

Dar es Salaam City Council
The United Republic of Tanzania

Dar es Salaam

Transport Policy and System Development

Master Plan

Final Report

June 2008

JAPAN INTERNATIONAL COOPERATION AGENCY

PACIFIC CONSULTANTS INTERNATIONAL
CONSTRUCTION PROJECT CONSULTANTS

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(as of December 2007)

Preface

In July 2005, The Government of Tanzania (hereinafter referred to as GOT) officially requested the Government of Japan (hereinafter referred to as GOJ) to provide Japan's technical assistance in developing a transportation master plan named the "Urban Transport Policy and System Development Master Plan for the City of Dar es Salaam" (hereinafter referred to as the Study).

In response to the request from GOT, Japan International Cooperation Agency (hereinafter referred to as JICA) dispatched a preparatory study team, and the Scope of Work of the Study and the Minutes of Meeting were signed and exchanged between Dar es Salaam City Council (hereinafter referred to as DCC, the implementation agency of the Study) and JICA in December 2006.

JICA has selected a consortium of consultant, consisting of Pacific Consultants International (hereinafter referred to as PCI) and Construction Project Consultants Inc. (hereinafter referred to as CPC), both of Tokyo, Japan, in February 2007. The Study Team, under the direction of Mr. Junji Shibata, PE., has initiated technical efforts since April 2007 and has completed the Study in June 2008.

The overall goal of the Study is to formulate Transportation Policy and System Development Master Plan with the target year of 2030 for the city of Dar es Salaam. Under the short-term objectives of the Study, it is requested to formulate short-term action plans to alleviate the current traffic congestion problems and prepare Preliminary Feasibility Study (pre-FS) for the selected priority projects. Concurrently it was required to develop a Capacity Development plan in order to assure effective implementation of the proposed projects.

Since the initial mobilization in April 2007, the study team has, over a 12 month period, conducted a series of traffic surveys, database development, transport modeling, preliminary feasibility studies and master plan development. In parallel with the study progress, a series of meetings were organized, which has resulted in an increase of ownership mind of the Study as well as quality of the products.

Finally, it is my hope that this report will contribute to prosperity of the city of Dar es Salaam towards a world city and I wish to express my sincere appreciation to all the officials and stakeholders for their generous cooperation to the Study.

June 2008

Eiji Hashimoto

Vice President

Japan International Cooperation Agency

June 2008

Mr. Eiji Hashimoto
Japan International Cooperation Agency
Tokyo, Japan

Letter of Transmittal

Dear Sir,

We are pleased to submit herewith the Final Report of the “Dar es Salaam Transport Policy and System Development Master Plan”.

The Study was undertaken in the United Republic of Tanzania from April 2007 through June 2008 by a consortium of consultant, consisting of Pacific Consultants International and Construction Project Consultants Inc., both of Tokyo.

The final deliverables include Executive Summary Report, Master Plan Report, Feasibility Study Reports of the selected two priority projects, a series of Technical Reports, and CDs including GIS database, Traffic Data and Transport Model developed by STRADA.

We would like to express our sincere gratitude and appreciation to all the officials of your agency and the JICA advisory committee. We also would like to send our great appreciation to all those who extended their kind assistance and cooperation to the Study Team, in particular, Dar es Salaam City Council as the counterpart agency.

We hope that implementation of the projects and recommendations suggested in the study reports will contribute to further development and prosperity of Dar es Salaam, the United Republic of Tanzania.

Very truly yours,

柴田純治

Junji Shibata, PE.
Study Team Leader
Pacific Consultants International

Dar es Salaam Transport Policy and System Development Master Plan

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ABBREVIATIONS

AfDB	African Development Bank
BRT	Bus Rapid Transit
B/C	Benefit/Cost
CBA	Cost Benefit Analysis
CBD	Central Business District
CDM	Clean Development Mechanism
CTS	Center for Transport Studies
DARCOBOA	Dar es Salaam Commuter Bus Owners Association
DART	Dar es Salaam Rapid Transit
DCC	Dar es Salaam City Council
DeS-RS	Dar es Salaam Regional Secretariat
DLAs	Dar es Salaam Local Authorities
DUDA	Dar es Salaam Urban Development Agency
DUTA	Dar es Salaam Urban Transport Authority
EC	European Commission
EIRR	Economic Internal Rate of Return
EU	European Union
GAM	Goal Achievement Matrix
GDP	Gross Domestic Product
GOT	Government of Tanzania
HIS	Household Interview Survey
ICD	Inland Container Depot
IMF	International Monetary Fund
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
LFA	Logical Framework Approach
MLHSD	Ministry of Lands and Human Settlements Development
MPWTC	Ministry of Public Works, Transportation and Communications*
MOF	Ministry of Financing
MOHAS	Ministry of Home Affairs and Security
MOID	Ministry of Infrastructure and Development
MOLHSD	Ministry of Lands, Housing and Human Settlement Development
MOTC	Ministry of Transportation and Communications*
NBS	National Bureau of Statistics
NCTS	National Center for Transportation Studies
NGO	Non-Governmental Organizations
NHC	National Housing Corporation
NIT	National Institute of Technology
NMT	Non-motorized Transport
NPV	Net Present Value
NRC	National Railway Corporation
NSSF	National Social Security Fund
OBM	Output-based management
ORR	Outer Ring Road
PBC	Performance-based Contracts
PBM	Performance-based Management

PMO-RALG	Prime Minister's Office - Regional Administration and Local Government Office
PCM	Project Cycle Management
PDM	Project Design Matrix
PPP	Public Private Partnership
PSO	Public Service Obligation
PRSP	National Poverty Reduction Strategy Paper
RDS	Rural Development Strategy
ROW	Right-of-way
RPM	Regulatory Procedures Manual
SCF	Standard Conversion Factor
SMEs	Small and medium sized Enterprise
SUDP	Strategic Urban Development Plan
SUMATRA	Surface and Marine Transport Regulatory Authority
TANROADS	Tanzania National Roads Agency.
TAS	Tanzania Assistance Strategy
TDM	Traffic Demand Management
TDR	Transfer of Development Right
TIF	Tax Increment Financing
TRA	Tanzania Revenue Authority
TRD	Transfer of Development Right
TRL	Tanzania Railways Limited
TSIP	Transport Sector Investment Programme
TTC	Transport Training Center
UGB	Urban Growth Boundary
UN	United Nations
USAID	United States Agency for International Development
VAT	Value Added Tax
VOC	Vehicle Operating Cost
WB	World Bank

Chapter 1 Introduction

1.1 Introductory Comments

The overall goal of the Study is to formulate Transportation Policy and System Development Master Plan with the target year of year 2030 for the city of Dar es Salaam. As the short-term objectives of the Study, it is requested to formulate action plans to alleviate the current traffic congestion problems and prepare preliminary feasibility study (pre-FS) for the selected two priority projects: Gerezani Area Transport Enhancement Project and Tazara Intersection Improvement Project. Concurrently it is required to develop a capacity development plan in order to assure effective implementation of the proposed projects, which has been developed as a plan for establishing National Center for Transport Studies (NCTS). Institutional development is another important issue in order to implement the proposed projects in a sustainable manner. An organization named Dar es Salaam Urban Transport Authority (DUTA) has been proposed in this study, which shall be responsible for overall transport development in Dar es Salaam.

Since the first mobilization in April 2007, the study team has, over an about one year period, conducted a series of traffic surveys, review work on the previous efforts, a series of steering committee meetings and stakeholder meetings, transport model development and a number of simulation works. Each of which has led to some important fact findings and the ideas presented in this final report.

This Final Report compiles the ideas that have been developed together by the Study Team and the stakeholders during the last twelve months period. It is very much appreciated if this report could be a basis for further discussions to be made by the present and future stakeholders.

1.2 Major Contents

Chapter 2, The Vision for Dar es Salaam, provides long-term perspectives and framework for the Dar es Salaam Transport Policy and System Development Master Plan. As the recommended vision of the city, the Dar es Salaam Development Vision – 2030: the Gamma World City was developed. **Chapter 3, Planning Framework**, following the vision statement presented in Chapter 2, this chapter designates a long-term planning framework for the transport system development in terms of demographic, economic and spatial structure (guideline).

Chapter 4, Road Transport Sector, summarises the proposed road network plan for the two planning horizons, namely the year 2015 and 2030 with an overall implementation plan of them. A significant proposal is prepared for new standards of urban roads in Dar es Salaam. Also this chapter identifies some priority areas where immediate actions are very much necessary to alleviate serious traffic problems in near future. The identified priority areas include Ubungo and Tazara intersection and Gerezani area. Among them, the areas: Taraza intersection and Gerezani area were selected as objectives of the pre-FS. In addition, 8 priority intersections were identified, that require grade separation in the near future.

Chapter 5, Public Transport Sector, summarises the proposed public transport system for Dar es Salaam. Bus Rapid Transit (BRT) systems will be the primary (or spine) public transport system in future. A total of about 370km BRT routes was identified on the proposed primary arterial roads. In addition to the BRT system, secondary bus systems (large buses) on the secondary arterial roads are also included in the plan, while the current Dala Dala operation will be removed from the city in future. In addition to the physical development plan of the public transport system, an important discussion was made in the field of institutional and organizational development for improvement of the public transport service provision in Dar es Salaam. In this context, role of DART agency and its risk management are presented in this chapter. A short-term improvement plan for Dala Dala was also briefly discussed as a part of short-term action plans.

Chapter 6, CBD Traffic Management, focuses on the short-term traffic management of CBD (central business district) with BRT Phase 1 operation (which is expected to open to public in late 2009). The BRT Phase 1 project, of which financing for the civil works has been committed by WB as of year 2007, will have a significant impact on the CBD road network. The JICA study team made a careful analysis of the CBD traffic flow using microscopic simulation model, and accordingly proposed some improvements for this area. In addition a general idea for medium to long-term traffic management and enhancement in CBD is also presented.

Chapter 7, Institutional Development – The Dar es Salaam Transport Authority, has proposed to establish the Dar es Salaam Urban Transport Authority (DUTA) as an accountable and transparent authority responsible for the transport system development of Dar es Salaam. The management of urban transport as a function is almost nonexistent in Dar es Salaam specifically due to the lack of guidance attention for responsible agencies and the number of responsible entities involved, with municipalities and also national authorities cross-cutting into urban transport affairs. This has resulted in a fragmented planning process and lack of coordination, vertically and horizontally between levels of government and departmental disciplines. As one of the strategic policies to meeting these challenges DUTA has been proposed and its conceptual design is presented.

Chapter 8, Capacity Development – The National Centre for Transport Studies, has proposed to establish the National Centre for Transport Studies (NCTS) as a strategic educational organization under National Institute of Technology (NIT), being responsible for human resource development and R&D in the field of transport policy and planning, which is also expected to perform as a technical

advisory organization to DUTA.

Chapter 9, Financing Plan, summarises financing plan for the proposed master plan components. The financial analysis indicates some projects can be implemented by employing PPP (public private partnership) concept, while most of the arterial road developments should be financed by the public sector. Considering the current limited capacity in the public sector, several new ideas to increase public sector's revenue are proposed: Transfer of Development Right (TRD) and Clean Development Mechanism (CDM).

Chapter 10, Master Plan Evaluation, summarises performance of the proposed master plan using multiple criteria and several benchmarks. Economic viability is the most important criteria in identifying the priority projects, however several other factors such as relevance to the upstream policies, mutuality (for some projects a feasibility study has been prepared), sequence with other committed projects, environmental factors, and financial viability are also taken into consideration.

Chapter 11, Project Monitoring Plan, monitoring of project implementation is one of the DUTA's important responsibilities as the prime public authority responsible for Dar es Salaam transport system development. A general idea of the project monitoring system is presented in this chapter. Readers will find two important ideas: Output-based management (OBM) and Performance-based Management (PBM).

Chapter 12 The Way Forward, gives recommended consequent activities towards implementation of the Master Plan.

1.3 Progress Synopsis

1.3.1 Overall Progress

Since the mobilization date of April 9th, the JICA Study Team has prepared and submitted the Inception Report in May, Progress Report in July, Interim Report in December 2007, Draft Final Report in March 2008, and this Final Report in June 2008 by reflecting all the comments and suggestions given by the steering committee members and stakeholders. A great number of meetings were held in the form of both formal and informal manner to develop the ideas with relevant people, which were really fruitful in developing ownership and stewardship of the Master Plan. Following section summarizes briefly a series of formal meetings held during the study.

1.3.2 Presentation and Meetings

(1) 1st Steering Committee Meeting: Inception Report Presentation

The first progress presentation was made on 2nd May, 2007 to the steering committee members that are specially organized for this Master Plan Study. The presentation included: 1) understanding of the project, 2) several preliminary assessments, and 3) schedule of the traffic surveys.

At the same time the Inception Report was submitted to Dar es Salaam City Council as well as JICA for their technical review.

(2) Workshop on Future Urban Structure and Development Scenario

The first workshop presentation was held on June 25th at the Karimjee Hall. Most of the steering committee members joined this workshop. The workshop discussed the following issues:

- Review of the Master Plan of 1979 and the Strategic Urban Development Plan (SUDP)
- Identification of Urban Planning Issues in Dar es Salaam
- Three Alternatives of Future Urban Structure: Mono-centric Radial Development; Ply-centric Satellite Centers Development; and Compact Corridor Development Patterns
- Innovative Methods of Local Revenue Generation and Encouraging Urban Development, such as TIF, TDR, etc.

Following the presentation, constructive and fruitful discussions were made by the participants.

(3) Press Conference

A press conference was held on 21st June. The primary objective of this press conference was publicity of the Master Plan study activities through media including newspapers, radio, and TV programs. During the conference Mr. Kingobi, City Director of DCC made a brief presentation on the Dar es Salaam Transport Policy and System Development Master Plan sponsored by JICA to the invited media at the conference room of DCC. Through this press conference, many people in Dar es Salaam acknowledged the Study, and which was very helpful for the traffic surveys in the field.

(4) 2nd Steering Committee Meeting: Progress Report Presentation

A presentation of the Progress Report was made on 24th July at the Karimjee Hall. The progress of the field survey and some review work results were presented to the steering committee members.

(5) 3rd Steering Committee Meeting

A progress presentation as of September 2007 was made on 4th October at the Karimjee Hall. The presentations included initial discussion on;

- Development Vision
- Planning Framework
- Urban & Regional Structure
- Traffic Surveys & Analysis
- Center for Transport Studies (CTS)
- Urban Transport Authority
- Priority areas for pre-feasibility study.

Two important decisions were made in the 3rd steering committee meeting; those are:

- National Institute of Transport (NIT) takes an initiative in establishing the CTS; and
- The priority areas for JICA's pre-feasibility study are Tazara Intersection and Gerezai area.

The meeting was further informed that the JICA Study Team submitted twenty (20) copies of the interim report and draft pre-FS reports prior to the meeting on December 4th.

(6) 4th Steering Committee Meeting

Detailed study results on the issues listed below were presented on 4th December at the Karimjee Hall.

- Center for Transport Studies
- Planning Framework
- Road Network Development Plan
- Public Transport System Development Plan
- CBD Traffic Control and Management Plan
- Special Issue: Managing BRT Options at Ubungo Intersection
- Pre-FS Progress

(7) 5th Steering Committee Meeting

The fifth, in fact the final steering committee meeting was held on 8th May 2008 at the Karimjee Hall. Major issues in the draft final report were discussed by the steering committee members, and confirmed as follows:

(1) Study Conclusions

- **A vision for Dar es Salaam**
 - Its position on the context of national development: gateway of the region
 - Transport development planning plays a key role in the future outcomes
- **Spatial Structure**
 - Urban development framework: Urban Growth Boundary
 - Option for densification of major radial corridors (led by BRT development)
- **Road Sector development**
 - Road hierarchy & integration with urban development and public transport provision
 - Priority for Public Transport but maintaining a balance for optimum efficiency
- **Traffic Control & management:**
 - A short-term CBD traffic management plan with the BRT Phase 1 operation
 - Better traffic management (establish specific agency: Traffic Control Center)
- **Public Transport Sector**
 - Improve under DART /BRT implementation (system management & contracted business model)
 - Efficient system network planning & development

■ **Capacity development**

- Establish Center for Transport Studies (CTS) for database & training to enhance transport planning and administration capacity

■ **Institutional Development**

- establish Dar es Salaam Urban Transport Authority (DUTA) for better coordination across all concerned agencies

■ **Financing Strategy**

- Local tax revenue increase
- Infrastructure Development Bond/Fund
- External loans: prepare feasibility studies for application to AfDB, WB, JBIC, EC, etc.
- Private sectors: BRT and Urban Expressway (can be tolled)
- Use of Clean Development Mechanism (CDM): CDM credit by BRT

■ **Candidate projects (Pre-FS Projects)**

- Gerezani Area Transport Enhancement Project
- Tazara Intersection Improvement Project

Necessary urgent actions towards implementation of the Master Plan are recommended as follows:

■ **DUTA – what concrete steps are needed to establish DUTA**

- Early establishment of Board of Management
- DUTA under PMO-RALG/DCC in the consequent phase
- Funding for DUTA

■ **MOID / TANROADS**

- Strategic budget allocation to urban roads in Dar es Salaam
- Establish urban road design standards in accordance with the proposed BRT road hierarchy
- Feasibility Study of the Kigamboni Bridge and Access Roads Development / Selander Bridge Bypass / Ubungo Intersection

■ **DCC and Municipalities**

- Local Tax increase – budget allocation to secondary / tertiary roads
- Urban Planning within the Growth Boundary
- Coordination with other sectors including water supply, waste water management, etc.
- DCC to submit the proposed road hierarchy to the Ministry of Lands and Human Settlement Development which is developing an urban road classification to serve as an input.

■ **DART**

- Early successful implementation of BRT Phase 1 including CBD traffic management
- Effective business model for DART and risk management
- Negotiation with TRL to secure the right to use the disused Tabata line
- Negotiation with Government/TRL to move the central railway station to the city outskirts and use the space for a BRT terminal.

■ **National Institute of Transport**

- Early implementation of CTS (Center for Transport Studies)

■ **Priority projects (Pre-FS Projects)**

- Preparation of application document for international donor agencies.
 - Gerezani Area Transport Enhancement Project
 - Tazara Intersection Improvement Project

The Steering Committee in general accepted the draft final report, however, some amendments and improvements were required in producing the final report. The JICA Study team agreed to consider the comments from the steering committee members and accordingly improved them to produce this final report.

Chapter 2 The Vision for Dar es Salaam

This Chapter presents the long-term perspective and framework for the Dar es Salaam Transport Policy and System Development Master Plan. It discusses both the general Development Vision for Dar es Salaam with the year 2030 perspective and the more specific and directly inter-related Vision for the future Transport System in Dar es Salaam.

2.1 Introduction

The year 2003 National Transport Policy underwrites the principle of achieving “... *efficient and cost-effective domestic and international transport services to all segments of the population and sectors of the national economy with maximum safety and minimum environmental degradation.*”¹ Realizing the principle requires substantial efforts oriented to creating “...*safe, reliable, effective, efficient and fully integrated transport Infrastructure and Operations which will best meet the needs of travel and transport at improving levels of Service at lower costs in a manner, which supports government strategies for, socio-economic Development whilst being economically and environmentally sustainable.*”²

The Transport Policy thus proclaims that initiatives taken in its policy, economy, society and environment will define the city’s long-term development (Figure 2.1.1).

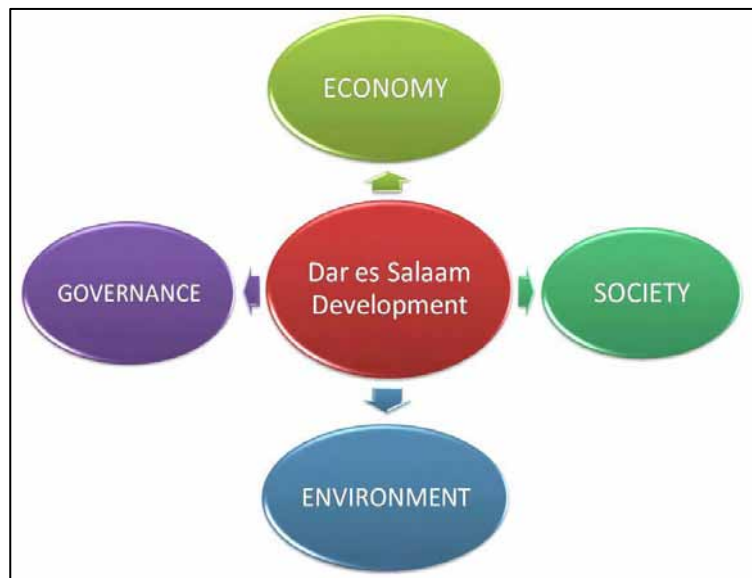


Figure 2.1.1 Development Framework

¹ United Republic of Tanzania, Ministry of Communications and Transport. *National Transport Policy*. 2003, p1 - Introduction
² *ibid*

The “National Transport Policy and System Development Master Plan” argues that the fundamental requirement for improvement is the establishment of an adequate institutional framework.

Creating the appropriate institutional framework cannot be realized successfully without a balanced and integrated approach where vision, strategy, and action are intertwined and part of a wider vision for sustainable economic development (Figure 2.1.2).

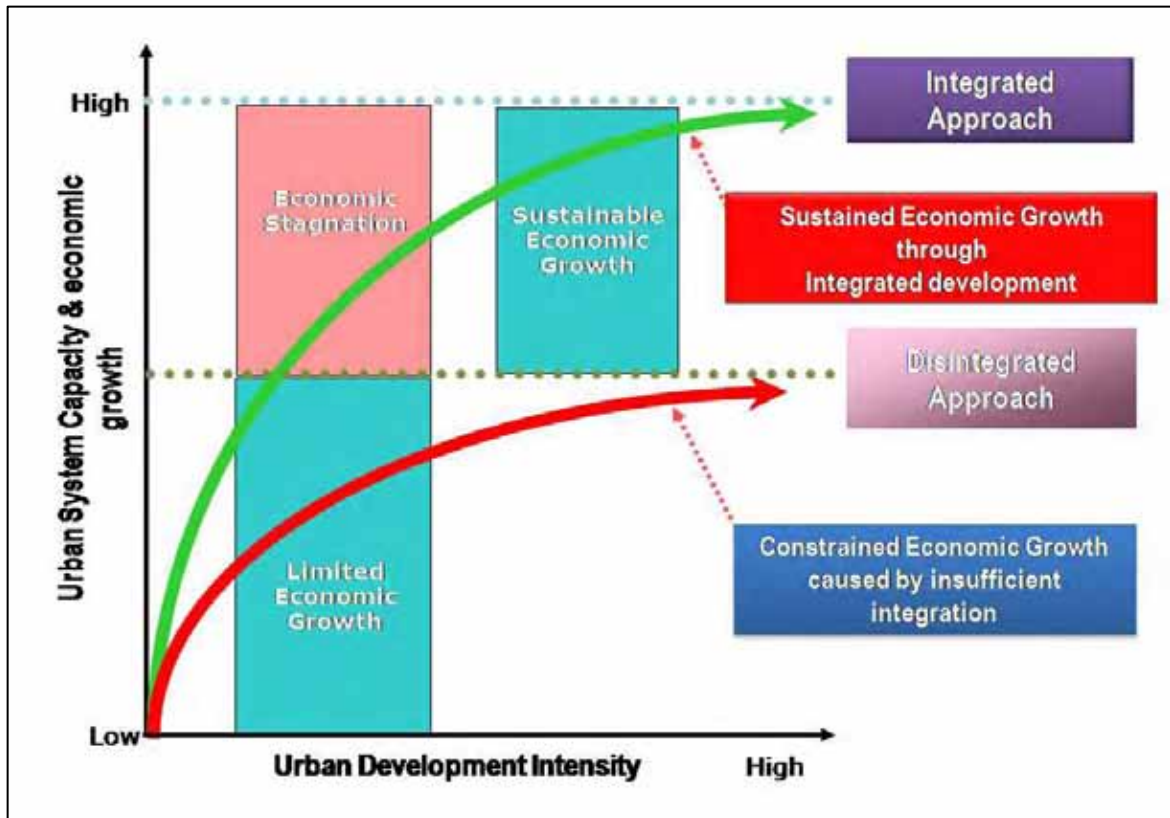


Figure 2.1.2 Integrated approach and economic growth

The National Transport Policy acknowledges the need for an integrated approach when it links the efforts in the field of transport with the long-term development goal of the country as expressed in the Tanzania Development Vision – 2025 and a range of other national guidelines such as the National Poverty Reduction Strategy Paper (PRSP), the Rural Development Strategy (RDS), the Civil Service Reform Program, and reform programs aiming at private sector involvement in economic development, strategic environmental sustainability, gender issues, eradication of diseases and literacy campaigns³. The National Transport Policy therewith recognizes the pivoting role of transport and acknowledges that the realization of objectives in “...priority sectors such as education, health, water, agriculture, manufacturing, tourism, mining, energy, land and good governance hinges on the availability of adequate and reliable transport to reach inputs to production points and also to distribute outputs from production points to consumption points/markets.”⁴

³ Ibid. p7.

⁴ Ibid. p8.

The integrated approach is thus imperative and finds justification in the scale and scope of the (urban) transport problem including: “... *high cost, low quality services due to various reasons including the existence of high backlog of infrastructure maintenance and rehabilitation, inadequate institutional arrangements, laws, regulations and procedures which are not consistent or compatible with each other to create conducive climate for investment and hence growth of the sector, inadequate capacity caused by low level of investment in resources, and low level of enforcement of safety, environmental sustainability and gender issues.*”⁵

The “Transport Policy and System Development Master Plan” therefore entrenches the future transport system for Dar es Salaam into a wider vision related to the long-term social and economic development of the City, the “Dar es Salaam Development Vision – 2030”. The Dar es Salaam Development Vision – 2030 follows a sequential logic where the *Vision* leads to a *Strategy*, itself defined by a number of concrete *Actions* of which the development of an integrated urban transport system is one, albeit critical, component (**Figure 2.2.1**).

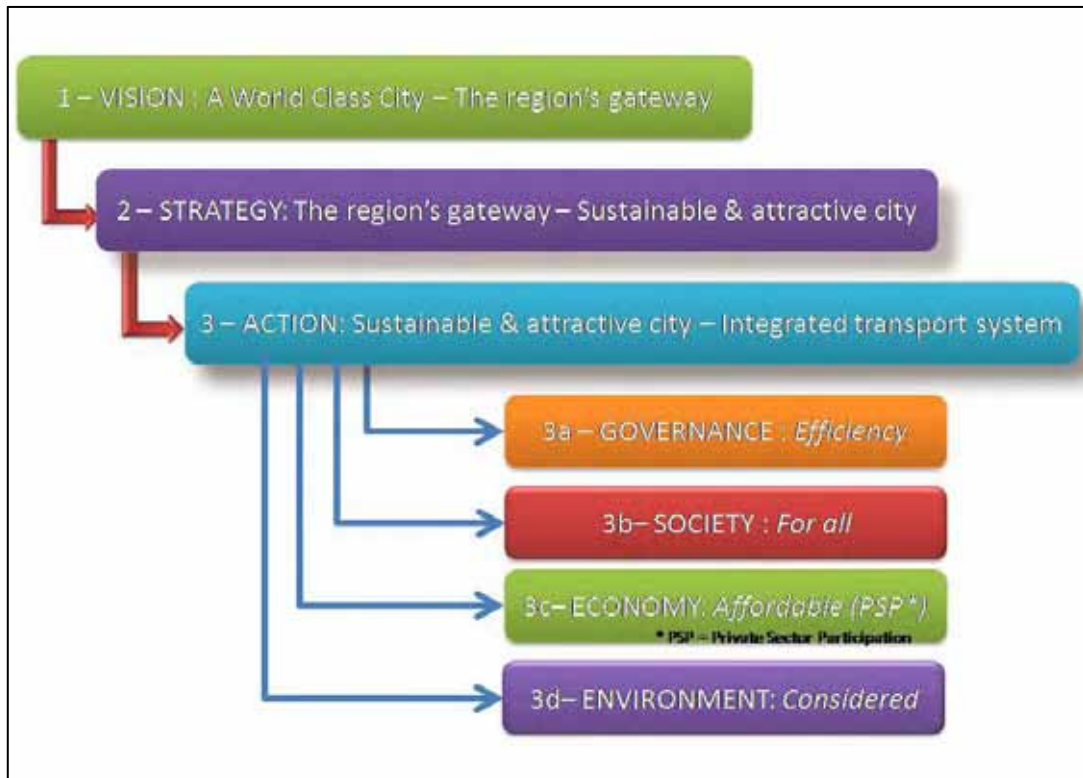


Figure 2.2.1 Integrated approach for the new Urban Transport System

⁵ Ibid. p1.

The approach for the transport policy and system development master plan follows a structured and hierarchical (sequential) approach:

1. **The Vision for Dar es Salaam.** The vision is a long-term and final objective according to which all initiatives need to be targeted. Achieving this vision might take several decades but it provides a general framework along which strategies can be / are developed that contribute to proceeding towards the realization of the vision
2. **The Strategy for Dar es Salaam** The strategy for Dar es Salaam is the translation of the vision into concrete initiatives in different areas that contribute to the realization of the vision (the growth and development of Dar es Salaam towards becoming a world-class city). The key of the strategy is that all actions (sub-strategies) need to work towards the transformation of the city into a sustainable and attractive city.
3. **The Actions necessary to create a sustainable and attractive city.** Actions are needed in different areas, such as urban planning, land use planning, environmental protection, etc. One of the critical areas for concrete action is the (long-term) urban transport strategy for which the “Transport Policy and System Development Master Plan” will formulate the “Dar es Salaam Transport Vision – 2030” which provides the four (4) building blocks essential to achieving attractiveness and sustainability of the city, namely:
 - a. **Governance:** considering the most efficient structure to develop and manage an integrated transport system, now and in the future;
 - b. **Society:** ensuring that the transport system is accessible to all, including (and in particular) to the less fortunate and the poor members of the community as well as the physically challenged persons. At the same time, it should be of a quality that is attractive and acceptable for visitors, in particular tourists and business persons.
 - c. **Economy:** where realism on the affordability of the transport system should be the guiding principle which means that infrastructure planning and transport services should consider budgetary constraints, not only focusing capital investments but equally and maybe even more importantly considering long-term maintenance and operating costs. To increase the possibilities of capital expenditure for major infrastructure developments, a gradual reduction of the present dependence upon international donors and IFI’s should be pursued by inviting the private sector to participate in the efforts.
 - d. **Environment:** where the (long-term) impact on the environment, in particular on fauna and flora and on the quality of air should be considered important elements of sustainability and attractiveness of the city. Lack of fauna and flora is unattractive and creates “unsafe” population concentrations while a poor quality of air impacts the health of its inhabitants (e.g., respiratory problems). All these problems will increase

the cost of social well-being and will put pressure on the city's public budget and spending capacity._

The “Transport Policy and System Development Master Plan for Dar es Salaam” will thus recommend concrete actions for the creation of an integrated transport system in the city. That action plan will be embedded in the comprehensive strategy to create a sustainable and attractive city, based upon a clear vision about that future development of Dar es Salaam.

2.2 The Dar es Salaam Development Vision – 2030

2.2.1 The Tanzania Development Vision – 2025

The Tanzania Development Vision – 2025 is the main building block for the Dar es Salaam Development Vision – 2030. The Tanzania Development Vision – 2025 aims to steer national efforts and resources to maintain and strengthen the expected intensive economic competition and to create by the year 2025 a Tanzania free from poverty and transformed from the group of least-developed countries to that of middle-income countries. The concept and scope of the national development vision, expected to be realized by the year 2025 include⁶:

- *A high-quality livelihood; for all Tanzanian through:*
 - Food self-sufficiency and food security,
 - Universal primary education,
 - Gender equality,
 - Access to quality primary health care for all,
 - Access to quality reproductive health services for all individuals of appropriate age,
 - Reduction in infant and maternal mortality rates by three quarters of current levels,
 - Universal access to safe water,
 - Life expectancy comparable to the level attained by typical middle-income countries,
 - Absence of abject poverty.
- *Peace, stability and unity*
- *Good governance, characterized by :*
 - Desirable moral and cultural uprightness,
 - Strong adherence to and respect for the rule of law,
 - Absence of corruption and other vices,
- *A well-educated and learning society which is confident, learns from its own development experience and that of others and owns and determines its own development agenda; and*
- *A competitive economy, capable of producing sustainable growth and shared benefits via*
 - A diversified and semi-industrialised economy with a substantial industrial sector comparable to typical middle-income countries.

⁶ See www.tanzania.go.tz/vision.htm

- Macroeconomic stability manifested by a low inflation economy and basic macroeconomic balances.
- A growth rate of at least 8% per annum.
- An adequate level of physical infrastructure needed to cope with the requirements of the Vision in all sectors.
- An active and competitive player in the regional and world markets, with the capacity to promote national interests and to adjust quickly to regional and global market shifts.

One important component in the document is the acknowledgement that there are two key prerequisites for the effective implementation of the Development Vision 2025 which are *good governance* and *economic competitiveness*. A joint and integrated nurturing of both will be the means for sustainable development and an effective improvement of the quality of life of the people.

These concepts are “translated” into the “Dar es Salaam Development Vision – 2030” by advocating the steering of its development to become a “World City”.

2.2.2 The Dar es Salaam Development Vision – 2030: *the Gamma World City*

Basic principle

The city of Dar es Salaam will be the key driver for economic growth and sustainable social progress of the country and therefore requires a comprehensive and integrated long-term vision that embodies the key components of the Tanzania Development Vision – 2025. The aims and goals of the Tanzania Development Vision – 2025 and the central role of Dar es Salaam in realizing that vision allows expressing the Dar es Salaam Development Vision – 2030 by means of its gradual evolution to become a “World City”.

The World City concept

World cities emerged from the globalization of trade, commerce, and leisure and are driven by on-line communication and computing technologies and are undoubtedly a “new” breed of cities of which the characteristics surpass these of the well-know “mega-city”. According to this service-based approach, there are 3 groups of World Cities, complemented by 3 groups of cities evolving towards becoming a world city (**Table 2.2.1**).

In the service-based classification for world-class status, consideration is given to the global capacity of cities in terms of selected services they provide. Global capacity is defined empirically (calculated) in terms of aggregate scores and interpreted theoretically as concentrations of expertise and knowledge. The focus for this classification was on four key services: accounting, advertising, banking and law although other economic activities can also be considered. Cities are evaluated as global service centres in each of these sectors and aggregation of these results to other “supporting” domains provides a measure of a city's global capacity or “world city-ness”.

Table 2.2.1 Classification of principal World Cities

Established World Cities				
Classification		ALPHA CITY (α city)	BETA CITY (β city)	GAMMA CITY (Γ city)
Description		<i>Full service world cities</i>	<i>Major world cities</i>	<i>Minor world cities</i>
Examples	<i>First level</i>	London; New York; Paris; Tokyo	San Francisco, Sydney, Toronto, Zurich	Amsterdam, Boston, Caracas, Dallas, Düsseldorf, Geneva, Houston Jakarta, Johannesburg , Melbourne, Osaka, Prague, Santiago, Taipei, Washington
	<i>Second level</i>	Chicago, Frankfurt, Hong Kong, Los Angeles, Milan, Singapore	Brussels, Madrid, Mexico City, Sao Paulo	Bangkok, Beijing, Montreal, Rome, Stockholm, Warsaw
	<i>Third level</i>		Moscow, Seoul	Atlanta, Barcelona, Berlin, Budapest, Buenos Aires, Copenhagen, Hamburg, Istanbul, Kuala Lumpur, Manila, Miami, Minneapolis, Munich, Shanghai
Emerging World Cities				
Relative strong evidence		Athens, Auckland, Dublin, Helsinki, Luxembourg, Lyon, Mumbai, New Delhi, Philadelphia, Rio de Janeiro, Tel Aviv, Vienna.		
Some evidence		Abu Dhabi, Almaty, Birmingham, Bogota, Bratislava, Brisbane, Bucharest, Cairo, Cleveland, Cologne, Detroit, Dubai, Kiev, Lima, Lisbon, Manchester, Montevideo, Oslo, Riyadh, Rotterdam, Seattle, Stuttgart, The Hague, Vancouver, Ho Chi Minh City.		
Minor evidence		Adelaide, Antwerp, Arhus, Baltimore, Bangalore, Bologna, Brasilia, Calgary, Cape Town, Colombo, Columbus, Dresden, Edinburgh, Genoa, Glasgow, Gothenburg, Guangzhou, Hanoi, Kansas City, Leeds, Lille, Marseille, Richmond, St Petersburg, Tashkent, Tehran, Tijuana, Turin, Utrecht, Wellington.		

Source: J.V. Beaverstock, R.G. Smith and P.J. Taylor. *A Roster of World Cities*. in *Cities*, 16 (6), (1999), pp 445-458

The advantage of the “producer service approach” is, according to Sassen, that the ranking firmly associates the cities with their tendency to engage with the internationalization, concentration, and intensity of producer services in the world economy⁷.

According to the classification methods above, London, New York, Paris, and Tokyo are prime examples of world cities and are also mega-cities. However, it is possible and even common for cities that are not mega-cities to be world cities and vice-versa.

Overall, a world city, also known as a “world-class city”, can be defined by 10 characteristics and the level to which the city incorporates these characteristics determines its status as world city:

1. *Name familiarity* where the city name is sufficient and there is no need to add the country name.

⁷ See for example, Sassen S. *Cities in a World Economy*. Pine Forge Press, London. 1994; Sassen S. *The urban complex in a world economy*. in *International Social Science Journal* 139 pp 43-62. 1994.

2. *Active influence and participation in international events and world affairs*, with the city housing international headquarters such as the UN (New York), the EU Commission (Brussels) or the European Central Bank (Frankfort).
3. A fairly *large population* with at least one million inhabitants but typically several million.
4. A major *international airport* acting as high-profile hub for several international airlines.
5. An *advanced transportation system* offering multiple modes of (public) transportation and a highly developed road network.
6. Home to *international cultures and communities* or a city which attracts large foreign businesses and related expatriate communities.
7. Home to *international business and stock exchanges* that influence the world economy.
8. *Advanced communications* infrastructure with WIFI and high-speed broadband.
9. World-renowned *cultural institutions and events and a lively cultural scene*, including festivals, premieres, music, opera, and theatre scene.
10. Several *powerful and influential media outlets* with an international reach.

Dar es Salaam: a future Gamma World City

The year 2030 Development Vision for Dar es Salaam can be confined into the “***Gamma Objective***”, meaning that the long-term goal for all investments and initiatives should be oriented to reaching in the future the status of a ***Gamma World City***.

The effort to create the gateway function of the city can focus three domains where there is real opportunity, tourism, economy and culture/sports (**Figure 2.2.2**), that is, Dar es Salaam has natural advantages upon which to build:

- *Political Stability*
- *Educated workforce*
- *Geographic location:*
 - Port access to eastern Africa
 - Close sea access to markets of Asia
 - Regional service centres
- *Tourism / culture / sports potential:*
 - National Parks
 - Zanzibar
 - Coast line
 - Dar es Salaam new stadium
 - Heritage and culture



Figure 2.2.2 Towards a Regional Gateway

In terms of world city criteria, Dar es Salaam already meets several criteria (Table 2.2.2). It should however be clear that the transformation of Dar es Salaam into a regional gateway requires coordinated action to attract investors, develop touristic attractions, improve existing sport facilities, and stimulate cultural events with international appeal.

Table 2.2.2 World City criteria and Dar es Salaam

<i>World City Criterion</i>	<i>Present status</i>
Name familiarity	Good (although improvement is necessary)
International events and world affairs	Limited
A fairly large population	Yes, 3.0 million in 2007
A major international airport	Yes, (but can be improved further)
An advanced transportation system	Under development (BRT)
International cultures and communities	Yes
International business and stock exchanges	Very limited (only very few international businesses are present)
Advanced communications	Gradually improving
Cultural institutions and events and a lively cultural scene	Partly
Powerful and influential media outlets	Very limited

Source: JICA Study Team

The evolution towards a world-class city is thus a long-term process with different hurdles to pass. The process should therefore be closely monitored, as much as possible quantified and the progress compared with one or more benchmark cities.

Of course, the basic advantage of the inventory of cities presented in Table is its grounding in a large quantity of comparative data thus giving identification of world cities a robust empirical basis. We hope it helps alleviate the confusion illustrated by the many differences among the lists in **Table 2.2.1** is that it produces an inventory of contemporary world cities. However, world cities are much more than just service centers and proper consideration for all criteria is essential when evaluating the world city-ness of Dar es Salaam. **Table 2.2.3** provides examples of monitoring criteria to make a quantifiable and weighted appreciation of the evolution towards world-class city status.

Continuous monitoring will allow seeing concrete results and offers the opportunity to initiate changes in vision, strategy, and / or action plans. Monitoring progress through continued benchmarking will have to start with one or more cities that demonstrates only minor evidence of world city formation, followed in the medium and long-term future with cities having respectively some and relatively strong evidence of world city formation. The final benchmark would then be to compare Dar es Salaam with one or more Gamma level world cities.

Table 2.2.3 Examples for quantifiable progress verification criteria

World City item	Criteria 1	Criteria 2	Criteria 3	Weighted average score
<i>Name familiarity</i>	Economic	Politics	Tourism	WAV(criteria 1,....,3)
<i>International world affairs</i>	International political organizations	Regional political organizations	Hosting international events	WAV(criteria 1,....,3)
<i>Large population</i>	Total population	Annual growth	Long-term projection	WAV(criteria 1,....,3)
<i>International airport</i>	# international airlines	# passengers / year	Volume of cargo / year	WAV(criteria 1,....,3)
<i>Advanced transportation</i>	Length of paved road network	Public transport passengers / year	Vehicle trips / year	WAV(criteria 1,....,3)
<i>Advanced communications</i>	Computers / household	Internet speed	# of private operators	WAV(criteria 1,....,3)
<i>Cultures and communities</i>	# identified cultural groups	Ratio nationals / foreigners	# of international visitors / year	WAV(criteria 1,....,3)
<i>Business and stock exchange</i>	# of registered international businesses	Annual FDI	Annual turnover of stock exchange	WAV(criteria 1,....,3)
<i>Cultural scene</i>	# international cultural events	# theatres & cinemas	# international sporting events	WAV(criteria 1,....,3)
<i>International media outlets</i>	# global news agencies	# of regional news agencies	# international radio / TV events	WAV(criteria 1,....,3)

2.3 The Dar es Salaam Transport Vision – 2030

The development of an advanced and integrated transport system in Dar es Salaam is an important (on-going) factor in the city's evolution towards world city status and therefore warrants and even requires the formulation of a comprehensive “Dar es Salaam Transport Vision – 2030” as part of the year 2030 city development vision outlined in previous paragraph.

The Transport Vision – 2030 fully incorporates the original preposition of the year 2003 National Transport Policy that (urban) transport has a direct relationship with the economy, the population at large, and policy (governance).

The Dar es Salaam Transport Vision – 2030 finds its rationale in the observation that several structural failures exist, notably:

- Lack of attention to formulating a defined urban transport policy for Dar es Salaam causing simultaneously a policy vacuum and a failure in urban governance;
- A fragmented planning process and lack of vertical and horizontal coordination between levels of government and departmental disciplines, creating a gap between concrete needs and actual development and a close to total absence of transparency and accountability;
- The fragmented planning process also is a principal cause for the failure to adequately deliver on policy objectives. This failure is further worsened by unclear lines of responsibility between planning and implementation (through a ‘disconnect’); and
- Operators providing services under a flawed business model with disproportionate risk.

The Transport Vision – 2030 in itself is developed as guiding framework for the “Transport Policy and System Development Master Plan for Dar es Salaam”. The vision upholds the basic principle for the City to develop efficient and sustainable transport systems that provides affordable access and contributes to poverty alleviation via guaranteed mobility for commercial, business, educational, social, and cultural activities to create a better future. In other words, the Transport Vision – 2030 incorporates the key objectives of both the year 2003 National Transport Policy and the Tanzania Development Vision – 2025, focusing on the one hand a sustainable transport system and on the other hand, a contribution to achieving a sizable poverty reduction (**Figure 2.3.1**).

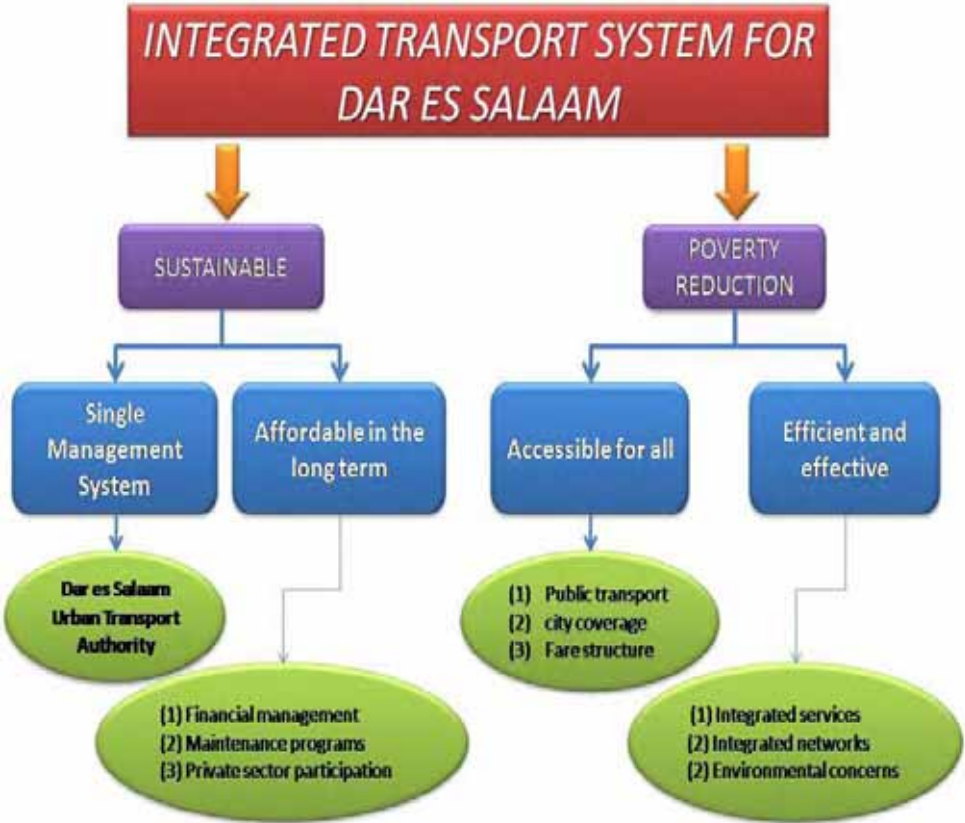


Figure 2.3.1 Key objectives of the Transport Vision – 2030

The creation of a sustainable transport system that notably contributes to reducing poverty in Dar es Salaam will require the establishment of an integrated transport system in the city that is characterized by 4 principal requirements: a single management system, affordable in the long term, accessible for all and efficient and effective in operations. These four requirements can be further divided into a number of key objectives that combined will maximize the chances of realizing the year 2030 transport vision for the city.

Achieving a sustainable transport system that makes a serious contribution to poverty reduction via the realization of the four key strategic objectives will require a range of specific actions.

Sustainability of the Dar es Salaam urban transport system can only be guaranteed via the establishment of a single management system that operates a truly affordable transport system. This requires the establishment of Dar es Salaam Urban Transport Authority (DUTA) that allows sound financial management, development of comprehensive programs for maintaining and / or improving operational quality of transport infrastructures and services, and the participation of the private sector in the development of the integrated transport system.

The future transport system of Dar es Salaam can contribute to the *alleviation of poverty* only if it is accessible to all layers of the population and operates efficiently and effectively. Accessibility is

particularly important. The existence of a comprehensive public transport system that covers all corners of the city that is offered at reasonable prices (fare structure), which also allows the poor and the less favoured people to benefit from the service, will improve accessibility for these people to job opportunities and consequently, allow more (poor) families to have a reasonable income.

The year 2003 National Transport Policy argued in favour of a major overhaul of the present urban transport systems with the particular objective of integrating the existing and new / future transport modes via a strong and modern traffic management and monitoring system. Two issues were considered of particular importance, namely the creation of a suitable institutional and regulatory framework and the participation of the private sector. The “Dar es Salaam Transport Policy and System Development Master Plan” will be instrumental in integrating all internal factors (urban transport considerations) and external sometimes conflicting priorities (urban and other development considerations), as schematized in **Figure 2.3.2**.

Translating the year 2030 transport vision into the Transport Master Plan means that the Master Plan has to consider and integrate into a comprehensive approach a wide range of internal issues. Most important issues are the institutional (policy) and environmental elements, the necessary infrastructures and services to be improved or developed, and the financial frameworks to finance concrete implementation of all these initiatives.



Figure 2.3.2 The dual dimension of the Transport Plan

However, the Transport Master Plan for Dar es Salaam at the same time needs to integrate these plans with a wide range of external considerations that directly or indirectly influence (urban) transport or are depending upon that same transport of which economic activity and urban planning undoubtedly are the most prominent examples.

In that context, the Transport Vision – 2030 upholds the principle that realism is a key component, meaning that one should not try to redo past efforts or re-invent concepts, but on the contrary should use the positive efforts of the past and structure them into a long-term and sustainable improvement.

The decision to develop the BRT (phase 1) and the intention of constructing several important transport infrastructures constitutes one of the key pillars of the urban transport master plan and will be fully integrated in a comprehensive urban planning and expansion strategy. The integration of realistic transport development and urban planning finds its concrete expression in the recommended “**compact**

corridor concept”, one of the basic principles of the Transport Vision (**Figure 2.3.3**) in terms of spatial structure of the city.

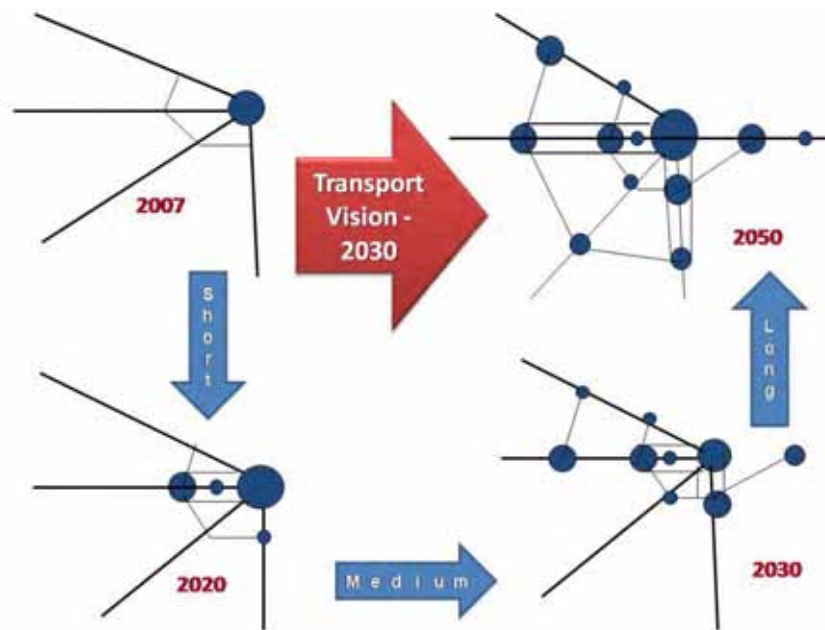


Figure 2.3.3 The Compact Corridor concept (2007 – 2050)

In summary, the Dar es Salaam Transport Vision – 2030 starts from the principle that Dar es Salaam has a real potential to become a *World City* and a *Regional Gateway* to connect (central and eastern) Africa with fast growing countries in Asia.

2.4 General Urban Transport Enhancement Strategy

Transport is an entitlement to the citizens of Dar es Salaam, and good transport networks have multiplicity of benefits; socially, economically, environmentally and culturally. Equity is also important as transport should be affordable to all so that there is equal and affordable access to opportunities of employment, education and social inclusion. Furthermore the paybacks in both direct and indirect terms are substantial and will contribute directly to improved economic performance, productivity and greatly reduce the negative stresses that citizens endure on a daily basis.

The increasingly difficult urban transport situation in the city, characterized by a high degree of traffic congestion, constrained resources for urban transport and deteriorating air quality, lies in the forefront of concerns. Urban transport problems are borne out of a set of complex and diverse environmental and economic factors and profound institutional failures. In Dar es Salaam, due to a low level of car ownership and high dependence on public transport, the problems of public transport are synonymous with the problems of urban transport because public transport vehicles (Dala Dala) serve such a large proportion of total trip demand. The present public transport system in Dar es Salaam is highly unsatisfactory from the perspectives of all stakeholders: the public, the city, the operators and the users.

Government is now addressing its growing transport problems with the introduction of the Bus Rapid Transit (BRT) with the essential associated administrative and institutional reforms.

A key consideration in this regard is that, most certainly within the near-term planning horizon, **the need to move people must take precedence over the need to move vehicles.**

However, in the medium to longer term, other transport pressure will arise. If history holds any lessons, it is that future growth in income will inevitably catalyze an increase in trip making, as well as changes in the modes used to accomplish such trips. It is likely that private modes of transport, such as passenger cars, will continue to become increasingly popular with the citizens of Dar es Salaam. It is expected that the current 74,000 private vehicles located within the metropolitan area will increase to about 180,000 by year 2015, and near 515,000 by year 2030. This means that vehicle ownership will more than triple from 25 cars per 1,000 persons in year 2007, to 89 cars per 1,000 persons by year 2030. **Pronounced impacts on Dar es Salaam congestion, and the need for additional road infrastructure, are consequently expected.** The construction of BRT will certainly be a key mitigating factor in defining the modal choice relationship in terms of inducing mode-switching and providing increased mobility for transit-dependent elements of the population. However, demand on the road network is nevertheless expected to dramatically increase in future in line with rising socio-economic well being of the populace.

No single remedy can be expected to comprehensively address such phenomena, instead, a more holistic approach is needed which relies on intermodality and a harmonious combination of the various modes that compromise a multi-faceted and integrated urban transport system. **Herein lies the challenge; solutions are needed whose practicality can be viewed through the prism of existing realities, and whose validity will remain intact over the Master Plan planning horizon extending to year 2030.**

In defining transport systems for the future, the Study Team has fully considered a number of key features which will dictate the nature of transport evolution from a strategic viewpoint; namely

- The physical characteristics (space for road expansion, increasing traffic etc) and urban structure (type and extent of land use) of the city;
- A developing city with constrained financial resources;
- The social characteristics of its people (high dependency on public transport, need for mobility to increase opportunity and reduce poverty; increasing well being in future); and
- The policy and regulatory frameworks as key to developing sustainable transport.

Chapter 4, 5, and 6 provide a synopsis of the key infrastructure elements which comprise the transport aspect of the Master Plan. It is concurrently noted that institutional and organizational issues represent a critical aspect of any solutions matrix. One of the key Master Plan recommendations is that, in order to improve what is at present an overlapping and (often) ineffective organizational approach to developing road systems, executing traffic control and management, as well as operating

public transport, the formation of a multi-disciplinary and multi-modal DUTA (Dar es Salaam Urban Transport Authority) is strongly urged, which is presented in Chapter 7. At the same time Capacity Development is very necessary in the field of transport planning and administration. An organization named National Center for Transport Studies (NCTS), whose responsibility is placed on education and research & development, is proposed. This idea is presented in Chapter 8.

Chapter 3 Planning Framework

Following the world city development concept presented in Chapter 2: The Vision for Dar es Salaam, this Chapter presents the long-term planning framework for the Dar es Salaam Transport Policy and System Development Master Plan in terms of demography, spatial structure and economic growth of the city. The framework established in this Chapter is numerical expression of the future world city of Dar es Salaam as well as the inputs to the transportation plans.

3.1 Population Framework

Taking into account the two population projections in the past: NBS and DART projections, this Maser Plan employs a population projection for Dar es Salaam with a target of somewhere in between, as a medium growth case. In this projection, the population of Dar es Salaam will increase from 2.6 million in 2003 to 4.0 million in 2015 and to 5.8 million habitants in 2030 (**Table 3.1.1**). Accordingly, some 2.8 million habitants will increase in Dar es Salaam for the next 23 years from 2007 to 2030. **Figure 3.3.1** shows a comparison of population projections for Dar es Salaam made by the NBS, DART Study and JICA Study.

Table 3.1.1 Population Projection for Dar es Salaam

Year	Tanzania Mainland	Dar es Salaam Region		
	Population (1,000)	Population (1,000)	Average Annual Growth Rate	% share in Tanzania Mainland
2003	33,846	2,564		7.6%
2007	38,291	3,030	4.3% (2003-2007)	7.9%
2010	38,291	3,400	4.1% (2007-2010)	8.1%
2015	41,914	4,000	3.3% (2010-2015)	8.3%
2020	48,366	4,600	2.8% (2015-2020)	8.3%
2025	55,356	5,200	2.5% (2020-2025)	8.2%
2030	63,299	5,800	2.2% (2025-2030)	8.1%

Source: JICA Study Team

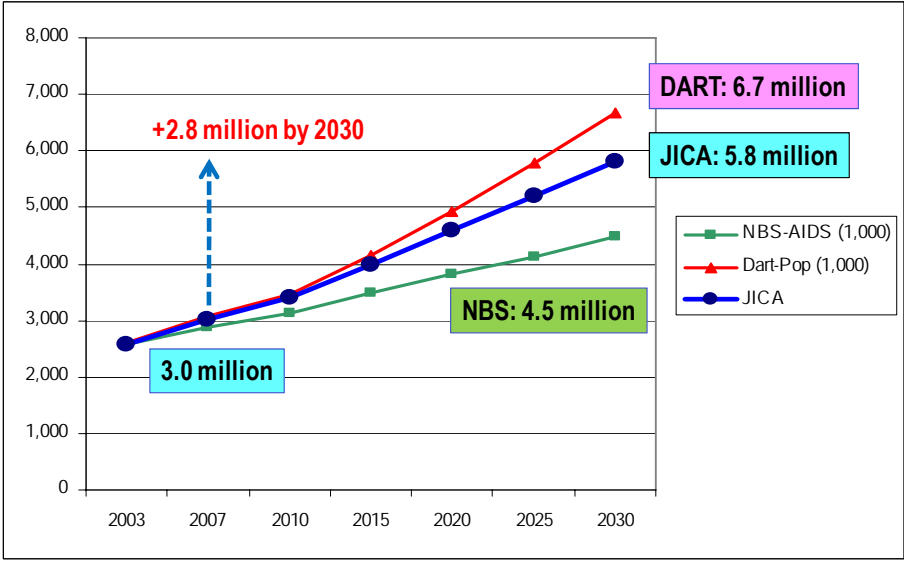


Figure 3.1.1 Comparison of Population Projections for Dar es Salaam made by NBS, DART Study and JICA Study, 2003-2030

3.2 Economic Framework

Tanzanian has experienced relatively high economic growth since year 2000. The average annual growth rate of real GDP at constant 1992 prices was 4.2 percent between 1995 and 2000 and it increased to 6.1 percent between 2000 and 2005. In general, future macro economic projection is always an uncertain entity, because the national economy is affected by a number of internal and external factors such as natural and social environment and unpredictable changes of the global economy.

The Master Plan employs an average real economic growth rate of 5.5 percent per annum for Tanzania Mainland, as a moderate-high economic growth scenario of the country. Based on this macro economic assumption, a GDP per capita will increase 2.04 times between 2003 and 2030 in Tanzania Mainland.

It is assumed that Dar es Salaam economy will grow faster than the national average. Taking into consideration dominance of the tertiary industry in Dar es Salaam, the average annual growth rate of regional GDP is assumed to be 7.6 percent between 2003 and 2010 and then it will gradually decrease to 6.1 percent between 2025 and 2030. The per capita income in Dar es Salaam will also grow faster than the national average. The Master Plan assumes that the regional GDP per capita growth rate in Dar es Salaam is one point higher than the national average. Accordingly, the per capita income of Dar es Salaam will increase 2.65 times between 2003 and 2030 in real terms. These assumptions are summarized in **Table 3.2.1**.

Table 3.2.1 Economic Growth Assumption by JICA Study

Year	TANZANIA			Dar es Salaam		
	GDP Growth Rate	GDP Percapita Growth Rate	Per capita GDP 2003=100	GRDP Annual Growth Rate	GRDP Percapita Growth Rate	Per capita GRDP 2003=100
2003-2010	5.5%	2.5%	119	7.6%	3.5%	127
2010-2015	5.5%	2.6%	135	7.0%	3.6%	152
2015-2020	5.5%	2.7%	155	6.7%	3.7%	182
2020-2025	5.5%	2.8%	177	6.4%	3.8%	220
2025-2030	5.5%	2.8%	204	6.1%	3.8%	265

Source: JICA Study Team

Based on the economic growth assumption, future work population by economic sector was estimated. It is assumed that job participation rate in the total population will increase from 37.3 percent in 2002 to 40 percent in 2030. The projection of work population in 2030 by economic sector is summarized in **Table 3.2.2**. The work population will grow from 0.93 million persons in 2002 to 2.32 million persons in 2030, especially the work population in the tertiary sector will increase triple from 0.64 million persons in 2002 to 1.97 million persons in 2030.

Table 3.3.2 Projection of Work Population by Economic Sector in Dar es Salaam, 2030

Year	Primary	Secondary	Tertiary	Total
2002	164,279	123,016	640,239	927,534
2030	116,000	232,000	1,972,000	2,320,000

Source: JICA Study Team

3.3 Development Constraints

The population of Dar es Salaam will reach 5.8 million habitants by 2030. This indicates that another roughly 2.8 million people need to be accommodated within the city for the next two decades. A question is where this population will be accommodated. If adequate land development policies are not prepared, urban sprawl and illegal settlements would continue and extend beyond the boundary of the jurisdiction, especially along the major arterial roads such as Morogoro, New Bagamoyo, Nyerere and Kilwa road. This will cause chaotic traffic congestions on the city's road system and further deterioration of the living environment.

The SUDP designated potential hazardous areas including swamp, land erosion and flood plain areas as unsuitable areas for future urbanization. The SUDP also identified natural resources to maintain ecosystem of the city. Such physical constraints for future urbanization is illustrated in **Figure 3.3.1**. The areas being not suitable for future urbanization includes existing river valleys, erosion areas along the coast and steep slope areas in the eastern parts of the city.

In addition, a long-term future development plans by utility agencies are important factors to identify a spatial limit of future urbanization. According to the long-term water supply plan, the future service

coverage area will expand to the north along Bagamoyo road and to the south-east, especially in Temeke municipality (see also **Figure 3.3.1**).

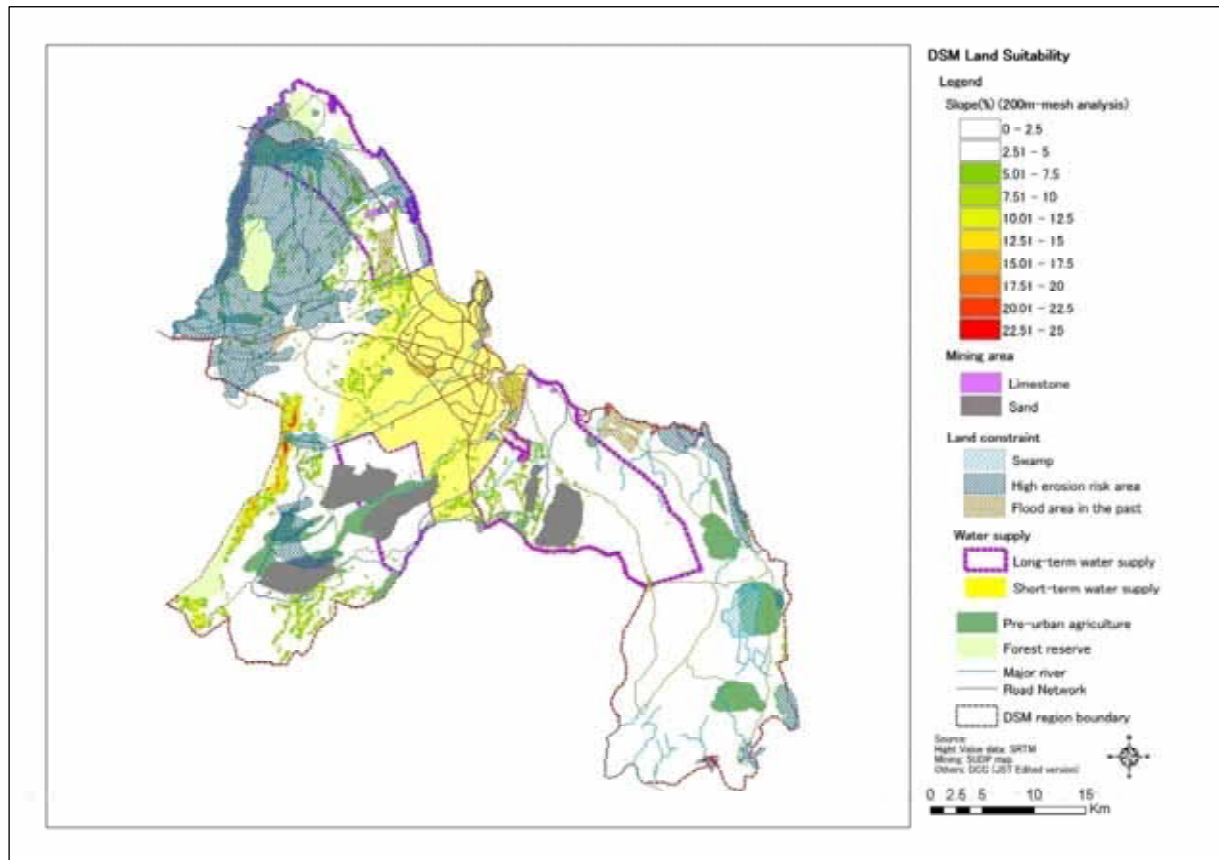


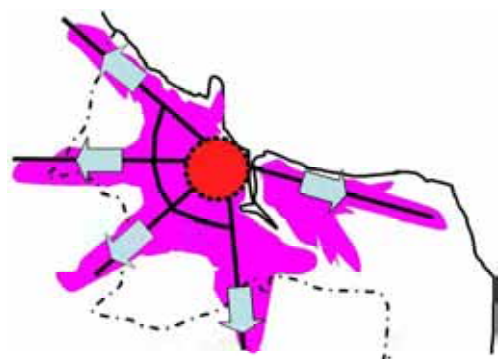
Figure 3.3.1 Constraints for Future Urbanization by SUDP

3.4 Proposed Future Urban Structure

Future urban structure is closely associated with the pattern of future transport demand. Urban structure indicates distribution patterns of population, jobs and other urban activities. Conceptually, there are three patterns as the probable future urban development scenario in Dar es Salaam. They are: (i) Mono-centric Radial Development Pattern; (ii) Poly-centric Satellite Centers Development Pattern; and (iii) Strategic Corridor Development Pattern. Each development pattern is discussed:

Mono-centric Radial Development Pattern

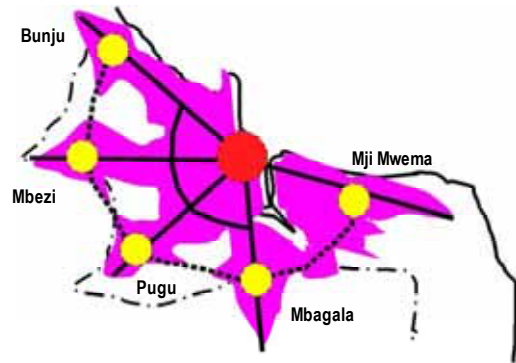
Major urban functions and activities will continue to concentrate in the central area (CBD, Kariakoo and surrounding areas) and along the major arterial roads. In order to accommodate the increased population in the city, residential areas will expand to further outside of the city beyond 30 km distance from the central area.



The agricultural lands, forests and open spaces between the major arterial roads will be rapidly lost and occupied by informal settlements in the near future. The continuous concentration of administrative functions and economic activities in the central area and along the major arterial roads will cause further traffic congestion and deterioration of the urban environment.

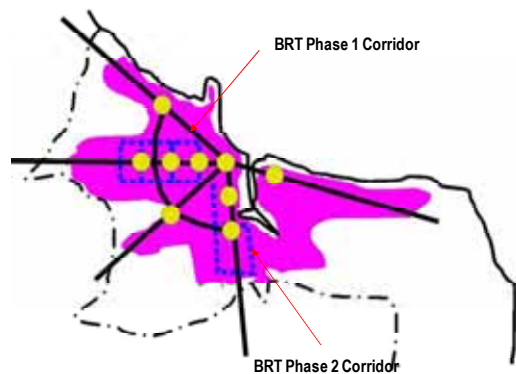
Poly-centric Satellite Centers Development Pattern

In the Poly-centric Satellite Centers Development Pattern, new satellite centers will be developed in the peripheral areas within 15-20 km distance from the central area. This concept of satellite centers development was originally proposed by the DCC through the Strategic Urban Development Plan (SUDP). The potential sites for the satellite centers are Bunju and Mbezi in Kinondoni Municipality, Pugu in Ilala Municipality, and Mbagala Kongo and Mji Mwema in Temeke Municipality. Some economic activities and employment opportunities should be decentralized from the existing central area to the satellite centers. Intensive urban development and public and private investments must be encouraged in the satellite centers.



Strategic Corridor Development Pattern

In the Strategic Corridor Development Pattern, urban development and public and private investments can be concentrated into strategic development axis. The potential development axis will be the BRT corridor along Morogoro road, connecting the City Center with Kariakoo, Magomeni, Manzese, Ubungo and Kimara in the first phase. Major urban activities will be encouraged to concentrate along the corridor, aiming to establish a compact and efficient urban structure. In a long-term perspective, the development corridor will be extended to the south along Kilwa road and then to the east to Kigamboni area after construction of a bridge crossing the river.



Future Development Scenario

The mono-centric radial development pattern is somewhat continuation of existing development pattern with the concentration of urban activities in the central city and along limited arterial roads. It causes excessive concentration of urban activities and traffic in and around the central area. Due to the limitation of available land in the central area, urban growth will expand towards the peripheral areas along the arterial roads. If the present haphazard urban sprawl continues, serious urban and environmental problems would be accelerated, such as long travel times to work, deterioration of living

environment and contamination of water and air. This is the worst scenario of the future urban structure in Dar es Salaam.

In the polycentric satellite centers development pattern, it is necessary to encourage decentralization of over concentration of urban functions from the central area to the satellite centers. A large number of employment opportunities need to be generated in these satellite centers, and new residential areas with high- and medium-densities should be developed around the satellite centers. In order to attract private investment into the satellite centers, new transport system connecting between the central area and satellite centers will be necessary to alleviate heavy traffic congestion on the existing arterial roads. However, the development of new satellite centers takes long time, and large amount of investment is essential. In order to attract private investment in the satellite centers, strong institutional measures must also be established by the government initiative.

The strategic corridor development pattern is the most preferred and realistic urban structure for Dar es Salaam in terms of cost effectiveness and balanced development in a medium to long-term perspective. The BRT Phase 1 operation is expected to be a trigger to encourage the change of urban structure: i.e., from mono-centric radial development pattern to strategic corridor development pattern. The property value along the corridor will increase significantly and urban development will take advantage of these changes. There are significant opportunities for public and private sectors to invest urban development to seek more effective use of land along the corridor. As a result, the strategic corridor development pattern is recommended as the most suitable and realistic urban development strategy for Dar es Salaam toward the year 2030. In theory, however, the poly-centric satellite centers development pattern may be the better option in the long-term perspective. The Master Plan proposes three satellite centers within UGB as shown in **Figure 3.5.3**. **Figure 3.4.1** shows conceptual development scenario for Dar es Salaam in a timeframe from 2007 to 2050.

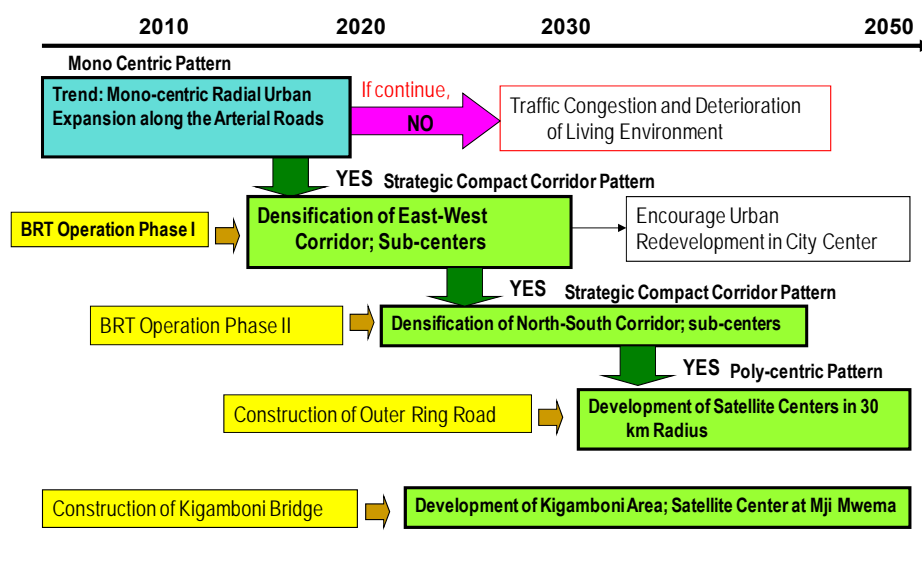


Figure 3.4.1 Urban Development Scenario for Dar es Salaam toward 2050

3.5 Major Policies for Future Urban Development

Urban Growth Boundary

In order to avoid disordered urban sprawl and expansion of unplanned settlements to the peripheral area, one of the effective tools is urban growth boundary (UGB) to identify a limit of urbanization for the next 20 years. The UGB can be reviewed every 5 years based on the analysis of population growth, natural conditions, land development constraints, and infrastructure development programs. The inside of the UGB is priority area of intensive urban development to accommodate future population. **Figure 3.5.1** illustrates a proposed UGB toward year 2030.

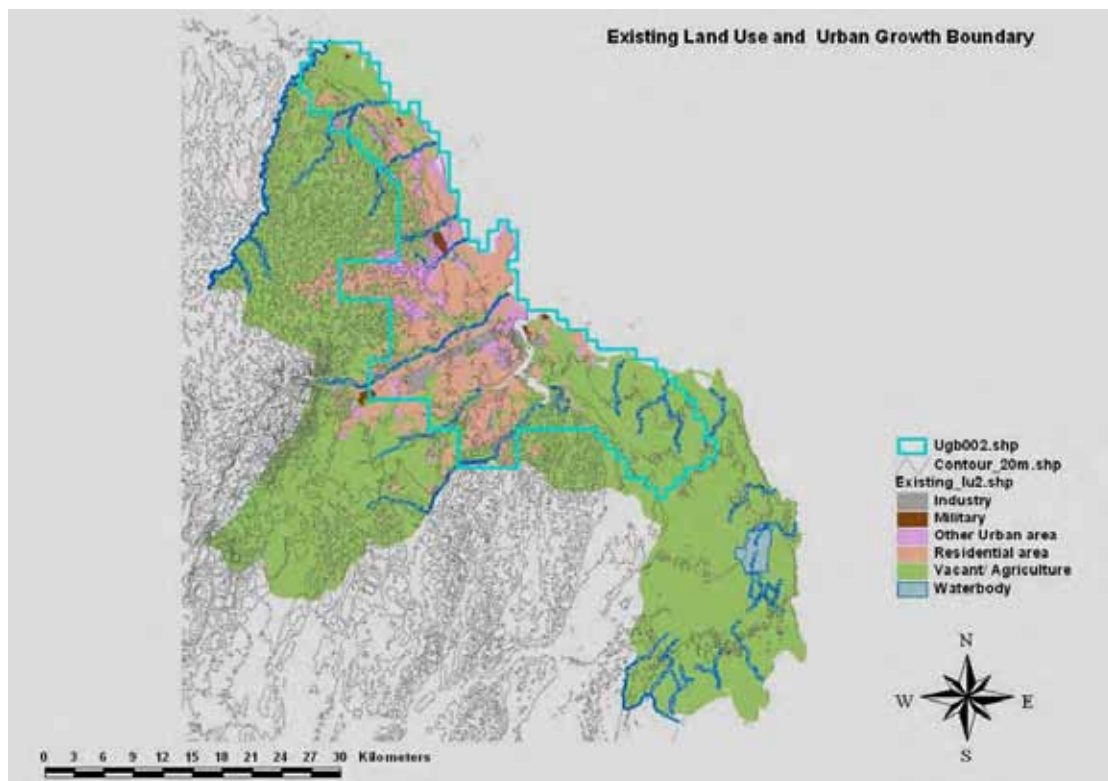


Figure 3.5.1 Proposed Urban Growth Boundary

Housing Development

A large scale of residential development is essential to absorb rapidly increasing population in the city. The potential areas for the large scale of residential developments are 15-20 km radius from the city center, such as Kimara and Goba in Kinondoni municipality, Kitunda and Ukonga in Ilala municipality, and Kibada and Tangoma in Temeke municipality. In the CBD area, there are many old properties owned by public authorities, including National Housing Corporation (NHC) and National Railway Corporation (NRC). Some of these properties are not used effectively. It is encouraged to implement redevelopment in these properties with involvement of private sector.

The provision of housing is one of the critical factors to achieve effective urbanization in Dar es Salaam. Ministry of Lands and Human Settlements Development (MLHSD) should perform a

leading role to provide housing especially for middle- and low-income people with close collaboration with National Housing Corporation (NHC) and National Social Security Fund (NSSF) as well as local governments. **Figure 3.5.2** shows go-going housing project called the 20,000 plots projects.

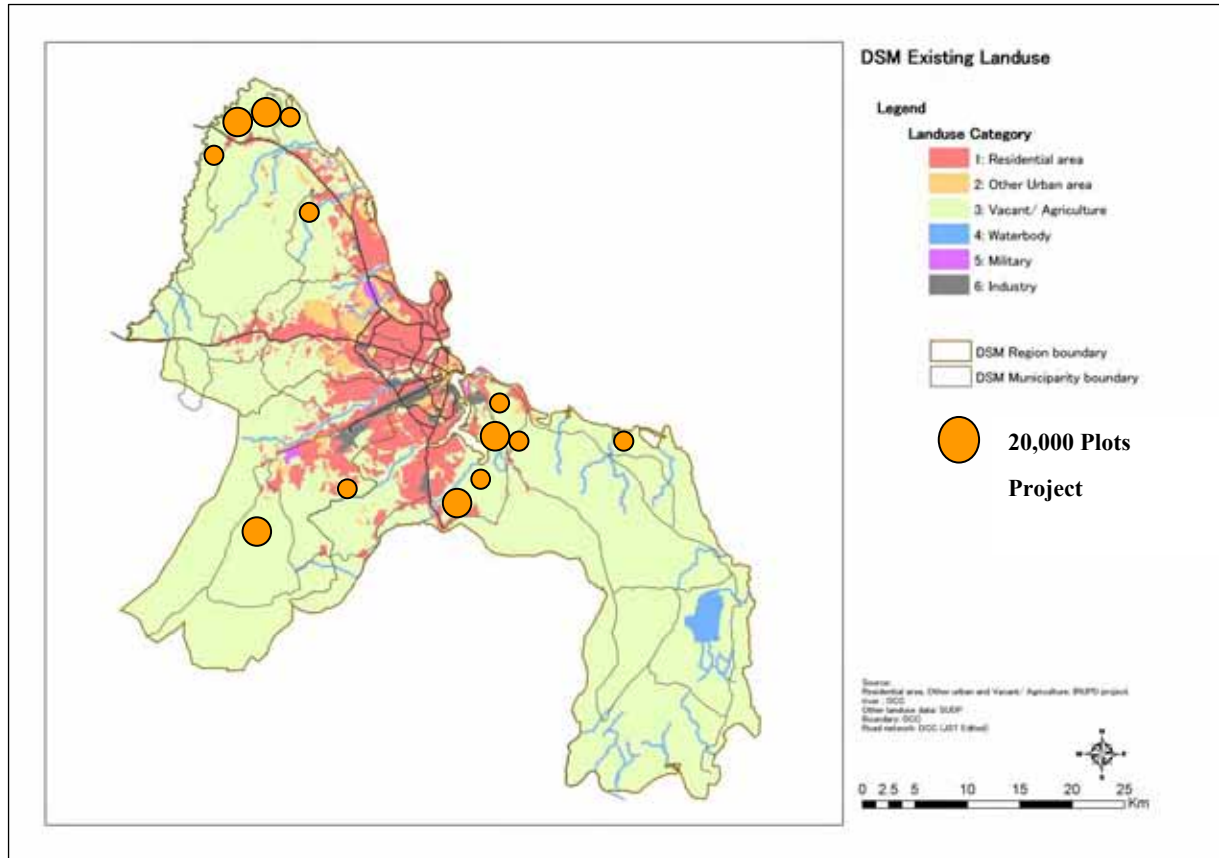


Figure 3.5.2 Locations of 20,000 Plots Projects by MLHSD

Commercial and Business Development

In order to promote the strategic corridor development, intensive commercial and business development should be implemented along the BRT corridors, especially the areas at Kawawa intersection, Ubungo intersection and Morocco Terminal. Potential locations of other urban service centers are the surrounding areas of BRT stations and intersections of primary arterial roads, such as Ubungo, Mwenge, Changombe, Mgulani and Kigamboni areas. Satellite Centers will be developed at Kunduchi in the north, Kiwarani in the south west and Kisarawe in the south east as shown in **Figure 3.5.3**. The decentralization of commercial and business activities from the central area to sub-centers should be encouraged.

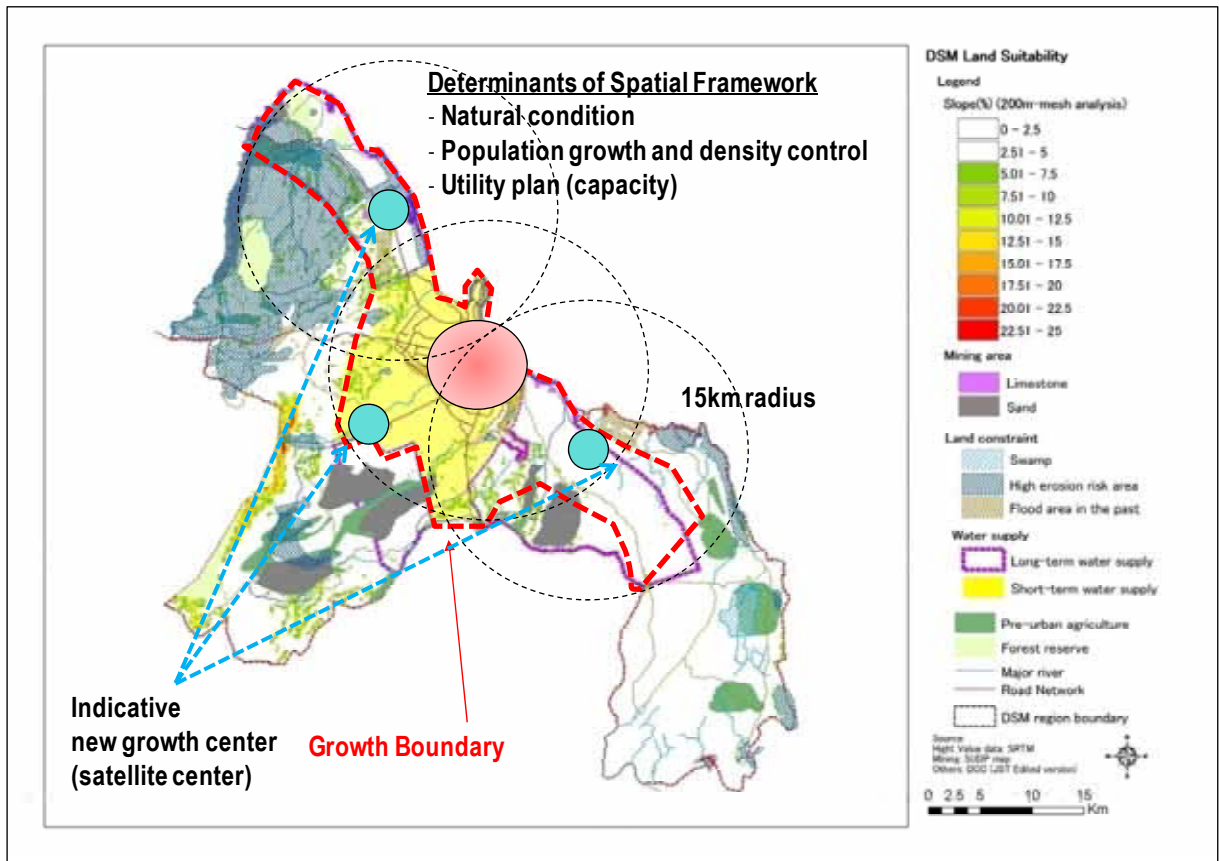


Figure 3.5.3 Proposed Satellite Centers

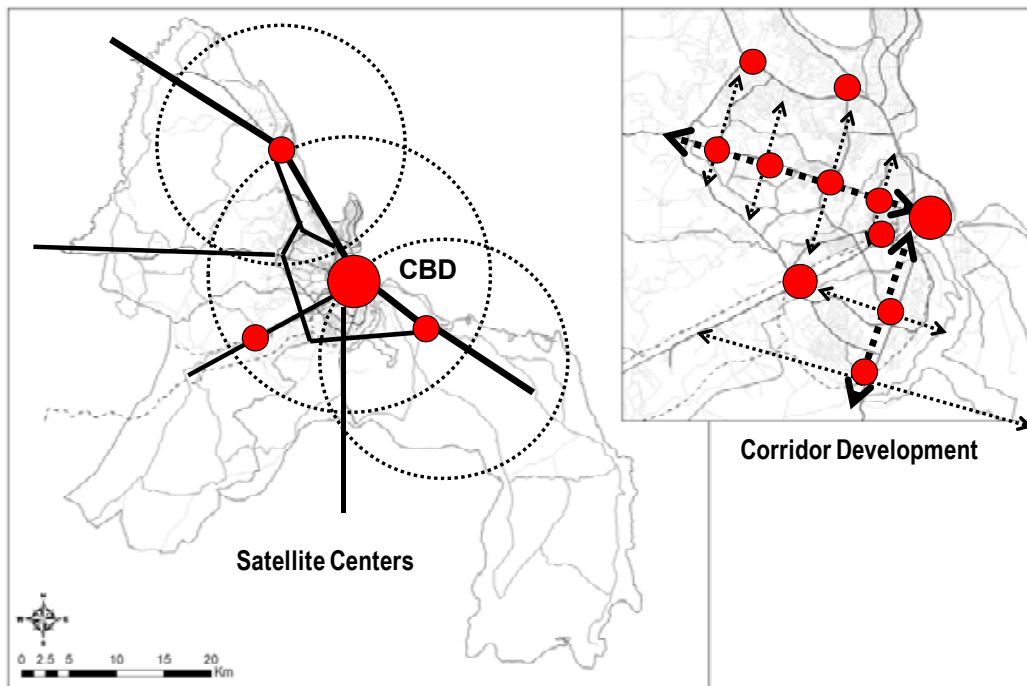


Figure 3.5.4 Satellite Centers and Corridor Development

Intensive Corridor Development

In parallel with Morogoro road, at least two secondary arterial roads should be developed to promote effective corridor development. **Figure 3.5.5** illustrates the image of corridor development. The area between the arterial roads can be designated as a special development zone to encourage intensive urban development by public and private partnership. It is important to develop some mechanisms to encourage participation of private sector in urban development along the corridor.

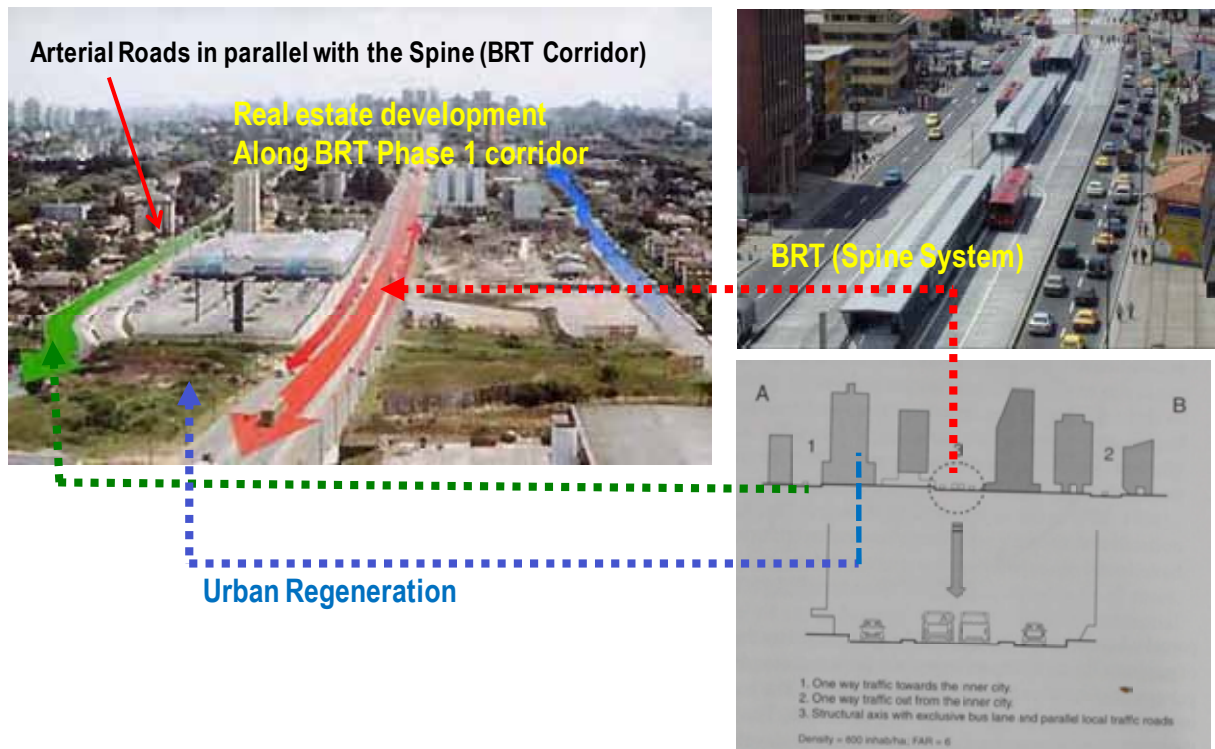


Figure 3.5.5 Image of Intensive Corridor Development

3.6 Future Distribution of Population and Jobs in 2030

Population Distribution in 2030

The future population distribution was calculated by super zone illustrated in **Figure 3.6.1**. The super zone system is a geographical unit characterized by the current degree of urbanization, distance from city center and differentiation of corridor. The basic concepts for the future population allocation are summarized as follows:

- Zone 1 (City Center within about 3 km radius) is already occupied by residential, commercial, business and government facilities. Through urban redevelopment activities, the population will increase slightly from 77,800 habitants in 2007 to 116,600 habitants in 2030. The population density will increase from 73 persons/ha in 2007 to about 110 persons/ha in 2030.
- Zone-2 (Msasani) is mainly low-density and good residential area located in the coast. The good living environment should be maintained, and the population will increase slightly from 31,400 habitants in 2007 to 60,900 habitants in 2030.
- The areas from Zone-3 to zone-7 (roughly inside of Nelson Mandela road) are already densely populated areas and there is no much open space for future development. It is expected that intensive urban redevelopment will be implemented in the Morogoro corridor (Zone-4) and it will cause some changes land use from residential to commercial or business uses. Thus, the population in zone-4 is expected to increase very slightly from 404,300 habitants in 2007 to 409,000 habitants in 2030.
- Zone-8 (Kigamboni area within 5 km from the city center) will increase its population significantly by nearly 388,200 habitants between 2007 and 2030, with intensive urban development. The construction of new bridge crossing the river is essential to promote urban development in this zone.
- The areas from zone-9 to zone-12 are just outside of Nelson Mandela road. In these area there are still a plenty of vacant lands and can absorb future increasing population. The population in these areas is expected to become almost double from 1,36 million habitants in 2007 to 2.42 million habitants in 2030.
- The areas from zone-13 to zone-16 are located in the city boundary, roughly 20-30 km from the city center. These areas are still not urbanized and they are mainly occupied by agriculture and forest. In these areas, some housing projects like 20,000 plots projects are already on going. Thus, the population will increase in strategic locations in these areas. Especially, zone-13 and zone-16 are expected to have large population growth.

Figure 3.6.2 shows the future population distribution pattern in 2030 by using 1 km grid. This population distribution is based on the intensive population allocation within the proposed UBG.

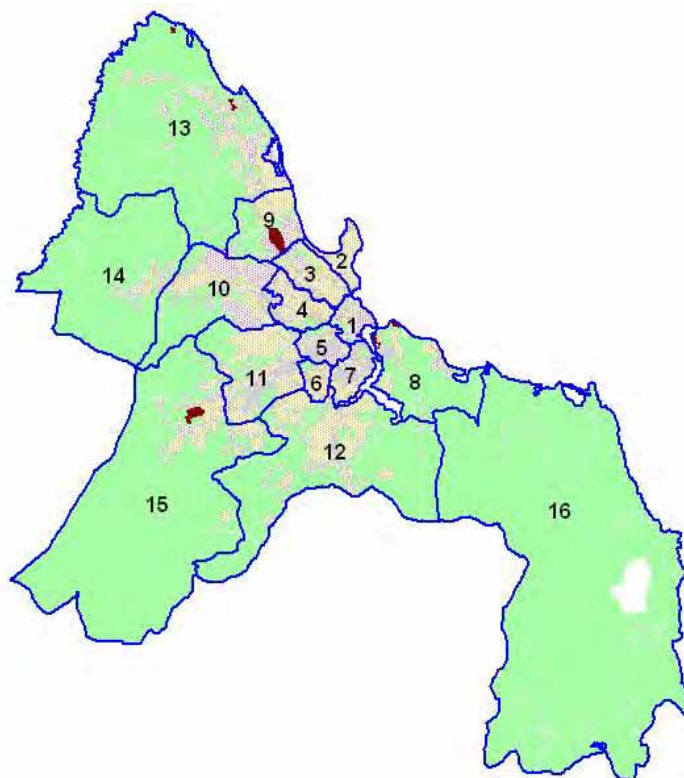


Figure 3.6.1 Super Zone System

Table 3.6.1 Future Population by Super Zone

SPZ	Area (sqkm)	2003	2007	2015	2030 with UGB
1	1,060.1	64,500	77,800	110,400	116,600
2	1,123.7	23,200	31,400	45,300	60,900
3	2,053.8	178,800	212,600	248,200	282,200
4	1,875.4	396,700	404,300	405,800	409,000
5	1,249.0	163,200	187,400	185,100	202,800
6	798.2	97,800	108,900	119,300	128,100
7	1,419.2	133,000	158,600	180,100	193,300
8	5,423.6	49,500	62,600	118,000	450,800
9	3,254.2	81,400	106,900	185,400	243,500
10	7,098.6	172,500	222,800	367,800	568,800
11	5,779.9	388,300	471,900	632,000	671,300
12	16,718.4	464,400	564,900	709,100	933,200
13	23,199.1	108,200	123,200	178,200	434,900
14	14,326.8	51,800	63,000	104,400	283,700
15	30,754.5	167,300	207,400	355,400	449,500
16	52,592.1	23,500	26,500	55,400	371,500
TOTAL	168,726.8	2,564,000	3,030,000	4,000,000	5,800,000

Source: NBS for year 2003 and JICA Study Team for the estimates

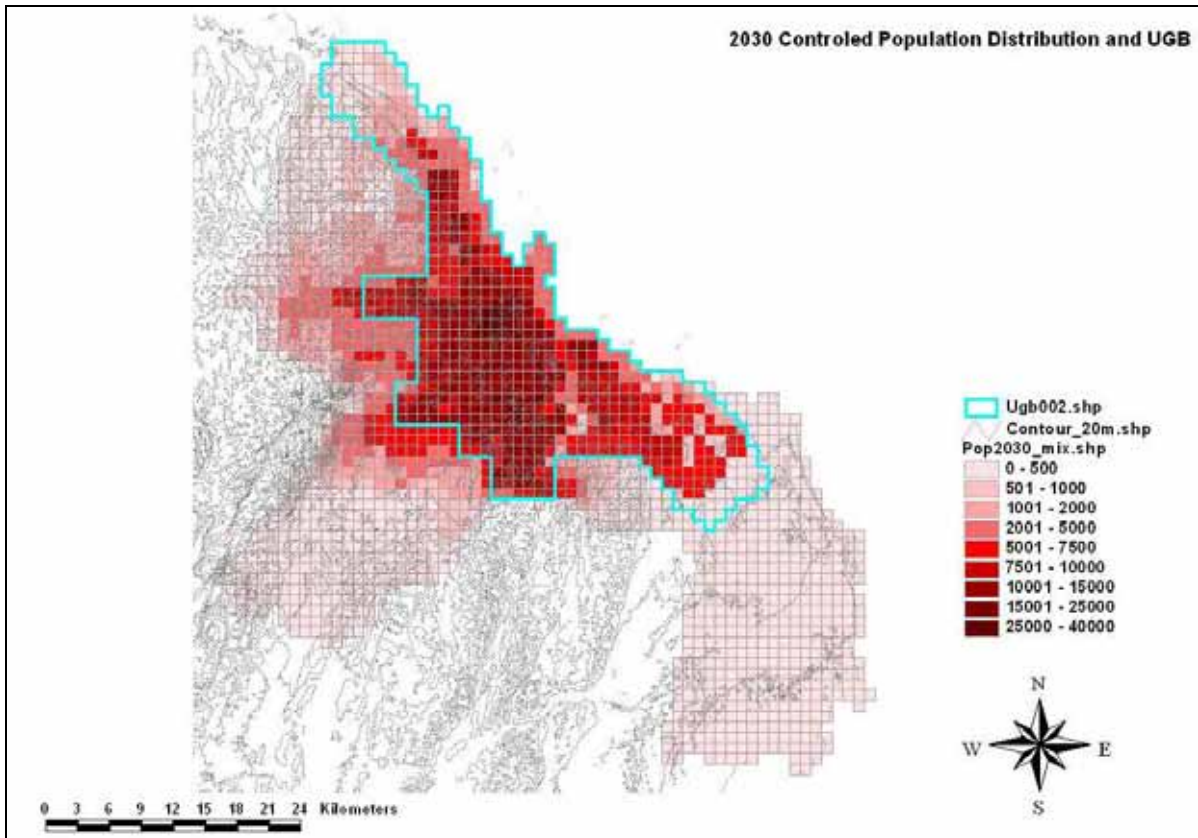


Figure 3.6.2 Future Population Distribution with Intensive Allocation within the UGB, 2030

Job Distribution in 2030

The total work population will increase about 1.3 million persons from 1,140,000 persons in 2007 to 2,320,000 persons in 2030. The future locations of jobs by economic sector were estimated based on the proposed strategic corridor development pattern. Some 82,400 jobs in the primary sector will be located mainly in the peripheral areas, such as zone-10, 12, 14 15 and 16. Some 157,000 jobs in the secondary sector will be located at strategic places concentrated in zone-4 inside of Nelson Mandela road and zone-8 in Kigamboni as well as places outside of Nelson Mandela road, such as zone-10, 11 and 12. About 1.2 million jobs in the tertiary sector will be concentrated in the central city (zone-1), Morogoro corridor (zone-4) and surrounding urban centers (zone-8 and zone-11). Although many tertiary jobs will be developed outside of the city center, the city center will still maintain its major functions as political, administrative, commercial and financial center at a national and regional level. **Figure 3.6.3** illustrates the distribution of jobs in 2030.

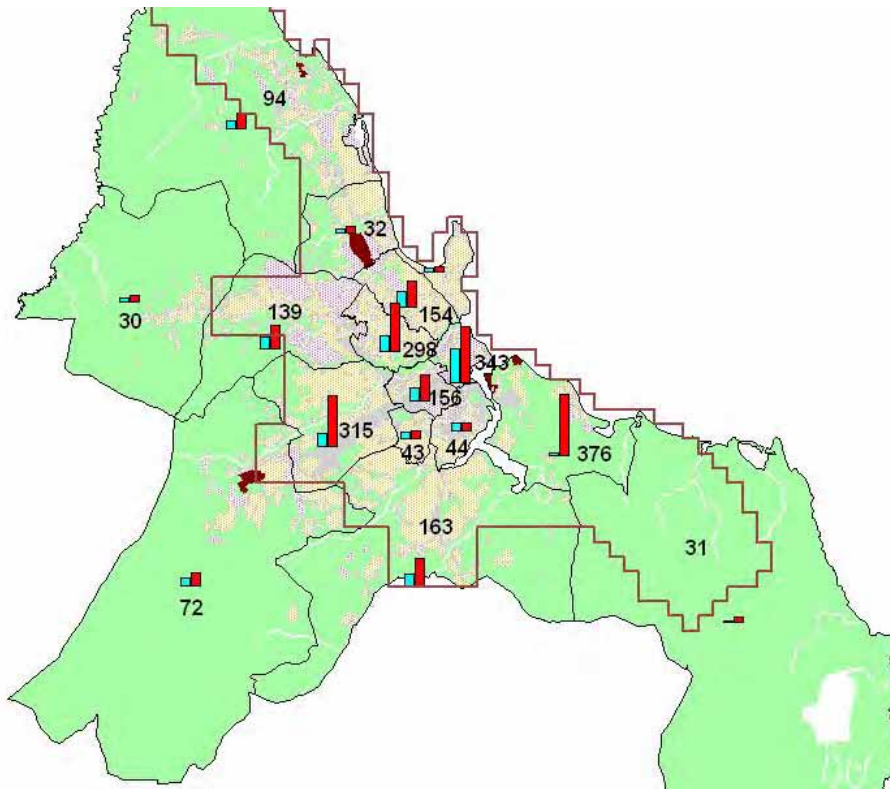


Figure 3.6.3 Future Distribution of Jobs by Zone, 2030

3.7 Recommendations

There are three possible urban development patterns in Dar es Salaam: (i) mono-centric radial development pattern, (ii) poly-centric satellite centers development pattern, and (iii) strategic corridor development pattern. Through the comparative analysis, the strategic corridor development pattern is preferred as a base option for future urban structure of Dar es Salaam towards year 2030. The BRT operation will become a trigger to change urban structure from the existing mono-centric radial development pattern to the strategic corridor development pattern.

In order to avoid disordered urban sprawl and expansion of unplanned settlements to the peripheral area, urban growth boundary (UGB) should be introduced. The UGB designates a limit of urbanization for the next 20 years. The inside of the UGB is a priority area in implementation of intensive urban development to accommodate future increasing population. The outside of the UGB is rather rural area with emphasizing on protection of agriculture and natural forest. A long-term investment of infrastructure should concentrate on inside of the UGB.

Future population and economic activities should accordingly be allocated based on the strategic corridor development pattern. The future population will increase significantly in the areas between Nelson Mandela road and the UGB and Kigamboni side in Temeke Municipality. It is essential in the construction of new bridge crossing the Indian Ocean (Krasini Creek) from a strategic point of view towards development of Kigamboni area. The future economic activities are encouraged to develop in the proposed urban centers located on the corridor as well as in the Kigamboni side.

In order to regenerate urban structure from mono-centric radial development pattern to strategic corridor development pattern, several potential measures were proposed. They are: (i) urban redevelopment for creating new urban centers; (ii) transfer of development right (TDR) and (iii) tax increment financing (TIF) to promote private investment along the corridor. These methods have a great potential to regenerate urban structure of Dar es Salaam. It should, however, be noted that successful implementation of urban redevelopment and application of TDR and TIF to Dar es Salaam needs a strong leadership of the government. Administrative and institutional capability building of the central and local governments are essential in successful implementation of these methods.

Finally, it should be noted that urban development and transport planning are two wheels to achieve effective urbanization. Without effective transport policy and planning, intensive urban development along the BRT corridor cannot be realized and vice versa. In order to realize such effective urbanization in Dar es Salaam, it is recommended to establish a new organization, called Dar es Salaam Urban Development Agency (DUDA), which will be responsible for urban planning and development issues in Dar es Salaam under the Dar es Salaam Urban Transport Authority (DUTA). Along with the proper guidance by DUTA, Dar es Salaam Urban Development Agency (DUDA) will play a leading role to regenerate the city of Dar es Salaam.

Chapter 4 Road Transport Sector

4.1 Towards Functional Road Classification Scheme

The approach to road classification in Tanzania relies on administrative responsibility, rather than functional use. At the most generic level, two types of roads exist; namely, national roads and those under local government (municipality) jurisdiction. The national roads fall under authority of the Ministry of Infrastructure Development, or, more precisely, the Ministry's executing agency TANROADS. Local roads in Dar es Salaam fall under the jurisdiction of municipalities (Ilala, Temeke, and Kinondoni). In addition, the Dar es Salaam City Council is in charge of cross-border issues among the municipalities, for example, solid waste management, traffic management (traffic police) and some major road development and maintenance. Thus, several issues emerge:

- Roads are only classed according to administrative responsibility, not functional role.
- Road design standards appropriate to intercity conditions are not necessarily appropriate to urban conditions.
- There is no consistent design (or use) guideline for local roads.
- Currently employed criteria do not routinely incorporate alternative uses such as pedestrian systems or higher-order forms of public transport.

The derivation of a functional road hierarchy for Dar es Salaam represents a division of the road network, both existing and future, into identifiable road classifications which reflect the functionality of the roads making up the highway network. It does not change the ownership or "take roads away" from current owners. Each classification has a number of criteria to differentiate it from other classifications. The criteria are based on the purpose and function of the roads making up the particular classification.

The functional road hierarchy is intended to form the central planning and administrative framework and assist in meeting the following broad aims:

- Effective design, maintenance and management of the highway network superimposed onto the current administrative classifications;
- Contribute to the minimization of adverse transport impact; and,

- Ensure that the highway network contributes towards continued economic development.

The establishment of a good functional road hierarchy is expected to catalyze the following benefits within the Dar es Salaam context:

- Provides a potential framework for policy, planning, implementation, management and monitoring;
- Assists with establishing design standards and guidance appropriate to an urban environment; and,
- Develops an understanding of road network functions.

Such a revised classification scheme forms an integral element of the Master Plan. Toward that end, it is proposed that a scheme be defined which includes expressway/motorway, primary arterial road, secondary arterial road, tertiary arterial road, community/local road and special road. The functional intent is:

- Expressway/motorway embodies high-type segregated design, and is to be used exclusively by motor vehicles. This road class will connect, for example, CBD with suburban satellite centers, residential areas, airport, seaport, and other high-activity trip generation precincts. Expressways/motorways may be tolled, should this prove desirable.
- Arterial roads are stratified into primary, secondary and tertiary facilities according to the level of services. Primary arterial roads represent critical road transport spines that anchor future urban evolution and economic activity. BRT, a vital form of urban mobility (mass transit) for Dar es Salaam, is thus seen as an integral part of this road class in that BRT busways may only be placed into primary arterial roads. Secondary arterial roads provide mobility for medium distance traffic, such as between wards or districts within the city. Network bus services may be provided on this type of road (as well as other lower road classes as long as physical and operational conditions so permit), but will largely operate in mixed traffic. Tertiary arterial roads provide accessibility to defined geographical areas within the city, and are intended to provide linkage with other higher-order roads.
- Community roads or local roads provide accessibility to and/or between neighborhoods, communities and individual plots. This level of roads lie below the focus of the Transport Master Plan.
- Special roads used for specific purposes, such as pedestrian mall, exclusive BRT road, scenic road, non-motorized vehicle way, and pedestrian way.

The main characteristics of each functional class are summarized in **Table 4.1.1** and **Figure 4.1.1**. The functional elements of the new system embody not only “traffic oriented” considerations, but also the broader aspect of mobility and connectivity between various elements of the urban fabric. For example, primary arterials form the backbone of connectivity involving major urban precincts such as wards or regions. Neighborhoods and communities, in turn, would have a higher reliance on

secondary arterials. This, in turn, implies various guidelines in terms of cross-section, speed, number of lanes and design (**Table 4.1.2**).

The unique requirements of mass transit (BRT) and commercial vehicles carry distinct implications. The previous discussion notes that BRT busways are to be provided in (and only in) primary arterial roads. In addition, the needs of heavy commercial vehicles (refer following section 4.2) entail that the needs of cargo, BRT and other road users are harmoniously integrated within the functional classification system. It is therefore proposed that a three-level stratification be implemented. While the overall functional intent of primary arterial roads remains unchanged from previous discussions, increased sensitivity has been achieved on how these roads may operate efficiently and safely (**Table 4.1.3**).

- Primary Type I arterial does not contain any BRT busway facilities.
- Primary Type II and III arterials contain busways, but with differing station designs. While BRT stations may, at first inspection, be seen in a peripheral light vis-à-vis a functional road classification, there nevertheless exist important efficiency and safety consideration in the interplay of BRT passengers, heavy commercial vehicles and other elements of the traffic stream.

Table 4.1.1 Proposed Urban Road Functional Classification Scheme

Classification	Facility Stratification	Application	Intent
Expressway / Motorway	Tolled or non-tolled	Entire Region	<ul style="list-style-type: none"> - Exclusively vehicular use; no pedestrian facilities - Access controlled with grade separated interchanges - Accommodate longer and faster trips.
Arterial Roads	Primary Arterial	Entire Region Link to trunk roads outside of Dar Es Salaam	<ul style="list-style-type: none"> - Form core metropolitan spines - Accommodate longer trips - Connect major trip generators (sub-centers, port, airport, etc.) - Link to national trunk roads - Can accommodate BRT busways
	Secondary Arterial	Between wards. Link to primary arterial	<ul style="list-style-type: none"> - Accommodate travel demands between wards in the region - Link to primary arterial roads - Network bus services provided - Transit priority (but not BRT busways) possible.
	Tertiary Arterial	Between neighboring precincts Link to primary and secondary arterial roads	<ul style="list-style-type: none"> - Provide circulation within, as well as between, wards, sub-wards, and residential areas. - Link to secondary roads - Network bus services (likely smaller vehicles) possible.
Community Roads	Access Roads (local collector roads)	Within community and residential area Link to feeder roads	<ul style="list-style-type: none"> - Local circulation and property access. - Can be used by informal forms of public transport
Special Roads	BRT road	Exclusive BRT road excluding other vehicle types	Enhanced BRT operation in support of primary arterial network within unique precincts.
	Transit Mall	Within CBD or busy commercial areas	Only for public transport (buses) and pedestrian uses
	Roads for non-motorized modes	Various locations	Safe roads exclusive for pedestrians and non-motorized vehicles
	Scenic roads/walkway	Along the coast and other scenic areas	Improve landscape, provide comfort and facilitate tourism
	Pedestrian Mall	Within CBD or busy commercial area	Provide exclusive pedestrian space and related amenities

Source: JICA Study Team

Table 4.1.2 Potential Functional Classification Profiles

Classification	Facility Stratification	Design Speed (km/hr)	Lane Width (meters)	Typical Number of Lanes
Expressway / Motorway	Tolled or non-tolled	80-100	3.50-3.75	4-6
Arterial Roads	Primary Arterial	60-80 (less with BRT busway)	3.25-3.50	4-8 (including BRT lanes)
	Secondary Arterial	40-60	3.25-3.50	4 (plus turning lanes)
	Tertiary Arterial	30-40	3.00-3.25	2
Community Roads	Access Roads (local collector roads)	Varies by use	3.00	2
Special Roads		Varies by purpose	Varies by purpose	Varies by purpose

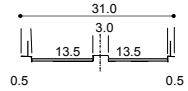
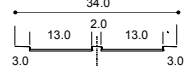
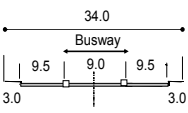
Source: JICA Study Team

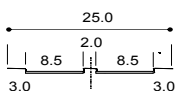
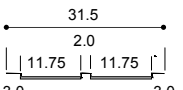
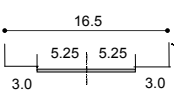
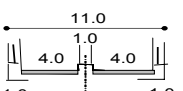
Table 4.1.3 Stratification of the Primary Arterial Classification

Classification	Implications by Vehicle Grouping		
	Bus Rapid Transit	Heavy Commercial Vehicles	Comments
Primary Type I	No BRT busways provided	Use permitted, and particularly encouraged in case of some designated facilities (truck routes).	Network (i.e. non-busway) bus services expected in absence of BRT. Provision of curbside bus bays encouraged. Service truck likely pronounced.
Primary Type II	BRT busway provided. Station design involves at-grade crossing of adjacent traffic lanes by BRT patrons (the Phase I BRT Project Concept)	Not permitted.	Network bus services to be minimal due to BRT service. Service truck activity unavoidable, but should be discouraged.
Primary Type III	BRT busway provided. Station design involves grade separated (pedestrian overpass) crossing of adjacent traffic lanes by BRT patrons.	Use permitted.	Network bus services to be minimal due to BRT service. Service truck activity expected.

Source: JICA Study Team. Heavy commercial vehicles considered articulated trucks and truck-trailer combinations.

Figure 4.1.1 Representative examples of functional road class cross-sections

Classification	Number of Indicated Lanes	Cross-section (meters)	Comment
Expressway	4 - 6		Six lanes @ 3.5 meters plus three meter outside shoulders; three meter median; 0.5 meter barriers.
Primary Arterial	6 (without BRT)		Six lanes @ 3.5 meters plus 2.5 meter outside shoulders; two meter median; three meter lateral footpaths
	6 (with BRT)		Four mixed traffic lanes @ 3.5 meters plus 2.5 meter outside shoulders; three meter lateral footpaths; two BRT lanes in median alignment @ all-inclusive 4.5 meters each. Design will require additional widening within BRT station areas to account for platform width (five meters) plus two additional BRT passing lanes.

Classification	Number of Indicated Lanes	Cross-section (meters)	Comment
Secondary Arterial	4		Four lanes @ 3.25 meters plus two meter outside shoulders; two meter median; three meter lateral footpaths
	4 (with curb bus stops)		Addition of two 3.25 meter bus bays located at curbside
Tertiary Arterial	2		Two lanes @ 3.25 meters plus two meter outside shoulders; three meter lateral footpaths
Special Roads	Varies		Wide variety of designs possible based on intended use. Indicated example is for a two-lane elevated BRT structure. Two lanes @ 4.0 meters, one meter median and one meter flanking barriers.

The functional classification is, for illustration purposes, superimposed onto the “do maximum” road plan, an element of the determination of the future road network (**Figure 4.1.2**).

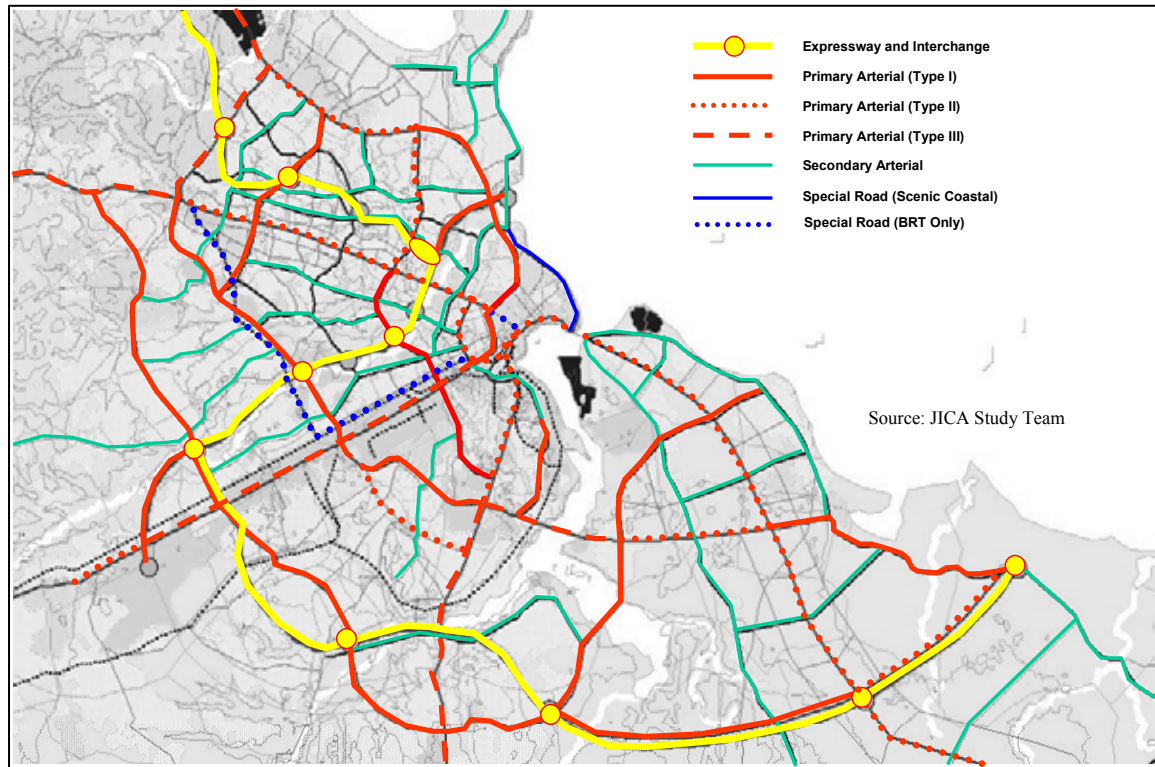


Figure 4.1.2 Year 2030 Road Network Functional Classification

Some six percent of roads incorporated within the year 2030 network would be classed as motorway/expressway, about 20 percent as primary arterials, 16 percent as secondary arterials, and near 56 percent as tertiary arterials. Type II and III primary arterials, which include facilities for busways, represent about 12 percent of the modeled road network (**Table 4.1.4**).

Table 4.1.4 Year 2030 Network Extent

Functional Classification	Subcategory	Allocation	
		Kilometers	Percent
Expressway		59.8	5.5
Primary Arterial	Type I	92.2	8.5
	Type II	52.4	4.8
	Type III	76.2	7.0
Secondary Arterial		178.8	16.4
Tertiary Arterial		611.3	56.0
Special Roads and other ⁽¹⁾		20.3	1.9
Total		1,091.0	100.0

Source: JICA Study Team.

⁽¹⁾: Includes alignments within Tabata rail right-of-way.

4.2 Commercial Vehicle Needs

Several key recommendations have emerged based on the cargo activity analysis.

- The issue of truck routes is becoming increasingly relevant already within the current context. The *Cargo Transport Survey* confirmed the importance of Nelson Mandela Road as a primary choice as corridor of heavy vehicle travel, and, to a lesser extent, Morogoro Road, Nyerere Road and Kilwa Road. Each has important implications for cargo movement by heavy commercial vehicles (articulated trucks and truck-trailer combinations). Based on these preferences, as well as reviews conducted within the framework of the Master Plan, an indication of an “immediate action” truck route is depicted in **Figure 4.2.1**, to include a circumferential link (the Nelson Mandela Road belt) with radial connectors along main corridors of heavy vehicle activity.
- Heavy commercial vehicles would be restricted from penetrating within the Mandela belt on roads other than the truck route network. A “service license” exemption for qualifying enterprises is possible with proper permits and with payment of an appropriate fee. But fees should be sufficiently high to discourage widespread exemptions from the regulation and enforcement must be of sufficient, on-going and honest magnitude to prevent abuse of the system.
- A truck depot, suitable for transfer of cargo between heavy commercial vehicles and service trucks, should be established to support restrictions in road facilities available for large trucks (i.e. the truck route concept). The current impetus for such a facility is along Morogoro Road several kilometers west of Nelson Mandela Road (Kimara truck terminal). This should continue to be encouraged. Furthermore, some truck terminal facilities inside the Nelson Mandela Road ring have already been removed (Janguani truck terminal) thus providing de-facto support for the proposed truck route concept.
- Inland container depot (ICD): (a) it is far preferable that any ICD be sited outside of the Nelson Mandela Road belt, ideally near the perimeter of Dar es Salaam (integration with the Kimara truck terminal should be considered), (b) if the Ubungo ICD is nevertheless sited as currently proposed, it is absolutely essential that truck ingress/egress be achieved via Nelson Mandela Road, and absolutely not via Morogoro Road, and (c) a linked element of the Ubungo ICD concept is the use of the disused Tabata rail-right-of-way for implementing a rail link with the seaport. However, the Study Team has proposed a much more productive use in that a BRT line should be sited within this right-of-way.
- The placement of BRT, heavy vehicle truck route network and urban activity are closely linked within the functional classification system. For example, Morogoro Road east of Nelson Mandela Road is identified as a Primary Arterial Type II facility due to implementation of the BRT Phase I concept and anticipated intense urban activity. Due in part to BRT design, movements by heavy commercial vehicles in this corridor should be banned. However,

Morogoro Road west of Nelson Mandela Road is included as a key element of the near-term truck route network. BRT Phase I concurrently extends into this area as well. However, truck activity will be pronounced, thus, Morogoro Road west of Nelson Mandela Road is designated as a Primary Arterial Type III facility. The implication of this is that the BRT Phase I concept west of Morogoro Road must be re-designed to permit elevated (pedestrian walkways) access to, and egress from, BRT stations.

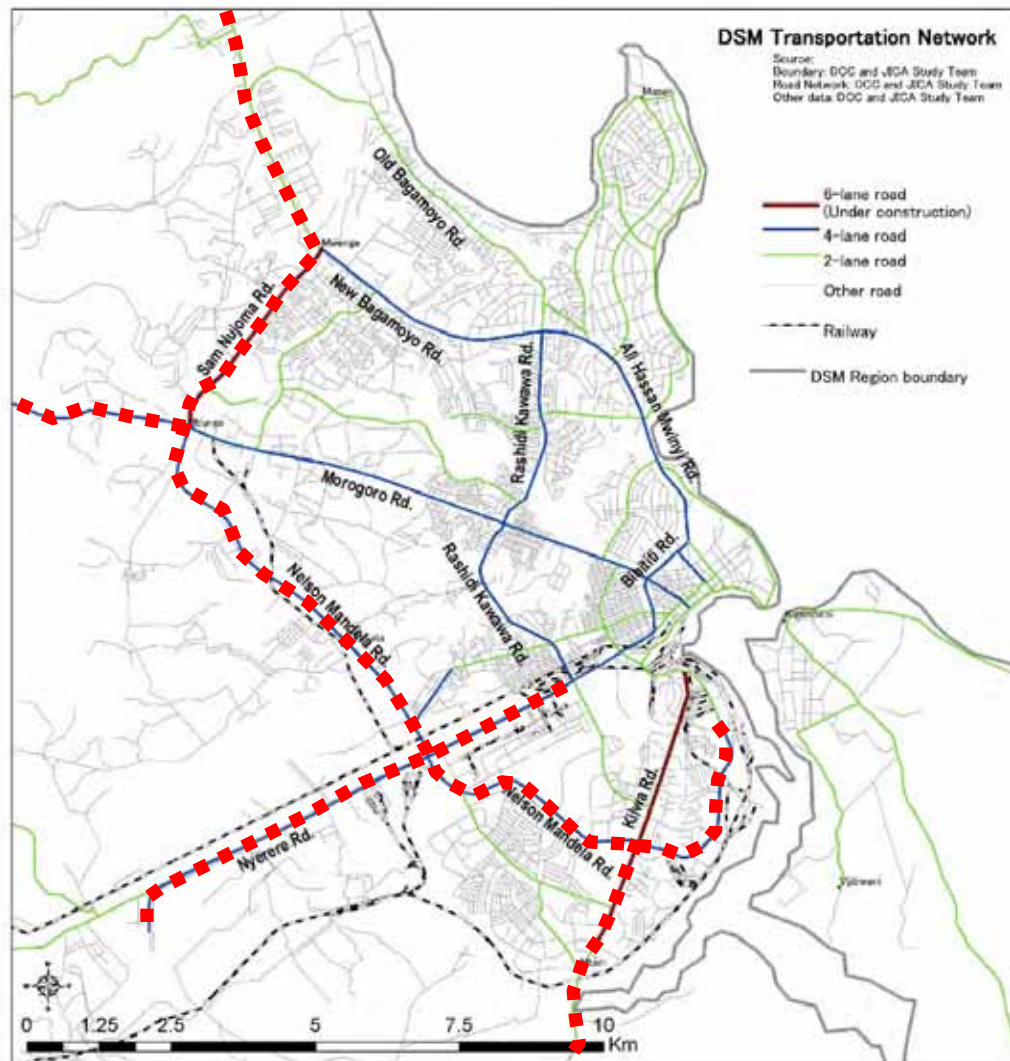


Figure 4.2.1 Proposed Near-term Truck Route Network for Heavy Commercial Vehicles

The future urban structure as promulgated by the Master Plan confirms that Morogoro Road (within Nelson Mandela Road) will emerge as a corridor urban activity precinct, anchored by the BRT Phase I system. The level of activity is expected to rival that of the current CBD. Several important considerations emerge:

- As the urban nature of the corridor intensifies, there will be an increasing need to service establishments via what will be smaller (two axle) trucks. Heavy commercial vehicles, in line

with the proposed truck route scheme, are not expected to be an issue along Morogoro Road inside of the Mandela belt.

- Three issues complicate the role of service trucks: firstly, the lack of alternative road space other than Morogoro Road itself (that is, there are no paralleling facilities or minor roads via which “backdoor” service could be provided using other than Morogoro Road); secondly, the urban form of BRT within this corridor, that is, access to/from BRT stations via at-grade pedestrian crossings of Morogoro Road, will depress vehicular capacity and, lastly, overall congestion is expected to increase.
- The Master Plan is conscious of these issues and, as part of longer-term solutions, various new road facilities (or upgraded existing facilities) have been proposed to overcome the lack of sufficient road space in the corridor.
- Nevertheless, there may well emerge justification for considering a peak hour (during hours of heaviest vehicular activity) ban on service truck activity within the Morogoro Road corridor. This would suggest an increase (vis-à-vis present practices) of off-peak (likely evening) goods delivery.

Such a measure would be seen as an interim step to controlling congestion until additional road space can be provided in the longer term.

4.3 Road Network Master Plan

4.3.1 Evolution of the Road Network

(1) Year 2030 Network

A total of 1,091 km roads including the proposed expressway is tested with the year 2030 traffic demand of UGB assumption. As suggested in the planning framework, intensive road improvement and construction are proposed within the UGB as shown in **Figure 4.3.1**. Most of the roads in Kiganmobi side are new roads that are expected to attract future urban development in the south of Dar es Salaam.

An expressway system is proposed, which runs through the entire UGB area as a spine road system for the region. The transport policy suggests that the priority should be given to people’s mobility, but at the same time mobility of cars is important in order to improve the attractiveness of Dar es Salaam as a Gunma World City in future. The expressway runs in parallel with the Morogoro road in the future urban business/commercial axis, hence which provides direct access with motorists to go to their destinations along the BRT Phase 1 corridor. This expressway alignment will contribute to the urban regeneration of the BRT Phase 1 corridor as well.

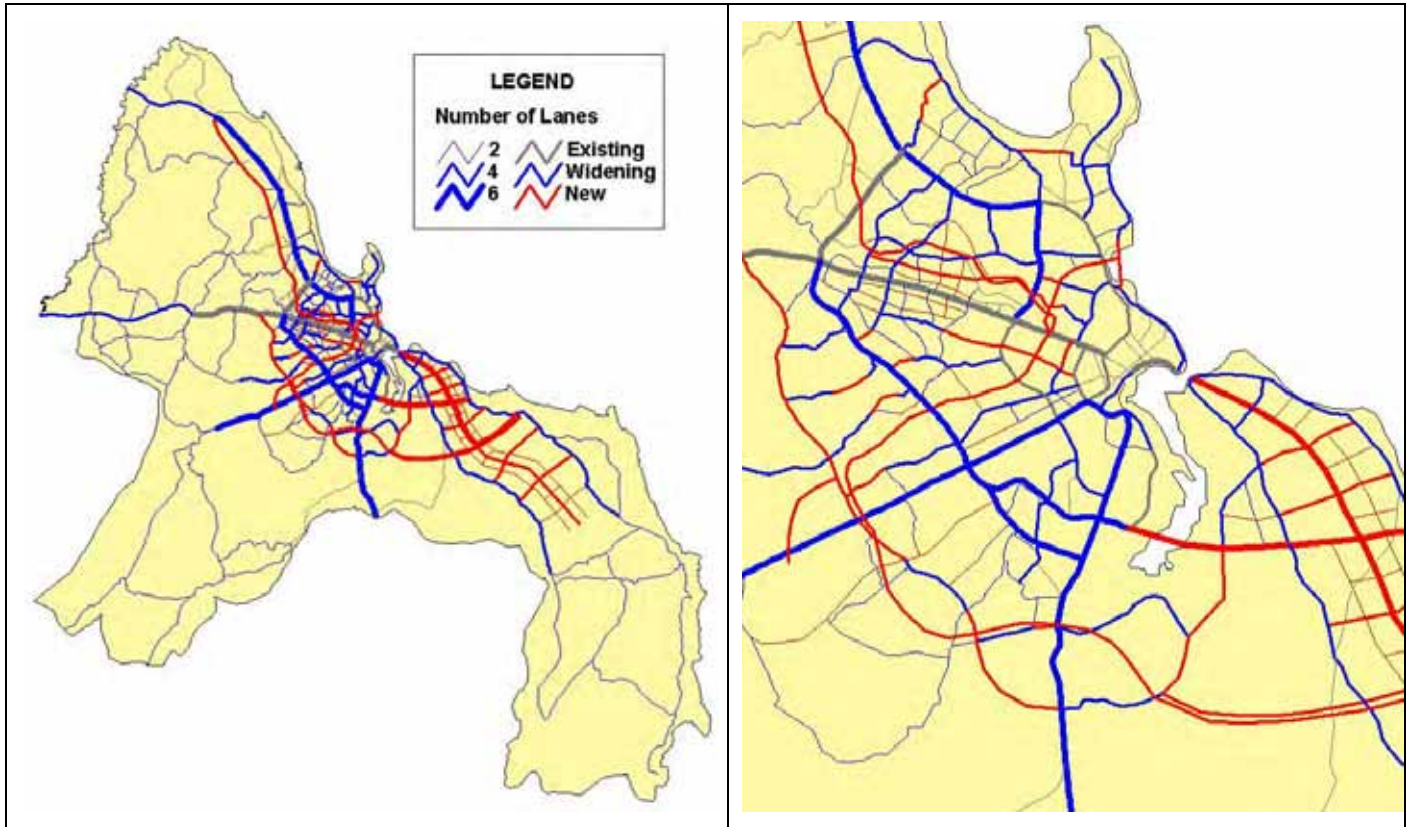


Figure 4.3.1 Year 2030 Network by the number of lane

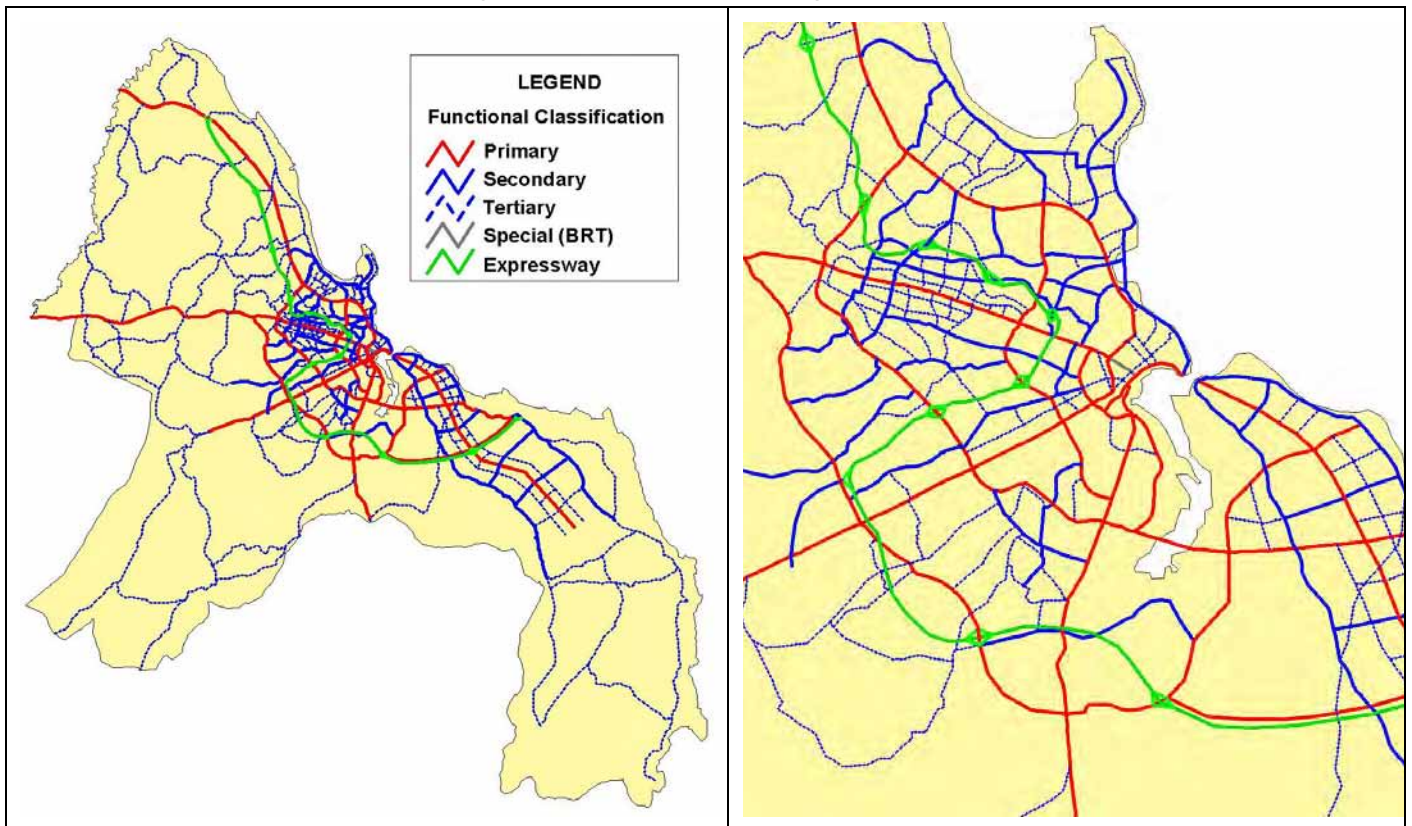


Figure 4.3.2 Year 2030 Network by road class

Table 4.3.1 The Master Plan Road Development Project List

Project No.	Project Name	Road Classification	Project Length (km)	Project Cost (Million Tshs)
101	New Bagamoyo Road Widening	1	17.0	81,371
102	Nelson Mandela Road Widening	1	12.9	59,290
103	Kigamboni Bridge and Access Road Improvement	1	8.1	130,116
104A	Inner Ring Road/Kawawa Road Development	1	3.6	16,882
104B	Inner Ring Road/Kawawa Road Development	1	2.8	6,339
105	Nyerere Road Widening	1	15.1	51,128
106	Outer Ring Road Development	1/2	30.3	91,120
107	BRT Phase 1 Corridor and Road Development	3	9.4	11,635
108	BRT Phase 1 Corridor and Road Development	2	5.4	21,743
109A	Gerezani Area Transport Enhancement	1	15.8	33,121
109B	Gerezani Area Transport Enhancement	1	2.6	5,973
110	Selander Bridge Bypass	2	7.2	30,411
111	Kigamboni Corridor Road Development	2	8.4	20,990
112	Tabata BRT Development	5	15.5	106,390
113	Flyover Installation	1	0.0	78,048
114	CBD Traffic Management	1/2/3	0.0	2,792
115A	Expressway (Wazo-Sam Nujoma)	4	17.8	50,545
115B	Expressway (Wazo-Sam Nujoma)	3	3.2	4,009
116	Expressway (Sam Nujoma-Airport)	4	21.8	2,047,993
117	Expressway (Sam Nujoma-Airport)	2	3.1	9,075
118	Expressway (Sam Nujoma-Airport)	2	3.4	9,776
119	Expressway (Airport-Kigamboni)	4	19.4	55,193
120	Mikocheni Road Widening	2	3.1	6,457
121	Haile Selassie Street Widening	2	5.0	10,666
122	Old Bagamoyo Road Widening	2	7.7	19,470
123	Mwinyjuma Road Widening	2	8.0	22,270
124	Shekilango Road Widening	2	5.3	19,183
125A	Kigamboni Road Development 7	1	16.0	69,008
125B	Kigamboni Road Development 8	1	8.1	25,743
126	United Nations Road Widening	2	3.7	7,839
127	Morogoro Road Bypass (North)	2	6.8	19,922
128	Morogoro Road Bypass (South)	2	5.8	17,497
129	Uhuru Street Widening	2	7.5	16,078
130	Kimanga/Tabata Road Widening	2	4.5	9,443
131	Tabata Road Development	2	6.6	19,236
132	Changombe/Tandika Road Widening	2	4.3	10,019
133	Mbagala/Tandika Road Widening	2	3.5	11,044
134	Mbagala Road Widening	2	7.0	14,555
135	Sam Nujoma Road Extension	2	2.6	5,426
136	Kibada Road Widening	2	26.1	61,154
137	Kigamboni Road Widening	1/2	18.8	46,748
138	Kigamboni Road Development 1	2	1.7	3,594
139	Kigamboni Road Development 2	2	3.4	9,782
140	Kigamboni Road Development 3	2	4.5	9,326

Project No.	Project Name	Road Classification	Project Length (km)	Project Cost (Million Tshs)
141	Kigamboni Road Development 4	2	6.6	13,765
142	Kigamboni Road Development 5	2	6.4	18,670
143	Kigamboni Road Development 6	1	12.0	34,352
144	Vijibweni Road Widening/Development	1	5.7	16,564
145A	New Bagamoyo Road Extension	1	4.9	17,083
145B	New Bagamoyo Road Extension	1	8.8	23,470
146	Upanda Road Improvement	2	1.7	6,070
148	Msasani Area Road Improvement	3	1.8	2,274
149	Regent Area Road Development	3	12.2	16,346
150	Old Bagamoyo Road Extension	3	12.7	18,335
151	Kinondoni Regional Road Development	3	104.0	131,164
152	Kinondoni Regional Road Development 2	3	53.7	70,289
153	Ilala Regional Road Development	3	75.3	98,238
154	Ilala Regional Road Development 2	3	27.3	36,364
155	Temeke Regional Road Development	3	93.2	119,057
156	Temeke Regional Road Development 2	3	47.7	64,100
157	Temeke Regional Road Development 3	3	23.8	32,002
158	Corridor and Road Development 3	3	24.0	33,588
159	Tandika Area Road Improvement	3	17.5	25,512
160	Industrial Area Road Improvement	3	7.2	8,861
161	Tabata Area Road Improvement	3	4.5	6,892
162	Flyover Installation (Phase2)	1	0.0	58,536
Total			933.7	4,209,932

Note: The number of road classification indicates; 1: Primary Arterial, 2: Secondary Arterial, 3: Tertiary Arterial, 4: Expressway, and 5: Others (Tabata BRT Development, dedicated for BRT).

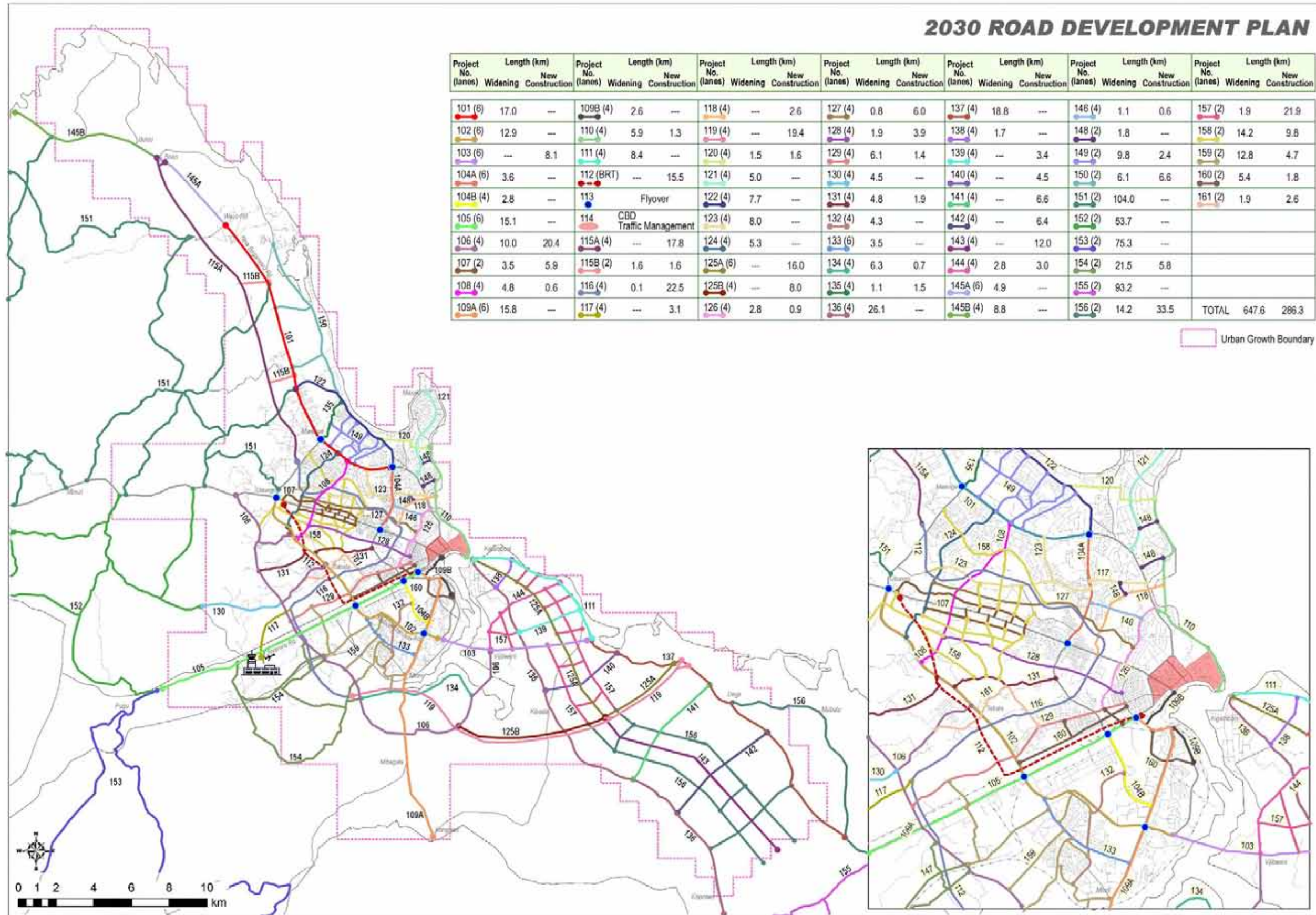


Figure 4.3.3 The Master Plan Road Network

(1) Year 2015 Network

A total of 149km road improvement and construction plus five flyovers and traffic management system (e.g., seven signalized intersections) in CBD are recommended by GAM¹ as the priority projects to be completed (open to public) by the year 2015 as shown in **Table 4.3.2**.

The 2015 priority projects include the committed Bagamoyo road widening project, widening of major primary arterial roads for future BRT operation after BRT Phase 1, Tabata BRT special road using the unused rail corridor, a series of Morogoro BRT corridor development, Outer Ring Road (this is different from the existing idea of ORR alignment).

Table 4.3.2 The Priority Road Development by 2015

Project No.	Project Name/Location	Road Class	Project Length (km)	Project Cost (mil Tshs)	Note
101	New Bagamoyo Road Widening	1	17.0	81,371	Excluding project cost of BRT buses
103	Kigamboni Bridge and Access Road Improvement	1	8.1	130,116	
104A	Inner Ring Road/Kawawa Road Development	1	3.6	16,882	
104B	Inner Ring Road/Kawawa Road Development	1	2.8	6,339	
105	Nyerere Road Widening	1	15.1	51,128	Excluding project cost of BRT buses
106	Outer Ring Road Development	1/2	30.3	91,120	
107	BRT Phase 1 Corridor and Road Development	3	9.4	11,635	
108	BRT Phase 1 Corridor and Road Development	2	5.4	21,743	
109A	Gerezani Area Transport Enhancement	1	15.8	21,588	Excluding project cost of BRT buses, including BRT flyover to Kariakoo.
109B	Gerezani Area Transport Enhancement	1	2.6	5,973	Excluding project cost of BRT buses
110	Selander Bridge Bypass	2	7.2	30,411	
111	Kigamboni Corridor Road Development	2	8.4	20,990	
112	Tabata BRT Development	4	15.5	106,390	Excluding project cost of BRT buses
113	Flyover Installation	1	0.0	78,048	4 intersections: Tazara, Ubungo, Mwenge, Kawawa-Nyerere
114	CBD Traffic Management	1/2/3	0.0	2,792	7 Signalized Intersections
120	Mikocheni Road Widening	2	3.1	6,457	
132	Changombe/Tandika Road Widening	2	4.3	10,019	
Total			148.6	693,002	

Source: JICA Study Team

¹ Please refer Technical Report 5 to understand GAM analysis for selecting the priority projects.

4.3.2 Performance of the Proposed Draft Master Plan Road Network

The performance indicators include average vehicle speed (km/hr), the share of private (vehicle) transport (percent), daily vehicle-kilometers (in terms of pcu-km), and average congestion of the network as a whole.

The average vehicular travel speed in 2007 is estimated at 25.6km per hour, which will decrease to 10.0km per hour in 2030 if nothing has done. The average volume capacity ratio will increase from 0.66 in 2007 to 3.24 in 2030. This simulation indicates the situation will be chaotic if nothing is done in the next twenty year. With the year 2030 proposed network, the average volume capacity ratio will increase to 0.89, which is reasonably acceptable level of service as a whole. However, vehicular travel speed will slightly decrease to 25.2km per hour. The “Core Network” which has no expressway system performs good as well. The average volume capacity ratio will become 0.94, which is still acceptable level of service.

The share of public transport modes will decrease from 84.4 % in 2007 to 66.4% in 2030 due to the increase of vehicle ownership. The number of registered vehicle is expected to increase from 74,000 in 2007 to 515,000 in 2030. It is quite difficult to restrict the vehicle ownership itself, but the simulation suggests a sort of traffic demand management technique might be necessary, especially in CBD, if we wish to increase the modal share of public transport in 2030.

Table 4.3.3 Network Performance Summary

	Travel Distance (PCU*km)	Travel Time (PCU*hr)	Capacity*km (PCU*km)	Road Length (km)	Ave. VCR	Ave. Travel Speed (km/h)
2007 Existing Case	4,790,442	187,005	7,305,131	783	0.66	25.6
2015 Without Case	10,054,140	647,281	7,305,131	783	1.38	15.5
2015 Base Case	8,008,715	263,979	12,485,079	959	0.64	30.3
2030 Without Case	23,688,605	2,379,228	7,305,131	783	3.24	10.0
2030 Base Case	22,012,455	871,949	24,741,882	1,215	0.89	25.2
2030 Without Expressway	20,951,285	1,007,062	20,262,879	1,142	1.03	20.8

Source: JICA Study Team

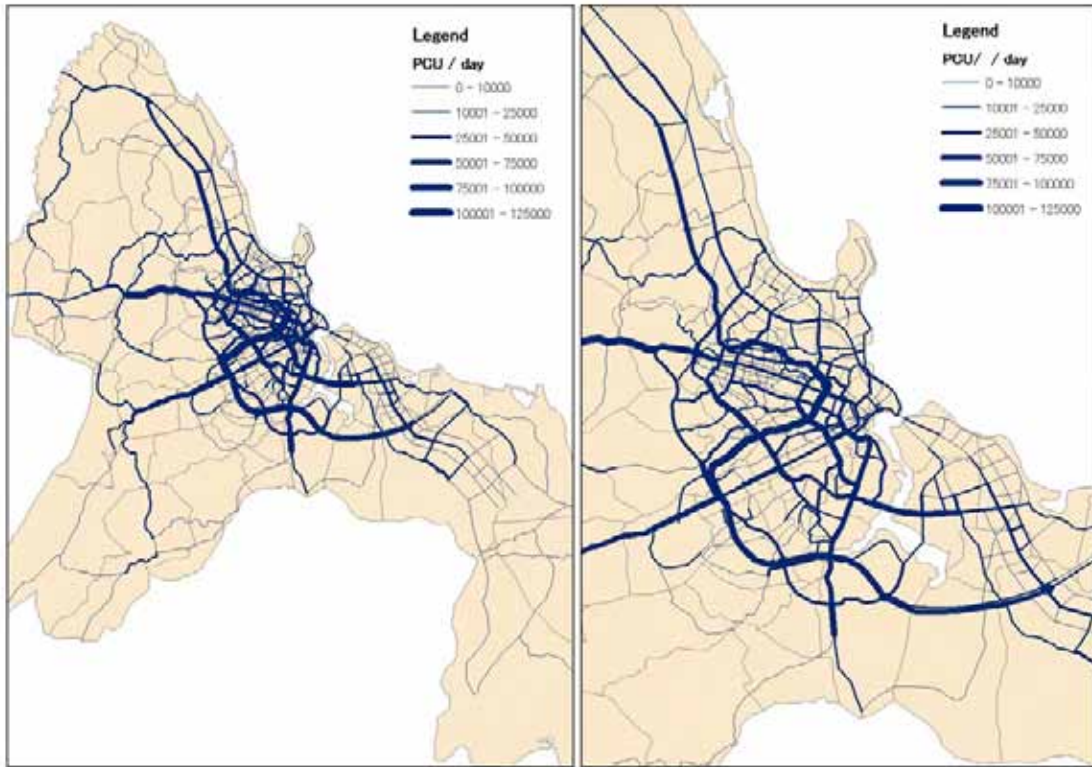


Figure 4.3.4 Year 2030 Traffic Assignment Result

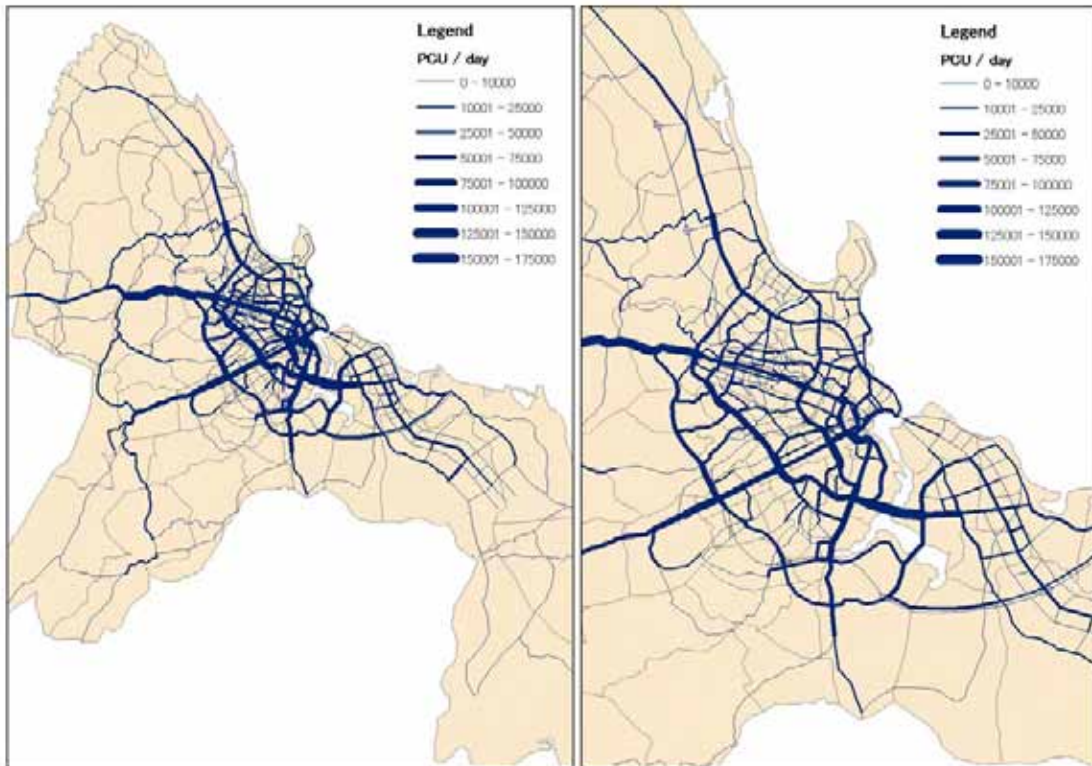


Figure 4.3.5 Year 2030 Traffic Assignment Result (Core Network without Expressway)

4.4 Critical Locations – short-term actions

4.4.1 Priority Intersections

The review of Dar es Salaam priority intersections, as documented in *Technical Report 2*, is inclusive of a variety of considerations and leads to a series of conclusions. These are:

- The highest priority locations in terms of needed action include Ubungo Intersection, Tazara Intersection and Bandari Intersection (involving several possible solutions in the surrounding Gerezani area) (**Figure 4.4.1**).

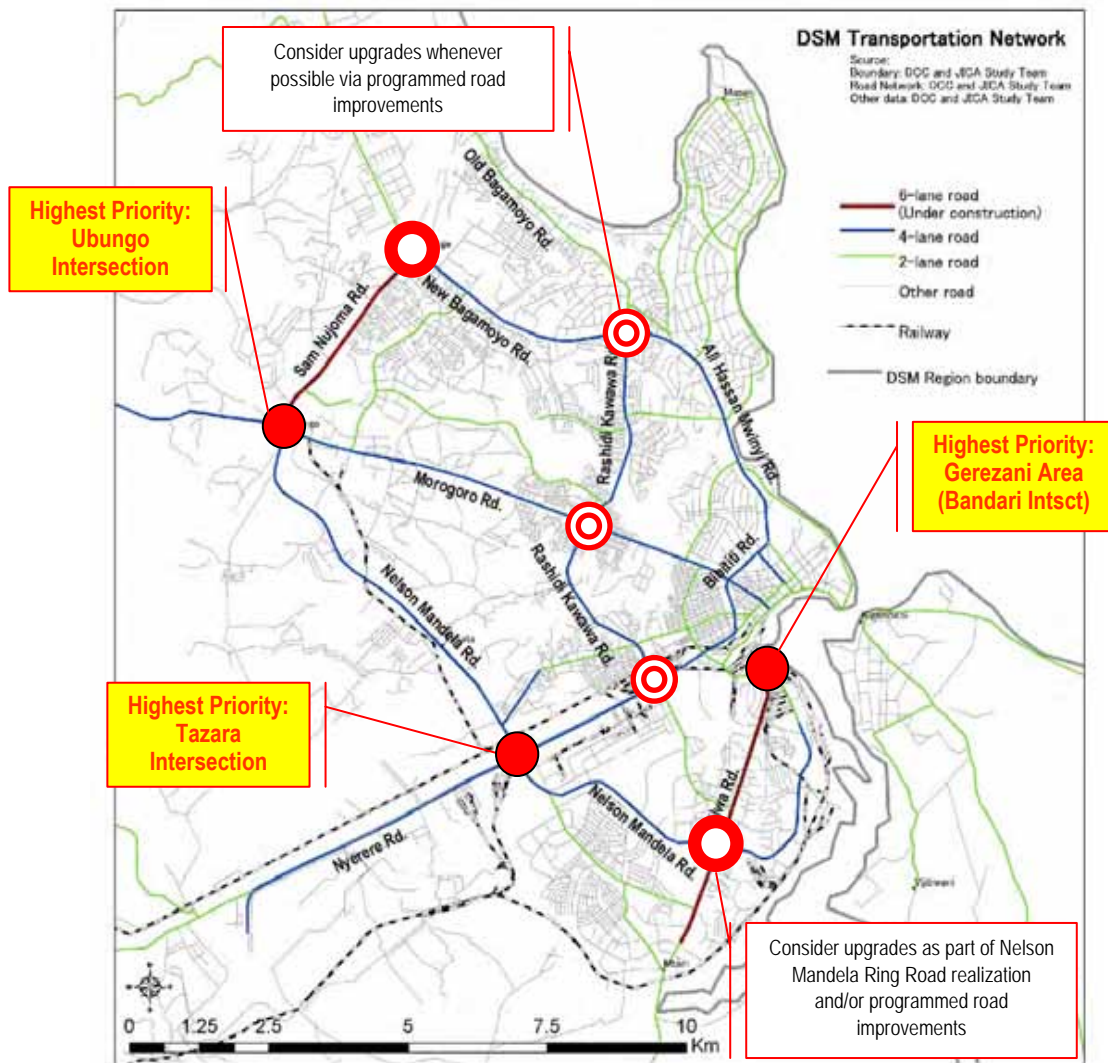


Figure 4.4.1 Priority Arterial Intersections Targeted for Upgrading

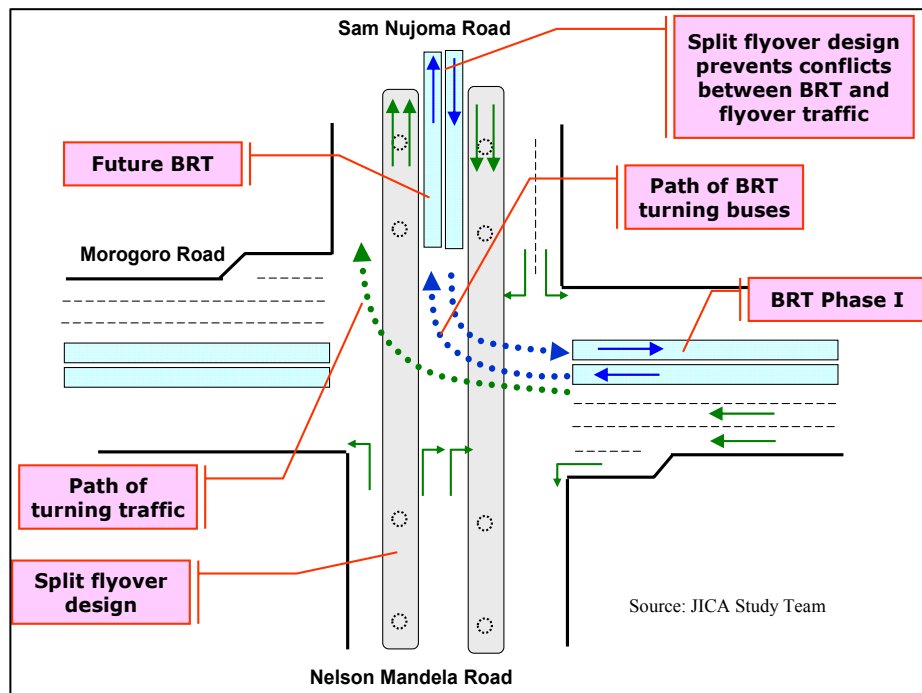
- Reinforcement of the Nelson Mandela Road beltway is seen as a highly desirable strategy. As also reviewed as part of the longer-term road network, the belt represents an important circumferential route for heavy commercial vehicles and other users alike. If adopted solutions at the Ubungo and Tazara Intersections follow the Master Plan recommendation of flyovers, then grade separation should be in direction of the belt. It is anticipated that the Mwenge Intersection (Sam Nujoma and New Bagomoyo Roads) will offer next, after priority sites, opportunity for flyover implementation as part of the programmed New Bagomoyo Road widening.
- Morocco and Magomeni Intersections could well be optimized as part of programmed improvements. Chang Ombe Intersection, in turn, could be upgraded in line with BRT realization, although it is desirable to concurrently expand the Chang Ombe profile.
- The Selandar Bridge area has clearly emerged as a congested area. While intersections flank the bridge, it is unlikely that intersection-specific solutions will rectify this situation. Instead, more rigorous approaches (construction of a road paralleling Ali Hassan Mwinyi road) are needed as pursued within the framework of the longer-term Master Plan solutions.

4.4.2 Ubungo Intersection

The focus of this section is managing BRT Phase I operation at this critical location. Conclusions are, in summary:

- The Master Plan is fully supportive of the DART BRT concept, and is in full agreement with the implementation of this exciting mode in Dar es Salaam. The BRT concept has been fully integrated within the framework of the Master Plan and is seen as a cornerstone in the provision of enhanced urban mobility. While the proposal for the BRT Phase I system is the result of considerable and thorough professional investigations, the proposed concept contains a BRT-centric approach and, accordingly, broader perspectives are needed to ensure that other modes of traffic (to include other buses, heavy commercial vehicles – in particular articulated long-distance trucks - and cars) are not overly and unnecessarily penalized by the introduction of BRT.
- The BRT Phase I design as of December 2007 will cause unwanted delay and operational difficulties at Ubungo Intersection, largely due to U-turn facilities proposed north and south of Morogoro Road. It is, therefore, highly desirable to raise these issues prior to begin of Phase I construction.
- There is a strong need for a quick resolution of the identified concerns as the Phase I system is rapidly moving towards implementation. Yet, alternative solutions require more detailed review to ensure that physical and operational criteria are fully met to the satisfaction of the Government of Tanzania and the World Bank. This is possible with a concerted “fast track” approach to problem solving.

- The solution can follow two generic paths. Firstly, if only the needs of BRT are considered, to the exclusion of other modes in the mixed traffic stream, than the current BRT Phase I concept fulfills these expectations and no concept adjustments are needed. However, if the broader needs of all intersection users are considered, there indeed exists a need to “fix the intersection”.
- An optimization of Ubungo Intersection from the existing Phase I concept is possible considering current levels of demand. Proposed adjustments include the adoption of four-phase signalization, inclusion of right-turns at the intersection proper (hence no U-turn facilities as currently proposed by the BRT Phase I concept), the reduction of dala dala activity per a post-BRT scenario, and the relocation of the Ubungo dala dala terminal access point (both as proposed by the BRT Phase I concept).
- Implementation of this change will entail modification of the BRT Phase I concept. However, adjustments to the Phase I-proposed layout, in particular removal of the proposed U-turn facilities and the retention of right-turn lanes, are not seen as being technically difficult (assuming physical conditions so permit) nor excessively time consuming. However, several foreign sponsoring entities, in addition to the Government of Tanzania, are stakeholders in intersection improvements; thus immediate coordination (and cooperation) is essential.
- The indicated modification is likely, in the short to medium term future, to cater for anticipated intersection demand. However, in the longer term, increasing traffic may overwhelm this at-grade solution. More robust cures will be needed to “fix the intersection”. The demand analysis suggests that construction of a mixed traffic flyover, using to split (portal) design to account for future BRT lanes along Sam Nujoma Road, is likely to offer most benefit in terms of intersection (and indeed corridor) traffic operations (**Figure 4.4.2**). It is suggested that the flyover be constructed along the Nelson Mandela-Sam Nujoma Roads axis, thus reinforcing the “inner ring road” concept whose realization will preempt “congestion transfer” to downstream junctions. The flyover solution could be pursued for near-term implementation, thus negating the need for any sort of at-grade solution. While financing remains an issue, quick flyover implementation will offer many benefits at this congested location while presenting timely coordination possibilities with on-going road improvements sponsored by the European Commission (Nelson Mandela Road) and the Government of Tanzania (Sam Nujoma Road).
- If construction of the flyover evolves as a future project, two implications are important: (a) to ensure that the final Phase I layout (at-grade solution) is, as practical and possible, compatible with future intersection configurations to prevent duplication of effort and wasted use of scarce financial resources; and, (b) timely agreement among stakeholders regarding intersection improvement implementation strategies.



**Figure 4.4.2 Schematic of Potential Mid to Longer-term Solution
Split Structure Nelson Mandela Road Flyover for Mixed Traffic**

A further issue exists and should be pointed out at this opportune moment.

The Phase I BRT system (Morogoro Road corridor) features two mixed traffic lanes per direction plus the BRT busway. BRT stations are to be provided every 500-700 meters. Station design requires that passengers entering to, and departing from, the median-sited stations must cross Morogoro Road at-grade. Each station will have two walkways in each lateral direction, protected by a “speed bump” design (each walkway will be raised between five and 10 centimeters above street level). This will considerably depress vehicular capacity since, in addition to intersections, there will be at least two “speed bump pedestrian crossings” every 500-700 meters in each direction of travel. This design is also very problematic for heavy commercial vehicles, which currently are numerous on Morogoro Road west of Nelson Mandela Road (the dominant cargo corridor linking upcountry and seaport lies along the Morogoro Road – Nelson Mandela Road axis).

There is considerable concern regarding the safety of pedestrians and BRT users at BRT stations sited within Morogoro Road west of Nelson Mandela Road. In the interests of pedestrian safety, as well as enhanced road operations for all members of the traffic stream, the BRT Phase I Morogoro Road stations west of Nelson Mandela Road should be equipped with elevated pedestrian walkways instead of at-grade road crossings.

- A need to link the Kilwa Road BRT system with other BRT lines, and/or the major BRT stations at Kariakoo, DCC and Railway Street station.
- Any solution must not funnel additional traffic into the CBD, whose intersections and pedestrian systems are already operating at capacity.

Considering the above issues, a preliminary feasibility study for the Gerezani area suggests the widening of Bandari – Gerezani road and the BRT flyover to the Kariakoo BRT terminal as follows:

(1) Bandari Road

Bandari Road, beginning from Gerezani Roundabout, traverses over the railway by the 35 m long Gerezani Bridge and goes down to the B.P Deposit area. Following the existing road, the widening to 6 lanes (including 2 BRT lanes) in this section is recommended almost in parallel with the existing road alignment. The total road to be widened is about 900m (see **Figure 4.4.4**).

(2) Gerezani Road and Bridge

From Gerezani Roundabout, passing the Gerezani bridge, the road goes to Nyerere Road with a ROW width of about 20 m. Land acquisition and house compensation might be required for widening to 6 lanes including 2 BRT lanes (see **Figure 4.4.4**).

(3) Flyover Bridge crossing Nyerere

A flyover is necessary to overpass the Nyerere Road, TRL and Msimbazi Street. Salient feature of the proposed flyover is summarized in **Table 4.4.1**. And, plan and profile is given in **Figure 4.4.5**.

Table 4.4.1 Salient Feature of Flyover Passing Nyerere Road

Item	Description
Type of structure	Fly over passing Nyerere road
Total length	566m
Bridge portion	270m
Approach portion	132m+164m
Type of bridge	Post tension PC Girder
Girder height	2.50m
Width of fly over	11.00m
Carriageway	4.5m+4.5m=9m
Median	1m
Clearance	5.30m
Slope	4%
Span arrangement	8 spans(1@50m,5@30m, 2@35m)
Type of foundation	Concrete pile foundation

Source: JICA Study Team

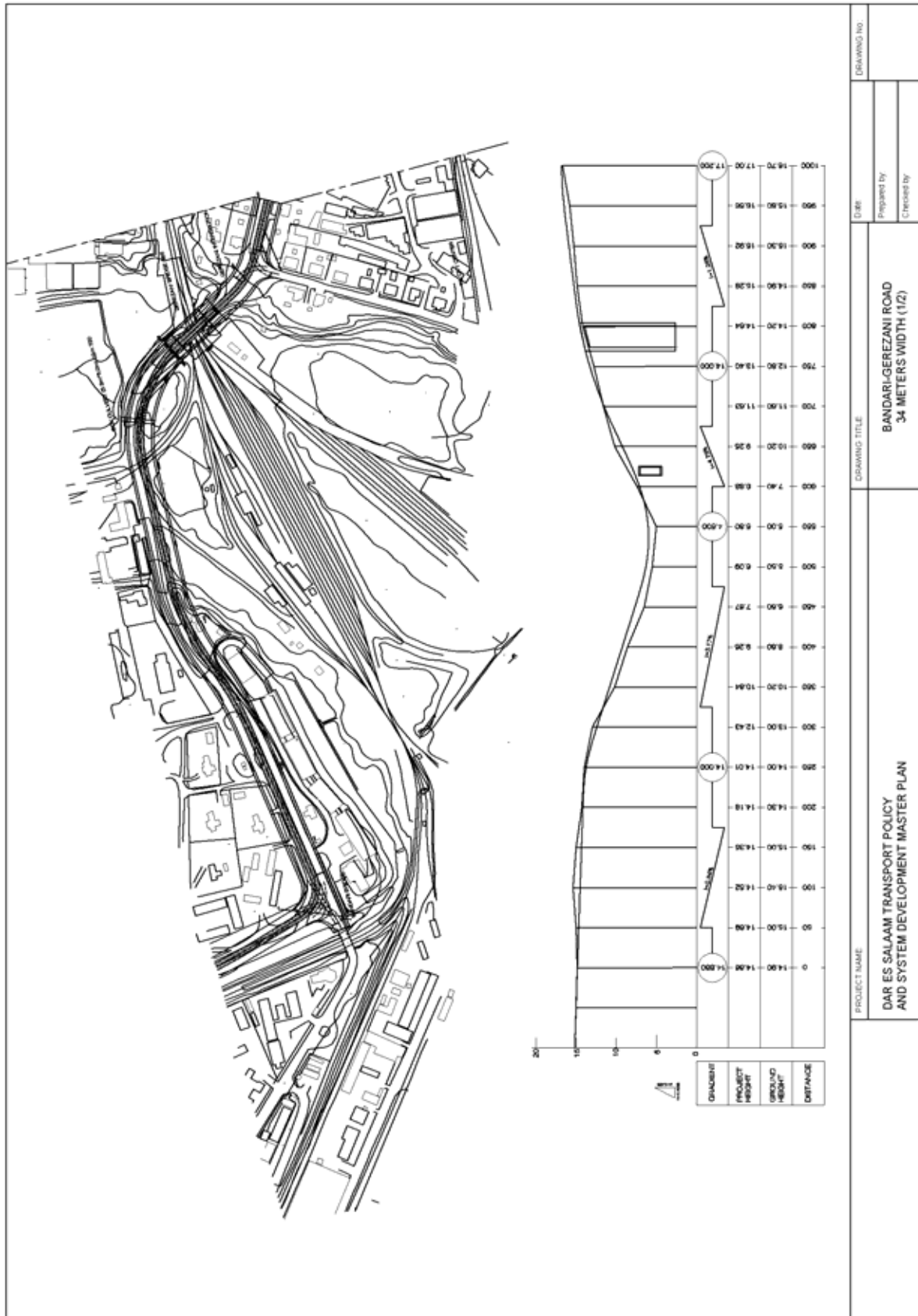


Figure 4.4.4 Bandari – Gerezani Road (6-lane)

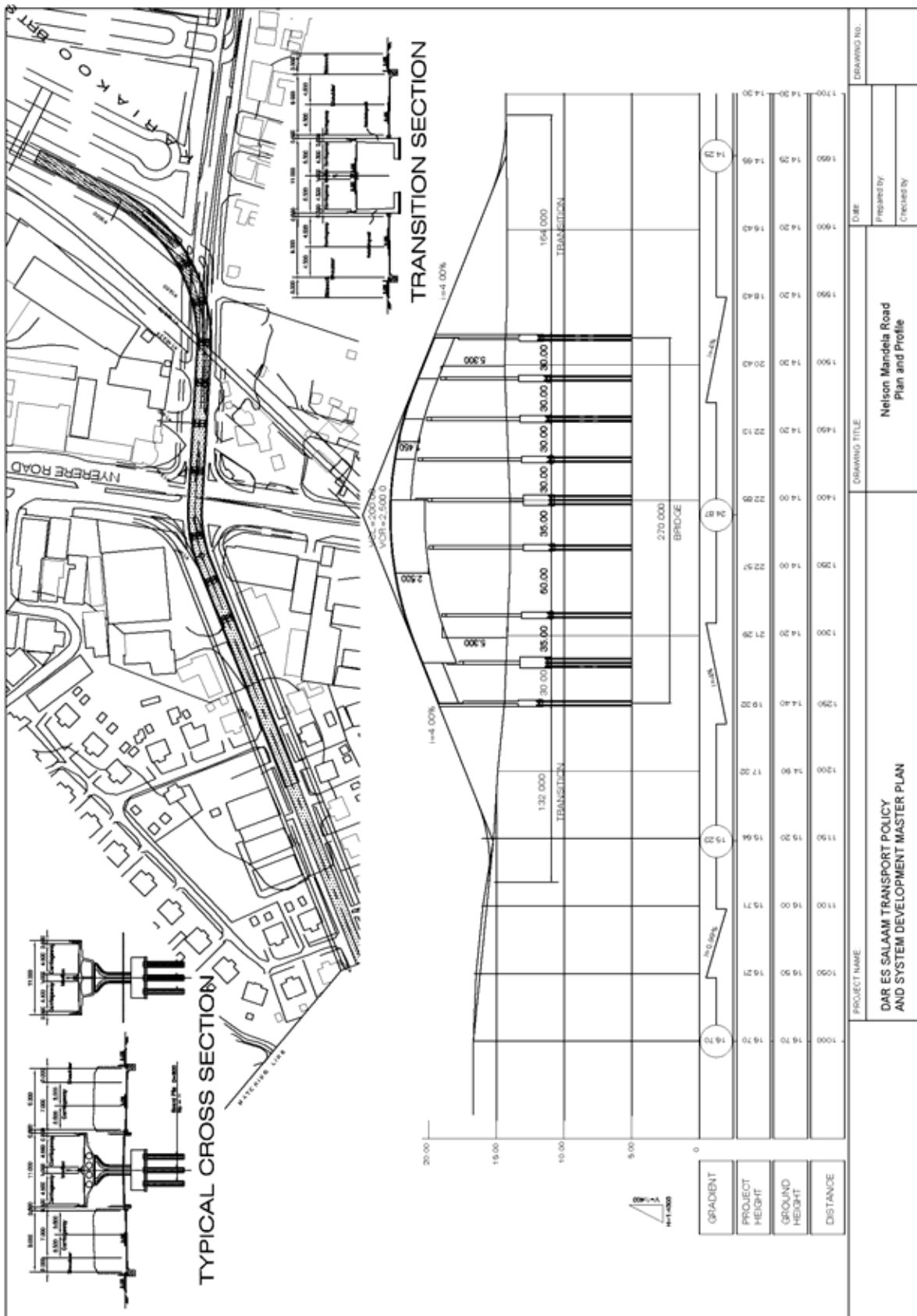


Figure 4.4.5 BRT Flyover to Kariakoo Terminal

4.4.4 Tazara Intersection

Traffic demand at Tazara Intersection is pronounced already at present, and expected to further escalate in future. Current peak hour sufficiency reviews confirm the intersection is operating at an unacceptable high saturation ratio, one of the worst monitored in the study area.

Nelson Mandela Road will be improved over some 16 kilometers, largely within existing alignments, between approximately the seaport and Morogoro Road. The existing multi-lane cross-section will be retained, but considerable enhancements of road surface, drainage and traffic control are foreseen. The project is sponsored by the European Commission, with completion expected in approximately two years (in 2009). Current plans at Tazara Intersection call for implementation of geometric improvements and a high-order signal system. While this will undoubtedly catalyze many improvements for intersection operation, the demand forecast suggests that any at-grade solution at this location represents only a near to mid-term benefit, and that growing traffic volumes will likely overwhelm any at-grade betterment in due course. Master Plan reviews have confirmed the desirability of implementing a Nelson Mandela Road flyover at Nyerere Road.

Furthermore, the flyover solution is consistent with the spirit and intent of the at-grade solution, and completely compatible with subsequently needed infrastructure for the Phase 2 BRT Nyerere Road BRT system (see **Table 4.4.2** and **Figure 4.4.6**).

Table 4.4.2 Salient Feature of Taraza Flyover

Item	Description
Total length	613m
Bridge portion	300m
Approach portion	137m+176m
Type of bridge	PC box girder PC hollow slab
Girder height	2.3m for PC box girder 1.4m for PC hollow slab
Width of fly over	17.00m
Carriageway	7m+7m=14m
Median	1m
Shoulder	0.5m+0.5m=1.0m
Clearance	5.3m
Slope	4%
Span arrangement	9 spans (50m, 2@35m, 6@35m)
Type of foundation	Concrete pile foundation

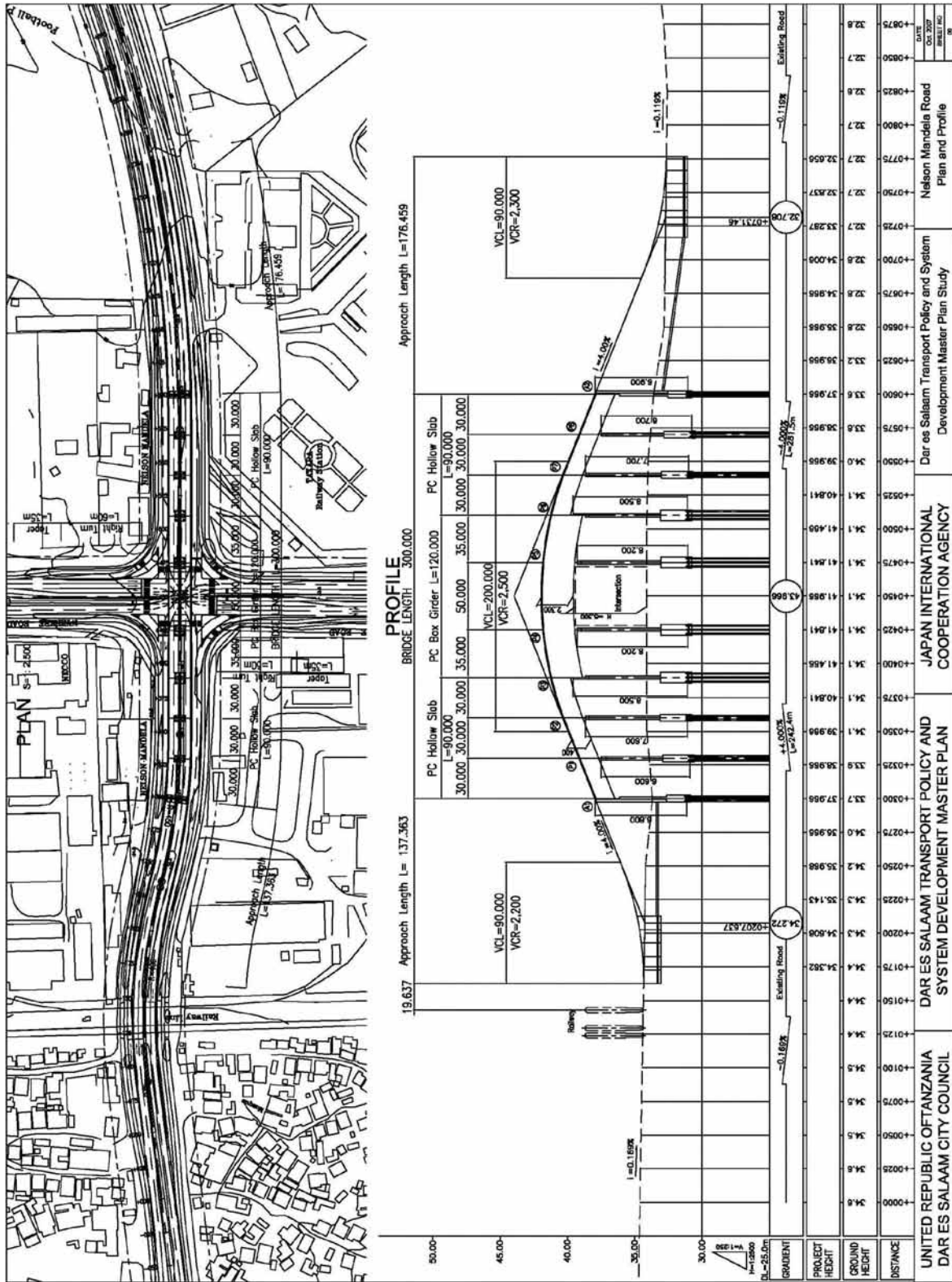


Figure 4.4.6 Tazara Flyover Plan & Profile