.6 List of Proposed Projects for Capacity Development

9. Capacity Development Projects												
Components	Project Name		Project No.	Length (km)	Location / Road Name	Term	Short	Medium	Long	after 2040	Project Cost (Billion TZS)	Executive Agencies
1	Management Mechanism Project		9-1-1			Short					-	DCC,MCs, DSM-RS, PO-RALG
2	DSM Information Centre Project		9-2-1			Short -Medium					-	DCC,MCs, DSM-RS, PO-RALG
3	Promote TOD Approach Project		9-3-1	21.7	Case study at Kinondoni MC. Projects includes the establishment of supportive regulation or legal framework.	Short -Medium					-	DCC, MCs, TRC, PO-RALG, MOWTC
4	Technical Development	Monitoring System Development Project	9-4-1			Short-Medium-Long					-	DCC, MCs, DSM-RS, PO-RALG
		MRT Operation and Maintenance Project	9-4-2			Medium-Long					-	TRC, MOWTC (T)
		Road Management and Maintenance Project	9-4-3			Short-Medium-Long					-	TANROADS, MOWTC (W), TARURA
		Traffic Management Project	9-4-4			Short-Medium-Long					-	TANROADS, DCC, MOWTC (W), TARURA, Police

11.4.3 Key Projects and Priority Projects

The suggested projects in the M/P are divided into five (5) categories; Road, Public Transport, Traffic Management, Urban Management and Capacity Development. Furthermore, every category has several key projects. Here as the key projects, ten (10) projects are picked up mainly from short term projects although railway projects and transport terminal projects include medium-term projects because new railway projects take long time to complete, as shown in Table11.4.7. The key projects exclude collector/feeder road projects, upgrade of existing railway projects, waterway projects, urban management projects and capacity development projects. This is why such projects excluded are relatively lower cost and benefit than the key projects.

Table 11.4.7 Key Projects in the M/P

Key Project		Section, Area	Short/Medium Term, Current Progress and Situation
A. Road Project	01. Middle Ring Road *1 *2	Morogoro-Nyerere-Airport	Short term. No work has been done.
	02. Bay Link Road	Old Bagamoyo-New Selander Bridge	Short term, F/S for the New Selander Bridge was undertaken.
	03. Outer Ring Road	Southern Section (Expressway)	Short term, F/S was undertaken.
	04. Flyover	Mwenge, Chang'ombe	Short term, No work has been done for Mwenge
B. Railway Project	01. Loop Line	Mwenge-CBD Mwenge-Ubungo	Short-Medium term, no work has been done,
	02. Bagamoyo Line	Tegeta line (Mwenge-Tegeta)	Short-Medium term, no work has been done,
	03. Morogoro Line	Ubungo-Mbezi	Short-Medium term, no work has been done
C. BRT Project	BRT Lane Construction	Phase2 – Phase4	Short term. WB, AfDB are preparing for Phase- 2 to 4
D. Terminal	Public Transportation Terminal	Ubungo, Mwenge,Tazara, Tegeta, Ukonga, Temeke, Mbagla	Short-Medium term No work has been done without Ubungo terminal
E. Traffic Management	IT Facilities and Traffic Signals	Strategic Traffic Management Area	Short term, WB is preparing for some parts of BRT management

*1: with Airport Access *2: with Second Kigamboni Bridge
Source: JST

Next, Priority projects are picked up among the key projects from the following evaluation items;

1) Contribution to urgent problems
   As the most serious congestion on road is on Bagamoyo road based on the traffic survey results in 2017. The projects which can contribute to improve traffic congestion on Bagamoyo Road are evaluated as "High" rank.
2) Important role to transport network
   Five urban corridors and a circular corridor with Middle Ring, Outer Ring and Bay Link road are main transport networks. The projects which can contribute to build the main transport networks are evaluated as "High" rank.
3) Possibility to implement in short term
   Here the projects which can implement in short term without land acquisition and higher investment are evaluated as "High" rank.

Priority projects are selected among key projects if the number of high rank among the above three evaluation items is more than one as shown in Table 11.4.8. Five key projects are selected as the priority projects. Among the priority projects BRT projects are conducting by WB. On the other hand, the other four projects are just suggested by this Master Plan without any work.

Table 11.4.8 Priority Projects in the M/P

Key Project		1) Contribution to urgent problems	2) Important role to transport network	3) Possibility to implement in short term	Result of Evaluation
A. Road Project	01. Middle Ring Road *1 *2		High		
	02. Bay Link Road		High		
	03. Outer Ring Road		High		
	04. Flyover	High		High	Priority Project
B. Railway Project	01. Loop Line	High	High		Priority Project
	02. Bagamoyo Line	High	High		Priority Project
	03. Morogoro Line		High		
C. BRT Project	BRT Lane Construction	High	High	High	Priority Project
D. Terminal	Public Transportation Terminal		High		
E. Traffic Management	IT Facilities and Traffic Signals	High		High	Priority Project

*1: with Airport Access *2: with Second Kigamboni Bridge
Source: JST

The following feasibility studies for the priority projects are proposed to implement as soon as possible.

(1) Feasibility study on Mwenge Flyover Project

Fly-over at Mwenge intersection is proposed to conduct the feasibility study to support BRT and Railway projects urgently. This is because there is a need to coordinate on-going several projects including road expansion, BRT installation and Railway construction.

(2) Feasibility study on Tegeta line and Loop line

As the first Railway/MRT project, Tegeta line including Loop line between CBD and Mwenge can be seen as the most expected to improve road congestion on Bagamoyo road. In the feasibility study, a railway-network development plan until 2030 shall be examined for combination of Bagamoyo Line, Morogoro Line and Loop line.

(3) Feasibility study on Traffic Management in the Strategic Traffic Management Area

Traffic management is proposed to be implemented as soon as possible in DSM. These surely need to tackle with traffic movement more efficiently and safely. It is on the way to build up BRT network including phase1-4, Tazara Fly-over, Ubungo Fly-over and Ubungo terminal construction. It is good timing to establish traffic management system for Strategic Traffic Management area.

CHAPTER 12 COST ESTIMATION, ECONOMIC AND FINANCIAL ANALYSIS

12.1 Cost Estimation

12.1.1 Method of Cost Estimation

(1) Numerical unit and calculation criteria

The International System (SI) is applied for the Numerical unit. Criteria for the calculation are not particularly defined.

(2) Currency

Currency for the estimation is the international currency; US dollar (USD) and the local currency - Tanzanian Shilling (TZS). The official exchange rate is utilized for the currency conversion.

(3) Calculation Date

Estimated costs were calculated on December 2017.

(4) Exchange Rate

The Exchange Rate used is 1USD=2,226TZS, 1US$=111.291JPY on December 2017.

(5) Unit Price

The unit price is referred and set based on the following;

1) Similar on-going JICA projects in East Africa (JICA loan, Grant)
2) Interviews and meeting with the Contractors in Tanzania (Tazara Flyover, Nippo, Konoike)
3) BOQ of similar projects under contract to the Tanzania Government
4) Comparison of the construction unit price of each work with the actual unit price in Japan

(6) Construction Cost

Construction Cost is composed of the followings; Direct Cost, Indirect Cost and General Administrative Expenses.

- Direct Cost
  The Direct Cost includes all Labour Cost, Material Cost and Equipment Cost which are necessary for the completion of the project works.
- Indirect Cost
  Indirect Cost includes the “Common Temporary Cost” and the “Site Administrative Expenses”

  (Common Temporary Cost)
  The calculation of Common Temporary Cost is applied the same formula used in Japan.

Dc (Direct Cost)	Steel bridge	PC bridge	Road Pavement and Structure
	9.18%	7.05%	5.92%

Safety management expenses in the dense residential areas are costly, and difficult to ensure the temporary storage yard. The proposed projects of the Urban Transport Projects in DSM are required to consider urban area (DID) correction. The percentage above calculation is added 1.3 times for DID correction.

(Site Administrative Expenses)

The calculation for Site Administrative Expenses is applied the same as percentage used in Japan. The expenses of International Trip, Accommodations and Vehicle for management are added.

Np (Direct cost + Common temporary)	Steel bridge	PC bridge	Road and Structures
	28.56%	19.84%	16.52%

The percentage above is added 1.1times for DID correction.

(General Administrative Expenses)

The General Administrative Expenses are the cost for operation of Head Office of Contractor, and the percentage is applied the same as in Japan.

Construction Cost	Percentage
	7.41%

(7) Tax and Custom Duties

Tax and Custom Duties in Tanzania are not included.

(8) Price Escalation

Price Escalation is not considered.

12.1.2 Construction Cost and Project Cost

The total construction cost and project cost for this Master Plan is estimated as shown in Table 12.1.1. Most of the construction costs are accounted for the railway and road projects.

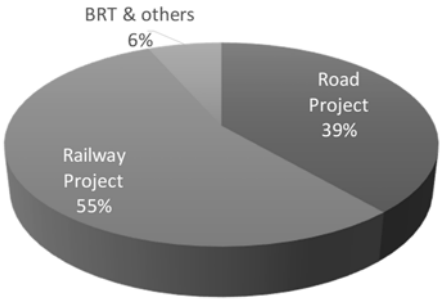
Table 12.1.1 Construction Cost and Project Cost

Project	Plan	Quantities	USD (Million)	TZS (Billion)
A. Road Project	01. Middle Ring Road *1	50.9 km	903	2,010
	02. Bay Link Road	46.7 km	707	1,574
	03. Outer Ring Road	77.5 km	664	1,478
	04. Flyover	11 nos	987	2,197
	05. Collector Road	L.S	460	1,024
	Sub-Total		**3,721**	**8,283**
B. Railway Project *2	01. Upgrade of Ubungo line	11.7 km	207	461
	Civil Work	L.S.	58	129
	Rolling Stock	L.S.	85	190
	Eelectrical & Mechanical	L.S.	32	71
	Signal & Telecommunication	L.S.	32	71
	02. Track doubling of Pugu line	20.0 km	231	514
	Civil Work	L.S.	29	64
	Rolling Stock	L.S.	118	263
	Eelectrical & Mechanical	L.S.	23	51
	Signal & Telecommunication	L.S.	61	136
	03. Tegeta Line (Aga Khan-Tegeta)	21.7 km	1,196	2,662
	Civil Work	L.S.	655	1,458
	Rolling Stock	L.S.	328	730
	Eelectrical & Mechanical	L.S.	93	207
	Signal & Telecommunication	L.S.	120	267
	04. Extension line between Mwenge and Ubungo	4.5 km	151	336
	Civil Work	L.S.	27	60
	Rolling Stock	L.S.	84	186
	Eelectrical & Mechanical	L.S.	20	45

	Signal & Telecommunication	L.S.	20	45
	05. Morogoro line	26.0 km	1,216	2,707
	Civil Work	L.S.	639	1,422
	Rolling Stock	L.S.	322	717
	Eelectrical & Mechanical	L.S.	67	149
	Signal & Telecommunication	L.S.	188	419
	06. Extension line between Aga Khan and Central	4.7 km	999	2,224
	Civil Work	L.S.	881	1,961
	Rolling Stock	L.S.	84	187
	Eelectrical & Mechanical	L.S.	16	36
	Signal & Telecommunication	L.S.	18	40
	07. Extension line between Tegeta and Bunju	13.0 km	517	1,151
	Civil Work	L.S.	304	676
	Rolling Stock	L.S.	135	301
	Eelectrical & Mechanical	L.S.	29	65
	Signal & Telecommunication	L.S.	49	109
	08. Kilwa line	15.0 km	757	1,685
	Civil Work	L.S.	414	922
	Rolling Stock	L.S.	208	463
	Eelectrical & Mechanical	L.S.	59	131
	Signal & Telecommunication	L.S.	76	169
	Sub-Total		**5,274**	**11,740**
C. BRT Project	01. BRT Lane Construction	142.2 km	**499**	**1,111**
D. Terminal	01. Public Transportation Terminal	17 nos	**33**	**74**
E. Traffic Management	01. ITS Facilities, Signals and Parking Facilities	1 nos	3	7
	01. ITS Facilities, Signals and Parking Facilities	1 nos	2	4
	01. ITS Facilities, Signals and Parking Facilities	1 nos	0.2	0.4
	01. ITS Facilities, Signals and Parking Facilities	1 nos	30	67
	01. ITS Facilities, Signals and Parking Facilities	1 nos	0.4	1
	01. ITS Facilities, Signals and Parking Facilities	1 nos	36	80
	01. ITS Facilities, Signals and Parking Facilities	1 nos	7	16
	Sub-Total		**78**	**174**
F. Waterway	01. Piers Construction	1 nos	10	22
	02. Boats Purchase	2 nos	13	29
	Sub-Total		**23**	**51**
CONSTRUCTION COST TOTAL			**9,628**	**21,432**
Administration Cost (Construction Cost x 1.8%)			173	385
Land Acquisition, Compensation and Removal Cost			674	1,500
Consultant Services Cost (Construction Cost x 8.0%)			770	1,714
Contingency (Construction Cost x 5.0%)			481	1,071
PROJECT COST TOTAL			**11,726**	**26,102**

*1: with Airport Access and Second Kigamboni Bridge
*2: include rolling stock, signal and telecommunication
Source: JST

The share of total construction cost is shown in Figure 12.1.1. The railway project shares 55%, while the road project has 39% of total cost.



Source: JST

Figure 12.1.1 Share of Total Construction Cost

12.1.3 Envisaged Source of Finance for Projects

(1) Rational of classification for the category of implementation

While the Economic IRR of the projects proposed for Dar es Salaam Master Plan shows 32.2% which verify the effectiveness for the city of Dar es Salaam, Project IRR for financial analysis varied from negative figure and positive PIRR that the later could be achieved by a means of Unbundled (Horizontal Cut methodology) PPP.

This section analyses the envisaged source of finance for the proposed Master Plan Projects so that the financial burden of Tanzania Government, City of Dar es Salaam and Private Sector will be allotted. Since the accurate allotment of the source of finance shall be determined through the detailed feasibility study of each projects, the methodology of the evaluation shall be based on the description in Chapter 11 "11.1.4 (2) b) "Table 11.1.9 Qualitative Evaluation Methodology".

Table 11.1.9 Qualitative Evaluation Methodology aim to decide the probability of the participation of private sector thus the higher score will be given to the probability of participation of private investors, financial institutions and beneficially payment while high participation of public finance score as negative. The contribution to GDP and economic impact are scored from minimal to medium.

(2) The result of the qualitative evaluation of the projects

The objects of the projects for the Qualitative Evaluation are referred to Table 12.1.1 Construction Cost and Project Cost, and Dar es Salaam Urban Transport Master Plan Proposed Components and Project List Table.

Qualitative evaluation for the classification of each project of Road, Railway, BRT and Waterway have been verified through PPP arrangement as shown on Figure 11.1.22 and Table 11.1.9.

Table 12.1.2 Qualitative Evaluation of Public Transport Projects

Project Name	Evaluation Criteria						Score (SUM(1:6))	Result		Remark & Note
	1.Provability of Participation of Private Investor	2.Availability of International and Local Financial Market	3.Provability of Beneficiary Payment	4.Level of Contribution to GDP	5.Level of impotence of Economic Impact	6.Level of Financial Burden to Public Sector		Suggested Category for PPP Arrangement	Private sector's share in implementing entity (%)	
A. Road Project										
01. Middle Ring Road except 01a & 01b	0	0	0	3	3	-5	1	D	0%	Public Work
01a. Airport Access Road	5	5	5	1	2	-2	16	A	70%	BOT
01b. Second Kigamboni Bridge	1	1	3	1	2	-5	3	C	5%	Service & Management
02. Bay Link Road except 02a &02b.	0	0	0	2	3	-5	0	D	0%	Public Work
02a. New Selander Bridge	1	1	3	1	2	-5	3	C	5%	Service & Management
02b. Undersea Tunnel	1	1	3	1	2	-5	3	C	5%	service & Management
03. Outer Ring Road except 03a.	0	0	0	1	2	-5	-2	D	0%	Public Work
03a. Dar es Salaam-Chalinze Expressway	3	3	4	2	3	-4	11	B	30%	Unbundled BOT
04. Flyover	0	0	0	1	3	-5	-1	D	0%	Public Work
05. Collector Road	0	0	0	1	2	-5	-2	D	0%	Public Work
B. Railway Project										
01. Existing Line(CBD-Ubungo) except 01a	0	0	4	2	3	-5	4	D	0%	Public Work
01a. Rolling Stock, Signal and O&M	2	2	4	2	3	-4	9	B	30%	Unbundled BOT

02. Pugo Double Track(Commuter) except 02a	0	0	4	2	3	-5	4	D	0%	Public Work
02a. Rolling Stock, Signal and O&M	2	2	4	2	3	-4	9	B	30%	Unbundled BOT
03. Tegeta Line(Tegeta-Aga Khan) except 03a	0	0	4	2	3	-5	4	C	0%	Public Work
03a. Rolling Stock, Signal and O&M	4	4	4	2	3	-1	16	A	70%	Unbundled BOT
04. Extension to Mwenge and Ubungo except 04a	0	0	4	2	3	-5	4	C	0%	Public Work
04a. Rolling Stock, Signal and O&M	4	4	4	2	3	-1	16	A	70%	Unbundled BOT
05. Morogoro Line except 05a	0	0	4	2	3	-5	4	C	0%	Public Work
05a. Rolling Stock, Signal and O&M	4	4	4	2	3	-1	16	A	70%	Unbundled BOT
06. Extension Aga Khan and Central except 06a	0	0	4	2	3	-5	4	C	0%	Public Work
06a. Rolling Stock, Signal and O&M	4	4	4	2	3	-1	16	A	70%	Unbundled BOT
07. Extension between Tegeta and Bunju except 07a	0	0	4	2	3	-5	4	C	0%	Public Work
07a. Rolling Stock, Signal and O&M	4	4	4	2	3	-1	16	A	70%	Unbundled BOT
08. Kilawa line except 08a	0	0	4	2	3	-5	4	C	0%	Public Work
08a. Rolling Stock, Signal and O&M	2	2	4	2	3	-4	9	B	30%	Unbundled BOT
C. BRT Project exc. C1	0	0	5	2	2	-5	4	C	0%	Public Work
C1 Procurement of Buses and O&M	5	5	5	2	2	0	19	A	100%	Unbundled BOT
D. Terminal	0	0	0	1	2	-5	-2	D	0%	Public Work
E. Traffic Management	0	0	0	1	2	-5	-2	D	0%	Public Work
F. Waterway										
01. Piers Construction	0	0	0	1	1	-5	-3	D	0%	Public Work
02. Boats Purchase	0	0	1	1	1	-5	-2	D	0%	Public Work

Evaluation score result		Result
Category A	HIGH Private Exposure	SUM ≧16
Category B	Hybrid Public and Private Exposure	SUM ≧9
Category C	High Public Exposure	SUM ≧2
Category D	Conventional Public Work	SUM <1

Allotment 1-5	Score	Allotment 6	Score
Satisfied	5	Huge	-5
Medium	3	Medium	-3
Minimal	1	Minimal	-1
None	0	None	0

(3) Envisaged implementation scheme and source of finance for each project

The envisaged source of finance and Implementation Arrangement for the Public Transport Projects are shown in Table 12.1.3 “Envisaged implementation scheme and source of finance”. The concrete source of finance shall be determined through the detailed feasibility study for each project.

The methodology to allocate the Source of Finance has been based on the Qualitative Evaluation as shown on Table 12.1.2. Basic rational for the determination of the allocation have been taken into account the following considerations.

- Private sector's share in implementing entity as shown in Table 12.1.2 is the guideline for the arrangement of project type and the Envisaged Source of Finance.
- 0% means conventional public work with the following categories;
  - Tanzania Government bears 100% of project cost in case of low technology Road project, at grade civil work for Railway project, BRT project, Terminal, Traffic Management and Waterway project.
  - Tanzania Government and Donor shall share the project cost by 50% and 50% in case of high technology Road project and all civil work of Railway project
- 5% means PPP (Service and Management) type project with the following categories;
  - Tanzania Government bears 45% and Donor bears 50% while Private sector invests 5% of project cost respectively. Private sector undertakes services for operation and maintenance only.
- 30% means PPP Hybrid type project with the following categories;
  - Tanzania Government bears 20% and Donor bears 50% while Private sector invests 30% of project cost respectively. Donor bears 50% for the project cost to assure the relatively lower finance cost. Private sector undertakes a part investment and the full operation and maintenance.
- 70% means PPP BOT type project with the following categories;
  - Tanzania Government bears 30% while Private sector invests 70% of project cost respectively for the Airport Access Road. Due to the size of the project, Donor is not considered.
  - Tanzania Government bears 10% and Donor bears 20% while Private sector invests 70% of project cost respectively for the Railway unbundled project. Private sector undertakes main investment, the full operation and maintenance.
- Note; The project cost is 21.8% over the construction costs in Table 12.1.1. Envisaged Source of Finance are shown in TZS billion.

Table 12.1.3 Envisaged Source of Finance for the Master Plan Projects

Source of Finance / Project Cost	Project Cost USD (million)	Project Cost TZS (billion)	Envisaged Source of Finance with Qualitative Evaluation (TZS billion)								Implementation Arrangement	Construction Cost	
			Public (GOT)		Further Breakdown of Public				Private Sector				
					Public (TZS GOT)		Public (ODA Donor)					USD Mill	TZS Bill
			Amount	%	Amount	%	Amount	%	Amount	%			
A. Road Project													
01. Middle Ring Road except 01a & 01b	847	1,884	1,884	100%	942	50%	942	50%	0	0%	Public Work	695	1,547
01a. Airport Access Road	67	150	45	30%	45	30%	0	0%	105	70%	Hybrid PPP	55	123
01b. Second Kigamboni Bridge	186	415	395	95%	187	45%	208	50%	21	5%	PPP (S & M)	153	341
02. Bay Link Road except 02a & 02b.	151	335	335	100%	167	50%	167	50%	0	0%	Public Work	124	275
02a. New Selander Bridge	128	285	271	95%	128	45%	143	50%	14	5%	PPP (S & M)	105	234
02b. Undersea Tunnel	582	1,296	1,231	95%	583	45%	648	50%	65	5%	PPP (S & M)	478	1,064
03. Outer Ring Road except 03a.	231	516	516	100%	258	50%	258	50%	0	0%	Public Work	190	424
03a. Dar es Salaam-Chalinze Expressway	577	1,285	899	70%	385	30%	514	40%	385	30%	Hybrid PPP	474	1,055
04. Flyover	1,202	2,676	2,676	100%	1,338	50%	1,338	50%	0	0%	Public Work	987	2,197
05. Collector Road	560	1,247	1,247	100%	1,247	100%	0	0%	0	0%	Public Work	460	1,024
Sum (A)	4,532	10,090	9,500		5,282		4,218		590			3,721	8,284

B. Railway Project													
01. Existing Line(CBD-Ubungo) except 01a	71	158	158	100%	158	100%	0	0%	0	0%	Public Work	58	130
01a. Rolling Stock, Signal and O&M	181	403	282	70%	81	20%	202	50%	121	30%	Hybrid PPP	149	331
02. Pugo Double Track(Commuter) except 02a	34	77	77	100%	77	100%	0	0%	0	0%	Public Work	28	63
02a. Rolling Stock, Signal and O&M	246	548	384	70%	110	20%	274	50%	164	30%	Hybrid PPP	202	450
03. Tegeta Line(Tegeta-Aga Khan) except 03a	798	1,775	1,775	100%	887	50%	887	50%	0	0%	Public Work	655	1,457
03a. Rolling Stock, Signal and O&M	660	1,469	441	30%	147	10%	294	20%	1,028	70%	PPP (Unbundle)	542	1,206
04. Extension to Mwenge and Ubungo except 04a	33	74	74	100%	37	50%	37	50%	0	0%	Public Work	27	61
04a. Rolling Stock, Signal and O&M	151	335	100	30%	33	10%	67	20%	234	70%	PPP (Unbundle)	124	275
05. Morogoro Line except 05a	778	1,733	1,733	100%	867	50%	867	50%	0	0%	Public Work	639	1,423
05a. Rolling Stock, Signal and O&M	703	1,564	469	30%	156	10%	313	20%	1,095	70%	PPP (Unbundle)	577	1,284
06. Extension Aga Khan and Central except 06a	1,073	2,388	2,388	100%	1,194	50%	1,194	50%	0	0%	Public Work	881	1,961
06a. Rolling Stock, Signal and O&M	144	320	96	30%	32	10%	64	20%	224	70%	PPP (Unbundle)	118	263
07. Extension between Tegeta and Bunju except 07a	370	825	825	100%	412	50%	412	50%	0	0%	Public Work	304	677
07a. Rolling Stock, Signal and O&M	259	577	173	30%	58	10%	115	20%	404	70%	PPP (BOOT)	213	474
08. Kilawa line except 08a	504	1,123	1,123	100%	561	50%	561	50%	0	0%	Public Work	414	922
08a. Rolling Stock, Signal and O&M	418	929	651	70%	186	20%	465	50%	279	30%	Hybrid PPP	343	763
Sum (B)	6,424	14,299	10,749		4,997		5,752		3,550			5,274	11,740
C. BRT Project except C1	608	1,353	1,353	100%	1,353	100%	0	0%	0	0%	Public Work	499	1,111
C1 Procurement of Buses and O&M												-	-
D. Terminal	40	90	90	100%	90	100%	0	0%	0	0%	Public Work	33	74
E. Traffic Management	95	212	212	100%	212	100%	0	0%	0	0%	Public Work	78	174
F. Waterway	0	0	0		0		0		0				
01. Piers Construction	28	63	63	100%	63	100%	0	0%	0	0%	Public Work	23	52
02. Boats Purchase	0	0	0	0	0	0%	0	0%	0	0%	Public Work		
Sum (C-F)	771	1,719	1,719		1,719		0		0			633	1,411
Total	11,727	26,108	21,968		11,997		9,970		4,140			9,628	21,435

(4) Summary

Total magnitude of the envisaged financial source for the Tanzania Government including ODA of Donor and the Private Sector are shown in Table 12.1.4. As the conclusion, Tanzania Government bears 46%, International Donors loan 38% and Private Sector invests 16% of the all projects cost.

Table 12.1.4 Summary of Envisaged Source of Finance for the Master Plan Projects

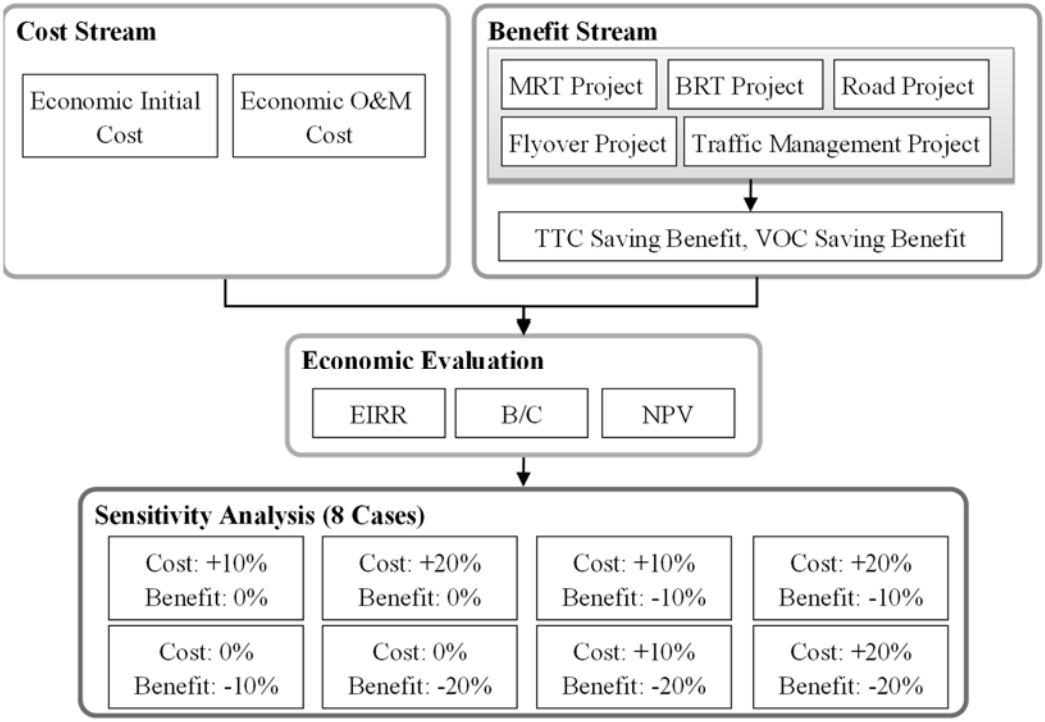
Source of Finance / Project Cost	Project Cost USD (million)	Project Cost TZS(billion)	Envisaged Source of Finance with Qualitative Evaluation (TSZ billion)								Remark
			Public (GOT)		Further Breakdown of Public				Private Sector		
					Public (GOT TSZ)		Public (ODA Donor)				
			Amount	%	Amount	%	Amount	%	Amount	%	
Total	11,727	26,108	21,968	84%	11,997	46%	9,970	38%	4,140	16%	% of Total Cost

12.2 Economic Evaluation

12.2.1 Method of Economic Estimation

(1) Methodology of the Economic Evaluation

JST conducted the economic analysis in order to evaluate the efficiency and effectiveness, and to clarify the feasibility of the proposed projects. The method of economic evaluation is done by applying cost benefit analysis, and discounted cash flow. Figure 12.2.1 shows the work flow of the economic evaluation.



Source: JST

Figure 12.2.1 Work Flow for Economic Evaluation

(2) Condition of Economic Evaluation

JST set the estimate period for the economic evaluation as 44 years, starting at 2017 up to 2060. Major construction and implementation of the proposed projects will be completed by the target year of 2040. With the consideration of rapid growth and changes of socio-economic conditions, JST add 20 years to the target year of 2040.

The economic costs and benefits throughout the project period are analysed by a discount cash flow analysis. The 12% discount rate is adopted based on TANROADS' manual namely, "TANROADS' Investment Appraisal Manual, Project Benefits, 2015". For the economic evaluation, three indicators are applied; Economic Internal Rate of Return (EIRR), Cost Benefit Ratio (B/C), and Net Present Value (NPV).

Table 12.2.1 Calculation Formula or Value

No.	Indicator	Calculation Formula or Value
1	Project Evaluation Period	Period for 2017-2060 (44 years)
2	Discount Rate	12% as a social discount rate generally used in Tanzania and approved by TANROADS' Investment Appraisal Manual
2	EIRR	$\sum \frac{B_n}{(1+r)^n} = \sum \frac{C_n}{(1+r)^n}$ r = satisfying B = Benefit, C = Cost
3	B/C	$\sum \frac{B_n}{(1+DR)^n} = \sum \frac{C_n}{(1+DR)^n}$ DR = Discount Rate
4	NPV	$\sum \frac{B_n - C_n}{(1+DR)^n}$
5	Project Evaluation Period	Period for 2017-2060 (44 years)

Source: JST

(3) Economic Evaluation Case Setting

Table below shows the case setting for the economic evaluation applied with the traffic demand forecast described in Chapter 8. JST calculates the base year of economic benefit of 2030 and 2040.

Table 12.2.2 Economic Evaluation Cases

<Year 2030>

	Without Project	With Project
Road Project	BRT routes complete	60% Complete
Railway Project	-	Existing Line + Tegeta Line
BRT Project	Phase1-4	Phase 1-6
Terminal Project	-	70% Complete
Traffic Management	-	70% Complete
Waterway Project	-	All Project Complete

<Year 2040>

	Without Project	With Project
Road Project	BRT routes complete	All Project Complete
Railway Project	-	
BRT Project	Phase1-4	
Terminal Project	-	
Traffic Management	-	
Waterway Project	-	

Source: JST

12.2.2 Economic Cost

(1) Initial Cost

According to economic evaluation case setting, initial cost for the Economic Evaluation is shown in Table 12.2.3. This project cost does not include VAT and Tax, thus, the project cost is simply used as the economic cost.

Table 12.2.3 Initial Cost for the Economic Evaluation

Project	Plan	Quantities	USD (million)	TZS (billion)
A. Road Project	01. Middle Ring Road	50.9 km	903	2,010
	02. Bay Link Road	46.7 km	707	1,574
	03. Outer Ring Road	77.5 km	664	1,478
	04. Flyover	11 nos	987	2,197
	05. Collector Road	L.S	460	1,024
	Total		**3,721**	**8,283**
B. Railway Project *1	01. Upgrade of Ubungo line	11.7 km	207	461
	02. Track doubling of Pugu line	20.0 km	231	514
	03. Tegeta Line (Aga Khan-Tegeta)	21.7 km	1,196	2,662
	04. Extension line between Mwenge and Ubungo	4.5 km	151	336
	05. Morogoro line	26.0 km	1,216	2,707
	06. Extension line between Aga Khan and Central	4.7 km	999	2,224
	07. Extension line between Tegeta and Bunju	13.0 km	517	1,151
	Total		**4,517**	**10,055**
C. BRT Project	01. BRT Lane Construction *2	72 km	**249**	**554**
D. Terminal	01. Public Transportation Terminal	17 nos	**33**	**73**
E. Traffic Management	01. ITS Facilities and Signals *3	1 nos	**78**	**174**
F. Waterway	01. Pier Construction	1 nos	10	22
	02. Boat Purchase	2 nos	13	29
	Total		**23**	**51**
Total Construction Cost			**8,621**	**19,190**
Administration Cost (A*1.8%)			155	345
Land Acquisition, Compensation and Removal Cost			448	997
Consultant Services Cost (A*8.0%)			688	1,532
Contingency (A*5.0%)			431	960
Economic Cost			**10,343**	**23,024**

*1: excluding Kilwa line (construction after 2040)
*2: excluding phase-1 (Extension) - phase 4
*3: including ITS and Signal only, excluding other facilities
Source: JST

(2) O&M (Operation and Maintenance) Cost

O&M cost is assumed as 3.0% of the estimated construction cost.

12.2.3 Economic Benefit

Economic benefits are calculated based on the estimated traffic volumes and unit Vehicle Operating Cost (VOC) /Travel Time Cost (TTC). The benefit is figured out from the amount of 'without' case minus 'with' case. For the VOC value calculation, JST referred the "TANROADS' Investment Appraisal Manual, Baseline Values Vehicle Operation Cost and Value of Travel Time, 2015".

(1) Unit Vehicle Operation Cost (VOC)

The VOC per unit distance is estimated by the following components;

1. Vehicle Price & Economic Cost	7. Annual average overhead cost
2. Vehicle Service Life	8. Fuel & lubricants
3. Interest rate for vehicle capital	9. Tyres & tubes
4. Vehicle performance behaviour	10. Crew costs
5. Insurance charges	11. Workshop labour costs
6. Annual vehicle license fee	

Source: TANROADS' Investment Appraisal Manual, Baseline Values Vehicle Operation Cost and Value of Travel Time, 2015

Table 12.2.4 shows estimated VOC in 2017, provided by TANROADS for DSM. This unit VOC is applied for the calculation of economic benefit in this report.

Table 12.2.4 Unit VOC Provided by TANROADS in 2017

2017	Car	4WD & Pickup	Light Truck	Small Bus	Large Bus	Medium Truck	Heavy Truck	Artic Truck
USD/km	0.20	0.48	0.32	0.34	1.02	0.60	0.93	1.46
TZS/km	450.1	1,077.0	717.4	765.3	2,260.5	1,332.4	2,076.3	3,240.6

1 USD = 2,226 TZS

Source: TANROADS

(2) Unit Travel Time Cost (TTC)

a) Unit TTC in 2017 estimated by TANROADS' Investment Appraisal Manual

The time value is determined by the indicators of macro-economic performance, such as per capita GDP, employment ratio, consumption expenditure, the trip purposes and the vehicle occupancy rates. All are described in TANROADS' Investment Appraisal Manual. Estimation of the passenger travel time cost, data inputs and corresponding sources are shown in Table 12.2.5. Table 12.2.6. TANROADS' Investment Appraisal Manual notes that, the estimated VOT for freight traffic is ranging from 2.0 times the passenger working travel time cost, which could be used for the economic evaluation.

Table 12.2.5 Data Inputs for Estimation of Passenger Travel Time by TANROADS' Investment Appraisal Manual

No.	Particular	Estimates	Remarks / Source of Data
A	Per Capita Income in US$	1,442.8	Statistical Abstract, 2016
B	Employment Ratio (%)	0.70	Labor Force Survey, 2006
C	GDP/Economically Active Person (US$)	2,061.2	(A)/(B)
D	Consumption Ratio (%)	1.00	Statistical Abstract, 2013
E	Consumption - Employed Person (US$)	2,061.2	(C)*(D)
F	Annual Working Hours	1,900	Labor Force Survey, 2006
G	Wage Rate/hour (US$)	1.085	(E)/(F)
H	Employment Overhead Cost Factor	0.33	Gwilliam OT-5(World Bank)
I	Value of Working Time/Hour[1] (US$)	1.443	(G)*(1+(H))
J	Value of Non-working Time/Hour (US$)	0.433	(G)*30%

Source: TANROADS' Investment Appraisal Manual

[1] Working time of the car passengers was proposed as twice of the normal passenger working time.

Table 12.2.6 Unit TTC in 2017

	USD/hour	TZS/hour
Passenger (person)	1.54	3,427
Freight Traffic (veh)	3.08	6,854

Note: 1 USD = 2,226 TZS
TTC was based on 2017 price with the GDP Growth Rate of 6.7%
Source: JST calculated by TANROADS' Investment Appraisal Manual

b) **Estimation of Unit TTC for Transport Master Plan**

The procedure of the calculation of Unit TTC is as follows.

i. Unit TTC is converted from passenger base to vehicle base, by applying the average number of passenger. Time value by vehicle type is also considered.

i. Time value is calculated by the result of person trip survey, as shown in Table 12.2.7. Time value of car is estimated as 8,387 TZS/hour/vehicle, that is almost same as the value of multiplying passenger unit TTC (3,427*2.6=8,909).

ii. Time value of the Car use (Table 12.2.7) is set to be the base case (1.00), and the ratio of other vehicle type is calculated by applying unit cost by passenger by vehicle type.

iii. Based on the above, unit TTC is calculated and shown in Table 12.2.8.

Table 12.2.7 Time Value Calculated by Result of Person Trip Survey

	MC	CAR	BUS	MRT	BRT
Time Value (TZS/min/vehicle)	54.1	139.8	41.7	63.0	55.8
Hourly Time Value (TZS/hour/vehicle)	3,247	8,387	2,504	3,780	3,350
Ratio	0.39	1.00 (base case)	0.30	0.45	0.40

Source: JST calculated based on the result of person trip survey

Table 12.2.8 Unit TTC by Vehicle in 2017

	MC	CAR	BUS	TRUCK	MRT	BRT
Unit Cost by Passenger (TZS/person)	1,336	3,427	1,028	6,892	1,544	1.369
No. of Passenger (Person)	1.8	2.6	23.5	-	-	-
Unit Cost by Vehicle (TZS/vehicle)	2,405	8,909	24,158	6,892	-	-

Note: Unit cost by passenger was calculated by time value
Number of passenger was estimated based on the result of roadside OD interview survey
Source: Calculated by JST based on the TANROAD' Investment Appraisal Manual and result of person trip survey

12.2.4 Calculated Economic Benefit

Based on the unit VOC by vehicle type and the total vehicle-km, JST estimated saving of VOC by year. Saving of TTC by year is also estimated based on the unit TTC by vehicle type and the total vehicle-hour is shown in the Table below. Saving of TTC by MRT, BRT and Bus is calculated by total passenger-km and average travel speed.

- Savings of VOC and TTC are increasing from 2030 to 2040 as shown in Table 12.2.9 and Table 12.2.10.
- The reason of this increase of VOC and TTC is assumed due to the increase the number of usage of MRT and BRT from Bus.
- Savings of TTC by MRT and BRT shows negative benefit in 2030 and 2040.

Table 12.2.9 Savings of VOC and TTC by Vehicle Type in 2030

Unit: Billion TZS/year

		MC	CAR	BUS	TRUCK	Total
VOC	Without Case	505	3,663	2,187	1,242	7,597
	With Case	515	3,418	1,783	1,315	7,031
	Saving	-10	245	405	-73	**566**
TTC	Without Case	375	2,265	2,215	378	5,232
	With Case	148	789	641	168	1,746
	Saving	227	1,476	1,573	210	**3,486**

Source: Calculated by JST

Table 12.2.10 Savings of VOC and TTC by Vehicle Type in 2040

Unit: Billion TZS/year

		MC	CAR	BUS	TRUCK	Total
VOC	Without Case	251	2,409	4,669	2,516	9,845
	With Case	377	2,115	2,000	2,550	7,042
	Saving	-126	294	2,670	-34	**2,803**
TTC	Without Case	394	1,587	4,977	777	7,735
	With Case	156	500	815	303	1,774
	Saving	238	1,087	4,162	474	**5,961**

Source: Calculated by JST

Table 12.2.11 Savings of TTC by the Public Transport Project

Unit: Billion TZS/year

		MRT	BRT	BUS	Total
2030	Without Case	324	718	2,438	3,480
	With Case	356	796	2,141	3,293
	Saving	-32	-77	297	**187**
2040	Without Case	378	766	3,941	5,086
	With Case	909	1,143	2,608	4,660
	Saving	-531	-377	1,334	**425**

Source: Calculated by JST

Based on the above savings of VOC and TTC, total benefit is shown in Table 12.2.12.

- Total benefit in 2030 and 2040 is calculated as 4,240 billion TZS (2030) and 9,190 billion TZS (2040).
- 87 % of total benefit in 2030 is TTC, while 70 % of those in 2040. Total benefit is mostly from TTC.

Table 12.2.12 Total Benefit

Unit: Billion TZS/year

	2030	2040
TTC	3,673 (87%)	6,386 (70%)
VOC	566 (13%)	2,803 (30%)
Total Benefit	**4,239**	**9,189**

Source: Calculated by JST

12.2.5 Economic Evaluation

(1) Result of Economic Analysis

The summary of economic evaluation is shown in Table 12.2.13. EIRR (32.3%) is exceeding the social discount rate (12%), B/C (2.72) is bigger than 1.0. This result indicates the implementation of proposed projects is appropriate and feasible from the economic points of view. The cost benefit stream is shown in Table 12.2.14.

Table 12.2.13 Result of Economic Analysis

Economic Benefit		
EIRR	**B/C**	**NPV (Billion TZS)**
32.3%	2.72	13,184.7

Source: Calculated by JST

Table 12.2.14 Cost Benefit Stream for Master Plan Projects

Dar Es Salaam Master Plan

Undiscounted Benefit Cost Stream — Bill TZS

sq	Year	Project Cost including DD, SV, ROW and Environmental Cost(A)	O&M Cost (B)	Cost (C)	Benefit (D) VOC	Benefit (E) TTC	Benefit (G=D+E)	Benefit - Cost (G-C)
1	2017	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	2018	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	2019	156.9	0.0	156.9	0.0	0.0	0.0	-156.9
4	2020	282.0	0.0	282.0	0.0	0.0	0.0	-282.0
5	2021	1,078.3	62.0	1,140.2	8.0	334.5	342.5	-797.8
6	2022	1,120.9	62.0	1,182.9	16.0	669.0	684.9	-497.9
7	2023	1,234.6	62.0	1,296.6	23.9	1,003.4	1,027.4	-269.2
8	2024	1,816.1	62.0	1,878.0	31.9	1,337.9	1,369.8	-508.2
9	2025	1,261.3	154.9	1,416.2	8.0	1,672.4	1,680.4	264.2
10	2026	1,347.8	154.9	1,502.7	47.9	2,006.9	2,054.8	552.1
11	2027	1,356.1	154.9	1,511.0	55.9	2,341.4	2,397.2	886.2
12	2028	1,056.7	154.9	1,211.5	63.8	2,675.8	2,739.7	1,528.1
13	2029	1,292.9	154.9	1,447.8	71.8	3,010.3	3,082.1	1,634.4
14	2030	681.6	216.8	898.4	566.3	3,673.4	4,239.7	3,341.3
15	2031	575.9	216.8	792.7	664.5	3,882.2	4,546.8	3,754.1
16	2032	1,320.7	216.8	1,537.5	779.8	4,103.0	4,882.8	3,345.3
17	2033	1,320.7	216.8	1,537.5	915.0	4,336.3	5,251.3	3,713.8
18	2034	1,482.8	216.8	1,699.6	1,073.7	4,582.9	5,656.6	3,957.0
19	2035	1,482.8	216.8	1,699.6	1,260.0	4,843.5	6,103.5	4,403.9
20	2036	1,416.9	216.8	1,633.8	1,478.5	5,118.9	6,597.4	4,963.7
21	2037	1,380.6	216.8	1,597.4	1,734.9	5,410.0	7,144.9	5,547.5
22	2038	859.2	216.8	1,076.0	2,035.8	5,717.6	7,753.5	6,677.4
23	2039	859.2	216.8	1,076.0	2,388.9	6,042.8	8,431.7	7,355.7
24	2040		309.8	309.8	2,803.3	6,386.4	9,189.7	8,879.9
25	2041		309.8	309.8	2,895.9	6,597.3	9,493.1	9,183.3
26	2042		309.8	309.8	2,991.5	6,815.1	9,806.6	9,496.8
27	2043		309.8	309.8	3,090.3	7,040.2	10,130.4	9,820.6
28	2044		309.8	309.8	3,192.3	7,272.6	10,464.9	10,155.2
29	2045		309.8	309.8	3,297.7	7,512.8	10,810.5	10,500.7
30	2046		309.8	309.8	3,406.6	7,760.9	11,167.5	10,857.7
31	2047		309.8	309.8	3,519.1	8,017.1	11,536.2	11,226.5
32	2048		309.8	309.8	3,635.3	8,281.9	11,917.2	11,607.4
33	2049		309.8	309.8	3,755.4	8,555.3	12,310.7	12,000.9
34	2050		309.8	309.8	3,879.4	8,837.8	12,717.2	12,407.4
35	2051		309.8	309.8	4,007.5	9,129.7	13,137.1	12,827.4
36	2052		309.8	309.8	4,139.8	9,431.1	13,570.9	13,261.2
37	2053		309.8	309.8	4,276.5	9,742.6	14,019.1	13,709.3
38	2054		309.8	309.8	4,417.7	10,064.3	14,482.0	14,172.2
39	2055		309.8	309.8	4,563.6	10,396.6	14,960.2	14,650.4
40	2056		309.8	309.8	4,714.3	10,739.9	15,454.2	15,144.4
41	2057		309.8	309.8	4,869.9	11,094.6	15,964.5	15,654.7
42	2058		309.8	309.8	5,030.8	11,460.9	16,491.7	16,181.9
43	2059		309.8	309.8	5,196.9	11,839.4	17,036.3	16,726.5
44	2060		309.8	309.8	5,368.5	12,230.3	17,598.8	17,289.0
		23,383.5	9,696.1	33,079.6	96,276.8	251,969.0	348,245.8	315,166.1

Discounted Benefit Cost Stream — Bill TZS

sq	Year	Discounted (12%)	Cost (A)	Benefit (B)	Benefit - Cost (A-B)
1	2017	1.00	0.0	0.0	0.0
2	2018	1.12	0.0	0.0	0.0
3	2019	1.25	125.0	0.0	-125.0
4	2020	1.40	200.7	0.0	-200.7
5	2021	1.57	724.6	217.6	-507.0
6	2022	1.76	671.2	388.6	-282.5
7	2023	1.97	656.9	520.5	-136.4
8	2024	2.21	849.5	619.6	-229.9
9	2025	2.48	572.0	678.7	106.7
10	2026	2.77	541.9	741.0	199.1
11	2027	3.11	486.5	771.8	285.3
12	2028	3.48	348.3	787.6	439.3
13	2029	3.90	371.6	791.1	419.5
14	2030	4.36	205.9	971.6	765.7
15	2031	4.89	162.2	930.4	768.2
16	2032	5.47	280.9	892.1	611.2
17	2033	6.13	250.8	856.6	605.8
18	2034	6.87	247.5	823.9	576.3
19	2035	7.69	221.0	793.7	572.7
20	2036	8.61	189.7	766.0	576.3
21	2037	9.65	165.6	740.7	575.1
22	2038	10.80	99.6	717.7	618.1
23	2039	12.10	88.9	696.8	607.9
24	2040	13.55	22.9	678.1	655.2
25	2041	15.18	20.4	625.4	605.0
26	2042	17.00	18.2	576.9	558.6
27	2043	19.04	16.3	532.1	515.8
28	2044	21.32	14.5	490.7	476.2
29	2045	23.88	13.0	452.6	439.7
30	2046	26.75	11.6	417.5	405.9
31	2047	29.96	10.3	385.1	374.7
32	2048	33.56	9.2	355.2	345.9
33	2049	37.58	8.2	327.6	319.3
34	2050	42.09	7.4	302.1	294.8
35	2051	47.14	6.6	278.7	272.1
36	2052	52.80	5.9	257.0	251.2
37	2053	59.14	5.2	237.1	231.8
38	2054	66.23	4.7	218.7	214.0
39	2055	74.18	4.2	201.7	197.5
40	2056	83.08	3.7	186.0	182.3
41	2057	93.05	3.3	171.6	168.2
42	2058	104.22	3.0	158.2	155.3
43	2059	116.72	2.7	146.0	143.3
44	2060	130.73	2.4	134.6	132.3
			7,654.0	20,838.7	13,184.7

Net Present Value (Billion TzS)	13,184.7
B/C Ratio	2.72
EIRR	32.3%

Source: JST

12.2.6 Sensitivity Analysis for Economic Evaluation

JST also carried out the sensitivity analysis. The aim of sensitivity analysis is to prepare and include risks for the estimation. The estimated costs would be increased, or the benefit would be reduced due to VOC and TTC may not be attained as expected. In this regard, JST set up 9 cases; the Cost rises up

to 0%, +10%, and +20%, while the Benefit falls -0%, -10%, and -20%. As a result of the evaluation, EIRR remains more than social discount rate (12%), even at the most serious case, which is the Cost rises +20%, the Benefit falls -20%.

Table 12.2.15 Result of Sensitivity Analyses

		Benefit		
		0%	-10%	-20%
Cost	0%	32.3%	28.9%	25.6%
	+10%	29.2%	26.2%	23.3%
	+20%	26.7%	24.0%	21.4%

Source: Calculated by JST

12.3 Financial Analysis

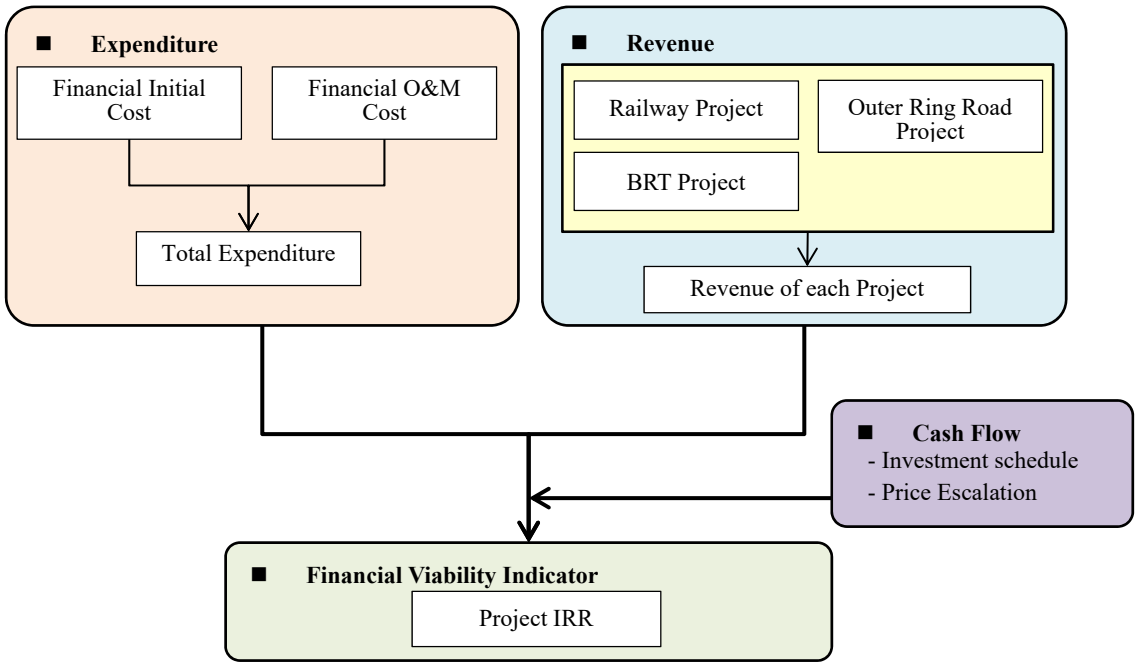
12.3.1 Method of Financial Analysis

The Project Internal Rate of Return (PIRR) is calculated to determine the balance between expenditure and revenue of the proposed projects.

JST conducted the financial analysis for the following proposed projects;

- Railway (MRT) Project
- Outer Ring Road Project
- BRT Project (Phase 1 to 7)

The framework of financial analysis is shown in Figure 12.3.1.



Source: JST

Figure 12.3.1 Work Flow and Financial Viability Indicator

The following Internal Rate of Return (IRR) are set for the examination of financial viability.

Table 12.3.1 Indicator of Financial Analysis

Indicator	Calculation Formula	
Project IRR	$\sum \frac{Ri-Ii-Ci}{(1+Project\ IRR)^i} = 0$	*Ri: Annual revenue from Toll Tariff at year i* *Ii: Annual project cost at year i* *Ci: Annual operating cost at year i*

Source: JST

12.3.2 Railway Project

(1) Prerequisite Conditions for Financial Analysis

The analysis of the PIRR depends upon the conditions therein. The prerequisite conditions to apply the railway project are shown in the table below:

Table 12.3.2 Prerequisite Conditions for Financial Analysis of Railway Project

Item	Description	Details	Term/Amount
1	Preparation and Construction	1. Upgrade of Ubungo line 2. Track doubling of Pugu line 3. Tegeta line 4. Extension line between Mwenge and Ubungo 5. Morogoro line 6. Extension line between Aga Khan and Central 7. Extension line between Tegeta and Bunju	2018-2039
2	Fare (Starting amount in 2021)	Adult	USD0.037/man/km
		Student	50% of Adult
		Escalation ratio	2.0%/year, compound
3	Yearly Operation Date	Excluded Sunday and Holiday	300 days
4	Commercial Operation Date (COD)	-	2021
5	Capital Expenditure (Million USD) - inclusive of Civil, Track, Electrical, Mechanical, Signal, Telecommunication and Rolling Stock	Construction Cost	5,143.2
		Consultant Fee	361.1
		Other Cost	667.5
		Total	6,171.8
6	Operation & Maintenance Cost	Existing & New Line	CAPEX*3.0%
7	Project Cost for Rolling Stock	VAT	Not Applicable
8	PIRR	Investment for all Cost (Public)	Cost of Construction & Rolling Stock

Source: JST

(2) Estimated Project Revenue

Table 12.3.3 shows the annual revenue estimated through a traffic demand forecast for 2030 and 2040.

Table 12.3.3 Railway Project Revenue in 2030 and 2040

Year	Amount by USD (Million)	Amount by TZS (Billion)
2030	265.6	591.3
2040	521.7	1,161.3

Source: Calculated by JST

(3) Result of the Financial Analysis

Result of the financial analysis and the sensitivity analysis are shown in Table 12.3.4 below. Railway project has a project IRR exceeding 0.01% interest rate of Yen Loan making it very feasible. The Tanzanian Government can pay Yen Loan without high risk (Opening of MRT usually have long delays, etc.).

Table 12.3.4 PIRR of Base Case & Sensitivity Analysis (%)

Case	Classification	PIRR for Railway
I	Base Case	5.7%
II	CAPEX up +20%	3.8%
III	Net profit -20%	3.4%
IV	CAPEX up +20% & Net Profit -20%	1.6%

Source : JST

(4) Possibility of the Private Sector Participation (PPP)

In order to reduce the financial burden of the government, the participation of private sector is considered. As stated in Section 11.1.3, the private sector needs a certain level of PIRR, i.e., from 20.0% to 25.0%, under the financial market situation in Tanzania. Since the Horizontal Cut (Unbundle) PPP as a joint investment by the public and private is highly complicated on the implementation of the project due to the demarcation, the Horizontal Cut (Unbundle) PPP modality is adopted.

The Horizontal Cut (Unbundle) PPP modality is the "Horizontal Separation of Infrastructure and Operation in the Railway System", where the public invests for all costs of Right of Way and infrastructure, while private sector invests for the Rolling Stock and undertakes the operation and maintenance of the railway system. The serious issue is the generation of the repayment fund for the public sector. There is either way to fix the Rail Access Charge, or, to fix the ceiling of PIRR of private sector, so that public sector could be assured of the reasonable revenue to recover its expenses for the ROW and infrastructure.

Table 12.3.5 shows the PIRR for the Horizontal Cut (Unbundle) PPP modality for railway project. The sensitivity analysis which shows the case of with/without Railway Service Charge assumed at 20% of the net operating profit. The private company might have a chance to participate in the O&M business if there is a subsidy.

Table 12.3.5 PIRR of the Horizontal Cut of PPP Modality (Private Sector) for Railway

No.	Classification	Rolling Stock invests 100% by Private		Rolling Stock invests 50% by Private
		Case-1 Without Revenue Share to Public	**Case-2** With Revenue Share to Public (25% of Net Operating Profit)	**Case-3** Without Revenue Share to Public
1	Base Case	18.6%	13.4%	22.3%
2	CAPEX up +20%	15.3%	10.4%	18.5%
3	Net profit -20%	14.6%	9.7%	17.6%
4	CAPEX up +20% & Net Profit -20%	11.5%	6.8%	14.1%

Source: JST

12.3.3 Outer Ring Road Project

(1) Prerequisite Conditions for Financial Analysis

The Prerequisite Conditions to apply for Outer Ring Road project are shown below:

Table 12.3.6 Prerequisite Conditions of Financial Analysis for Road Project

Item	Description	Detail	Term/Amount
1	Preparation and Construction	Outer Ring Road (Kibamba IC – Kigamboni IC)	2018-2029
2	Fare (Starting amount in 2030)	-	20 TZS/ km
		Escalation ratio	2.0%/year, compound
3	Yearly Operation Date	-	365 days
4	Commercial Operation Date (COD)	-	2030
5	Capital Expenditure (Million USD)	Construction Cost (6 lane)	441.0
		Consultant Fee (6 lane)	35.3
		Other Cost (6 lane)	52.9
		Total (6 lane)	529.2
		Construction Cost (4 lane)	294.0
		Consultant Fee (4 lane)	23.5
		Other Cost (4 lane)	35.3
		Total (4 lane)	352.8

6	Operation & Maintenance Cost	-	CAPEX*1.0%
7	Project Cost	VAT	Not Applicable
8	PIRR	Investment for all Cost (Public)	Cost of Construction

Source: JST

(2) Case Setting

In order to confirm the relationship between the estimated revenue and the traffic volume, the following cases were set;

Table 12.3.7 Case Setting

Case	Toll Rate	Number of Lane
1	Free	6
2	Free	4
3	Toll (20 TZS/km)	6
4	Toll (20 TZS/km)	4

(3) Estimated Traffic Volume for each Case

Table 12.3.8 shows the estimated traffic volume in 2040 for each case. Comparison between Case-1 and Case-3, Case-2 and Case-4 respectively, in case of free toll rate, the traffic volume will be increased by approx. 5,000 vehicle/day. However, there is no big difference in the traffic volume due to number of lanes. Thus, the increase or decrease of the traffic volume of an outer ring road project is greatly affected by the difference in toll fee.

Table 12.3.8 Estimated Traffic Volume in 2040

Unit: Veh/day

	Case-1	Case-2	Case-3	Case-4
2040	37,000	36,100	31,800	31,500

Source : Calculated by JST

(4) Estimated Project Revenue

Table 12.3.9 shows the annual revenue in 2040 estimated by traffic demand forecast for Case-3 and Case-4. As mentioned above, there is no big difference in project revenue; the traffic volume is almost the same between Case-3 and Case-4,

Table 12.3.9 Outer Ring Road Project Revenue in 2040

Year	Amount by USD (Million)	Amount by TZS (Million)
Case-3	3.71	8,254.8
Case-4	3.69	8,205.5

Source : Calculated by JST

(5) Result of the Financial Analysis

Result of financial analysis and sensitivity analysis are shown in Table 12.3.10. The outer ring road project shows a negative project IRR percentage, making it as not a feasible project. The negative IRR is due to the low revenue income. If the toll revenue is insufficiently obtained, it would be difficult for private sector to participate.

Table 12.3.10 PIRR of Base Case & Sensitivity Analysis (%)

Case	Classification	PIRR (6 Lane)	PIRR (4 Lane)
I	Base Case	-5.7%	-3.7%
II	CAPEX up +20%	-7.1%	-4.7%
III	Net profit -20%	-7.5%	-4.9%
IV	CAPEX up +20% & Net Profit -20%	-9.3%	-6.1%

Source : JST

For reference, Table 12.3.11 shows the toll rate from the FS report "Final Feasibility Study and Preliminary Design Report, 2016" by South Korea, revenue and project IRR calculated using its toll rate.

The result of project IRR has exceeded 0.01% interest rate of Yen Loan. By applying the horizontal cut of PPP modality, the private sector participation is highly expected.

Table 12.3.11 Calculated Toll Rate, Revenue and Project IRR using the FS report

	Car	Bus	Truck2	Truck3	Truck4
Toll Rate (TZS/km)	80	300	200	280	360

Source: Final Feasibility Study and Preliminary Design Report, 2016

No. of Lane	Amount by USD (Million)	Amount by TZS (Billion)	Traffic Volume (veh/day)	Project IRR
6	17.2	38.4	21,000	1.6%
4	17.4	38.6	21,000	3.2%

Source: JST and Final Feasibility Study and Preliminary Design Report, 2016

12.3.4 BRT Project

(1) Prerequisite Conditions for Financial Analysis

The Prerequisite Conditions to apply the BRT project are shown Table 12.3.12.

Table 12.3.12 Prerequisite Conditions for Financial Analysis for BRT Project

Item	Description	Detail	Term/Amount
1	Preparation and Construction	Phase 1 to 7	2017-2035
2	Fare (Starting amount in 2021)	Trunk Route	Adult: 650 TZS, Student: 200 TZS
		Feeder Route	Adult: 400 TZS, Student: 200 TZS
		Trunk and Feeder Route	Adult: 800 TZS, Student: 200 TZS
		Escalation ratio	2.0%/year, compound
3	Yearly Operation Days	Excluded Sunday and Holiday	300 days
4	Commercial Operation Date (COD)	-	2021
5	Capital Expenditure (Million USD)	Construction Cost	499.0
		Consultant Fee	39.7
		Other Cost	60.1
		Total	598.8
6	Operation & Maintenance Cost	-	CAPEX*5.0%
7	Project Cost	VAT	Not Applicable
8	PIRR	Investment for all Cost (Public)	Cost of Construction

Source: JST

(2) Estimated Project Revenue

Table 12.3.13 indicates the annual revenue estimated through a traffic demand forecast for 2030 and 2040.

Table 12.3.13 BRT Project Revenue in 2030 and 2040

Year	Amount by USD (Million)	Amount by TZS (Billion)
2030	460.2	1,024.5
2040	607.9	1,353.2

Source : Calculated by JST

(3) Result of the Financial Analysis

Result of the financial analysis and the sensitivity analysis are shown in Table 12.3.14. BRT project

has a project IRR that exceeds 25% benchmark for private sector investment, giving it more chances for private sectors.

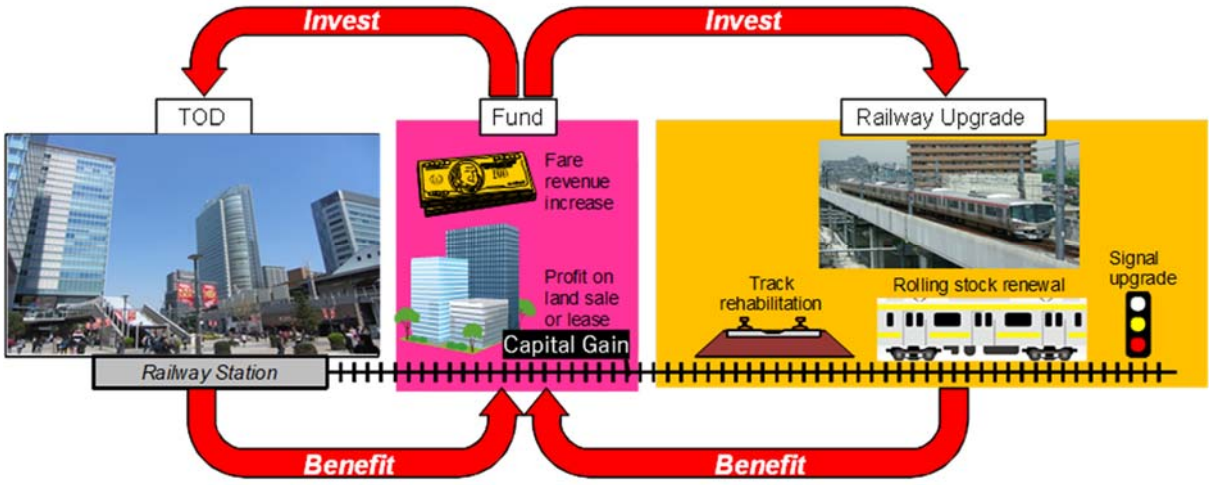
Table 12.3.14 PIRR of Base Case & Sensitivity Analysis (%)

Case	Classification	PIRR for MRT
I	Base Case	32.7%
II	CAPEX up +20%	29.2%
III	Net profit -20%	28.5%
IV	CAPEX up +20% & Net Profit -20%	25.4%

Source : JST

12.4 Land Value Capture

Accessibility among CBD, Sub-centres, and Satellite cities will be improved through TOD with railway development and urban development around the railway stations. Better access to be improved by TOD will add value to an area, which is reflected in land and property values. Land Value Capture (LVC) is the process of capturing the increase in the land and property value to be generated by improving accessibility. The revenue (capital gain) captured by increase in the land and property value can be given back to fund for railway development and would reduce the fare of the railway users. The following figure shows the image of land value capture for TOD with railway development.



Source: JST

Figure 12.4.1 Image of Land Value Capture with TOD and Railway Development

(1) Possible Land Value Capture Scheme

There are some value capture schemes on how to gain the benefit and return to the investment as follows.

1) Land Sale/Leasing

The government acquires the land for both railway development and urban development surrounding the train stations. The government can sell the acquired land after the land price increases through the railway development. The government also can lease the leasing the development or land use rights to other parties. In case the government sells the acquired land for the Tegeta line as mentioned above, the capital gain from land price increase is 708 billion TZS (318 million USD)

2) Revenue from Increase in Property Tax

In case the investors acquire the land from the existing land owners, the government obtains the revenue through collecting property tax. Increase in property tax is also expected as land price increases.

3) Tax Increment Financing (TIF)

By using a local government's regulatory power, the TIF generates revenue for local economic development in a specific geographical area called TIF district. The TIF allows the city to re-invest a portion of property tax revenue from the TIF district for a certain period. The property tax revenue would arise, if new developments take place, or if the value of existing properties rises. The increased portion of the property tax revenue is called "tax increment," and it can be spent on improvement of infrastructure or given as subsidies to encourage private development in the designated TIF district.

Since the property tax itself is narrowly applied only to buildings in Tanzania, the above 2) and 3), which assume applying to land, requires reforming of taxation system in Tanzania. In this context, the following estimation in (2) below considers the scheme for the above "land sale".

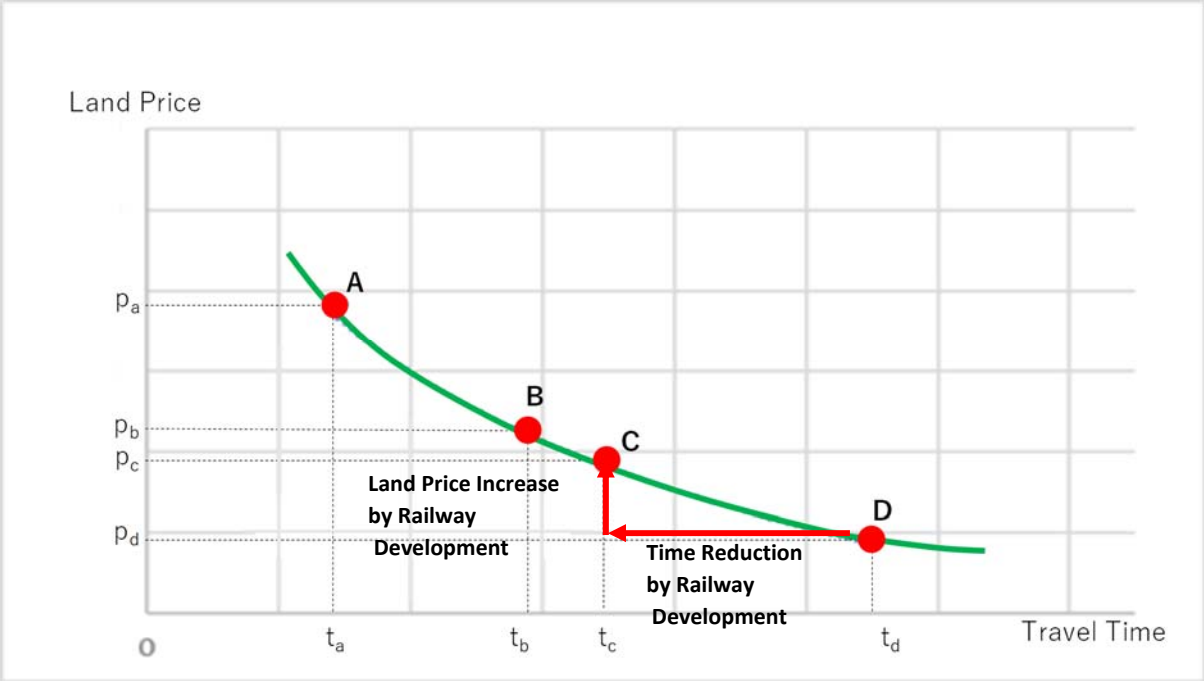
(2) Estimation of Capital Gain

This section estimates the capital gain (expected revenue) from land value increase along the planned Tegeta line. This estimation considers the case to gain the capital through the above (1) 1) Land Sale.

Applying Method

It is assumed that land price is decreasing as travel time from/to CBD increases as shown in Figure 12.4.2. It also means that land price decreases as distance from/to CBD increases. Here, there are four points: A,B,C, and D. Travel time for each point is t_a, t_b, t_c, and t_d, respectively. Land price for each point is p_a, p_b, p_c, and p_d, respectively.

Future land price after developing railway depends on how many minutes will be shorten by railway development. For instance, if (t_d-t_c) minutes are shorten in travel time to D as a result of railway development, then travel time to D will be t_c and land price will increase (p_c-p_d) and make p_c.



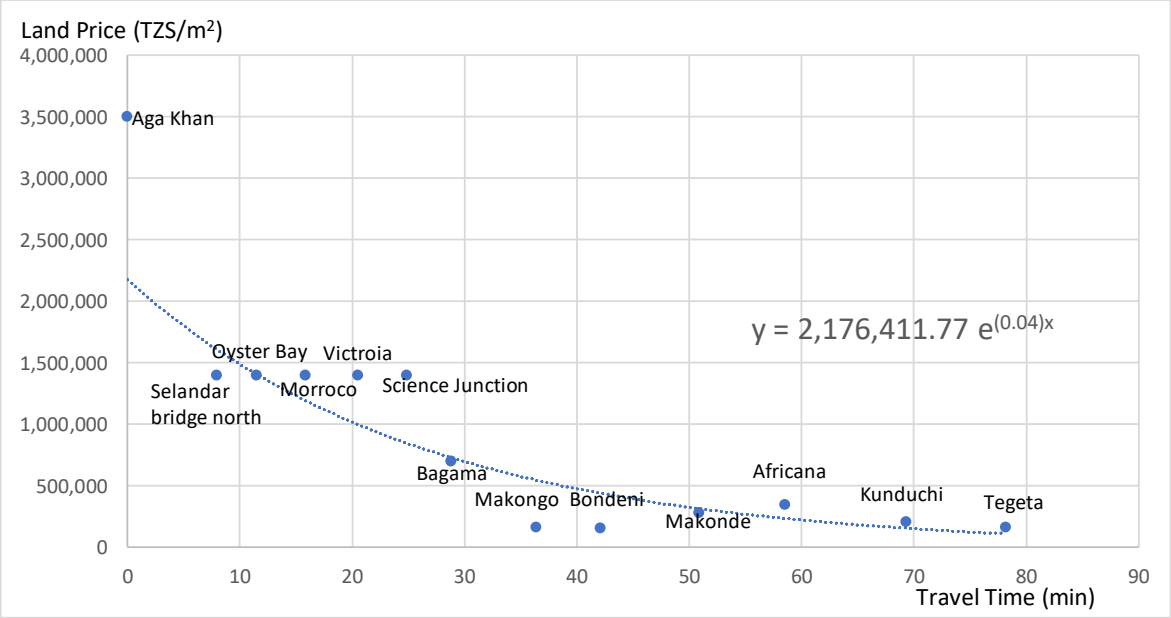
Source: JST

Figure 12.4.2 Relation between Travel Time and Land Price

Estimation of Capital Gain

Figure 12.4.3 shows the results of plotting land price in 2016 near each candidate station of Tegeta line. Land price tends to decrease as distance/travel time increases. In reality, land prices are influenced by not only travel time/distance from CBD but also other conditions such as soil profiles. As such, land price at some points are lower than those at further locations.

Approximation formula for expressing relation between travel time from/to CBD and land price is generated for estimating land price after railway development as shown in Figure 12.4.3.



Source: JST based on Land Price Data by National Housing Corporation

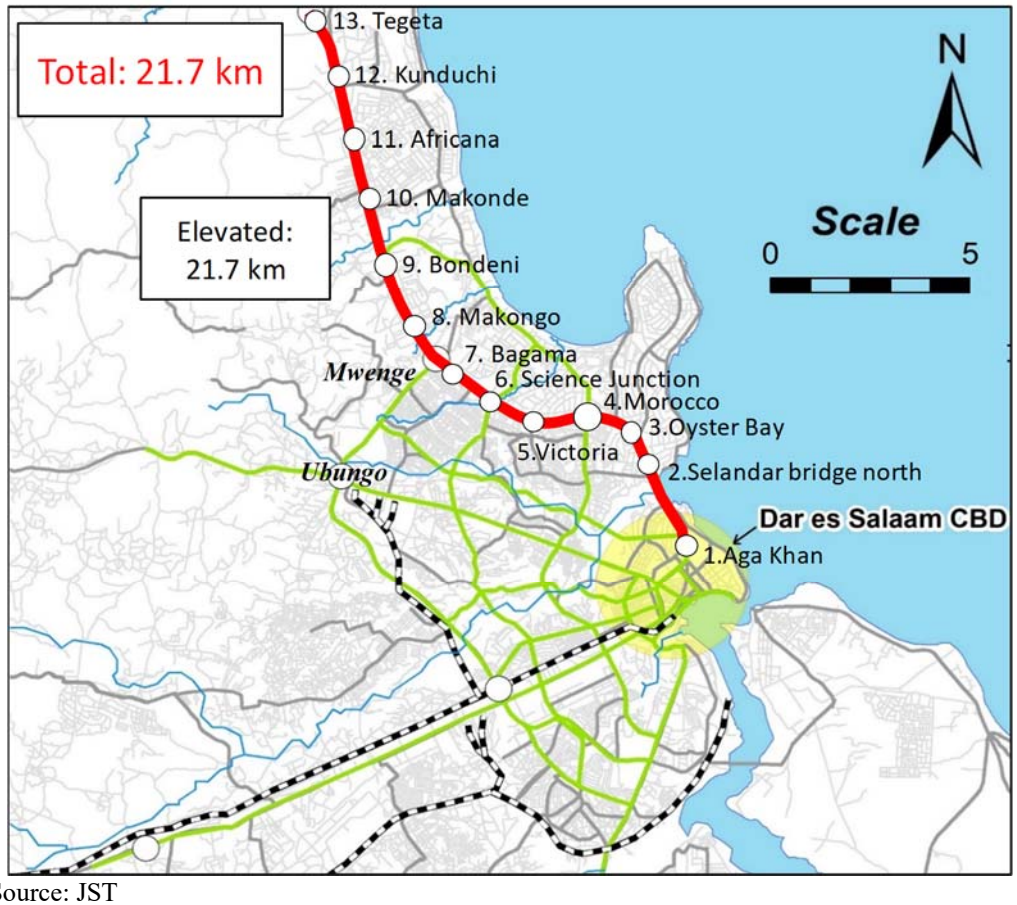
Figure 12.4.3 Relation between Travel Time and Land Price at Candidate Stations of Tegeta Line

For land areas to be acquired, JST assumes the followings. The location of the candidate stations is shown in Figure 12.4.4.

i) CBD (Aga Khan): 2.0 ha/station
ii) Out of CBD (Within 10km from CBD: Selandar bridge north – Bagama): 4.0 ha/station
iii) Out of CBD (beyond 10km from CBD: Makongo – Tegeta): 20 ha/station

CBD does not have much available land for redevelopment. JST assumed to purchase 1.0 ha for two sides of Aga Khan station or 2.0 ha in total. For stations within 10 km radius from CBD, still some vacant lots can be found. JST assumed to purchase 4.0 ha for each station. Since low density area below 70 persons/ha is still expanded beyond 10km from CBD, JST assumed to purchase 20 ha for each station. In this case, the capital gain from land price increase is 708 billion TZS (318 million USD). The amount is obtained from the estimation shown in Tables 12.4.1 and 12.4.2.

Table 12.4.1 shows the land price per square meter for each candidate station as of 2016 and acquired land price based on the above assumption of land area. In this case, acquired land price in total of developing around 13 stations is 643 billion TZS or 289 million USD.



Source: JST

Figure 12.4.4 Location of Candidate Stations of Tegeta Line

Table 12.4.1 Acquired Land Price

	Station	Distance from Aga Khan (km)	Current Travel Time	Future Travel Time	Area to be Acquired (m^2)	Land Price/m^2 (2016) TZS	Land Price/m^2 (2016) USD	Acquired Price (2016) billion TZS	Acquired Price (2016) million USD
1	Aga Khan	0	0	0	20,000	3,500,000	1,572	70	31
2	Selandar bridge north	2.2	8	3.8	40,000	1,400,000	629	56	25
3	Oyster Bay	3.2	12	5.5	40,000	1,400,000	629	56	25
4	Morocco	4.4	16	7.5	40,000	1,400,000	629	56	25
5	Victoria	5.7	21	9.8	40,000	1,400,000	629	56	25
6	Science Junction	6.9	25	11.8	40,000	1,400,000	629	56	25
7	Bagama	8.0	29	13.7	40,000	700,000	314	28	13
8	Makongo	10.1	36	17.3	200,000	165,000	74	33	15
9	Bondeni	11.7	42	20.1	200,000	154,000	69	31	14
10	Makonde	14.13	51	24.2	200,000	280,000	126	56	25
11	Africana	16.25	59	27.9	200,000	350,000	157	70	31
12	Kunduchi	19.25	69	33.0	200,000	210,000	94	42	19
13	Tegeta	21.70	78	37.2	200,000	168,000	75	34	15
								643	**289**

Source: JST estimated based on Land Price (NHC) and Travel Time (JST)

Table 12.4.2 shows land price per square meter for each candidate station after railway development and sold land price. The land price after railway development is obtained by substituting future travel time after railway development into the above approximation formula as shown in Figure 12.4.4. In this case, sold land price in total of developing around 13 stations is 1,352 billion TZS or 607 million USD. Capital gain is obtained by deducting acquired land price from sold land price.

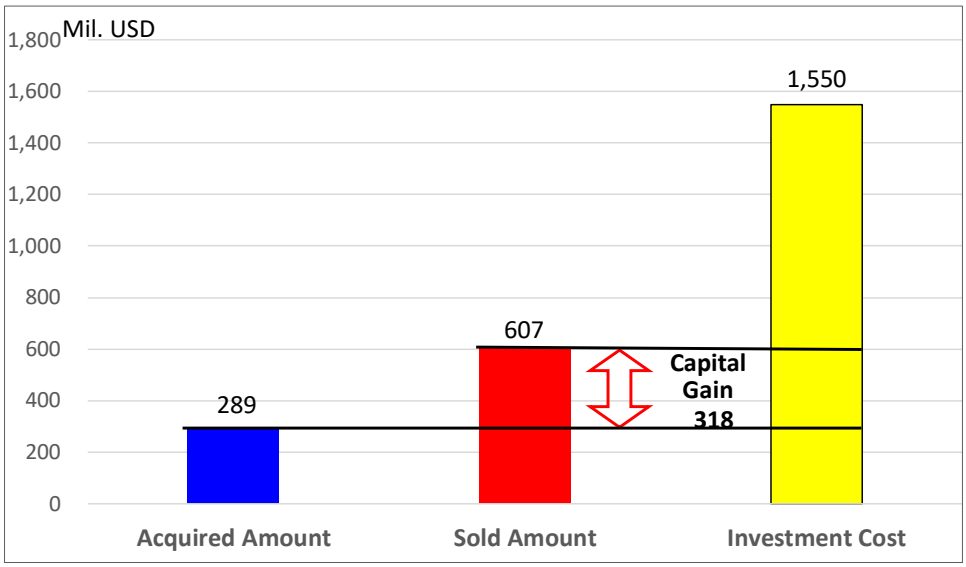
Table 12.4.2 Sold Land Price and Capital Gain

	Station	Current Travel Time	Future Travel Time	Area to be Acquired (m^2)	Land Price (after Railway Deve.) TZS	Land Price (after Railway Deve.) USD	Sold Price billion TZS	Sold Price million USD	Capital Gain billion TZS	Capital Gain million USD
1	Aga Khan	0	0	20,000	2,176,412	978	44	20	-26	-11.89
2	Selandar bridge north	8	3.8	40,000	1,871,650	841	75	34	19	8.48
3	Oyster Bay	12	5.5	40,000	1,747,610	785	70	31	14	6.25
4	Morocco	16	7.5	40,000	1,609,564	723	64	29	8	3.77
5	Victoria	21	9.8	40,000	1,472,292	661	59	26	3	1.30
6	Science Junction	25	11.8	40,000	1,355,994	609	54	24	-2	-0.79
7	Bagama	29	13.7	40,000	1,257,475	565	50	23	22	10.02
8	Makongo	36	17.3	200,000	1,088,833	489	218	98	185	83.00
9	Bondeni	42	20.1	200,000	975,692	438	195	88	164	73.83
10	Makonde	51	24.2	200,000	825,937	371	165	74	109	49.05
11	Africana	59	27.9	200,000	714,189	321	143	64	73	32.72
12	Kunduchi	69	33.0	200,000	581,396	261	116	52	74	33.37
13	Tegeta	78	37.2	200,000	491,486	221	98	44	65	29.06
							1,352	**607**	**708**	**318**

Source: JST estimated based on Land Price (NHC) and Travel Time (JST)

In the above table, capital gain at four stations shows negative value. However, land price at these stations will not decrease after railway development since railway development will improve accessibility and will not have much negative environmental impact.

The comparison between capital gain and investment cost is shown in Figure 12.4.5. The capital gain (318 million USD) amounts to 20.5% of the investment cost of railway development of Tegeta line (1,550 million USD). Capital gain is expected to cover a part of the investment cost of railway development.



Source: JST

Figure 12.4.5 Comparison between Investment Cost of Railway Development and Capital Gain

Amount of capital gain depends on size of land areas to be purchased. The capital gain for other five cases from Case 1 to Case 5 for land areas to be acquired is estimated as shown in Table 12.4.3.

Table 12.4.3 Capital Gain by Options of Land Area to be Purchased

	Land Area (m^2) to be purchased				Capital Gain (billion TZS)	Capital Gain (million USD)
	CBD	within 10km from CBD	beyond 10 km from CBD	Total		
	Aga Khan	Selandar bridge north-Bagama	Makongo-Tegeta			
Number of Stations	1	6	6	13		
Base Case	20,000	40,000	200,000	1,460,000	708	318
Case 1	10,000	20,000	100,000	730,000	354	159
Case 2	40,000	80,000	400,000	2,920,000	1,416	636
Case 3	20,000	40,000	400,000	2,660,000	1,378	619
Case 4	20,000	80,000	200,000	1,700,000	773	347
Case 5	40,000	40,000	200,000	1,480,000	682	306

Source: JST estimated based on Land Price (NHC) and Travel Time (JST)

CHAPTER 13 PRE-FEASIBILITY STUDY

13.1 Selection of the Project for the Pre-feasibility Study

There are three feasibility studies for the priority projects as shown in the Chapter 11, which are;

a) Feasibility study on Mwenge Flyover Project

b) Feasibility study on Tegeta line and Loop line

c) Feasibility study on Traffic Management in the Strategic Traffic Management Area

Among these, b) Tegeta line and Loop line project is selected as the project for the Pre-feasibility Study. The reasons for the selection are;

1) Railway projects require more expensive cost than road projects and traffic management projects. It is better to examine the rough feasibility with study for aliment, project cost and benefit.
2) The target section for feasibility study on Tegeta line and Loop line cannot easily be decided. There are several candidates of target section. It is better to clarify the target section through the pre-feasibility study before the feasibility study begins.

Table 13.1.1 Priority Projects among Key Projects in the M/P (as same as Table 11.4.8)

Key Project		1) Contribution to urgent problems	2) Important role to transport network	3) Possibility to implement in short term	Result of Evaluation
A. Road Project	01. Middle Ring Road *1 *2		High		
	02. Bay Link Road		High		
	03. Outer Ring Road		High		
	04. Flyover	High		High	Priority Project
B. Railway Project	01. Loop Line	High	High		Priority Project
	02. Bagamoyo Line	High	High		Priority Project
	03. Morogoro Line		High		
C. BRT Project	BRT Lane Construction	High	High	High	Priority Project
D. Terminal	Public Transportation Terminal		High		
E. Traffic Management	IT Facilities and Traffic Signals	High		High	Priority Project

*1: with Airport Access *2: with Second Kigamboni Bridge

Source: JST

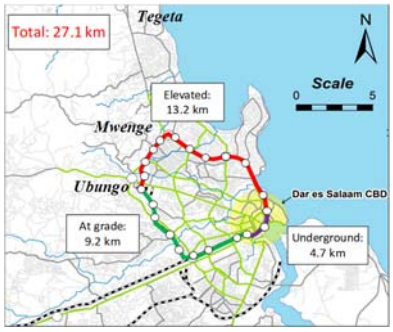
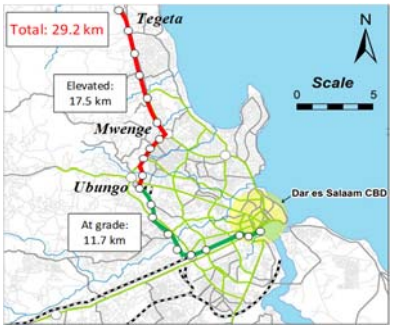
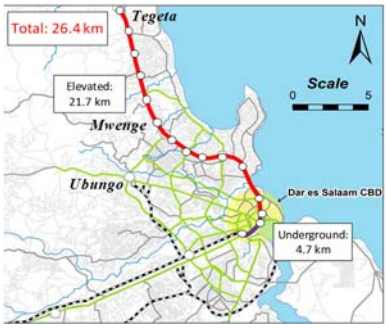
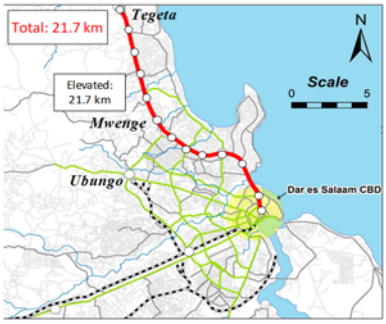
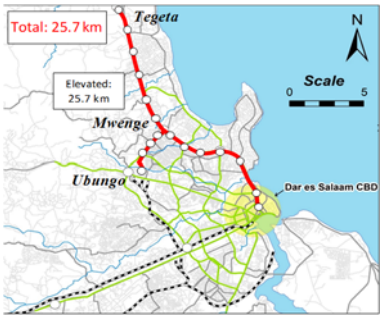
13.2 Pre-Feasibility Study

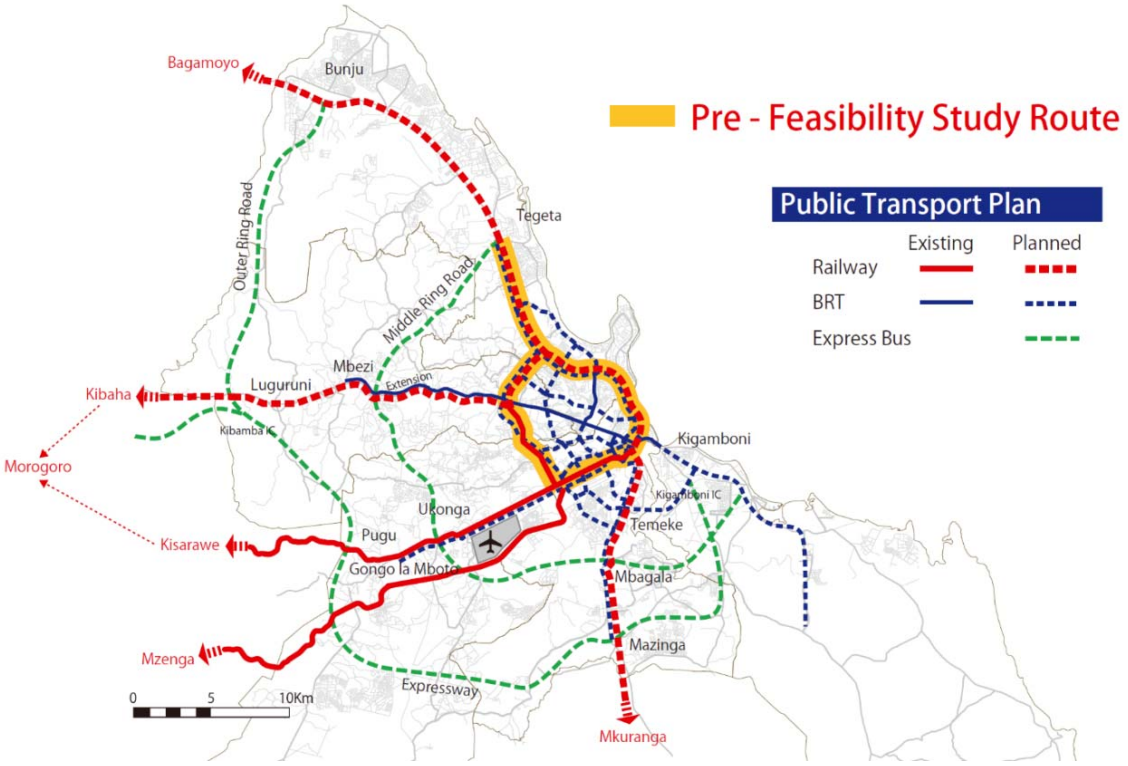
13.2.1 Case Setting for the Projects to be Implemented

As the selection of the pre-feasibility study, Railway Projects of Loop line and Bagamoyo Line for 2030 are proposed by the JST. In the study, Full loop line, Half loop and Tegeta line, or Tegeta line were examined to be able to identify which one is the more appropriate project for the short/medium stage project.

There are five alternatives for further development shown in Table 13.2.1. Case 1 is extended up to CBD to form the loop line. Case 2 is extended up to Tegeta. Case 3 is a new line from CBD and Tegeta via Morocco. Case 3a is connecting to central station via underground. Case3b is not connecting to central station then terminates in Aga Khan. Aga Khan is located at the transition from elevated section to underground section. Case 4 is the combination of Case 3b and Mwenge-Ubungo Section. These five alternatives were compared, and the most effective plan was proposed as the 2030 railway plan.

Table 13.2.1 Case Setting

Case 1  Loop Line (At grade, Elevated, Underground) **improvement of the public transport user's service within Nelson Mandela Road. Existing rail section will be upgrade (from single track to double track, SGR and Electric Multiple Unit).*	Case 2  Half Loop and Tegeta Line (At grade, Elevated) **combination of existing rail line and new elevated section. Existing rail section will be upgrade (from single line to double line, SGR and Electric Multiple Unit).*	Case 3a  Tegeta Line (1) (Underground, Elevated) **all new railway, combination of elevated and underground section.*
Case 3b  Tegeta Line (2) (Elevated only) **all new railway, all elevated section and no underground section*	Case 4  Tegeta Line and Loop (Mwenge-Ubungo) (Elevated only) **all new railway, all elevated section and no underground section*	



Source: JST

Figure 13.2.1 Location of the Pre-Feasibility Project

13.2.2 Evaluation Criteria of Case Study

(1) Evaluation Items

The following evaluation criteria were established.

a) **Economic Evaluation EIRR**

Economic viability is one of the essential factors in determining public infrastructure projects. The Economic Internal Rate of Return (EIRR) is calculated for all the cases. In Tanzania, EIRR's benchmark is 12%. At least, EIRR should be higher than 12%. Higher EIRR implies better project case.

b) **Financial Evaluation FIRR**

If it is implemented as a BOT scheme, Financial Internal Rate of Return (FIRR) should be higher than at least 20% in Tanzania. FIRR shows the attractiveness of the project for the private sectors. Same as EIRR, higher FIRR implies better project case.

**Benchmark of FIRR is assumed as follows*

(Debt-Equity ratio: 7:3, Interest rate (Debt 12.2%), Expected Equity Return 15.0%, Premium Risk 7.0% in Tanzania Investment Bank)

*Benchmark of FIRR: 12.2%*0.7+15.0%*0.3+ 7.0%= 20.0%*

c) **Passenger Demand –Daily Ridership**

Daily ridership in 2030 (opening year) is estimated based on the demand forecast. As the number of attracted passenger is higher, the project case is better.

d) **Investment Cost**

Investment costs consist of 1) construction cost, 2) rolling stock cost, 3) electric & mechanical cost and 4) signal & telecommunication cost and indirect cost (tax, contingency, etc.).
Investment cost is smaller means better project case.

e) **O&M Cost**

Operation and Maintenance Costs consist of 1) personnel cost, 2) electric cost, 3) maintenance (including rolling stock maintenance) cost, 4) renewal mechanical cost, and 5) administrative cost. The smaller the O&M cost indicates a better project case.

f) **Impact of Natural Environment**

Expected risk of natural environment impact will be subjectively evaluated.

Expected negative impacts of natural environment include the groundwater and waste soil by underground construction and the mangrove of protected area along Msimbezi river.

g) **Social Impact**

Smaller social impact implies less risk to implement the infrastructure project. Number of affected buildings and land acquisition area are calculated from a satellite map.
A lesser number of affected buildings and land acquisition area means better project case.

** Assumed Rail Right of Way (ROW) is 30m (Railway Act 2002). Though current Railway Act (2002) is only at grade section and when the Metro rail will be implemented, Railway act will be amended since the necessary viaduct section is approximately 10m ROW. Consideration on the safe side, 30 m ROW is assumed then counted the affected buildings.*

h) **Construction Period Risk**

The issue during construction period is the risk of delay in the start of operations. It will be evaluated subjectively.

i) **Contribution of Urban Development Structure**

MRT project will contribute to the growth of urban core, such as sub-centres and satellite cities.
The higher number of urban cores, especially the number of sub-centres, implies better project case.

j) **Other Aspects, if any**

Other positive and negative impacts, if any.

(2) Evaluation Criteria

1) As the quantified items, the following criteria were established:

Very Good (VG)	For the alternative which achieve the lowest value (or highest value)
Good (G)	For the alternative within 20% difference compared to the lowest (or highest)
Fair (F)	For the alternative over 20% difference compared to the lowest (or highest)

2) For narratively described items, impact was subjectively evaluated.

3) When all alternatives have the same value, **the item/s was/were not evaluated.**

4) Evaluation

- Assessed by the number of items evaluated as “Very Good”, “Good”, and “Fair”.
- An alternative which has more number of “Very Good” and least number of “Fair”.
- Assessed by total score: “Very Good” is +1 , “Good” is 0, and “Fair” is -1.

13.2.3 Evaluation of Cases

Evaluation result is shown in Table 13.2.2

Table 13.2.2 Evaluation of Case

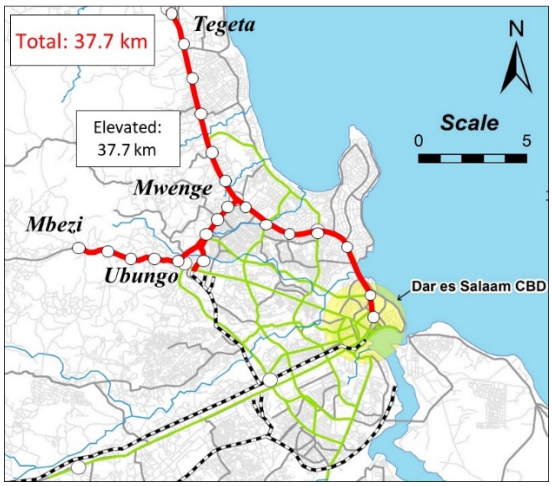
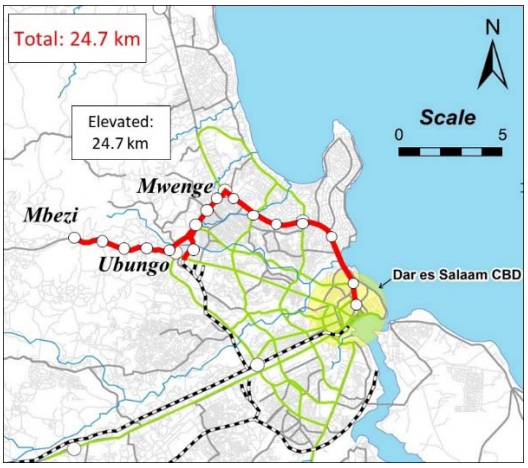
Evaluation Item	**Case1: Full Loop Line**	**Case 2:Half Loop +Tegeta**	**Case 3a :Tegeta**	**Case 3b : Tegeta (No CBD)**	**Case 4: Tegeta (No CBD)+loop**
1) EIRR	26.2% (0.82) Good	30.1% (0.93) Good	25.4% (0.79) Fair	32.3% (1.00) Very Good	28.6% (0.89) Good
2) FIRR	1.1% (0.13) Fair	6.9% (0.84) Good	3.8% (0.46) Fair	8.2 % (1.00) Very Good	8.2% (1.00) Very Good
3) Ridership Y2030	1.47 Mil. (0.99) Very Good	1.48 Mil. (1.00) Very Good	1.32 Mil. (0.89) Good	1.29 Mil. (0.87) Good	1.40 Mil. (0.95) Good
4) Invest. Cost	2.47 Bil. USD (1.59) Fair	1.63 Bil. USD (1.05) Good	2.94 Bil. USD (1.90) Fair	1.55 Bil. USD (1.00) Very Good	1.80 Bil. USD (1.16) Fair
5) O&M Cost/yr	71.1 Mil. USD (1.02) -	71.2 Mil. USD (1.02) -	71.8 Mil. USD (1.03) -	69.5 Mil. USD (1.00) -	72.6 Mil. USD (1.04) -
6) Impact of Natural Environment	Tunnel-Waste soil & Groundwater Msimbazi river –mangrove Fair	No Tunnel Very Good	Tunnel-Waste soil and Groundwater Msimbazi river – mangrove Fair	No Tunnel Msimbazi river – mangrove Good	No Tunnel Msimbazi river – mangrove Good
7-1) Number of affected Building	137 (1.39) Fair	114 (1.01) Very Good	113 (1.00) Very Good	113 (1.00) Very Good	192 (1.70) Fair
7-2) Land Acquisitions Area	18,300 m^2 (2.23) Fair	8,200 m^2 (1.00) Very Good	16,100 m^2 (1.96) Fair	8,600 m^2 (1.05) Very Good	13,800 m^2 (1.68) Fair
8) Construction period risk	Construction of subway station in CBD will be implemented with redevelopment Fair	Less const. period delays due to no tunnel section. Very Good	Same as Case-1 Fair	Same as Case-2 Very Good	Same as Case-2 Very Good
9) Contribution of urban development	CBD:1 Sub-Centre:4 Total: 5 (1+4) Very Good	CBD:1 Sub-Centre:3 Satellite City:1 Total:5 (1+3+1) Good	CBD:1 Sub-Centre:2 Satellite City:1 Total 4 (1+2+1) Good	Sub-Centre:2 Satellite City:1 Total 3v(0+2+1) Fair	Sub-Centre:3 Satellite City:1 Total 4 (0+3+1) Good
10) Others	Many illegal buildings are within the existing Rail ROW. It may take time to negotiate with local settlers. **(Fair)**		Whole section is new line. During construction, it does not disturb the present rail operation. It is good for rail operator and rail users**. (Very Good)**		
Evaluation					
Very Good (+1)	2	5	2	**7**	3
Good (0)	1	4	2	2	4
Fair (-1)	7	1	6	1	3
Score (Ranking)	-5 (5th)	4 (2nd)	-2 (4th)	6 (1st)	0 (3rd)
-				**Recommended**	

Note: O&M cost is relatively the same, thus, this item is not evaluated.

13.2.4 Other Alternative Case

As described above, the Case 3b was recommended for a pre-feasibility study. The Morogoro Line is one of the candidate short-medium term project, an additional two cases were compared with the Case 3b. Table 13.2.3 shows the outline of the additional two (2) cases.

Table 13.2.3 Outline of the Additional Two (2) Cases

Case 5	Case 6
 Tegeta Line and Morogoro Line **All new railway, all sections are elevated and there are no underground sections*	 Morogoro Line and Loop (Aga Khan - Mwenge-Ubungo) **All new railway, all sections are elevated and there are no underground sections*

Source: JST

The comparison results are shown in Table 13.2.4.

Table 13.2.4 Comparison Results of the Additional Two (2) Cases

Evaluation Item	**Case 3b : Tegeta**	**Case 5: Tegeta Line and Morogoro Line**	**Case 6: Morogoro Line and Loop**
1) EIRR	32.3%	28.8%	28.7 %
2) FIRR	8.2 %	6.7%	5.4 %
3) Ridership, Y2030	1.29 Million	1.75 Million	1.11 Million
4) Investment Cost	1.55 Billion USD	2.86 Billion USD	1.81 Billion USD

- EIRR of both cases is higher than the acceptable 12%, making these projects economically feasible. On the other hand, the FIRR is less than 20% (see section 13.2.2(1) 2)), thus, it will be implemented as a government project or a government support project and not a BOT project.
- Case 5 needs a huge investment cost as compared to Case 3b and Case 6. If the government can prepare a substantial budget, Case 5 is a good candidate case for a short-medium term project due to an expected high ridership demand.
- The most economically feasible case is Case 3b.

13.2.5 Recommendations

- Case-1 and Case-3a has underground sections. Construction of underground in CBD will be implemented at the same time as the redevelopment. Land acquisition of the transition section (at least 7500m^2) between viaduct and underground will be needed. The project construction has many unexpected issues that may occur such as *ground water, geological condition, etc.*

Construction period will be longer than expected and it may be difficult to start operation in 2030.

- Case-2 may require the relocation of illegal settlers within the existing railway ROW.
- Case-4 has many affected buildings between Mwenge and Ubungo.

In view of the above, these cases were not selected.

- As Case 3a has no underground section, and is the cheapest and most economical case.
- Case 3a has advantages over other cases on the following items;
  - Least coordination with the existing rail line due to all new lines
  - Requires least construction cost.
  - Least negative impact.

In view of the above, **Case-3b** was recommended for the short-medium rail project

13.2.6 Transport Demand Forecast for the Priority Project

(1) Case Setting

To measure the transport effectiveness of Railway Projects, five simulation cases are set up as shown in Table 13.2.5. Rail and road network are shown in Figure 13.2.2 and Figure 13.2.3. As shown in Figure 13.2.3, the northern half section of the Middle Ring Road is completed, although the southern section is not. Expressway is completed from Kigamboni to Kibamba. Outer Ring Road and Bay Link Road are not yet complete.

Table 13.2.5 Simulation Cases for Demand Forecast in 2030

	Case Name	Forecast Year	Urban Structure	BRT	Rail	Road Network
1	Loop Line	2030	Balanced Structure with Satellite Cities & Sub centres	Phase1-6	Current + New lines (Loop)	Current Network + Expressway (from Kigamboni to Kibamba) +Middle Ring (from Tegeta to Ukonga) etc.
2	Half loop and Tegeta Line				Current + New lines (Half loop, Tegeta)	
3a	Tegeta Line(1)				Current + New lines (Tegeta)	
3b	Tegeta Line(2)				Current + New lines (Tegeta (No CBD))	
4	Tegeta Line and Loop				Current + New lines (Tegeta (No CBD), Loop(Mwenge-Ubungo))	

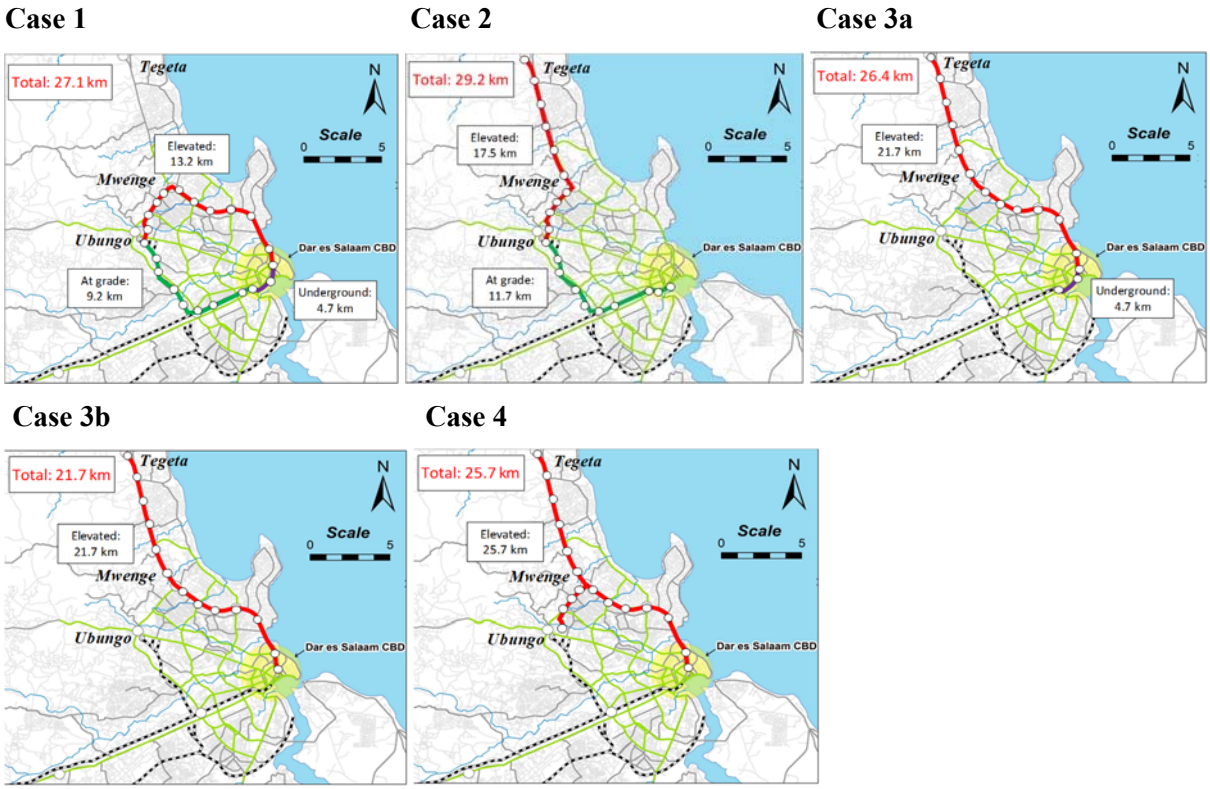


Figure 13.2.2 Railway Network for Demand Forecast in 2030

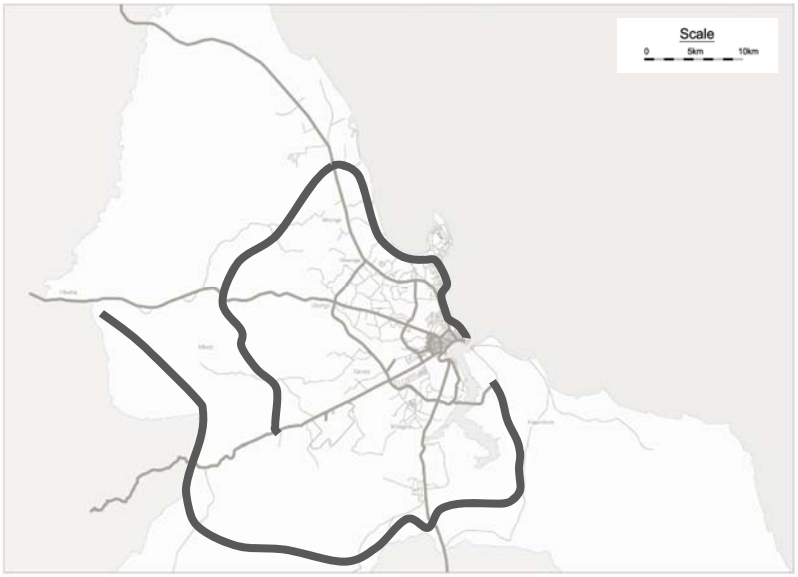


Figure 13.2.3 Major Road Network for Demand Forecast in 2030

(2) Methodology of Transport Demand Forecast in 2030

Framework of demand forecast in 2030 is almost the same as the one in 2040. Level of services is also the same as the one in 2040. The data, which are road capacity and maximum speed of road, velocities and others relating operation of public transit, are shown in Chapter 8.

Transport demand in 2030 is calculated by linear interpolation between 2017 and 2040 and the demand by trip purpose is shown in Table 13.2.6.

For the modal split and route assignment, the same model and parameters are used as shown in Chapter 8.

Table 13.2.6 Future Trip Generation in 2030

(Unit: million person trips/day)

Purpose	2030	2017	2040
To work	2.6	1.7	3.3
To School	2.8	1.6	3.7
Business	0.8	0.2	1.3
To Home	6.9	4.2	8.9
Private/Others	1.5	1.0	1.9
Total	14.6	8.8	19.2

(3) Result of Transport Demand Forecast in 2030

Table 13.2.7 shows the daily passenger section volume of railway and BRT. Both MRT and BRT are expected to have high demand. Even though both lines run side by side, BRT volume is still high and it will be approximately half of BRT as the case in 2040. BRT in Case 1 will expect 21,000 PHPDT, which is double that of the other cases. This is because MRT isn't installed toward Tegeta in Case 1 and BRT will play the role of MRT instead. Comparing Case 3a with 3b in the section D, MRT in Case 3a is bigger than in Case 3b because the MRT in 3b does not connect with CBD. But the difference is not that big. This is because BRT supports MRT as the fact that BRT in Case 3b is bigger than the Case 3a shows.

Table 13.2.8 shows the impact on road transportation, which is the result of road vehicle traffic assignment. As for road traffic, the difference among the cases is relatively small.

Table 13.2.7 Section Volume (Number of Passenger) in 2030

MRT

Unit: PHPDT*

Section	Case 1	Case 2	Case 3a	Case 3b	Case 4
A	-	32,000	33,000	33,000	34,000
B	25,000	27,000	-	-	26,000
C	-	-	-	-	-
D	20,000	-	22,000	20,000	19,000

BRT

Section	Case 1	Case 2	Case 3a	Case 3b	Case 4
A	21,000	11,000	10,000	10,000	10,000
B	14,000	15,000	15,000	16,000	14,000
C	15,000	15,000	15,000	15,000	15,000
D	12,000	15,000	15,000	17,000	16,000

*PHPDT: Peak Hour Peak Direction Traffic

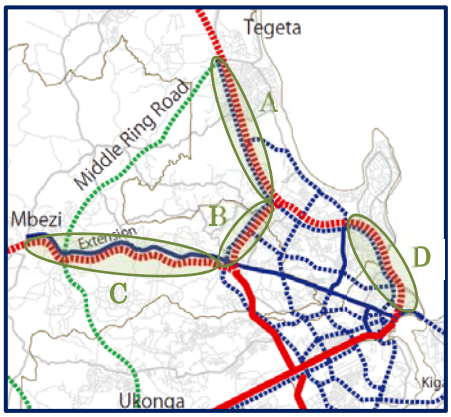


Table 13.2.8 Impact to Road Vehicle Transportation

	Case 1	Case 2	Case 3a	Case 3b	Case 4
Total vehicle kilometer	19,459,103	18,707,725	18,731,621	18,804,831	18,691,446
Total vehicle time	573,822	546,547	548,754	550,891	544,863
Average Congestion Ratio	0.81	0.78	0.78	0.79	0.78
Average Speed (km/h)	33.9	34.2	34.1	34.1	34.3

13.2.7 Preliminary MRT Plan

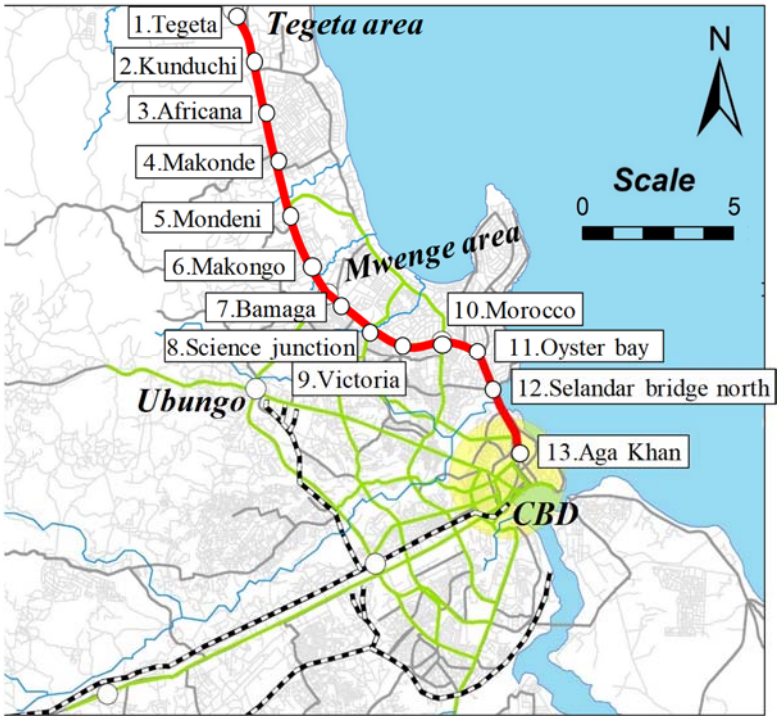
(1) Route Profile

Total length of proposed line is 21.7km and the number of stations is 13. The structure of proposed MRT line is all elevated. The pictures along the MRT line are summarized below.

		
Tegeta area	Makongo	Mwenge area
		
Morocco area	Selandar Bridge	Aga Khan area

Source: JST

Figure 13.2.4 Photos along the Route



Source: JST

Figure 13.2.5 Route Profile

(2) Station Location

The distance between two stations is set up as approximately 2-3km between Tegeta area and Mwenge area and approximately 1-2km between Mwenge area and Aga Khan area since BRT is running and BRT stations are constructed in 500-700m interval. The chainage, station distance and the place of the station are summarized in the table below. The station names are all tentative at present.

Table 13.2.9 Station Information

No.	Station Name	Chainage	Distance	Station place
1	Tegeta	0 km 000 m		The central area of tegeta area
			2.45	
2	Kunduchi	2 km 450 m		Close to the big housing area
			3.00	
3	Africana	5 km 450 m		Near intersection between Bagamoyo road and beach access road
			2.12	
4	Makonde	7 km 570 m		Close to the Mbezi beach area
			2.43	
5	Bondeni	10 km 000 m		Near intersection between Bagamoyo road and old Bagamoyo road
			1.60	
6	Makongo	11 km 600 m		North of the Mwenge intersection
			2.10	
7	Bamaga	13 km 700 m		In front of National Examination Council of Tanzania
			1.10	
8	Science junction	14 km 800 m		Near intersection among Bagamoyo road, Rose Garden road and Kajenge road.
			1.20	
9	Victoria	16 km 000 m		Near intersection between Bagamoyo road and Historia road
			1.30	
10	Morocco	17 km 300 m		Near intersection between Bagamoyo road and Kawawa road. Near current BRT station.
			1.20	
11	Oyster bay	18 km 500 m		The central area of oyster bay area
			1.00	
12	Selandar bridge north	19 km 500 m		Northern part of Selandar bridge
			2.20	
13	Aga Khan	21 km 700 m		Near Aga Khan Hospital and before the curve of Ali Hassan Road

Source: JST

(3) Salient Features

Salient features and design specification are summarized in the table below.

Table 13.2.10 Salient Features of MRT Line

Items	Specification
Gauge	1435mm
Number of Tracks	Double track
Rolling Stock	EMU (Electric Multiple Unit)
Design Speed	100km/h
Minimum Curve Radius	200m
Maximum Gradient	3.5 %
Electric Power Supply	AC 25,000V, Overhead catenary system
Signalling System	CBTC (Communication-Based Train Control)
Telecommunication System	Radio communication system, CCTV system
Railway Track	Ballast-less track for main line Ballast track for Depot
Station Facility	AFC (Automatic Fare Collection)

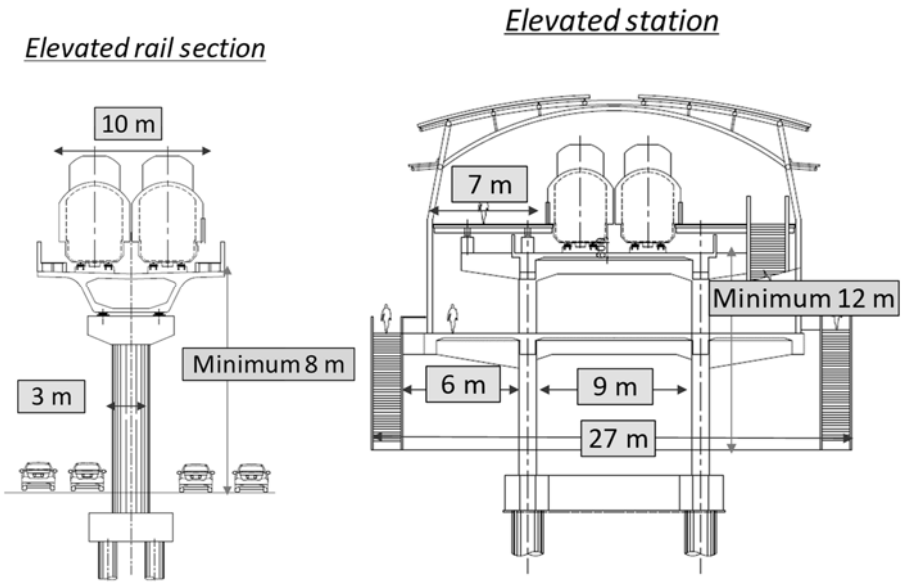
Source: JST

Gauge and electric system are coordinated with on-going SGR project because of the possibility of connection with future extension lines. Other specification is basically for passenger operation condition.

(4) Typical Cross Section Design

The viaduct pier is occupied within 3m for elevated rail section and minimum height between grand level and rail level is 8m, considering the road construction gauge and superstructure design.

Elevated station shall be three-story buildings which have road traffic on the ground floor, ticket gate on first floor and platform on second floor. Minimum height between grand level and rail level is 8m. Platform width is 7m and length is 200m to accommodate future expansion to 10 cars in a train set. Platform is lateral type which is built at both sides of tracks.



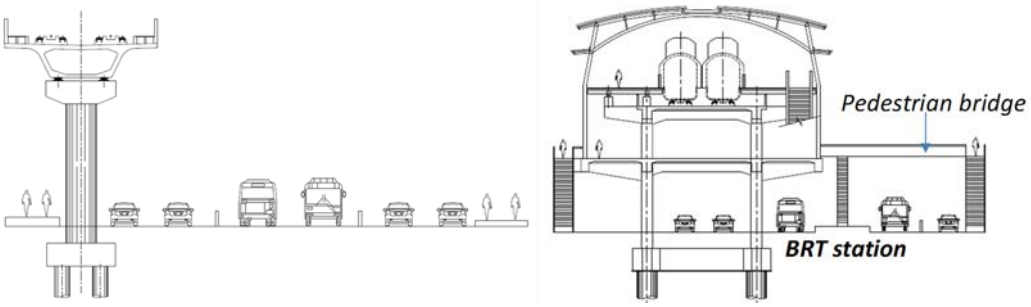
Source: JST

Figure 13.2.6 Typical Cross Section

(5) Coordination with Other Organizations

BRT Phase 4 is running parallel with proposed MRT line, so the viaduct pier shall be constructed at the side of the road. Coordination with DART, TANROADS and/or implementation organization shall be required in the early stage.

Road flyover is planned to be developed at Mwenge intersection. This intersection will be complicated due to the BRT exclusive lane, road flyover and MRT construction. More careful coordination must be done by implementing organizations.



Source: JST

Figure 13.2.7 BRT Parallel Running Section and Station

(6) Electric Power Supply System

Main power supply systems are Receiving Substation (RSS), Traction Substation (TSS), Auto Transformer Post (ATP) and Overhead Contact System (OCS). RSS, TSS and ATP shall be installed in Depot area.

As for the method of power supply to MRT line, RSS receives power from National Grid Substation of Tanzania Electric Supply Company Limited (TANESCO) and then RSS transforms the power to TSS and ATP.

Gas system is planned to be installed through Tanzania Petroleum Development Corporation (TPDC) at RSS to secure the reliability by the current on-going SGR project, so the same system shall also be installed for MRT line to coordinate with the on-going SGR project.

(7) Signal and Telecommunication System

The role of a signal system is to ensure safe train operations and high reliability that are required for signal facilities. In a situation of system failure, the system must operate safely which is called a fail-safe.

Proposed signal system is Automatic Train Stop (ATS), Automatic Train Control (ATC), Automatic Train Operation (ATO) and Communication-Based Train Control (CBTC). The CBTC is a train-control system based on radio communication with simple components and successful energy savings.

ATC is the traditional method for the signal safety system. The ATC system continuously monitors train movement based on allowable speed information for the train.

The Centralized Traffic Control (CTC) is recommended as the train operation control system from Operation Control Centre (OCC). For the train operation dispatcher, information collection of train operation conditions shall be required. The CTC contributes efficient operation via a monitoring indicator of the train position using the remote-controlled interlocking device by the dispatcher.

Telecommunication facilities are important for operational control of the train and the safety assurance of work on the wayside and in the yard. It is possible to provide information services to passengers at the station in addition to communication with station staff. The major MRT telecommunication systems are as follows:

Table 13.2.11 Major MRT Telecommunication System

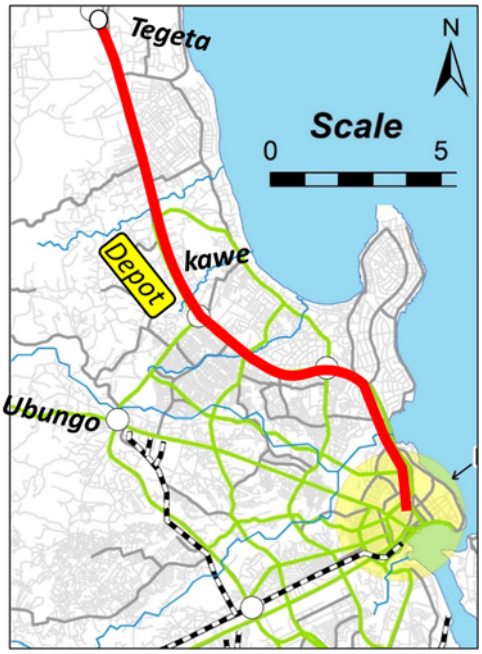
Items	Specification
Telecommunication facility for security	Dispatcher telephone, train radio system, wayside telephone, etc.
Telecommunication facilities for passenger services	Passenger information display system, clock system, public address facility and CCTV, etc.
Information collection facilities	Rain gauges, anemometers, seismometers, smoke alarms, etc.

Source: JICA Study Team

(8) Depot Plan

Proposed depot location is located at Kawe area by TRC (RAHCO) study. These areas are currently used by the military. In general, land acquisition is quite challenging even though the land owner is government due to the huge land acquisition. Comparative study for depot area shall be required to reduce the resettlement and to implement the next study stage smoothly.

Depot size might be approximately 10 ha which has the following functions: stabling yard, maintenance work shop, train wash track, test track, administration office and OCC.



Source: JST

Figure 13.2.8 Depot Location

(9) Rolling Stock and Operation Plan

Electric Multiple Unit is applied for smooth and environment-friendly operation. The basic concept for capacity and axle load is considered under AW3 condition which is 15.2-ton axle load and approximately 3,000 capacities in eight cars in a train set. It nearly has the same condition as 180% congestion ratio.

Planned train configuration is eight cars in a train set to transport the peak demand. The train configuration is as follows;

Tc – M – M – T – T – M – M – Tc

Tc: Trailer car with driving cab

M: Motor car

T: Trailer car

Figure 13.2.9 shows the conceptual design of leading car (Tc) and intermediated car (M or T). The length of one train is approximately 20m and body width is approximately 3m.

Source: JST

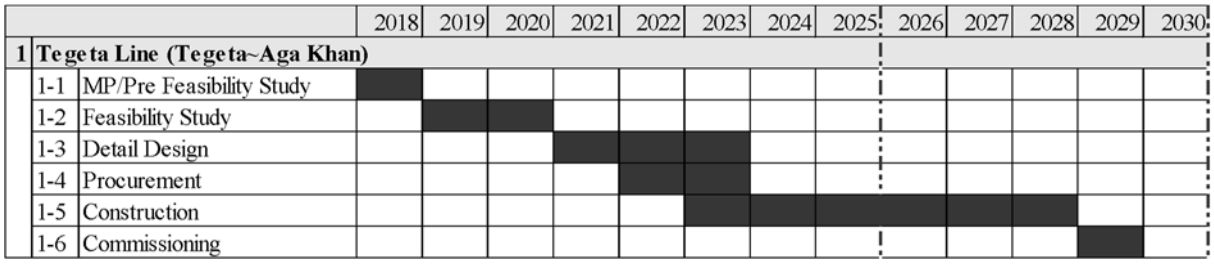
Figure 13.2.9 Conceptual Drawings of Leading Car (Left) and Intermediate Car (Right)

Minimum headway in peak time is 5 minutes based on the calculation by the transport capacity and demand. It means that 12 train sets are operated in an hour, so approximately 36,000 passengers can be transported in an hour. Off-peak headway shall be 10 minutes.

Based on these conditions, 19 train sets shall be required on the opening year to deal with the peak time demand. It includes the 10% (two train sets) spare trains.

(10) Implementation Schedule

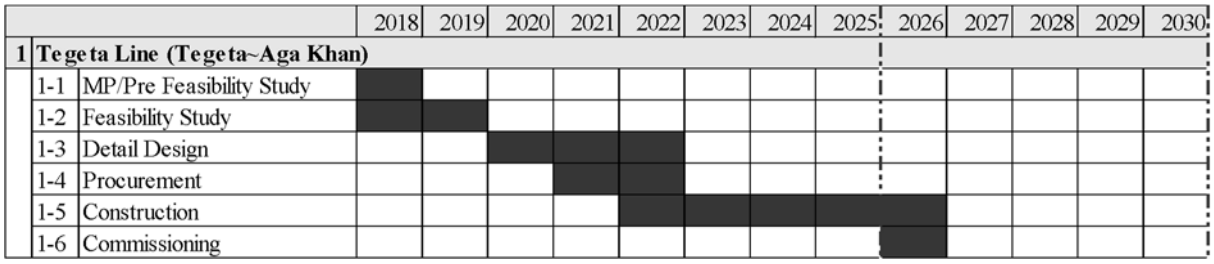
In general, the project implementation of new MRT construction and its preparation takes a long time due to the elevated structure construction, new railway Act/Row (or amendment of current Act/Row), many packages for contractor, financial procurement and so on. Figure 13.2.10 shows the realistic implementation schedule with reference to the other similar projects. Based on experience, it takes five to six years for preparation including MP and pre-FS stage and six years for construction. Another half year to one year is for commissioning. Thus, if the project starts from now in 2018, opening year will be in 2029.



Source: JST

Figure 13.2.10 Realistic Implementation Schedule

On the other hand, MRT opening is highly expected as early as possible because of the high demand and serious traffic congestion in Dar es Salaam. Figure 13.2.11 shows the time squeezed schedule which excludes decision making, any delay for procurement and construction, land acquisition protest, etc. In this condition, it takes four to five years for preparation including MP and pre-FS stage and four and half years for construction. Another half year is for commissioning. Thus, opening year will be the end of 2026 or the beginning of 2027.



Source: JST

Figure 13.2.11 Time Squeezed Implementation Schedule

(11) Cost Estimation

Local procurement condition is considered for civil and architecture cost as much as possible, but railway system and rolling stock procurement are referred to the other project experiences because of no experience in Tanzania. Indirect cost is assumed as 30% of direct cost.

Table 13.2.12 Cost Estimation

Item	Million USD
Civil, Architect and Track	654
Rolling stock	328
Electric & Mechanical	93
Signal & Telecommunication	120
Total of construction/procurement cost	**1,196**
Indirect cost	359
Grand Total	**1,555**

Source: JST

The following items will be considered in the O&M cost after the commencement of the operation: 1) Employment cost of operator's staff, 2) Electricity cost, 3) Maintenance cost, 4) Reinvestment cost for replacement of equipment and facilities and 5) Administration cost.

Condition for the future expansion and electric commuter operation is considered for employment cost based on the other projects.

Electricity cost is based on the operation plan and electric tariff is referred to TANESCO tariff rate and its' future tariff estimation.

Annual maintenance cost is considered at 3% of the initial investment cost of the railway system, track, station building equipment etc.

Each railway system has a decided design lifetime and it is necessary to consider the initial investment amount of the facility as the renewal investment cost for each design lifetime of each facility. Signalling and telecommunication system, for example, has 7 years design life and railway track has 25 years design life.

Administration cost every year is considered at 10% of 2) Electricity cost and 3) Maintenance cost.

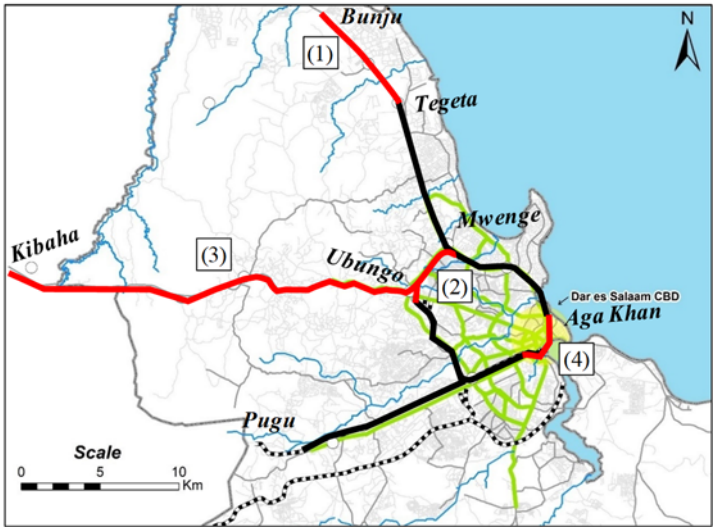
(12) Future Extension Plan

Extension of proposed route is expected to realize the master plan. Following extension lines are proposed until 2040. A loop line can be formed after completion of the extension (2) and (3).

Table 13.2.13 Summary of Extension Plan

Route	Length	Remarks
(1) From Tegeta to Bunju	13km	If the demand is more extended, the extension line shall also be extended accordingly.
(2) From Mwenge to Ubungo	4.5km	Connecting to the existing line
(3) From Aga Khan to Central station	4km	Connecting to the existing line
(4) From Kibaha to Ubungo	26km	Connecting to the loop line

Source: JST



Source: JST

Figure 13.2.12 Extension Plan

13.2.8 Environmental Evaluation of the Priority Project (IEE level)

(1) Scoping

This section overviews the identification and evaluation of potential environmental and socioeconomic impacts associated with the development of the proposed railway option (Case 3b). The vulnerable environmental components (receptors) and the respective potential impacts are outlined in the form of a matrix.

Table 13.2.14 Scoping Matrix

Item	Rating for each phase		Impact predicted and Reason of the rating (A to D)
	Pre-Co/Co	Op	
Pollution control / Public Nuisances			
Air quality	C-	C+	Co: Air pollution due to exhaust emissions from construction machinery and dust generated from earthworks. This potential effect is provisionally characterized as a direct, site-specific, short-term and very small magnitude impact. Op: Reduction of projected air pollution associated with motorway traffic due to the availability of the railway service and a consequently lower demand for road transit. This potential outcome is provisionally characterized as a direct, local, long-term and small magnitude impact.
Water quality	B-	D	Co: Water pollution at the estuary of Msimbazi River due to sedimention and re-suspension as well as resultant turbidity and remobilization of contaminants, as a result of expected dredging and excavation works for the construction of viaduct pier foundations. This potential effect is provisionally characterized as a direct, site-specific, short-term and medium-magnitude impact. Op: No impact is expected.
Solid Waste and/or Industrial Discharge	C-	C-	Co: Land littering from the generation of solid waste (such as spoils, packaging materials, fugitive emission of solid/fluid contaminants) during construction works, from domestic waste generated in and around temporary construction camps and from excavation spoils. This potential effect is provisionally characterized as a direct, site-specific, short-term and very small magnitude impact. Op:

Item	Rating for each phase		Impact predicted and Reason of the rating (A to D)
	Pre-Co/Co	Op	
			Generation of waste (organic scraps from food establishments and commercial packaging refuse from retail facilities) within passenger facilities on trains and train terminals. This potential effect is provisionally characterized as a direct, site-specific, long-term and very-small magnitude impact.
Soil Contamination	C-	C-	Co: Trace contamination of topsoil due to mishandling of chemical materials (e.g. fuels, lubricants, hydraulic fluids, coolants, etc.). This potential effect is provisionally characterized as a direct, site-specific, short-term and very-small magnitude impact. Op: Trace contamination of topsoil within the depot through sprays, leakages and spillages of contaminants (i.e. heavy metals, toxic organics, wood and steel from rails and rail ties) from maintenance and operational railway infrastructure. This potential effect is provisionally characterized as a direct, site-specific, long-term and very-small magnitude impact.
Noise and vibration	B-	A-	Co: Noise and vibration pollution from construction works such pile-driving, blasting, drilling and welding, etc. This potential effect is provisionally characterised as a direct, site-specific, short-term and large-magnitude impact. Op: Operational acoustic emissions from frictional, aerodynamic and traction effects. This potential effect is provisionally characterised as a direct, site-specific, long-term and large-magnitude impact.
Ground subsidence	C-	D	Co: Land destabilization and soil erosion from site preparation and construction works, particularly on sloping terrain and poorly consolidated substrate. This potential effect is provisionally characterized as a direct, site-specific, short-term and medium-magnitude impact. Op: No impact is expected.
Odor	D	D	Co and Op: No impact is expected.
Natural Environment			
Protected Areas	B-	D	Co: Disturbance of the mangrove habitat within the mouth of Msimbazi River through small-scale deforestation, excavation and the installation of permanent structures during construction. This potential effect is provisionally characterized as a direct, site-specific, short-term and large-magnitude impact.
Ecosystems	C-	C-	Pre-Co: Clearance of terrestrial vegetation as part of site preparation works. This potential effect is characterized as direct, site-specific, short-term and medium-magnitude impact. Op: Acoustic disturbance of the Dar es Salaam Coast Important Bird Area (stretching from the open bay of Ras Kiramoni in the North, up to and including Ndege Beach, to Ras Ndege, east of Mbwamaji village—a total length of 40km) due to operational noise and vibrations. This potential effect is provisionally characterized as a direct, long-term site-specific and small-magnitude impact.
Hydrology	D	D	Co and Op: No impact is expected.
Topography	D	D	Co and Op: No impact is expected.
Geology	D	D	Co and Op: No impact is expected.

Item	Rating for each phase		Impact predicted and Reason of the rating (A to D)
	Pre-Co/Co	Op	
Social Environment			
Involuntary Resettlement	A-	D	Pre-Co: The establishment of the railway route will necessitate the physical displacement of human settlements along the 30m Right of Way (RoW) as well as the train station and depot footprints of the proposed railway route. This outcome is provisionally characterized as a direct, local, long-term and large-magnitude impact.
Low income population	B-	B+	Pre-Co: The involuntary resettlement and economic displacement of residents along the RoW as well as the train station and depot footprints of the proposed railway route will result in the impoverishment of the low-income communities. This outcome is provisionally characterized as an indirect, local, long-term and large-magnitude impact. Op: The introduction of an affordable and efficient railway transit system will advantage the low-income population utilizing the transport corridor in that they will be unburdened from motorway traffic time wastages and more expensive, less reliable and/or less safe transport options (e.g. motorcycles, auto rickshaws, cars etc.). This is provisionally characterized as a direct, local, long-term and high- magnitude impact.
Ethnic minorities and indigenous people	D	D	Co and Op: No impact is expected as the IFAD (2012) Country Technical Note on Indigenous Peoples' Issues recognizes a few vulnerable tribes in Tanzania, which are restricted to certain parts of the country, outside of Dar es Salaam.
Local economies (employment, livelihood, etc.)	A+	B+	Pre-Co and Co: The project, in its mobilization and construction phases, will create employment and income-generation opportunities for a range of formal, informal, skilled and semi-skilled labour and construction industries. This outcome is provisionally characterized as a direct, local, short-term and large-magnitude impact. Op: The train system, once operational, will create employment through the operator agency. This outcome is provisionally characterized as a direct, local, long-term and large-magnitude impact.
Land use and utilization of local resources	D	A+	Op: The establishment of the railway line and stations will stimulate commercial and housing development, which will result in optimization of land use. This outcome is provisionally characterized as a direct, local, long-term and large-magnitude impact.
Public infrastructure and utilities	A-	D	Pre-Co and Co: The construction of the railway will entail the realignment and/or re-installation of water (DAWASCO), electricity (TANESCO), fibre optic cables and gas (SONGAS) distribution infrastructure as well as the disruption of supply regimes. This is provisionally characterised as a direct, local, long-term and large-magnitude impact.
Cultural heritage	D	D	Co and Op: No impact is expected as there are no cultural receptors along the potential project footprint.
Landscape	D	C-	Op: The new railway infrastructure, particularly the elevated section, will likely reduce the aesthetic value of the landscapes. This is provisionally characterised as a direct, local, long-term and small-magnitude impact.
Vulnerable groups (women and children)	C-	B+	Pre-Co: The physical and economic displacement along the railway RoW will negatively impact on the income level, access to social services and general welfare of the vulnerable demographics (i.e. women-headed households, children, the disabled and the elderly). This is provisionally characterized as a direct, local, short-term and large-magnitude impact.

Item	Rating for each phase		Impact predicted and Reason of the rating (A to D)
	Pre-Co/Co	Op	
			Co: Risk of child labor relating to construction works within the project area. This is provisionally characterized as a direct, local, short-term and medium-magnitude impact. Op: The introduction of an affordable and efficient railway transit system will be an advantage to the low-income communities utilizing the transport corridor, in that they will be unburdened from motorway traffic time wastages and more expensive, less reliable and/or less safe transport options (e.g. motorcycles, auto rickshaws, cars, etc.). This is provisionally characterized as a direct, local, long-term and high-magnitude impact.
Occupational safety and health	B-	B-	Co: Construction works for the railway establishment pose numerous occupational health and safety hazards (e.g. falls, cuts, electrocution etc.) This is provisionally characterized as a direct, local and medium-magnitude impact. Op: Certain operation and maintenance activities also pose occupational health and safety hazards (e.g. collisions, electrical shocks etc.) This is provisionally characterized as a direct, local, long-term and medium-magnitude impacts.
Public health and safety	C-	C+	Co: Construction works for the railway establishment pose numerous public health safety hazards (i.e. traffic accidents). This is provisionally characterized as a direct, local, short-term and large-magnitude impact. The influx of migrant workers for the construction labour raises increased risk of the spread of HIV/AIDS, especially in the low-income communities associated with the project area. This is provisionally characterized as a direct, local, short-term and medium-magnitude impact. Op: The railway system operation will likely alleviate the current prevalence of motorway accidents resulting from heavy congestion and use of faulty/overburdened vehicles. This is provisionally characterized as a direct, local, long-term and medium- magnitude impact.
Climate change	D	D	Pre-Co and Co: The construction works will involve the operation of vehicles and construction machinery which will result in greenhouse emissions. This is provisionally characterized as a direct, regional, short-term and very-small magnitude impact. Op: Although the railway system is anticipated to be electricity-powered, it will be indirectly dependent on a gas-based power grid and thereby contribute to the national carbon footprint. This is provisionally characterized as an indirect, regional, long-term and a very small-magnitude impact.

Note: 1) A+/-: Significant positive/negative impact is expected. B+/-: Positive/negative impact is expected to some extent. C+/-: Extent of positive/negative impact is slight or unknown. (A further examination is needed, and the impact could be clarified as the study progresses) D: No impact is expected or expected impact is negligible.

2) Pre-Co: Pre-construction phase, Co: Construction phase, and Op: Operation phase

(2) Potential Impacts and Mitigation Measures

a) Pre-Construction Phase

i. Clearance of vegetation

Mitigation of this impact will require the restriction of clearing works to the 30m Right of Way (RoW) of the railways.

ii. Physical displacement of settlements and involuntary resettlement

The estimates of property count have been computed under the assumption that the Right of Way (ROW) for the railway lines requires a railway strip width (from each side of the centreline) of 15m as mandated by the Railway Act (2002). There are 72 buildings (both residential and non-residential) within Case 3b (Tegeta – Mwenge – Aga Khan) ROW, 423 buildings (both residential and non-residential) within depot site, and 32 buildings (both residential and non-residential) within depot line ROW.

The adverse implications associated with resettlement can be precluded, alleviated and minimised as follows:

- ✓ Conduct of livelihoods restoration planning as part of resettlement planning;
- ✓ Participatory planning and engagement of the local communities in planning for best alignment alternatives;
- ✓ Provision of full and timely compensation to displaced property holders following proper property count and valuation survey within the Row; and
- ✓ Institution of grievance redresses mechanisms.

iii. Disruption of public infrastructure and utilities

Participatory planning and the engagement of utility management authorities in planning for the alignment of alternatives, and the relocation and/or re-installation of utility infrastructure will be required to mitigate the displacement and/or modification of the utility infrastructure.

b) Construction Phase

i. Air pollution due to exhaust emissions from construction machinery and dust generation

Mitigation measures to address air pollution are as follows:

- ✓ Powering off of idle construction machinery including all heavy equipment and vehicles;
- ✓ Non-usage of malfunctioning and fuel-inefficient machinery to reduce exhaust and fugitive output;
- ✓ Enforcement of routine maintenance checks and servicing for motorised construction machinery;
- ✓ Usage of dust-suppressing agents such as water (wetting) and compaction of exposed site surfaces and unpaved roads, particularly during dry weather;
- ✓ Side enclosure and covering of any aggregate or dusty material storage piles to for dust abatement;
- ✓ Minimisation of aggregates' dropping height;
- ✓ Coverage of aggregate hauling vehicles with tarpaulins or other impervious sheeting; and
- ✓ Provision of not less than 2.4m high hoarding from ground level along site boundaries adjoining publicly accessible zones (e.g. roads, streets etc.).

ii. Water pollution in the estuary of Msimbazi River

The impact can be abated as follows:

- ✓ Minimisation of mangroves clearance at excavations sites;
- ✓ At the dredging sites, adverse effects on water quality can be minimised by employment of hydraulic dredges, use of clamshell buckets (for mechanical dredges), installation of silt curtains,

proper maintenance of dredging equipment and restriction of the dredging time/rate; and

- ✓ At the disposal site(s), sediment dispersal can be curtailed by constraining the timing/rate of disposal, using submerged diffusers and placing dredged material in geotextile bags to reduce water column exposure during dumping.

iii. Land destabilization and soil erosion

Mitigation measures to be considered are as follows:

- ✓ Backfilling of borrow pits and reusing of outstanding spoil and aggregate piles;
- ✓ Compaction where necessary;
- ✓ Scheduling to avoid heavy rainfall periods (i.e., during the dry season) to the extent practical;
- ✓ Contouring and minimising length and steepness of slopes; and
- ✓ Re-vegetating areas promptly.

iv. Land Littering from generation of waste

Mitigation for this impact is to involve:

- ✓ Removal of all construction waste as part demobilisation activities within the project sites;
- ✓ Management of waste streams to isolate recyclable debris and any hazardous waste and compost organic waste;
- ✓ Placement of litter restriction signage where appropriate; and
- ✓ Installation of waste storage receptacles as resistant as possible to storm water runoff and scavenger animals.

v. Noise and vibration pollution

The following mitigation measures are to be considered:

- ✓ Selecting equipment with lower sound power levels;
- ✓ Installing silencers for fans;
- ✓ Installing suitable mufflers on engine exhausts and compressor components;
- ✓ Installing acoustic barriers without gaps and with a continuous minimum surface density of 10 kg/m2 to minimize the transmission of sound through the barrier. Barriers should be located close to the source or to the receptor location to be effective;
- ✓ Installing vibration isolation for mechanical equipment;
- ✓ Limiting the hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas; and
- ✓ Reducing project traffic routing through communities.

vi. Disturbance of mangrove forest habitat

The impact can be controlled by design and monitoring efforts to minimise the clearance of mangroves and earthworks within the estuarine ecosystem.

vii. Occupational safety and health hazards

Mitigation for this impact is to include:

- ✓ Provision of Health, Safety, Security and Environment (HSSE) induction for all construction labour;
- ✓ Provision of Personal Protective Equipment (PPE) and safety measures to safeguard workers from hazards.
- ✓ Mobilization of awareness creation campaigns for HIV/AIDS for the construction labour and

nearby service-providing communities.

viii. Risk of child labour

Mitigation for this includes the prohibition of child labour practices and due diligence and regular monitoring to ensure the non-employment of minors in the supply chain and supporting services.

c) Operation Phase

i. Trace contamination of topsoil and surface water

This impact can be mitigated by ensuring:

- ✓ Conduct of routine maintenance checks and servicing for operating train systems;
- ✓ Use of side track mats to retain wayside grease; and
- ✓ Proper chemical handling during maintenance activities and clean-up in the event of noxious spillages or deposits.

ii. Generation of waste within passenger facilities

Mitigation actions to control this aspect of waste production include:

- ✓ Institution of a solid waste recycling program providing for the use of labelled waste containers in passenger terminals; and
- ✓ Sensitising passenger train operators and cleaning contractors to collect and segregate waste for proper disposal and possible reusing and recycling.

iii. Operational acoustic emissions

The noise emission can be minimised as follows:

- ✓ Increase of the elasticity of the track superstructure;
- ✓ Use of wooden sleepers, rail dampers, or embedded rail systems;
- ✓ Elimination of running surface discontinuities;
- ✓ Regular maintenance of the rail running surface;
- ✓ Regular wheel re-profiling;
- ✓ Reduction of the speed of rail vehicles;
- ✓ Construction of barriers and/or tunnels.

iv. Depreciation of landscape

Mitigation measures include:

- ✓ Incorporate landscape factors into the design of railway-associated buildings; and
- ✓ Creation of a vegetation strip buffer along the railway lines where appropriate.

v. Occupational health and safety hazards

Mitigation measures include:

- ✓ Provision of Health, Safety, Security and Environment (HSSE) induction for all labour operation; and
- ✓ Provision of Personal Protective Equipment (PPE) and safety measures to safeguard maintenance workers from hazards.

(3) Environmental and Social Monitoring Plan

The Environmental and Social Monitoring Plan describes the monitoring activities to be undertaken to ensure that adverse environmental and social impacts are minimised while the positive impacts are enhanced during the project implementation. The plan describes how, when and where the monitoring activities will be undertaken and who will carry them out. The purpose of environmental and social monitoring is to measure the effectiveness of mitigation measures proposed during design stage.

Table 13.2.15 Environmental and Social Monitoring Plan

Potential impact	Monitoring parameter	Monitoring frequency	Sampling area	Target standard	Responsibility
Construction Phase					
Air pollution during construction	Concentration of particulates (dust)	Biannually	All construction sites and designated access roads	TZS 845:2005 Air Quality Specifications in the National Environmental Standards Compendium	Contractor and supervision consultant
Water pollution during construction	Water quality and sediment quality	Biannually	Excavation sites in the mangrove forest and construction sites neighbouring water bodies	TBS TZS 860:2005 Limits for municipal and industrial wastewaters	Contractor and supervision consultant
Noise and vibration pollution during construction	Ambient noise and vibration	Twice a week	All construction sites	Environmental Management Quality Standards (Control of Noise and Vibration) Regulations, 2011	Contractor and supervision consultant
Land littering from waste generation	Litter / Solid waste	Twice a week	All construction sites	Environmental Management (Solid Waste Management) Regulations, 2009	Contractor and supervision consultant
Disturbance of mangrove forest	Vegetation cover	Biannually	Excavation and dredging sites in the mangrove forest / excavation sites	Regeneration cleared mangrove species	Contractor and supervision consultant
Involuntary resettlement	The number of compensated households in ROW	Monthly	All inhabited / occupied areas within ROW	Full and prompt compensation to the registered households	Client, Municipal Community Development Officer, MOLHHSD
Operation Phase					
Operational acoustic emissions during operation	Ambient noise and vibration	Annually	Along the railway line	Environmental Management Quality Standards (Control of Noise and Vibration) Regulations, 2011	Operating authority
Soil contamination during operation	Water and soil quality	Biannually	Land strips along railway tracks	TBS TZS 860:2005 Limits for municipal and industrial wastewaters TZS 972: 2007 Soil quality – Limits for soil contaminants in habitat and agriculture	Operating authority

Disturbance of IBA	Population of less dominant and vulnerable / threatened bird species	Annually	all construction sites	Depopulation not exceeding 50% of the original population	Municipal wildlife officer
Occupational health and safety hazards	The number of significant incidents and number of hazard-predisposed workers equipped with PPE	Daily or monthly	Operation and maintenance sites	No significant/severe HSSE incidents (daily or monthly) and no of hazard-predisposed workers equipped with PPE.	Operating agency

13.2.9 Economic Evaluation of the Priority Project

The economic analysis was carried out on the five different cases of MRT as described in Section 13.2.1. This section used the same methodology of economic analysis (economic indicators) in Section 12.2.1

(1) Economic Cost for Each Case

The economic cost was applied for the Transport Master Plan Project (including not only MRT but also Road, BRT and so on) and yearly economic cost was calculated by the investment schedule. Thus, the difference in economic cost of each case is the investment schedule and cost from 2018 to 2030.

(2) Economic Benefit for Each Case

Economic benefit for each case is estimated in 2030 based on the traffic demand forecast. The result of economic benefit for each case in 2030 is shown in Table 13.2.16. The same result in each case was applied for the economic benefit in 2040. The characteristics of economic benefit results are shown below;

- The cases with high economic benefit, showing over 4,300 billion TZS were case 3a and 4.
- Most economic benefit is dependent on TTC. Case 1 in particular shows a ratio of 95%. Other cases show a ratio of about 85%.

Table 13.2.16 Economic Benefit for Each Case in 2030

Unit: Billion TZS/year

	Case 1	Case 2	Case 3a	Case 3b	Case 4
TTC	3,488 (95%)	3,558 (85%)	3,688 (86%)	3,673 (87%)	3,742 (85%)
VOC	194 (5%)	634 (15%)	613 (14%)	566 (13%)	636 (15%)
Total	3,682	4,192	4,301	4,239	4,378

Source: Calculated by JST

(3) Result of Economic Analysis

The results of economic evaluation for the five cases are shown in Table 13.2.17. It shows that the computed EIRR was greater than social discount rate (12%) and B/C was greater than 1.0. The highest EIRR is for Case 3b, which will contribute most in the economy of Dar es Salaam. The cost benefit stream of the five (5) cases is shown in Table 13.2.18 to Table 13.2.22.

Table 13.2.17 Result of Economic Analysis

Economic Benefit			
Case	**EIRR**	**B/C**	**NPV (Billion TZS)**
Case 1	26.2%	2.40	11,678.5
Case 2	30.1%	2.70	13,212.1
Case 3a	25.4%	2.39	12,158.0
Case 3b	32.3%	2.72	13,184.7
Case 4	28.6%	2.60	12,944.5

Source: Calculated by JST

Table 13.2.18 Cost Benefit Stream for Master Plan Project- Case 1

Dar Es Salaam Master Plan

Undiscounted Benefit Cost Stream — Bill TZS

sq	Year	Project Cost including DD, SV, ROW and Environmental Cost(A)	O&M Cost (B)	Cost (C)	Benefit (D) VOC	Benefit (E) TTC	Benefit (G=D+E)	Benefit - Cost (G-C)
1	2017	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	2018	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	2019	156.9	0.0	156.9	0.0	0.0	0.0	-156.9
4	2020	282.0	0.0	282.0	0.0	0.0	0.0	-282.0
5	2021	1,909.4	62.0	1,971.4	8.0	334.5	342.5	-1,628.9
6	2022	1,536.5	62.0	1,598.4	16.0	669.0	684.9	-913.5
7	2023	1,650.2	62.0	1,712.1	23.9	1,003.4	1,027.4	-684.8
8	2024	1,665.9	62.0	1,727.9	31.9	1,337.9	1,369.8	-358.0
9	2025	1,111.1	154.9	1,266.0	8.0	1,672.4	1,680.4	414.4
10	2026	1,197.7	154.9	1,352.5	47.9	2,006.9	2,054.8	702.2
11	2027	1,205.9	154.9	1,360.8	55.9	2,341.4	2,397.2	1,036.4
12	2028	1,189.4	154.9	1,344.3	63.8	2,675.8	2,739.7	1,395.4
13	2029	1,425.6	154.9	1,580.5	71.8	3,010.3	3,082.1	1,501.7
14	2030	1,044.7	216.8	1,261.6	194.2	3,488.2	3,682.3	2,420.7
15	2031	939.1	216.8	1,155.9	253.6	3,705.7	3,959.2	2,803.3
16	2032	975.4	216.8	1,192.2	331.2	3,936.7	4,267.9	3,075.6
17	2033	975.4	216.8	1,192.2	432.5	4,182.1	4,614.6	3,422.4
18	2034	1,491.7	216.8	1,708.6	564.9	4,442.9	5,007.7	3,299.2
19	2035	1,128.5	216.8	1,345.4	737.8	4,719.8	5,457.6	4,112.2
20	2036	1,062.7	216.8	1,279.5	963.5	5,014.1	5,977.6	4,698.1
21	2037	1,026.3	216.8	1,243.2	1,258.4	5,326.7	6,585.1	5,341.9
22	2038	504.9	216.8	721.8	1,643.5	5,658.8	7,302.3	6,580.5
23	2039	504.9	216.8	721.8	2,146.4	6,011.6	8,158.0	7,436.2
24	2040		309.8	309.8	2,803.3	6,386.4	9,189.7	8,879.9
25	2041		309.8	309.8	2,895.9	6,597.3	9,493.1	9,183.3
26	2042		309.8	309.8	2,991.5	6,815.1	9,806.6	9,496.8
27	2043		309.8	309.8	3,090.3	7,040.2	10,130.4	9,820.6
28	2044		309.8	309.8	3,192.3	7,272.6	10,464.9	10,155.2
29	2045		309.8	309.8	3,297.7	7,512.8	10,810.5	10,500.7
30	2046		309.8	309.8	3,406.6	7,760.9	11,167.5	10,857.7
31	2047		309.8	309.8	3,519.1	8,017.1	11,536.2	11,226.5
32	2048		309.8	309.8	3,635.3	8,281.9	11,917.2	11,607.4
33	2049		309.8	309.8	3,755.4	8,555.3	12,310.7	12,000.9
34	2050		309.8	309.8	3,879.4	8,837.8	12,717.2	12,407.4
35	2051		309.8	309.8	4,007.5	9,129.7	13,137.1	12,827.4
36	2052		309.8	309.8	4,139.8	9,431.1	13,570.9	13,261.2
37	2053		309.8	309.8	4,276.5	9,742.6	14,019.1	13,709.3
38	2054		309.8	309.8	4,417.7	10,064.3	14,482.0	14,172.2
39	2055		309.8	309.8	4,563.6	10,396.6	14,960.2	14,650.4
40	2056		309.8	309.8	4,714.3	10,739.9	15,454.2	15,144.4
41	2057		309.8	309.8	4,869.9	11,094.6	15,964.5	15,654.7
42	2058		309.8	309.8	5,030.8	11,460.9	16,491.7	16,181.9
43	2059		309.8	309.8	5,196.9	11,839.4	17,036.3	16,726.5
44	2060		309.8	309.8	5,368.5	12,230.3	17,598.8	17,289.0
		22,984.2	9,696.1	32,680.3	91,905.1	250,744.8	342,650.0	309,969.7

Discounted Benefit Cost Stream — Bill TZS

sq	Year	Discounted (12%)	Cost (A)	Benefit (B)	Benefit - Cost (A-B)
1	2017	1.00	0.0	0.0	0.0
2	2018	1.12	0.0	0.0	0.0
3	2019	1.25	125.0	0.0	-125.0
4	2020	1.40	200.7	0.0	-200.7
5	2021	1.57	1,252.8	217.6	-1,035.2
6	2022	1.76	907.0	388.6	-518.4
7	2023	1.97	867.4	520.5	-346.9
8	2024	2.21	781.6	619.6	-162.0
9	2025	2.48	511.3	678.7	167.4
10	2026	2.77	487.7	741.0	253.2
11	2027	3.11	438.2	771.8	333.7
12	2028	3.48	386.4	787.6	401.2
13	2029	3.90	405.7	791.1	385.4
14	2030	4.36	289.1	843.9	554.8
15	2031	4.89	236.5	810.1	573.6
16	2032	5.47	217.8	779.7	561.9
17	2033	6.13	194.5	752.7	558.3
18	2034	6.87	248.8	729.3	480.5
19	2035	7.69	174.9	709.7	534.8
20	2036	8.61	148.6	694.0	545.5
21	2037	9.65	128.9	682.7	553.8
22	2038	10.80	66.8	675.9	609.1
23	2039	12.10	59.7	674.2	614.5
24	2040	13.55	22.9	678.1	655.2
25	2041	15.18	20.4	625.4	605.0
26	2042	17.00	18.2	576.9	558.6
27	2043	19.04	16.3	532.1	515.8
28	2044	21.32	14.5	490.7	476.2
29	2045	23.88	13.0	452.6	439.7
30	2046	26.75	11.6	417.5	405.9
31	2047	29.96	10.3	385.1	374.7
32	2048	33.56	9.2	355.2	345.9
33	2049	37.58	8.2	327.6	319.3
34	2050	42.09	7.4	302.1	294.8
35	2051	47.14	6.6	278.7	272.1
36	2052	52.80	5.9	257.0	251.2
37	2053	59.14	5.2	237.1	231.8
38	2054	66.23	4.7	218.7	214.0
39	2055	74.18	4.2	201.7	197.5
40	2056	83.08	3.7	186.0	182.3
41	2057	93.05	3.3	171.6	168.2
42	2058	104.22	3.0	158.2	155.3
43	2059	116.72	2.7	146.0	143.3
44	2060	130.73	2.4	134.6	132.3
			8,323.2	20,001.6	11,678.5

Net Present Value (Billion TzS)	11,678.5
B/C Ratio	2.40
EIRR	26.2%

Source: JST

Table 13.2.19 Cost Benefit Stream for Master Plan Project - Case 2

Dar Es Salaam Master Plan

Undiscounted Benefit Cost Stream — Bill TZS

sq	Year	Project Cost including DD, SV, ROW and Environmental Cost(A)	O&M Cost (B)	Cost (C)	Benefit (D) VOC	Benefit (E) TTC	Benefit (G=D+E)	Benefit - Cost (G-C)
1	2017	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	2018	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	2019	156.9	0.0	156.9	0.0	0.0	0.0	-156.9
4	2020	282.0	0.0	282.0	0.0	0.0	0.0	-282.0
5	2021	1,599.9	62.0	1,661.9	8.0	334.5	342.5	-1,319.4
6	2022	1,381.7	62.0	1,443.7	16.0	669.0	684.9	-758.8
7	2023	1,495.4	62.0	1,557.4	23.9	1,003.4	1,027.4	-530.0
8	2024	1,511.2	62.0	1,573.1	31.9	1,337.9	1,369.8	-203.3
9	2025	956.4	154.9	1,111.3	8.0	1,672.4	1,680.4	569.1
10	2026	1,042.9	154.9	1,197.8	47.9	2,006.9	2,054.8	857.0
11	2027	1,051.2	154.9	1,206.1	55.9	2,341.4	2,397.2	1,191.1
12	2028	1,034.6	154.9	1,189.5	63.8	2,675.8	2,739.7	1,550.2
13	2029	1,270.8	154.9	1,425.7	71.8	3,010.3	3,082.1	1,656.4
14	2030	681.6	216.8	898.4	633.8	3,707.8	4,341.6	3,443.2
15	2031	575.9	216.8	792.7	735.4	3,915.0	4,650.4	3,857.7
16	2032	1,284.8	216.8	1,501.7	853.3	4,133.7	4,987.1	3,485.4
17	2033	1,284.8	216.8	1,501.7	990.1	4,364.7	5,354.8	3,853.2
18	2034	1,464.8	216.8	1,681.7	1,148.8	4,608.6	5,757.4	4,075.8
19	2035	1,464.8	216.8	1,681.7	1,333.0	4,866.1	6,199.1	4,517.4
20	2036	1,399.0	216.8	1,615.8	1,546.6	5,138.1	6,684.7	5,068.9
21	2037	1,362.7	216.8	1,579.5	1,794.6	5,425.2	7,219.7	5,640.2
22	2038	841.3	216.8	1,058.1	2,082.2	5,728.3	7,810.5	6,752.4
23	2039	841.3	216.8	1,058.1	2,416.0	6,048.4	8,464.4	7,406.3
24	2040		309.8	309.8	2,803.3	6,386.4	9,189.7	8,879.9
25	2041		309.8	309.8	2,895.9	6,597.3	9,493.1	9,183.3
26	2042		309.8	309.8	2,991.5	6,815.1	9,806.6	9,496.8
27	2043		309.8	309.8	3,090.3	7,040.2	10,130.4	9,820.6
28	2044		309.8	309.8	3,192.3	7,272.6	10,464.9	10,155.2
29	2045		309.8	309.8	3,297.7	7,512.8	10,810.5	10,500.7
30	2046		309.8	309.8	3,406.6	7,760.9	11,167.5	10,857.7
31	2047		309.8	309.8	3,519.1	8,017.1	11,536.2	11,226.5
32	2048		309.8	309.8	3,635.3	8,281.9	11,917.2	11,607.4
33	2049		309.8	309.8	3,755.4	8,555.3	12,310.7	12,000.9
34	2050		309.8	309.8	3,879.4	8,837.8	12,717.2	12,407.4
35	2051		309.8	309.8	4,007.5	9,129.7	13,137.1	12,827.4
36	2052		309.8	309.8	4,139.8	9,431.1	13,570.9	13,261.2
37	2053		309.8	309.8	4,276.5	9,742.6	14,019.1	13,709.3
38	2054		309.8	309.8	4,417.7	10,064.3	14,482.0	14,172.2
39	2055		309.8	309.8	4,563.6	10,396.6	14,960.2	14,650.4
40	2056		309.8	309.8	4,714.3	10,739.9	15,454.2	15,144.4
41	2057		309.8	309.8	4,869.9	11,094.6	15,964.5	15,654.7
42	2058		309.8	309.8	5,030.8	11,460.9	16,491.7	16,181.9
43	2059		309.8	309.8	5,196.9	11,839.4	17,036.3	16,726.5
44	2060		309.8	309.8	5,368.5	12,230.3	17,598.8	17,289.0
		22,983.8	9,696.1	32,679.9	96,913.2	252,194.2	349,107.4	316,427.5

Discounted Benefit Cost Stream — Bill TZS

sq	Year	Discounted (12%)	Cost (A)	Benefit (B)	Benefit - Cost (A-B)
1	2017	1.00	0.0	0.0	0.0
2	2018	1.12	0.0	0.0	0.0
3	2019	1.25	125.0	0.0	-125.0
4	2020	1.40	200.7	0.0	-200.7
5	2021	1.57	1,056.1	217.6	-838.5
6	2022	1.76	819.2	388.6	-430.5
7	2023	1.97	789.0	520.5	-268.5
8	2024	2.21	711.6	619.6	-92.0
9	2025	2.48	448.8	678.7	229.9
10	2026	2.77	431.9	741.0	309.0
11	2027	3.11	388.3	771.8	383.5
12	2028	3.48	342.0	787.6	445.6
13	2029	3.90	365.9	791.1	425.2
14	2030	4.36	205.9	995.0	789.1
15	2031	4.89	162.2	951.6	789.4
16	2032	5.47	274.3	911.1	636.8
17	2033	6.13	245.0	873.5	628.5
18	2034	6.87	244.9	838.5	593.6
19	2035	7.69	218.7	806.1	587.4
20	2036	8.61	187.6	776.1	588.5
21	2037	9.65	163.7	748.4	584.7
22	2038	10.80	97.9	722.9	625.0
23	2039	12.10	87.4	699.5	612.1
24	2040	13.55	22.9	678.1	655.2
25	2041	15.18	20.4	625.4	605.0
26	2042	17.00	18.2	576.9	558.6
27	2043	19.04	16.3	532.1	515.8
28	2044	21.32	14.5	490.7	476.2
29	2045	23.88	13.0	452.6	439.7
30	2046	26.75	11.6	417.5	405.9
31	2047	29.96	10.3	385.1	374.7
32	2048	33.56	9.2	355.2	345.9
33	2049	37.58	8.2	327.6	319.3
34	2050	42.09	7.4	302.1	294.8
35	2051	47.14	6.6	278.7	272.1
36	2052	52.80	5.9	257.0	251.2
37	2053	59.14	5.2	237.1	231.8
38	2054	66.23	4.7	218.7	214.0
39	2055	74.18	4.2	201.7	197.5
40	2056	83.08	3.7	186.0	182.3
41	2057	93.05	3.3	171.6	168.2
42	2058	104.22	3.0	158.2	155.3
43	2059	116.72	2.7	146.0	143.3
44	2060	130.73	2.4	134.6	132.3
			7,760.0	20,972.2	13,212.1

Net Present Value (Billion TzS)	13,212.1
B/C Ratio	2.70
EIRR	30.1%

Source: JST

Table 13.2.20 Cost Benefit Stream for Master Plan Project - Case 3a

Dar Es Salaam Master Plan

Undiscounted Benefit Cost Stream — Bill TZS

sq	Year	Project Cost including DD, SV, ROW and Environmental Cost(A)	O&M Cost (B)	Cost (C)	Benefit (D) VOC	Benefit (E) TTC	Benefit (G=D+E)	Benefit - Cost (G-C)
1	2017	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	2018	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	2019	156.9	0.0	156.9	0.0	0.0	0.0	-156.9
4	2020	282.0	0.0	282.0	0.0	0.0	0.0	-282.0
5	2021	2,194.2	62.0	2,256.1	8.0	334.5	342.5	-1,913.7
6	2022	1,678.9	62.0	1,740.8	16.0	669.0	684.9	-1,055.9
7	2023	1,792.6	62.0	1,854.5	23.9	1,003.4	1,027.4	-827.1
8	2024	1,808.3	62.0	1,870.3	31.9	1,337.9	1,369.8	-500.4
9	2025	1,253.5	154.9	1,408.4	8.0	1,672.4	1,680.4	272.0
10	2026	1,340.0	154.9	1,494.9	47.9	2,006.9	2,054.8	559.8
11	2027	1,348.3	154.9	1,503.2	55.9	2,341.4	2,397.2	894.0
12	2028	1,331.7	154.9	1,486.6	63.8	2,675.8	2,739.7	1,253.0
13	2029	1,568.0	154.9	1,722.8	71.8	3,010.3	3,082.1	1,359.3
14	2030	840.0	216.8	1,056.8	613.3	3,688.2	4,301.5	3,244.6
15	2031	734.3	216.8	951.1	713.9	3,896.4	4,610.3	3,659.1
16	2032	770.6	216.8	987.5	831.1	4,116.3	4,947.4	3,959.9
17	2033	770.6	216.8	987.5	967.5	4,348.6	5,316.1	4,328.6
18	2034	1,286.9	216.8	1,503.8	1,126.3	4,594.0	5,720.3	4,216.5
19	2035	1,128.5	216.8	1,345.4	1,311.2	4,853.3	6,164.4	4,819.1
20	2036	1,062.7	216.8	1,279.5	1,526.4	5,127.2	6,653.6	5,374.0
21	2037	1,026.3	216.8	1,243.2	1,776.9	5,416.6	7,193.4	5,950.3
22	2038	504.9	216.8	721.8	2,068.5	5,722.3	7,790.8	7,069.0
23	2039	504.9	216.8	721.8	2,408.0	6,045.2	8,453.3	7,731.5
24	2040		309.8	309.8	2,803.3	6,386.4	9,189.7	8,879.9
25	2041		309.8	309.8	2,895.9	6,597.3	9,493.1	9,183.3
26	2042		309.8	309.8	2,991.5	6,815.1	9,806.6	9,496.8
27	2043		309.8	309.8	3,090.3	7,040.2	10,130.4	9,820.6
28	2044		309.8	309.8	3,192.3	7,272.6	10,464.9	10,155.2
29	2045		309.8	309.8	3,297.7	7,512.8	10,810.5	10,500.7
30	2046		309.8	309.8	3,406.6	7,760.9	11,167.5	10,857.7
31	2047		309.8	309.8	3,519.1	8,017.1	11,536.2	11,226.5
32	2048		309.8	309.8	3,635.3	8,281.9	11,917.2	11,607.4
33	2049		309.8	309.8	3,755.4	8,555.3	12,310.7	12,000.9
34	2050		309.8	309.8	3,879.4	8,837.8	12,717.2	12,407.4
35	2051		309.8	309.8	4,007.5	9,129.7	13,137.1	12,827.4
36	2052		309.8	309.8	4,139.8	9,431.1	13,570.9	13,261.2
37	2053		309.8	309.8	4,276.5	9,742.6	14,019.1	13,709.3
38	2054		309.8	309.8	4,417.7	10,064.3	14,482.0	14,172.2
39	2055		309.8	309.8	4,563.6	10,396.6	14,960.2	14,650.4
40	2056		309.8	309.8	4,714.3	10,739.9	15,454.2	15,144.4
41	2057		309.8	309.8	4,869.9	11,094.6	15,964.5	15,654.7
42	2058		309.8	309.8	5,030.8	11,460.9	16,491.7	16,181.9
43	2059		309.8	309.8	5,196.9	11,839.4	17,036.3	16,726.5
44	2060		309.8	309.8	5,368.5	12,230.3	17,598.8	17,289.0
		23,384.2	9,696.1	33,080.3	96,722.2	252,066.3	348,788.6	315,708.2

Discounted Benefit Cost Stream — Bill TZS

sq	Year	Discounted (12%)	Cost (A)	Benefit (B)	Benefit - Cost (A-B)
1	2017	1.00	0.0	0.0	0.0
2	2018	1.12	0.0	0.0	0.0
3	2019	1.25	125.0	0.0	-125.0
4	2020	1.40	200.7	0.0	-200.7
5	2021	1.57	1,433.8	217.6	-1,216.2
6	2022	1.76	987.8	388.6	-599.1
7	2023	1.97	939.6	520.5	-419.1
8	2024	2.21	846.0	619.6	-226.4
9	2025	2.48	568.8	678.7	109.8
10	2026	2.77	539.1	741.0	201.9
11	2027	3.11	484.0	771.8	287.8
12	2028	3.48	427.4	787.6	360.2
13	2029	3.90	442.2	791.1	348.9
14	2030	4.36	242.2	985.8	743.6
15	2031	4.89	194.6	943.4	748.7
16	2032	5.47	180.4	903.9	723.5
17	2033	6.13	161.1	867.2	706.1
18	2034	6.87	219.0	833.1	614.1
19	2035	7.69	174.9	801.6	626.7
20	2036	8.61	148.6	772.5	624.0
21	2037	9.65	128.9	745.7	616.8
22	2038	10.80	66.8	721.1	654.3
23	2039	12.10	59.7	698.6	638.9
24	2040	13.55	22.9	678.1	655.2
25	2041	15.18	20.4	625.4	605.0
26	2042	17.00	18.2	576.9	558.6
27	2043	19.04	16.3	532.1	515.8
28	2044	21.32	14.5	490.7	476.2
29	2045	23.88	13.0	452.6	439.7
30	2046	26.75	11.6	417.5	405.9
31	2047	29.96	10.3	385.1	374.7
32	2048	33.56	9.2	355.2	345.9
33	2049	37.58	8.2	327.6	319.3
34	2050	42.09	7.4	302.1	294.8
35	2051	47.14	6.6	278.7	272.1
36	2052	52.80	5.9	257.0	251.2
37	2053	59.14	5.2	237.1	231.8
38	2054	66.23	4.7	218.7	214.0
39	2055	74.18	4.2	201.7	197.5
40	2056	83.08	3.7	186.0	182.3
41	2057	93.05	3.3	171.6	168.2
42	2058	104.22	3.0	158.2	155.3
43	2059	116.72	2.7	146.0	143.3
44	2060	130.73	2.4	134.6	132.3
			8,764.2	20,922.2	12,158.0

Net Present Value (Billion TzS)	12,158.0
B/C Ratio	2.39
EIRR	25.4%

Source: JST

Table 13.2.21 Cost Benefit Stream for Master Plan Project - Case 3b

Dar Es Salaam Master Plan

Undiscounted Benefit Cost Stream — Bill TZS

sq	Year	Project Cost including DD, SV, ROW and Environmental Cost(A)	O&M Cost (B)	Cost (C)	Benefit (D) VOC	Benefit (E) TTC	Benefit (G=D+E)	Benefit - Cost (G-C)
1	2017	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	2018	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	2019	156.9	0.0	156.9	0.0	0.0	0.0	-156.9
4	2020	282.0	0.0	282.0	0.0	0.0	0.0	-282.0
5	2021	1,078.3	62.0	1,140.2	8.0	334.5	342.5	-797.8
6	2022	1,120.9	62.0	1,182.9	16.0	669.0	684.9	-497.9
7	2023	1,234.6	62.0	1,296.6	23.9	1,003.4	1,027.4	-269.2
8	2024	1,816.1	62.0	1,878.0	31.9	1,337.9	1,369.8	-508.2
9	2025	1,261.3	154.9	1,416.2	8.0	1,672.4	1,680.4	264.2
10	2026	1,347.8	154.9	1,502.7	47.9	2,006.9	2,054.8	552.1
11	2027	1,356.1	154.9	1,511.0	55.9	2,341.4	2,397.2	886.2
12	2028	1,056.7	154.9	1,211.5	63.8	2,675.8	2,739.7	1,528.1
13	2029	1,292.9	154.9	1,447.8	71.8	3,010.3	3,082.1	1,634.4
14	2030	681.6	216.8	898.4	566.3	3,673.4	4,239.7	3,341.3
15	2031	575.9	216.8	792.7	664.5	3,882.2	4,546.8	3,754.1
16	2032	1,320.7	216.8	1,537.5	779.8	4,103.0	4,882.8	3,345.3
17	2033	1,320.7	216.8	1,537.5	915.0	4,336.3	5,251.3	3,713.8
18	2034	1,482.8	216.8	1,699.6	1,073.7	4,582.9	5,656.6	3,957.0
19	2035	1,482.8	216.8	1,699.6	1,260.0	4,843.5	6,103.5	4,403.9
20	2036	1,416.9	216.8	1,633.8	1,478.5	5,118.9	6,597.4	4,963.7
21	2037	1,380.6	216.8	1,597.4	1,734.9	5,410.0	7,144.9	5,547.5
22	2038	859.2	216.8	1,076.0	2,035.8	5,717.6	7,753.5	6,677.4
23	2039	859.2	216.8	1,076.0	2,388.9	6,042.8	8,431.7	7,355.7
24	2040		309.8	309.8	2,803.3	6,386.4	9,189.7	8,879.9
25	2041		309.8	309.8	2,895.9	6,597.3	9,493.1	9,183.3
26	2042		309.8	309.8	2,991.5	6,815.1	9,806.6	9,496.8
27	2043		309.8	309.8	3,090.3	7,040.2	10,130.4	9,820.6
28	2044		309.8	309.8	3,192.3	7,272.6	10,464.9	10,155.2
29	2045		309.8	309.8	3,297.7	7,512.8	10,810.5	10,500.7
30	2046		309.8	309.8	3,406.6	7,760.9	11,167.5	10,857.7
31	2047		309.8	309.8	3,519.1	8,017.1	11,536.2	11,226.5
32	2048		309.8	309.8	3,635.3	8,281.9	11,917.2	11,607.4
33	2049		309.8	309.8	3,755.4	8,555.3	12,310.7	12,000.9
34	2050		309.8	309.8	3,879.4	8,837.8	12,717.2	12,407.4
35	2051		309.8	309.8	4,007.5	9,129.7	13,137.1	12,827.4
36	2052		309.8	309.8	4,139.8	9,431.1	13,570.9	13,261.2
37	2053		309.8	309.8	4,276.5	9,742.6	14,019.1	13,709.3
38	2054		309.8	309.8	4,417.7	10,064.3	14,482.0	14,172.2
39	2055		309.8	309.8	4,563.6	10,396.6	14,960.2	14,650.4
40	2056		309.8	309.8	4,714.3	10,739.9	15,454.2	15,144.4
41	2057		309.8	309.8	4,869.9	11,094.6	15,964.5	15,654.7
42	2058		309.8	309.8	5,030.8	11,460.9	16,491.7	16,181.9
43	2059		309.8	309.8	5,196.9	11,839.4	17,036.3	16,726.5
44	2060		309.8	309.8	5,368.5	12,230.3	17,598.8	17,289.0
		23,383.5	9,696.1	33,079.6	96,276.8	251,969.0	348,245.8	315,166.1

Discounted Benefit Cost Stream — Bill TZS

sq	Year	Discounted (12%)	Cost (A)	Benefit (B)	Benefit - Cost (A-B)
1	2017	1.00	0.0	0.0	0.0
2	2018	1.12	0.0	0.0	0.0
3	2019	1.25	125.0	0.0	-125.0
4	2020	1.40	200.7	0.0	-200.7
5	2021	1.57	724.6	217.6	-507.0
6	2022	1.76	671.2	388.6	-282.5
7	2023	1.97	656.9	520.5	-136.4
8	2024	2.21	849.5	619.6	-229.9
9	2025	2.48	572.0	678.7	106.7
10	2026	2.77	541.9	741.0	199.1
11	2027	3.11	486.5	771.8	285.3
12	2028	3.48	348.3	787.6	439.3
13	2029	3.90	371.6	791.1	419.5
14	2030	4.36	205.9	971.6	765.7
15	2031	4.89	162.2	930.4	768.2
16	2032	5.47	280.9	892.1	611.2
17	2033	6.13	250.8	856.6	605.8
18	2034	6.87	247.5	823.9	576.3
19	2035	7.69	221.0	793.7	572.7
20	2036	8.61	189.7	766.0	576.3
21	2037	9.65	165.6	740.7	575.1
22	2038	10.80	99.6	717.7	618.1
23	2039	12.10	88.9	696.8	607.9
24	2040	13.55	22.9	678.1	655.2
25	2041	15.18	20.4	625.4	605.0
26	2042	17.00	18.2	576.9	558.6
27	2043	19.04	16.3	532.1	515.8
28	2044	21.32	14.5	490.7	476.2
29	2045	23.88	13.0	452.6	439.7
30	2046	26.75	11.6	417.5	405.9
31	2047	29.96	10.3	385.1	374.7
32	2048	33.56	9.2	355.2	345.9
33	2049	37.58	8.2	327.6	319.3
34	2050	42.09	7.4	302.1	294.8
35	2051	47.14	6.6	278.7	272.1
36	2052	52.80	5.9	257.0	251.2
37	2053	59.14	5.2	237.1	231.8
38	2054	66.23	4.7	218.7	214.0
39	2055	74.18	4.2	201.7	197.5
40	2056	83.08	3.7	186.0	182.3
41	2057	93.05	3.3	171.6	168.2
42	2058	104.22	3.0	158.2	155.3
43	2059	116.72	2.7	146.0	143.3
44	2060	130.73	2.4	134.6	132.3
			7,654.0	20,838.7	13,184.7

Net Present Value (Billion TzS)	13,184.7
B/C Ratio	2.72
EIRR	32.3%

Source: JST

Table 13.2.22 Cost Benefit Stream for Master Plan Project - Case 4

Dar Es Salaam Master Plan

Undiscounted Benefit Cost Stream — Bill TZS

sq	Year	Project Cost including DD, SV, ROW and Environmental Cost(A)	O&M Cost (B)	Cost (C)	Benefit (D) VOC	Benefit (E) TTC	Benefit (G=D+E)	Benefit - Cost (G-C)
1	2017	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	2018	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	2019	156.9	0.0	156.9	0.0	0.0	0.0	-156.9
4	2020	282.0	0.0	282.0	0.0	0.0	0.0	-282.0
5	2021	1,764.5	62.0	1,826.5	8.0	334.5	342.5	-1,484.0
6	2022	1,464.0	62.0	1,526.0	16.0	669.0	684.9	-841.1
7	2023	1,577.7	62.0	1,639.7	23.9	1,003.4	1,027.4	-612.3
8	2024	1,593.5	62.0	1,655.4	31.9	1,337.9	1,369.8	-285.6
9	2025	1,038.7	154.9	1,193.6	8.0	1,672.4	1,680.4	486.8
10	2026	1,125.2	154.9	1,280.1	47.9	2,006.9	2,054.8	774.7
11	2027	1,133.5	154.9	1,288.4	55.9	2,341.4	2,397.2	1,108.8
12	2028	1,116.9	154.9	1,271.8	63.8	2,675.8	2,739.7	1,467.9
13	2029	1,353.1	154.9	1,508.0	71.8	3,010.3	3,082.1	1,574.1
14	2030	681.6	216.8	898.4	635.7	3,742.0	4,377.7	3,479.3
15	2031	575.9	216.8	792.7	737.4	3,947.4	4,684.9	3,892.2
16	2032	1,200.1	216.8	1,417.0	855.4	4,164.2	5,019.6	3,602.6
17	2033	1,200.1	216.8	1,417.0	992.2	4,392.9	5,385.0	3,968.1
18	2034	1,422.5	216.8	1,639.3	1,150.9	4,634.1	5,785.0	4,145.6
19	2035	1,422.5	216.8	1,639.3	1,335.0	4,888.5	6,223.5	4,584.2
20	2036	1,356.6	216.8	1,573.5	1,548.5	5,156.9	6,705.5	5,132.0
21	2037	1,320.3	216.8	1,537.2	1,796.2	5,440.1	7,236.3	5,699.1
22	2038	798.9	216.8	1,015.8	2,083.5	5,738.8	7,822.3	6,806.5
23	2039	798.9	216.8	1,015.8	2,416.7	6,054.0	8,470.7	7,454.9
24	2040		309.8	309.8	2,803.3	6,386.4	9,189.7	8,879.9
25	2041		309.8	309.8	2,895.9	6,597.3	9,493.1	9,183.3
26	2042		309.8	309.8	2,991.5	6,815.1	9,806.6	9,496.8
27	2043		309.8	309.8	3,090.3	7,040.2	10,130.4	9,820.6
28	2044		309.8	309.8	3,192.3	7,272.6	10,464.9	10,155.2
29	2045		309.8	309.8	3,297.7	7,512.8	10,810.5	10,500.7
30	2046		309.8	309.8	3,406.6	7,760.9	11,167.5	10,857.7
31	2047		309.8	309.8	3,519.1	8,017.1	11,536.2	11,226.5
32	2048		309.8	309.8	3,635.3	8,281.9	11,917.2	11,607.4
33	2049		309.8	309.8	3,755.4	8,555.3	12,310.7	12,000.9
34	2050		309.8	309.8	3,879.4	8,837.8	12,717.2	12,407.4
35	2051		309.8	309.8	4,007.5	9,129.7	13,137.1	12,827.4
36	2052		309.8	309.8	4,139.8	9,431.1	13,570.9	13,261.2
37	2053		309.8	309.8	4,276.5	9,742.6	14,019.1	13,709.3
38	2054		309.8	309.8	4,417.7	10,064.3	14,482.0	14,172.2
39	2055		309.8	309.8	4,563.6	10,396.6	14,960.2	14,650.4
40	2056		309.8	309.8	4,714.3	10,739.9	15,454.2	15,144.4
41	2057		309.8	309.8	4,869.9	11,094.6	15,964.5	15,654.7
42	2058		309.8	309.8	5,030.8	11,460.9	16,491.7	16,181.9
43	2059		309.8	309.8	5,196.9	11,839.4	17,036.3	16,726.5
44	2060		309.8	309.8	5,368.5	12,230.3	17,598.8	17,289.0
		23,383.4	9,696.1	33,079.5	96,930.8	252,417.2	349,348.0	316,268.5

Discounted Benefit Cost Stream — Bill TZS

sq	Year	Discounted (12%)	Cost (A)	Benefit (B)	Benefit - Cost (A-B)
1	2017	1.00	0.0	0.0	0.0
2	2018	1.12	0.0	0.0	0.0
3	2019	1.25	125.0	0.0	-125.0
4	2020	1.40	200.7	0.0	-200.7
5	2021	1.57	1,160.7	217.6	-943.1
6	2022	1.76	865.9	388.6	-477.2
7	2023	1.97	830.7	520.5	-310.2
8	2024	2.21	748.8	619.6	-129.2
9	2025	2.48	482.1	678.7	196.6
10	2026	2.77	461.6	741.0	279.4
11	2027	3.11	414.8	771.8	357.0
12	2028	3.48	365.6	787.6	422.0
13	2029	3.90	387.1	791.1	404.0
14	2030	4.36	205.9	1,003.3	797.4
15	2031	4.89	162.2	958.6	796.4
16	2032	5.47	258.9	917.1	658.2
17	2033	6.13	231.1	878.4	647.3
18	2034	6.87	238.8	842.5	603.8
19	2035	7.69	213.2	809.3	596.1
20	2036	8.61	182.7	778.5	595.9
21	2037	9.65	159.4	750.2	590.8
22	2038	10.80	94.0	724.0	630.0
23	2039	12.10	83.9	700.0	616.1
24	2040	13.55	22.9	678.1	655.2
25	2041	15.18	20.4	625.4	605.0
26	2042	17.00	18.2	576.9	558.6
27	2043	19.04	16.3	532.1	515.8
28	2044	21.32	14.5	490.7	476.2
29	2045	23.88	13.0	452.6	439.7
30	2046	26.75	11.6	417.5	405.9
31	2047	29.96	10.3	385.1	374.7
32	2048	33.56	9.2	355.2	345.9
33	2049	37.58	8.2	327.6	319.3
34	2050	42.09	7.4	302.1	294.8
35	2051	47.14	6.6	278.7	272.1
36	2052	52.80	5.9	257.0	251.2
37	2053	59.14	5.2	237.1	231.8
38	2054	66.23	4.7	218.7	214.0
39	2055	74.18	4.2	201.7	197.5
40	2056	83.08	3.7	186.0	182.3
41	2057	93.05	3.3	171.6	168.2
42	2058	104.22	3.0	158.2	155.3
43	2059	116.72	2.7	146.0	143.3
44	2060	130.73	2.4	134.6	132.3
			8,066.8	21,011.3	12,944.5

Net Present Value (Billion TzS)	12,944.5
B/C Ratio	2.60
EIRR	28.6%

Source: JST

13.2.10 Financial Evaluation of the Priority Project

In this section, the financial analysis was also carried out for the 5 cases of MRT as described in Section 13.2.1. This section used the same methodology of conducting financial analysis as in Section 12.

The financial evaluation also tried to evaluate the probability of private sectors participation into the proposed projects by means of Hybrid (Horizontal Cut) PPP modality as explained in Chapter 11. Under this scenario, the private sector will undertake the investment of the whole Rolling Stock and full Operation and Maintenance (O&M) work of each line, while the public sector will undertake the investment for all infrastructures other than the Rolling Stock. The financial evaluation for the PPP modality has been conducted on the selected priority projects.

(1) Prerequisite Conditions for Financial Analysis

The Prerequisite Conditions applicable for the MRT project are shown in Table 13.2.23.

Table 13.2.23 Prerequisite Conditions for Financial Analysis

Item	Description	Detail	Term/Amount
1	Preparation and Construction	Existing Line	2018-2024
2	Preparation and Construction	New Line	2021-2029
3	Fare (Starting amount 2018)	Adult	USD0.037/man/km
4		Student	50% of Adult
5		Escalation ratio	2.0%/year, compound
6	Yearly Operation Days	Flat	300 days
7	Commercial Operation Date (COD)	Case 1&2(existing line)	2025
8		Case 1&2 (New Line)	2030
9		Case 3a, 3b & 4 New Line	2030
10	Operation Term (computation)	Last Year (30 years)	2059
11	Demand Focus of Passenger 2030-2040	Case 1 (1000 man-km)	12,368-15,844
12		Case 2 (ditto)	14,916-20,638
13		Case 3a (ditto)	13,173-17,710
14		Case 3b (ditto)	11,453-16,651
15		Case 4 (ditto)	13,444-19,106
16	Operation & Maintenance Cost	Case 1 (existing line)	CAPEX*6.4%
17		Case 1-2 (new line)	CAPEX*3.2%
18		Case 2 (existing & new line)	CAPEX*6.5%
19		Case 3a (new line)	CAPEX*2.6%
20		Case 3b (new line)	CAPEX*5.0%
21		Case 4 (new line)	CAPEX*4.3%
22	Project Cost for Construction	inclusive of Civil, Track, Electrical, Mechanical, Signal and Telecommunication	
23	Project Cost for Rolling Stock	All Rolling Stock	
24	PIRR for all Case	Investment for all Cost (Public)	Cost of Construction & Rolling Stock
25	PIRR by Horizontal Cut Modality	Investment (Private)	Cost of Rolling Stock

Source: JST

(2) Estimated Project Revenue

The following table indicate the magnitude of revenues generated by the commuters and/or passengers who will use the proposed MRT line. The amount corresponds to the number of users of each case.

Table 13.2.24 Project Revenue of All Cases (Accumulated 2030-2060)

Case	Description of Case	Amount by USD (unit million)	Amount by TZS (unit million)	Investment Amount (unit Billion USD)
Case 1	Full Loop Line	7,461	16,608,944	2.47
Case 2	Half Loop Line& Tegeta Line	9,948	22,144,703	1.48
Case 3a	Tegeta Line 1	7,950	17,696,426	1.28

Case 3b	Tegeta Line 2	7,397	16,464,939	1.29
Case 4	Tegeta Line + Loop Line	8,528	18,982,611	1.40

Source: Calculated by Source: JST

(3) Result of Financial Analysis

Based on the figures of prerequisite conditions, the PIRR was computed as shown in Table 13.2.25. Although the PIRR figure is low and the project seems not to be so profitable compared to aforesaid, the computed PIRR is still higher than the interest of Japanese ODA loan, which is 0.01% for Tanzania. The cash flow analysis also revealed that the Implementing Authority, assuming TRC, would be able to receive the surplus cash flow by the commencement of the operation. Therefore, the Project is acceptable in terms of financial feasibility.

Each candidate's result as the indicator of the computation is shown below.

Among the candidates, the highest PIRR is 8.24% for the Case 3b. Other cases are lower than Case 3b, therefore Case 3b is highly recommended as the first MRT project based on the evaluation methodology of PIRR.

Table 13.2.25 PIRR of Base Case & Sensitivity Analysis (%)

Case	Classification	Case 1	Case 2	Case 3a	Case 3b	Case 4
I	Base Case	1.07%	6.87%	3.85%	8.24%	8.19%
II	CAPEX up +20%	0.29%	5.81%	2.91%	7.01%	6.96%
III	Net profit -20%	0.11%	5.58%	2.70%	6.74%	6.69%
IV	CAPEX up +20% & Net Profit -20%	-0.64%	4.58%	1.82%	5.61%	5.56%
Investment Cost unit: Billion USD		2.47	1.63	2.94	1.55	1.80

Source: Calculated by JICA Study Team

(4) Consideration of the Possibility of the Public Private Partnership Methodology

Table 13.2.26 shows the sensitivity analysis where the case of with/without Railway Service Charge assumed 25% of the net operating profit. Private companies might have a chance to participate in the O&M business if there is a subsidy.

Table 13.2.26 PIRR for the Horizontal Cut (Unbundle) of PPP Modality (Private Sector) for Case 3b

No.	Classification	Rolling Stock invests 100% by Private		Rolling Stock invests 50% by Private
		Without Revenue Share to Public **Case 3b-1**	With Revenue Share to Public (25% of Net Operating Profit) **Case 3b-2**	With Revenue Share to Public (25% of Net Operating Profit) **Case 3b-3**
1	Base Case	18.03%	14.93%	24.78%
2	CAPEX up +20%	16.01%	13.19%	22.06%
3	Net profit -20%	15.58%	12.82%	21.49%
4	CAPEX up +20% & Net Profit -20%	13.79%	11.27%	19.10%

Source: Calculated by JICA Study Team

(5) Recommendation from the Financial and Economical Aspect

The MRT project shall be financially feasible and economically viable by means of either the conventional public work or the Horizontal Cut PPP modality, provided that the Government of Tanzania will have to procure the sufficient amount of funds lower than the PIRR. Also, in order to establish the financial sustainability, the following issues and counter measures are to be considered;

i. PIRR is insufficient for the participation of the private sector.

【Measures】The lower cost of finance than the PIRR shall be procured, i.e., ODA of the Government of Japan, for both public work and PPP modality.

ii. At present, the total investment cost for the Government of Tanzania is rather high.

【Measures】EIRR has clearly verified the necessity of the MRT project in the long term point of view for the Dar es Salaam. Thus, the Government of Tanzania shall proceed with the MRT projects based on the result recommendation of the financial analysis.

iii. PIRR of Horizontal Cut (Unbundle) modality is still weak for the private sectors.

【Measures】The lower cost of finance resource shall be procured for the private sectors, i.e., PSIF of JICA, including the support of the Government of Tanzania.

iv. Implementing Authority of MRT system does not exist in Tanzania.

【Measures】TRC or any Authority shall be structured, empowered and capacitated to cope with the new management, administration and operation and maintenance skills.

v. It is indispensable to establish a strong advisory group for the sustainable safety operation and be recognized by the public and/or private sectors.

【Measures】An experienced international railway operator shall be involved in the TRC or any Authority by means of the co-investor, advisor and/or contractor.

vi. Comprehensive financial sources shall be indispensable for all the M/P projects.

【Measures】Financial sources to implement the infrastructures of the M/P, the Government of Tanzania shall consider the following measures;

- To implement the appropriate beneficiary payment system.
- To implement the appropriate PPP modality.
- To consider the implementation of new taxes such as Traffic Tax.
- To generate additional revenues through the development of station area (TOD) to support TRC or any Authority.

CHAPTER 14 CONCLUSION AND RECOMMENDATION

In this chapter, the conclusions of the final report is summarised focusing on the most important contents of the Dar es Salaam Urban Transport Master Plan for 2040. Then, recommendations focusing on the next action is described.

14.1 Conclusion

1) Future Population and Urban Structure

Current population in Dar es Salaam is 5.8 million in 2017, and is estimated to be 12 million in 2040. Greater Dar es Salaam, areas covers approximately 50 km away from CBD, will be formed in 2040, and its population is estimated 15 million. Master Plan proposed the urban structure as "Palm and Fingers", forming five radial urban corridors and one loop corridor. To formulate that structure, Master Plan proposed the creation of sub-centres and satellite cities, which are connected to CBD.

2) Transit Oriented Mega City

In order to deal with the increasing traffic demand until 2040, cooperation and collaboration of BRT and Railway is proposed to improve travel speed, punctuality and mobility, thus one hour reachable within the City by public transport. BRT delivers transport service for short and medium distance movement, while urban railway covers middle and long distance travel. Transit Oriented Development (TOD) is proposed along railway and BRT corridor. Therefore, the Concept of the M/P is "Transit Oriented Mega City"

3) Improvement of Road Infrastructure to Maximize Investment Effect

Basic policy of Road Plan is to formulate a "Radial and Circular Trunk Road Network", to enhance the function and capacity of transport infrastructure. Three new road developments are proposed: Middle Ring Road at 20 km away from CBD, Outer Ring Road at 30 km away from CBD, and Bay Link Road to Kigamboni on coastline. Tunnel structure is included at the bay mouth of Bay Link Road, where linked CBD to Kigamboni.

Fry-over projects at the intersection and improvement of Feeder Roads are also proposed. Improvement of bottleneck shall contribute to reduce congestion, risk of traffic accident, flood prevention, and improvement of quality of life in DSM.

4) Traffic Management with Advanced Technology

Next 20 years shall be the innovative time for urban transport. Master Plan proposed the introduction of appropriate traffic management system with advanced technology; Dynamic Signal Control Optimization System, Real-Time Traffic Information System, and Public Transport Priority System until 2030. With those advanced traffic management system implementation, Dar es Salaam shall become a leading Mega City in Africa.

5) Capacity Development

To ensure the steady implementation, Master Plan Team clarified its ownership, demarcated the responsibility of stakeholders, proposed the creation of DSM Development Information Centre to share and integrate all the relevant data, and request early-establishment of coordination body. Public-Private partnership is also required to promote TOD. Technical cooperation shall assist capacity development to implement the Master Plan projects.

6) Project Cost and Economic Evaluation

Total project cost is about US $ 10 billion as a cost of investing in 22 years from 2018 to 2040. It equivalents to about 22 trillion Tanzanian Shilling, including construction, rolling stocks,

equipment, land acquisition and compensation, design, and overhead cost. Based on the economic evaluation, the economic internal rate of return (EIRR) is 32.3%, which is feasible.

Table 14.1.1 Summary of Proposed Project Cost

Project		Quantities	USD (million)
A. Road Project	01. Middle Ring Road	50.9 km	903
	02. Bay Link Road	46.7 km	707
	03. Outer Ring Road	77.5 km	664
	04. Flyover	11 nos	987
	05. Collector Road	L.S	460
	Total		**3,721**
B. Railway Project *1	01. Upgrade of Ubungo line	11.7 km	207
	02. Track doubling of Pugu line	20.0 km	231
	03. Tegeta Line (Aga Khan-Tegeta)	21.7 km	1,196
	04. Extension line between Mwenge and Ubungo	4.5 km	151
	05. Morogoro line	26.0 km	1,216
	06. Extension line between Aga Khan and Central	4.7 km	999
	07. Extension line between Tegeta and Bunju	13.0 km	517
	Total		**4,517**
C. BRT Project	01. BRT Lane Construction *2	72 km	**249**
D. Terminal	01. Public Transportation Terminal	17 nos	**33**
E. Traffic Management	01. ITS Facilities and Signals *3	1 nos	**78**
F. Waterway	01. Pier Construction	1 nos	10
	02. Boat Purchase	2 nos	13
	Total		**23**
Total Construction Cost			**8,621**
Others			**1,724**
Initial Cost			**10,345**

*1: excluding Kilwa line (construction after 2040)

*2: excluding phase-1 (Extension) - phase 4

*3: including ITS and Signal only, excluding other facilities

Source: JST

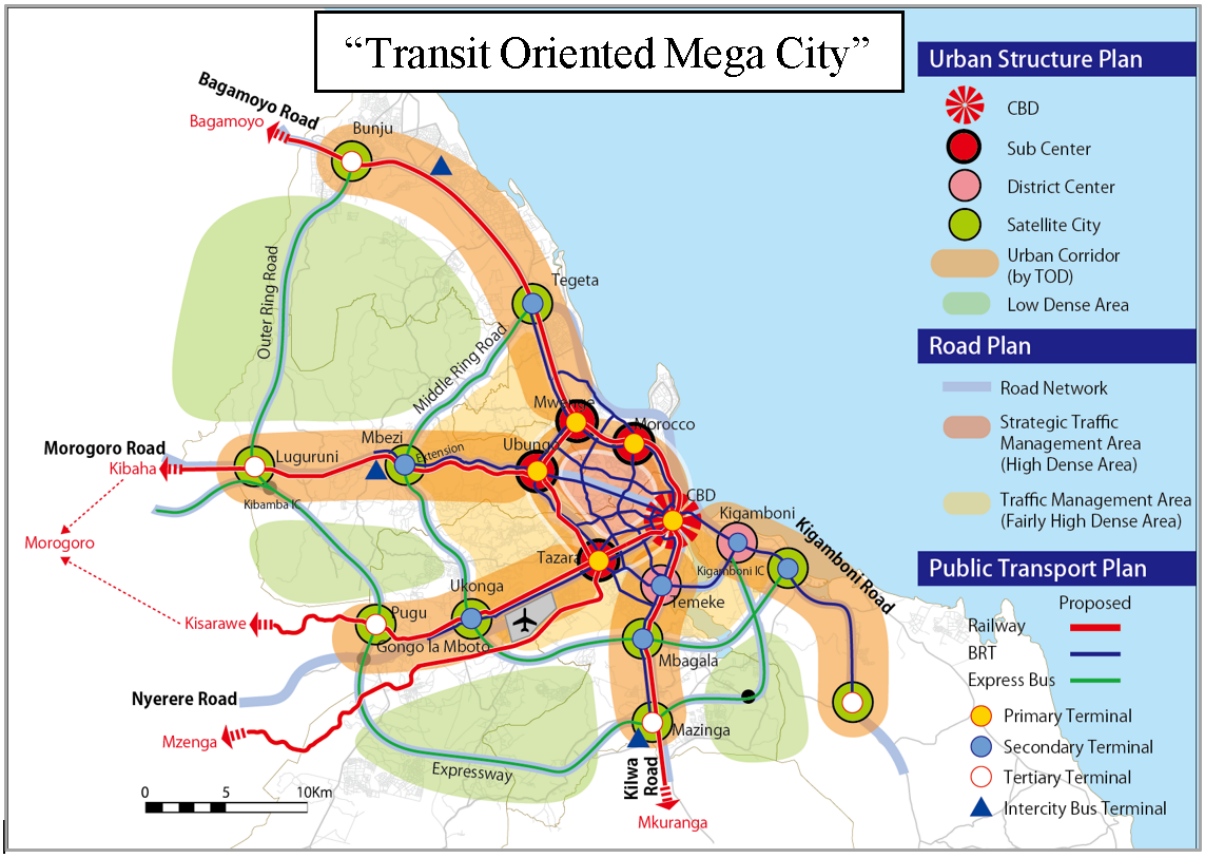


Figure 14.1.1 Dar es Salaam Urban Transport Master Plan Vison

Table 14.1.2 Comparison of Transport Infrastructures between Current Condition and Future Plan (2017 and 2040)

Item	Current Status 2017	Future Vision 2040	Remarks
Railway Network	TRC（2 lines）：31.7km TAZARA：18.0km	TRC（4 lines):101.4km TAZARA：18.0km	Additional 69.7km until 2040 Kilwa line with 15.0km after 2040
BRT Network	Phase 1 ：20.9km	Phase 1 -7：163.1km	Additional 142.2km until 2040
Roads Network	Roads with 4-6 lanes：102km Roads with 2 lanes：536km Total length：638km	Roads with 4-6 lanes：372km Roads with 2 lanes：1,195km Total length：1,566km	4-6lanes roads：additional 270km 2 lanes roads：additional 659km Total length：additional 929km

14.2 Recommendation

1) Reflecting M/P Proposal into the Relative Policy and Plans

The concept of this M/P is "Transit Oriented Mega City". Key strategy is to establish "Palm and Fingers" urban structure by applying TOD development, through improving capacity and service standard of the public transport by networking various transport modes, railway and BRT.

Concept shall be well known and shared among the stakeholders. In order to promote harmonization of the number of related plans and policies, it is requested for PO-RALG to ensure M/P contents is reflected into National, Regional and City plans and policies, specially to Dar es Salaam Master Plan (2012-2032, MOLHHSD), National Transport Policy (Transport-MOWTC), and the upcoming National Five-Year Development Plan (FYDP, MOFP).

2) Promoting Appropriate Land Use by the Regulation

It is surely assumed that the population of Dar es Salaam will continue to increase in the following years. Overcrowding invites various negative impacts and risks, such as traffic congestion, natural disasters, hygiene, security, and natural environment destruction. In order to prevent such a situation, it is necessary to focus on the effective investment for the transport infrastructure to guide appropriate inhabitants to five urban corridors (Bagamoyo, Morogoro, Nyerere, Kilwa, Kigamboni).

Hilly suburbs between the five corridors should be controlled within the zones and development any large-scale residential or commercial buildings should not be allowed. For that purpose, it is recommended to formulate appropriate land development regulation and standards. On-going DSM Master Plan undertaken by MOLHHSD shall be completed in a short period and is expected to act as the land use regulation for DSM to guide the City in the appropriate manner.

Land use regulation shall be formulated in consideration of population increase and population density in the future. Population of DSM is estimated at 12 million in 2040, thus, preventing overcrowding, risk of degrading sanitation, disaster and environmental damage shall be important issues. To guide appropriate land use to meet the increasing population in the future, population density of the City shall be set as less than 10,000 people / km^2.

3) Promoting TOD through Networking Railway and BRT Collaboration

Along the five urban corridors, it is recommended to invite the private sector for the constructive urban development. Promoting modal shift by improving the capacity and service standard of public transportation will contribute to decrease the traffic congestion and reduce the number of cars used. Networking railway and BRT in the future will be the main transport mode to promote TOD. Applying TOD approach shall improve revenue for the operating agencies by increasing number of users, and drastically reduce road congestion loss.

Proposed railway project with the elevated structure enables to provide high speed, frequent and mass transit services. It shall dramatically increase the value of land along the railway line. New business model shall be developed through TOD approach by revenue generation with sale of land around the station, development of commercial, business, residential area, etc. In addition to passenger revenue, such development projects lead to early recovery of infrastructure investment for the transport operation agencies. This business model is particularly noticeable as the good practice in Japanese railway business.

Virtuous circle towards TOD Mega City shall be created by applying TOD which has a wide range of spin-off effects in railway business, to generate revenue from various fields of development. Additional railway infrastructure shall be implemented with this business model and invite an increase of transportation users.

It is necessary to develop such business management in Tanzania. Establishing a legal framework and systems for TOD, creation of public-private funds is recommended through technical cooperation.

4) Developing Radial-Circular Road Network for Logistics

Middle ring road and the outer ring road shall formulate a new bypass route complementing the traffic volume of Nelson Mandela Road. It shall contribute to improve the traffic flow in the suburbs. In the future, three ring roads connect five radiating trunk roads. Creation of entire road network is crucial to meet the large demand of road traffic, and to ensure the safety.

New development of high standard roads in the suburbs is becoming difficult in DSM, since a number of houses are built every year. However, in Dar es Salaam where the expansion of urban area is proceeding, the proposed ring roads are indispensable to ensure safe, convenient, comfortable circumstances for the quality of life. It also prevents situations such as large cargo trucks overflowing on radial arterial roads, traffic congestion and accidents becoming chronic, cargo vehicles entering quiet environment areas in the suburbs.

Numbers of freight traffic from the industrial areas of DSM Port and the Nyerere Road shall shift to circled-bypassed road network, when proposed M/P project of Nelson Mandela Road (connecting 10 km away from CBD), middle ring road (20 km zone away from CBD) and outer ring road (30km zone away) are developed. In addition to promote modal shift of long-distance freight to railways from trucks, development of road capacity by ring road is crucial for cargo transport in DSM, Tanzania's largest consuming area. This is recommended as the priority action to be undertaken in the short-term period.

5) Early-Engagement for the Prioritized Project: F/S for Tegeta Railway Line

Tegeta railway line is recommended as one of the prioritized projects based on the Pre-F/S result, due to high traffic demand and effect on reducing congestion. Tegeta line connects Aga Khan in CBD and Tegeta town in suburb. This section consists partly of the proposed Bagamoyo railway line. Railway Morogoro line, connecting Ubungo and Movezi, is also a highly prioritized project, due to high traffic demand. Linkage of these two railway lines at an early stage shall significantly enhance the capacity of the entire public transportation network and contribute to improve the public transport service standard.

Tegeta railway line is appropriate for TOD, because of higher potential for urban development, reasonable land prices, and it is less difficult for technical railway construction due to topographical conditions, and low population density. For those reasons, it is recommended to engage F/S for Tegeta railway line early. While the case study is being carried out at Tegeta line, technical cooperation is recommended to support capacity development for TOD implementation, institutional arrangement of PPP, and establishment of investment fund.