Part 2:

A Pre-feasibility Study on New Bagamoyo Road Widening Project

1. Outline and Objectives of the Study

In July 2007, the Government of Tanzania officially requested Japan Grant Aid for New Bagamoyo Road Widening Project, from 2-lane to 4-lane (plus 2-lane island) for 35-km road section from Morocco Intersection to Mpiji, the boarder of Dar es Salaam City.

This Project Formulation Study on Road Transport Network - New Bagamoyo Road ("the Study") aims to improve efficiency of traffic flow of New Bagamoyo Road. The Study has the following specific objectives: (i) to justify the appropriateness of the road section of New Bagamoyo Road Widening Project ("the Project") for Japan Grand Aid, which has been officially requested for Japanese assistance by the Government of Tanzania and (ii) to provide recommendations in implementing the Project by Japan Grant Aid.

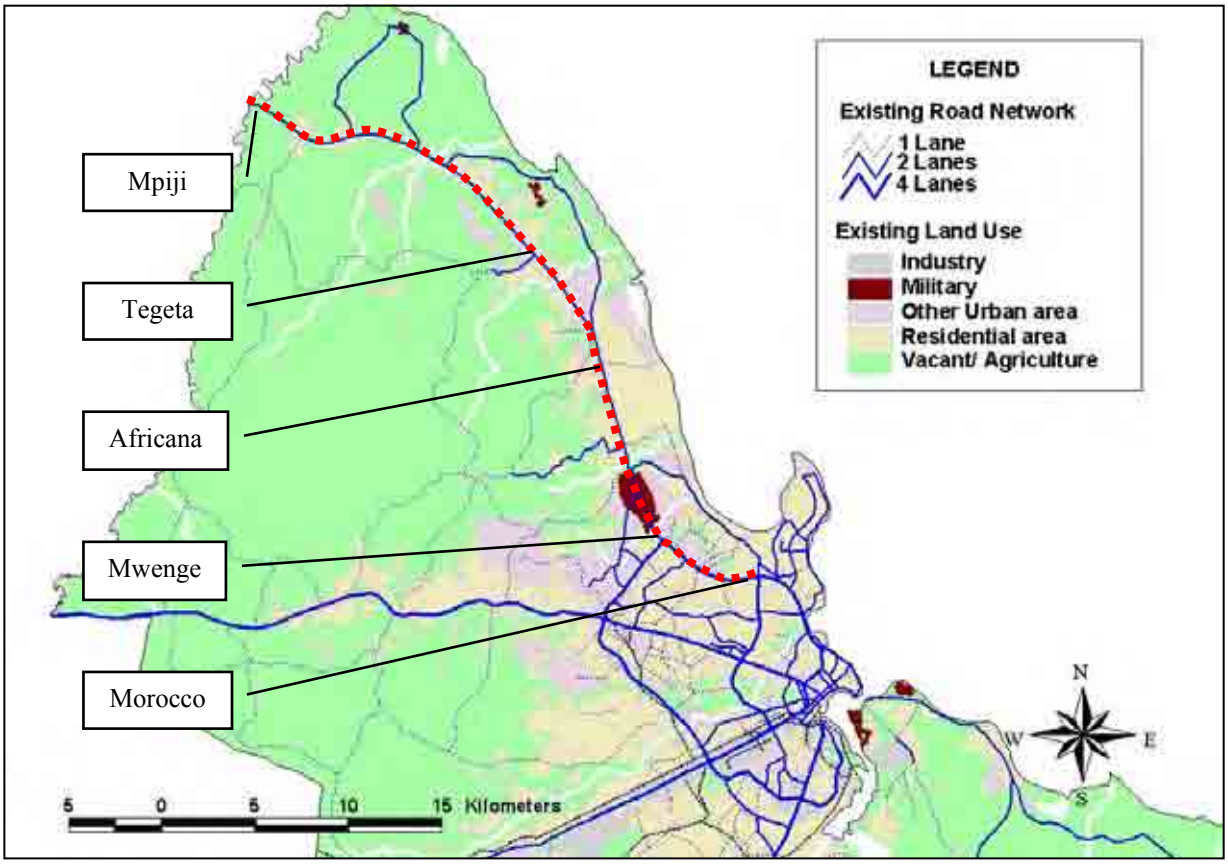


Figure 1.1 Study Area and Project Road (shown by the dotted line)

2. Outline of the Project and Issues for Implementation

The following issues are identified from the technical, economic and environmental viewpoints in adopting this Project under Japan Grant Aid.

(1) Traffic and Cross Section

- The number of lanes for the Project is determined referring to the traffic volume surveyed at the

most congested road section. This does not provide enough evidence to verify widening from 2-lane to 4-lane for the whole road section.

- In 2007, a series of traffic surveys were conducted in the Master Plan Study and traffic count surveys and travel speed survey were conducted along New Bagamoyo Road. The Master Plan Study also estimated future traffic demand with the target year of 2015 and 2030. This traffic information may be useful in determining the road function, future traffic demand, and cross section of the Project.

(2) BRT Project

- Two empirical studies on the BRT both of DART Agency and of the Master Plan Study have concluded the necessity and validity of the BRT project along New Bagamoyo Road and recommended installation of the BRT between Morocco Intersection and Tegeta or Boco. The request for the Project, however, plans to install the BRT for the whole stretch of the project road up to Mpiji, which is inconsistent with the said two studies.

(3) Alternatives and Environmental Consideration

- Following JICA Guidelines for Social and Environmental Considerations, the alternatives of the Project including zero-option need to be studied. Minimizing potential adverse impacts caused by the Project also need to be included in examining these alternatives.
- Comprehensive evaluation including technical, economic and environmental viewpoints was not conducted for the requested project as well as alternatives.

(4) Project Cost

- The same unit cost is applied in estimating the construction cost of 5 different types/lengths of bridges. Japanese signaling system is proposed for the Project. These indicate that the unit cost requested for the Project may not be well considered or may be overestimated.

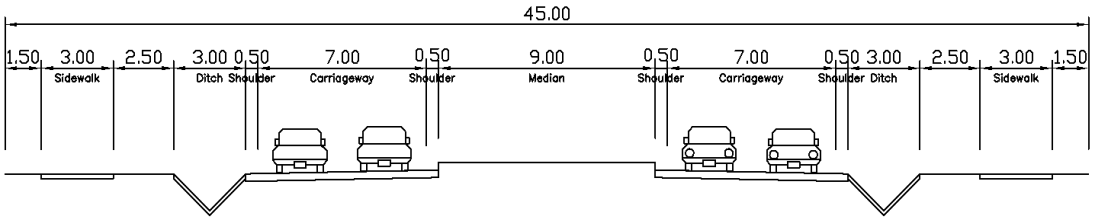


Figure 2.1 Typical Cross Section for the Project

3. Traffic Conditions and Demand Forecast

(1) Traffic Count Survey

Traffic count survey was conducted at three locations in the course of the traffic survey conducted in the Master Plan Study. In this Study, supplemental traffic count survey was conducted at three

locations: namely Africana, Tegeta and Bunju, in order to obtain the baseline data to examine and evaluate the project alternatives.

- A traffic volume differs significantly by the road section along New Bagamoyo Road. A considerable number of vehicles are observed at Mwenge (Makongo), Africana and Tegeta, where the daily traffic exceeds the traffic capacity of 16,800 PCU (passenger car unit). The traffic survey by the TANROADs also observed more than 24,000 PCU (2006) at Morocco Intersection, though classification of the vehicle is not yet disclosed.
- Severe traffic congestion is observed at Morocco Intersection and Mwenge Intersection during the morning and evening peak hours. At the Morocco Intersection, for instance, the travel speed did not exceed 10 km/h and in the evening peak hour when the traffic survey in the Master Plan Study was conducted.
- On the other hand, less traffic, ranging between 2,000 and 6,800 PCU per day, is observed at Bunju and Mpiji, where the vehicle capacity ratio ranges from 0.1 to 0.4 and is relatively small. The number of vehicles observed at Old Bagamoyo Road is 14,700 PCU and already over-saturates the traffic capacity of 10,400 PCU.

(2) Traffic Demand Forecast

The four traffic demands by case were forecasted, considering the project alternatives: 4-lane widening + BRT (Case 1), 4-lane widening without BRT (Case 2), bypass (Case 3) and zero option (Case 4). The results of the traffic demand forecast are summarized below.

- The traffic demand between Morocco and Kawe is estimated to over-saturate the traffic capacity by 2015 even when the Project is implemented. The traffic demand between Kawe and Tegeta is estimated to remain less than the traffic capacity only when the 4-lane widening + BRT (Case 1) is implemented, and the level of service, such as travel speed, maintains or even becomes better than in other cases.
- The passenger demand of the public transport between Kawe and Tegata is estimated to reach 190,000 to 220,000 trips per day (7,200 to 8,200 PCU if all the trips are transferred to daladala). Therefore, the future traffic demand in this road section will soon become larger than the traffic capacity unless the BRT is installed.
- All the case studies show that the future traffic demand between Tegeta and Mpiji remains relatively small. The traffic demand in 2015 in this road section is estimated to remain less than the capacity. The traffic demand in 2030 between Tegeta and Bunju is estimated to be slightly larger than the capacity. Considering that there is no major intersection and the road surface condition maintains good, the level of service at this road section remains at an acceptable level.
- Also, comparing bypass option (Case 3) and zero option (Case 4), the number of diverted traffic to the bypass is estimated to be much less and therefore the bypass option will not stop the traffic congestion in New Bagamoyo Road.

4. Natural Conditions

The study area is close to the equator (7 degrees south in latitude) with the climate of tropical forest zone. The season is divided into two: namely rainy season and dry season. The rainy season starts in March and lasts till May. The annual rainfall totals 1,124 mm. The rainfall in the rainy season accounts for approximately 55% of the annual rainfall. The dry season starts from June and lasts to February. Days with the rainfall during dry season are 5 days in a month on average. Especially from June to September, it becomes very dry and rainfall in this season is less than 40 mm per month.

The drainage condition of New Bagamoyo Road is rather bad. In a rainy season having much rain in a short time, the rainwater remains on the road surface for a few days. This is caused by bad road surface condition, insufficient capacity of drainage, and decreased capacity of drainage facilities due to insufficient maintenance. During the basic design stage, more detailed studies for the drainage should be conducted since the bad drainage condition causes traffic congestion especially in the rainy season.

5. Road Conditions

The road section from Morocco to Mwenge has 3-lane carriageway including a reversible lane, and each lane has markings. However, the reversible lane does not operate properly. The road section from Mwenge to Africana has 2-lane carriageway (one lane for each direction), as well as a climbing lane for a slow traffic on steep sections. The road section from Tegeta to Mpiji has 2-lane carriageway (one lane for each direction) and the surface is sometimes used as a shoulder.

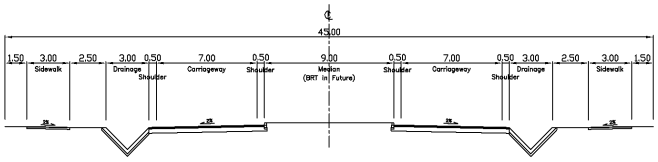
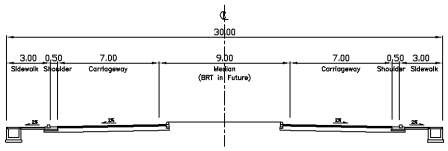
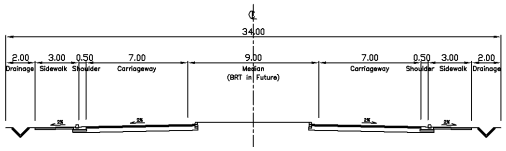
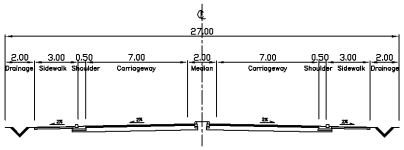
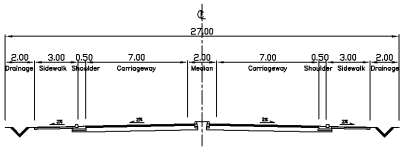
The road surface from Morocco to Mwenge is maintained in relatively good condition and has no cracks or potholes since this road section was improved in early 2008, although ruts are observed in some sections. The road surface from Mwenge to Tegeta is in bad condition, since cracks and potholes are frequently observed and flatness is not secured. The rough road surface causes traffic congestion because drivers are forced to decelerate at the potholes. However, it seems that the base course and sub-grades are maintained in good condition since serious damage such as alligator cracks were not observed. The road surface from Tegeta to Mpiji is maintained in good condition without any cracks and roughness since overly of this road section was carried out in 2002.

There are five bridges, namely Mlalakuwa, Lugalo, Tegeta, Boko and Mpiji, in New Bagamoyo Road from Morocco to Mpiji. Each superstructure and substructure has no fatal damage such as cracks and is maintained in relatively good condition.

6. Evaluation of Project Alternatives

Six alternative options of the typical cross section are tested with various criteria such as technical, economic, environmental and policy relevance for the four respective road sections.

Table 6.1 Alternative Options for the Project

Alternatives		Width	Cross Section
Original	Alternative A: 4-lane widening + BRT space	45m	
Alternative Options	Alternative B: 4-lane widening + BRT space (Minimum cross section width)	30m	
	Alternative C: 4-lane widening + BRT space (Adopting open side ditch for cost saving)	34m	
	Alternative D: 4-lane widening	27m	
	Alternative E Bypass (Widening and extension of Old Bagamoyo Road)	27m	
Other	Alternative F: Zero option	—	—

As a result of evaluation for each road section, Alternative C (ROW=34m): 4-lane widening + BRT space (adopting open side ditch for cost saving), was selected for road section from Morocco to Tegeta and Alternative F: Zero option, was selected for the road section from Tegeta to Mpiji.

In order to minimize the involuntary resettlement and mitigate the negative environmental impacts, Alternative B (ROW=30m) is also recommended to adopt. The proportion of Alternative B accounts for 20% of the road length in the road section from Morocco to Mwenge where many houses/shops are located and 5% of the road length in other road sections.

7. Preliminary Engineering Study and Cost Estimates

The design standards for the engineering study is determined and the typical cross section and horizontal and vertical alignment are studied accordingly. Based on the engineering design the Project, the project costs for the 17 km road widening from Morocco to Tegeta are estimated at Tshs 50,009 million (4,474 million Yen) for the construction cost.

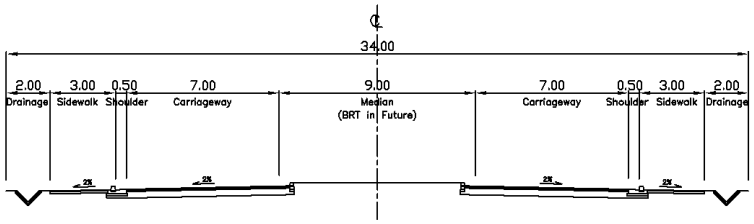


Figure 7.1 Typical Cross Section for Earthwork

8. Environmental and Social Considerations

Preliminary environmental studies including environmental screening and scoping for the proposed road improvement project were conducted based on JICA Guideline for Social and Environmental Considerations. The environmental screening work is carried out for common environmental features to be associated with each design alternative options. Based on this, the environmental scoping was carried out in order to identify possible environmental negative impacts to be caused by this proposed project.

Table 8.1 Environmental Scoping for New Bagamoyo Road Improvement Project

Factor	Evaluation	Descriptions
1. Air Quality	B	Roadside A/Q would be deteriorated due to traffic volume increases during/after construction phase.
2. Water Quality	C	Minor temporal water quality degradation may occur around nearby tributaries during construction phase.
3. Soil and Sedimentation	B	Minor sedimentation at nearby tributaries may occur during construction phase.
4. Waste Disposal	B	It is highly likely to have large amounts of construction wastes.
5. Noise/Vibration	B	Roadside noise/vibration would be deteriorated due to traffic volume increases during/after construction phase.
6. Subsidence	D	N/A
7. Bad Smell	B	There may be new obnoxious decaying vegetation - related smell problem due to additional long-term roadside inundations.
8. Topography/ geology	B	Slopes of quarries, located around Africana, do not have any slope-stabilization measures and have several minor on-going erosions. These unprotected slopes are very near to current New Bagamoyo Road and may have negative impacts on proposed road improvement project. Frequent roadside inundations due to both rapid run-off water from nearby mountains poor regional drainage system occur around Tegeta during rainy season. Run-off water collected from regional drainage system including road surface of New Bagamoyo Road is to be discharged into nearby tributaries around Tegeta, it may worsen regional floods during rainy season. It is essential to integrate drainage of road surface run-off water into appropriate regional drainage system as well as carry out relevant hydrological study to examine river section and/or flow capacities of nearby tributaries.
9. Riverbed	B	Minor changes in regional riverbed condition may occur due to accidental spill of soil and/or mud from construction site during construction phase.
10. Flora/Fauna	D	N/A
11. Water Resources	D	N/A

Factor	Evaluation	Descriptions
12. Accidents	C	Entire transport condition along New Bagamoyo Road will be improved, but severe traffic accidents due to unsafe driving (e.g., frequent violation of speed limit as side effect of road improvement) may be increased. Road crossing for pedestrian would be difficult and unsafe due to road widening to be carried out within this road improvement project, so it is essential to prepare safe road crossing measures.
13. Global Warming	C	It is essential to carry out regional CO2 emission loading study for New Bagamoyo Road Improvement Project.
14. Involuntary Resettlement	B	Many houses/offices/shops and/or restaurants exist at both sides of current New Bagamoyo Road. It is likely that certain amounts of expropriation shall be conducted for this proposed road improvement project. Note that most of properties to be expropriated are wall and/or fence.
15. Local Economy	B	Regional economic/social activities maybe hampered due to temporal traffic congestion, expropriation, resettlements of key facilities during construction phase.
16. Land use and Utilization of local Resources	D	N/A
17. Social Institutions	D	N/A
18. Existing social infrastructures and services	B	Service level of existing infrastructure as well as activities of Lugaro Barracks may be hampered due to temporal traffic congestion during construction phase. Many cables, water pipe and other lifeline facilities are buried along New Bagamoyo Road. It is essential to prepare appropriate relocation schedule of those facilities to minimize impacts on surrounding communities.
19. The poor, indigenous of ethnic group	D	N/A
20. Misdistribution of benefit and damage	D	N/A
21. Local Conflict of interests	D	N/A
22. Gender	D	N/A
23. Children's Right	D	N/A
24. Cultural Heritage	D	N/A
25. Infectious Disease	B	Malaria is rampant, and infections of those insect-borne diseases to construction workers may cause several delays to entire construction activities.

Note A: Significant, B: Minor, C: Unknown and need further relevant studies for its evaluation, D: Less significant or None (i.e., no need to carry out IEE and/or EIA Study).

Table 8.2 Overall Environmental Evaluation for proposed New Bagamoyo Road Improvement Project

Factor	Evaluation	Remarks
1. Air Quality	B	Carry out field A/Q study to obtain baseline A/Q condition. Carry out periodical roadside A/Q monitoring study while proper I/M of construction machinery/or trucks shall be conducted during construction phase.
2. Water Quality	C	Carry out field W/Q study to obtain baseline W/Q (surface/sub-surface waters) condition. Carry out periodic W/Q monitoring study during construction phase. Prepare appropriate sedimentation ponds around construction sites.

Factor	Evaluation	Remarks
3. Soil and Sedimentation	B	Carry out field soil survey to obtain baseline soil data and check if soil-contaminated sites exist or not. Prepare appropriate sedimentation ponds around construction sites.
4. Waste Disposal	B	Establish appropriate waste disposal program (e.g., adequate location of disposal sites and treatment program).
5. Noise/Vibration	B	Carry out field noise study to obtain baseline noise condition. Establish sound construction schedule that avoid any nighttime construction activities.
7. Bad Smell	B	Lessen/or eliminate the occurrence of long-term inundation that may be additional source of decaying vegetation-related obnoxious smell by establishing proper regional drainage system.
8. Topography/ Geology	B	Implement proper slope-stabilization measures at quarries to minimize risk of landslide to be caused by on-going erosion. Carry out relevant hydrological study to check if regional river systems have enough capacity to discharge run-off water collected from river basin including road surface around Mwenge – Tegeta region. Design appropriate regional drainage system around Tegeta to alleviate roadside inundation issues.
9. River bed	B	Prepare appropriate sedimentation ponds around construction sites (same to second remark of Factor 3).
12. Accidents	C	Establish appropriate traffic management and driver education programs. Also, need to prepare safe road crossing measures for pedestrians.
13. Global Warming	C	Carry out regional CO2 emission loading study for New Bagamoyo Road Improvement Project.
14. Involuntary Resettlement	B	Carry out comprehensive DMS based on finalized B/D and prepare appropriate RAP and compensation program.
15. Local Economy	B	Carry out comprehensive socio-cultural-economic studies to obtain baseline information of current socio-cultural-economic activities along New Bagamoyo Road (e.g., regional employment structure, access to markets, school, hospital and others). Based on these study results, relevant mitigation measures to minimize temporal negative impacts on those activities shall be prepared. Prepare appropriate engineering designs and construction plans to avoid interrupting activities of Lugaro Barracks.
18. Existing social infrastructures and services	B	
25. Infectious Disease	B	Prepare appropriate health awareness program (e.g., HIV/AIDS, Malaria) for construction workforce.

A preliminary land expropriation study was carried out in order to quantitatively evaluate the order of the magnitude of the land expropriation impacts to be caused by this road improvement project. As a result of the survey, direct impacts on house/or offices buildings therein are found relatively low since most of affected properties are classified as fences and/or walls. At the same time, this chapter explored the IEE study on the Project, and the Terms of Reference for the EIA-related study was prepared according to the result of the IEE study.

9. Economic Analysis

The construction cost was estimated at Tshs 50,009 million (4,474 million Yen) (including the engineering service cost and contingency), and the government administration cost at Tshs 1,272 million (114 million Yen) and Tshs 51,281 million (4,588 million Yen) in total project cost.

Assuming that the foreign currency portion of the Project amounts to Tshs 10,578 million and local

currency portion to Tshs 40,703 million, and applying the Standard Conversion Factor of 0.869, the economic cost of the Project is estimated at Tshs 45,949 million.

Based on the economic costs and benefits, annual flows of these cost and benefit are estimated and the economic evaluation results are summarized in Table 9.1. All three indicators of the economic evaluation ensure economic feasibility of the project investment: 35% EIRR, 3.9 B/C Ratio, and sufficiently positive NPV.

Table 9.1 Result of Cost Benefit Analysis

Indicator	Result
Net Present Value (at discount rate of 12%)	Tshs 76,824 million
EIRR	35.3%
B/C (at discount rate of 12%)	3.94

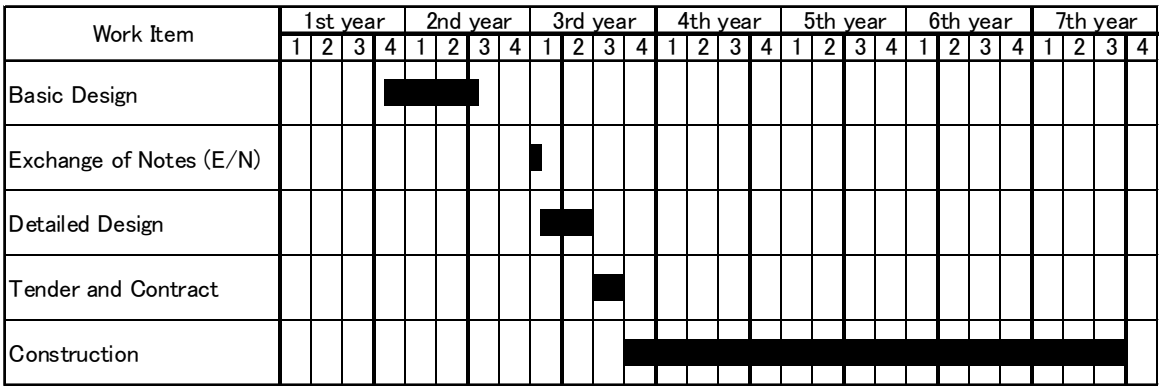
Source: JICA Study Team

10. Project Implementation Plan

After completion of this Study, the Project will be implemented in the following stages: (i) basic design, (ii) detailed design, (iii) tender and contract, and (iv) construction.

For widening the New Bagamoyo Road at the 17 km road section from Morocco to Tegeta by Japan Grant Aid, the construction period of this Project is estimated be 3 to 4 years, considering the size of the project, the amount of the budget by Japan Grant Aid and the implementation schedule of Kilwa Road Widening Project. The proposed implementation schedule for the Project is shown in Table 10.1.

Table 10.1 Proposed Implementation Schedule



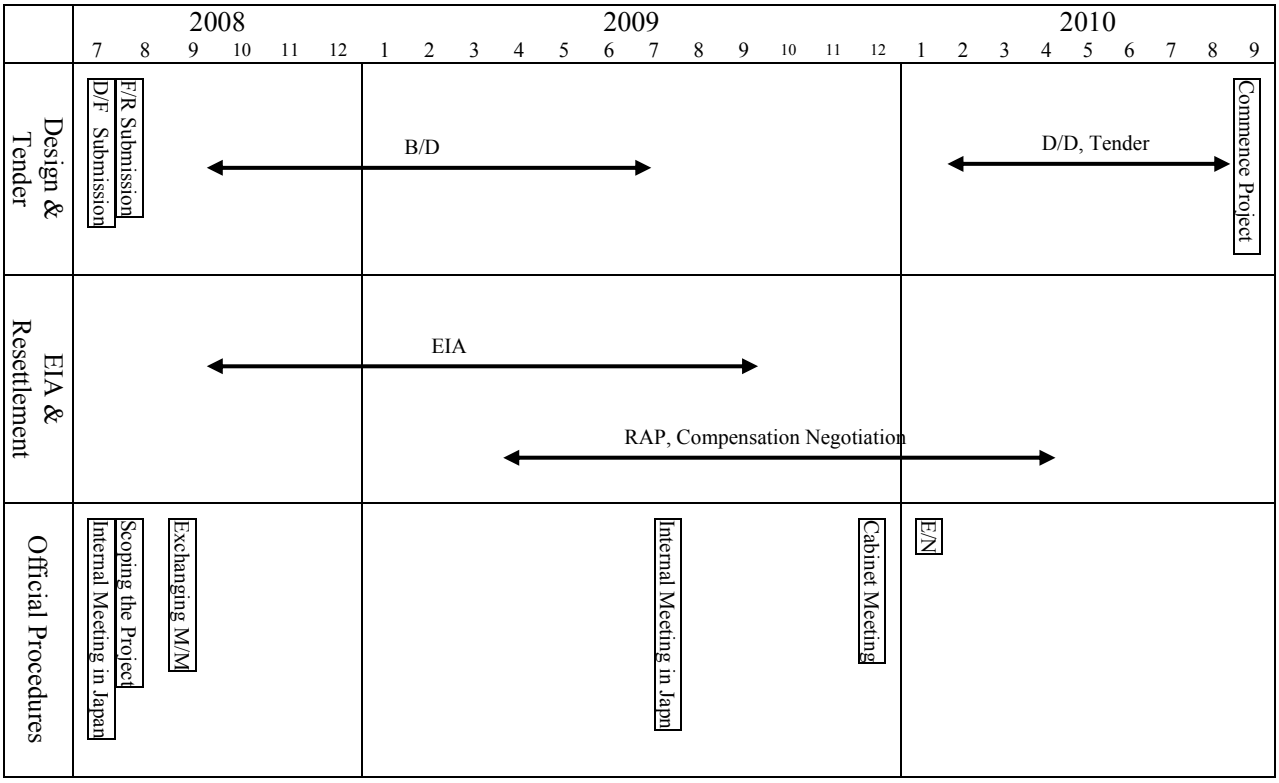
11. Recommendations for Implementation of Japan Grant Aid Project

(1) Proposed Schedule for EIA Procedure

As mentioned above, the Government of Tanzania is required to complete all the necessary procedures to obtain the EIA license by the time of E/N in implementing the Project by Japan Grant Aid. The Study Team exchanged a memorandum of the undertaking with MOID officials. In this regard, the obligation by the Government of Tanzania, such as registering the Project and implementing the EIA study of the Project, and the schedule regarding the procedure of EIA examination were confirmed.

It is estimated that it takes 12 months for the approval of EIA and 12 months for land acquisition and compensation, from the results of similar project as well as discussion with Government of Tanzania.

Table 11.1 Tentative Schedule till Commencement of the Project



(2) Further Considerations

In order to realize the Project by Japan Grant Aid, further considerations necessary to be discussed are summarized below.

- The Government of Tanzania officially requested Japan Grant Aid for New Bagamoyo Road Widening Project for 35-km road section from Morocco Intersection to Mpiji. As a result of the evaluation exercise, Alternative C: 4-lane widening plus BRT space, was selected as the most optimum solution for the road section from Morocco to Tegeta and Alternative F: Zero option, was selected for the road section from Tegeta to Mpiji. The meeting among the relevant officials needs to be held, aiming to confirm the appropriate road section by Japan Grant Aid and the improvement strategy for the remaining road section.
- The project cost was estimated based on the unit cost prepared referring to the current market price (May 2008) in Tanzania. It may change by the price escalation of crude oil, materials and labor, since the construction of the Project is to commence in late 2010 at earliest.
- In this Study, the types and sizes of culverts were determined assuming the same as the existing ones without the detailed survey and investigation. Accordingly, the detailed drainage study together with the hydrological survey/investigation should be conducted in the basic design stage. The pavement structure in this Study was determined with reference to that of Kilwa Road Project (JICA, 2006) since the surveys necessary to pavement design such as traffic survey, axle load

survey and soil survey are not conducted in this Study. Accordingly, the pavement structure should be determined with necessary surveys and pavement design in the basic design stage.

- The project cost was also estimated under the assumption that bus stops are installed at every 500 m between Morocco and Tegeta. The locations of the bus stops should be determined in accordance with the future BRT network and the existing daladala stations. Considering these, the following surveys are proposed to be conducted in the basic design stage.
- Accordingly, the Study concluded that the following surveys should be carried out during the basic design stage: Topographic Survey, Geological and Material Survey, Hydrological Survey, Traffic Survey, Underground Survey, Bridge Soundness Survey, EIA-related Survey.
- Mwenge Bus Terminal located near Mwenge Intersection is required to be relocated and/or expanded in implementation of the Project. According to the discussion with the officials of Dar es Salaam City Council and those of DART Agency, three alternatives need to be considered for the improvement of Mwenge Bus Terminal: (i) expansion of the existing bus terminal in the open space near Mwenge Bus Terminal, (ii) relocation to the existing bus terminal near Morocco Intersection, and (iii) construction of new bus terminal near Mwenge Intersection (open space in the industrial area on the north side of the intersection). The relocation or expansion of Mwenge Bus Terminal should be studied through the discussion with related agencies in the basic design stage.
- The Port Master Plan Study is underway under the support of the World Bank, and the Government of Tanzania (TPA) is expected to implement a detailed study on new port development. Accordingly, it may be too early to conduct the detailed traffic analysis to estimate the derived traffic generated from the new port project and to estimate the impact to the New Bagamoyo Road Widening Project. However, the information regarding port development should be continuously gathered.

Chapter 1 Introduction

1.1 Study Outline

Dar es Salaam City, the capital of the United Republic of Tanzania, is the focal point of economic and trade activities in Tanzania and all networks of transport, including road, railway, airport and port, stretch from Dar es Salaam to cover the rest of the country. From the viewpoint of the development of Dar es Salaam, the city initially developed within the CBD area and gradually sprawled along the four major radial roads, namely Morogoro Road, Nyerere Road, Kilwa Road and New Bagamoyo Road. In the last 10 years, the number of registered vehicles in Dar es Salaam increased rapidly by 7% per annum, which exceeds the annual population growth. Currently, the traffic congestion along the trunk roads, connecting the CBD and suburban area, exists in both peak and off-peak hours, and that hinters all economic activities in Dar es Salaam.

It is a shared view that every measure should be taken to calm the traffic congestion and accordingly to accomplish the sustainable development of Dar es Salaam City. In this regard, the Government of Tanzania officially requested Japan Grant Aid for New Bagamoyo Road Widening Project (35 km road section from Morocco Intersection to Mpiji, the border of Dar es Salaam City), one of the major radial trunk roads currently with only 2-lane carriageway.

JICA conducted a study on “Dar es Salaam Transport Policy and System Development Master Plan” (“the Master Plan Study”) It proposes both road and public transport network improvement projects with the target year of 2030. Considering the continuity of network and the financial constraints, the Master Plan Study has selected the priority urban transport projects for the period 2008 to 2015. As a result, New Bagamoyo Road Widening Project and installation of the BRT along the project road were evaluated as priority projects.

1.2 Study Objectives

This Project Formulation Study on Road Transport Network - New Bagamoyo Road (“the Study”) aims to improve efficiency of traffic flow of New Bagamoyo Road. The Study has the following specific objectives: (i) to justify the appropriateness of the road section of New Bagamoyo Road Widening Project (“the Project”) for Japan Grand Aid, which has been officially requested for Japanese

assistance by the Government of Tanzania and (ii) to provide recommendations in implementing the Project by Japan Grant Aid.

1.3 Study Area

The Study shall cover the whole stretch of the New Bagamoyo Road and surrounding area (see Figure 1.3.1).

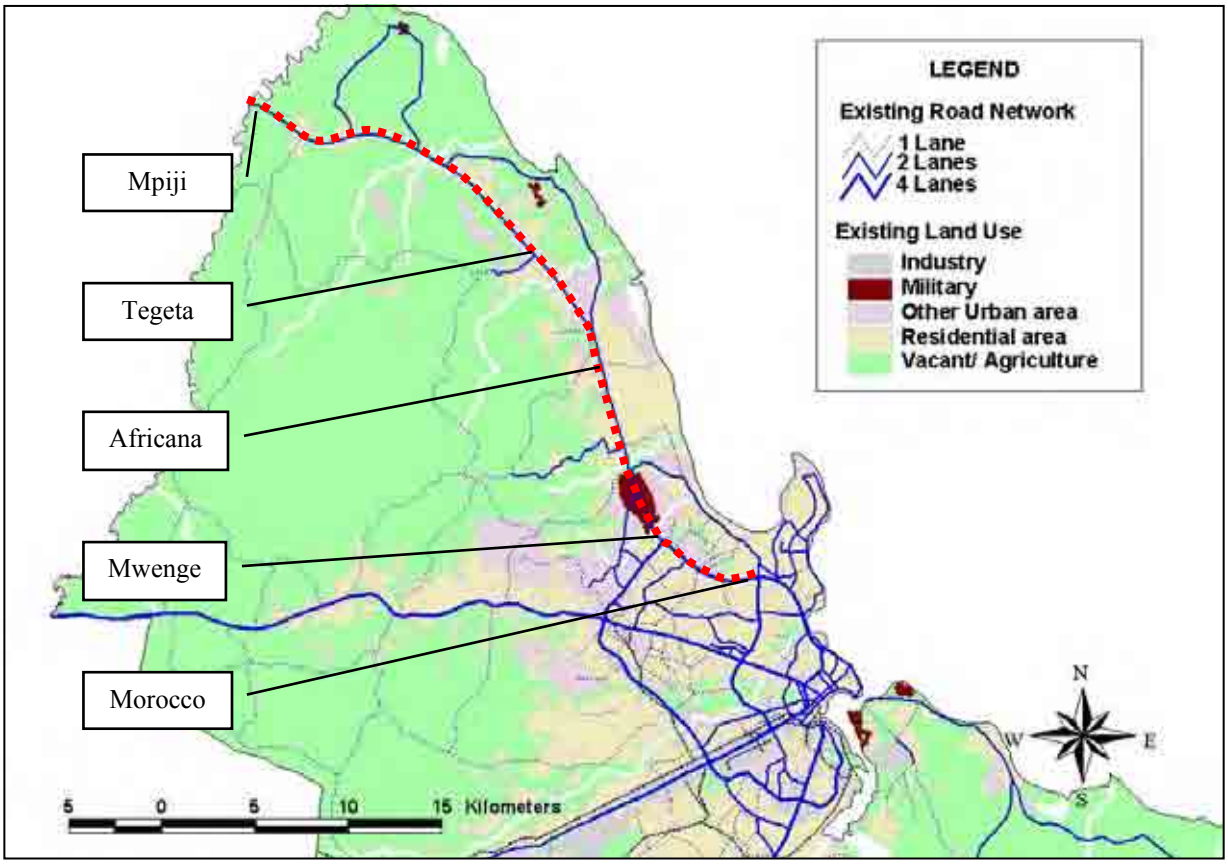


Figure 1.3.1 Study Area and Project Road (shown by the dotted line)

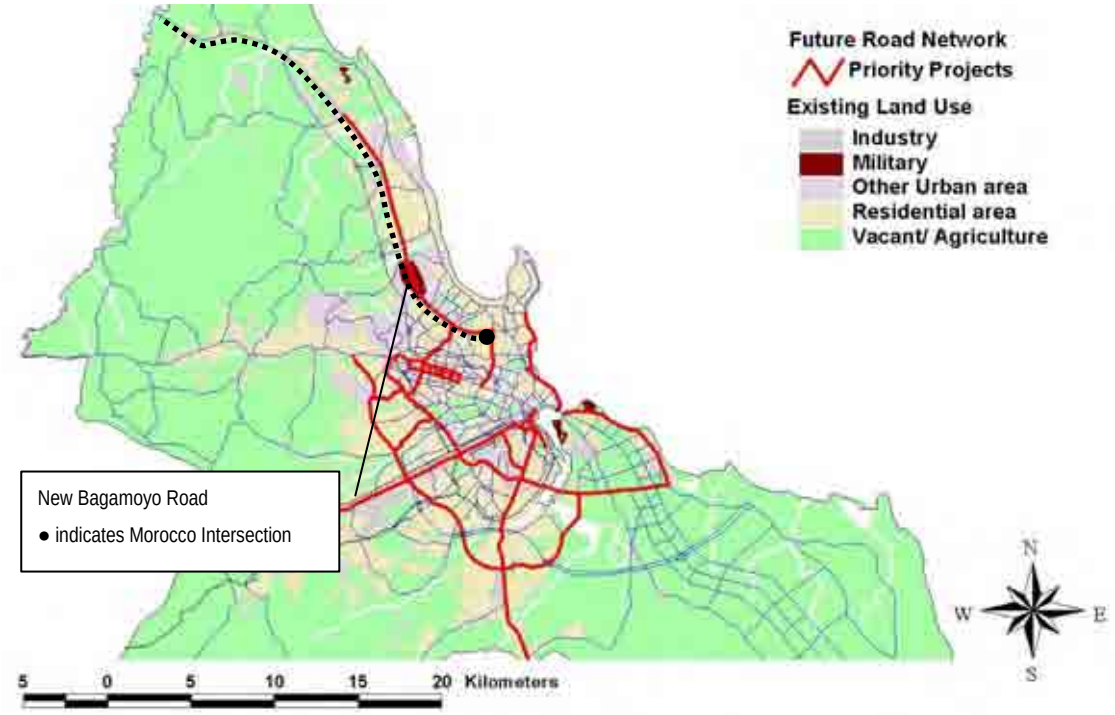
Chapter 2 Project Appreciation

2.1 Review of the Project

New Bagamoyo Road stretches to the north along the coast of Dar es Salaam and functions as an urban primary road to accommodate traffic between CBD and sub-urban area. In the long run, it may also function as the trunk road for long distance traffic from Tanga and Arusha in the northern part of Tanzania, and for cargo traffic when the new port is developed in Bagamoyo.

Tanzania Development Vision 2025 gives priority to development of road network to promote rural development. Transport Sector Investment Programme（TSIP）accordingly prioritizes this New Bagamoyo Road Widening Project as a short-term project.

"Dar es Salaam Transport Policy and System Development Master Plan" (hereinafter called "the Master Plan Study") proposes to improve approximately 1,000 km road network by 2030; it evaluates each road and public transportation improvement project from viewpoints such as economy, efficiency and urgency of the project. Considering the continuity of network and the financial constraints, the Master Plan Study selects the priority urban transport projects during the period of 2008 to 2015 (see Figure 2.1.1). As a result, New Bagamoyo Road Widening Project and installation of the BRT along the project road were evaluated as priority projects.



Source: Dar es Salaam Transport Policy and System Development Master Plan

Figure 2.1.1 Priority Project by 2015

2.2 Review of the Related Project

2.2.1 Construction of Reversible Lane in New Bagamoyo Road

As a temporary measure to ease congestion in New Bagamoyo Road, the central government (Road Fund) installed the reversible lane (road widened from 2-lane to 3-lane) from Morocco Intersection to Shekilango Road Intersection (3.1 km in length) as of February 2008; it was extended to Mwenge Intersection as of June 2008.

Figure 2.2.1 Reversible Lane in New Bagamoyo Road

2.2.2 Improvement of New Bagamoyo Road (Tegeta to Mpiji)

Under the support of Italian Government and European Development Fund, the road section between Tegeta and Mpiji along New Bagamoyo Road was improved (17.8 km in length, 2-lane overlay and installation of bus stops) as of December 2002.

Figure 2.2.2 Improvement of New Bagamoyo Road

2.2.3 Extension of Old Bagamoyo Road

The extension of Old Bagamoyo Road is under construction by the central government (Road Fund) and is scheduled to be completed by July 2008. Old Bagamoyo Road shall be extended to connect Morocco Intersection and Africana Intersection (see Figure 2.2.3).

Figure 2.2.3 Extension of Old Bagamoyo Road

2.2.4 Improvement of Sam Nujoma Road

The road widening of Sam Nujoma Road (Ubungo Intersection to Mwenge Intersection, 3.8 km in

length) is under construction by the central government. It will be completed by July 2008 although it was originally scheduled to be competed by August 2007. The project components include road widening to 4-lane, installation of BRT space at the median space, and improvement of signalized intersections at Mwenge Intersection (see Figure 2.2.4) and the intersection in front of shopping mall (Mlimani City).

Figure 2.2.4 Improvement of Mwenge Intersection

2.2.5 Bus Rapid Transit (BRT)

The Master Plan Study proposed a new BRT network plan based on the original plan developed by the DART Agency. Some of the BRT routes were developed in consideration of utilizing old rail corridors and supporting urban development in Kigamboni.

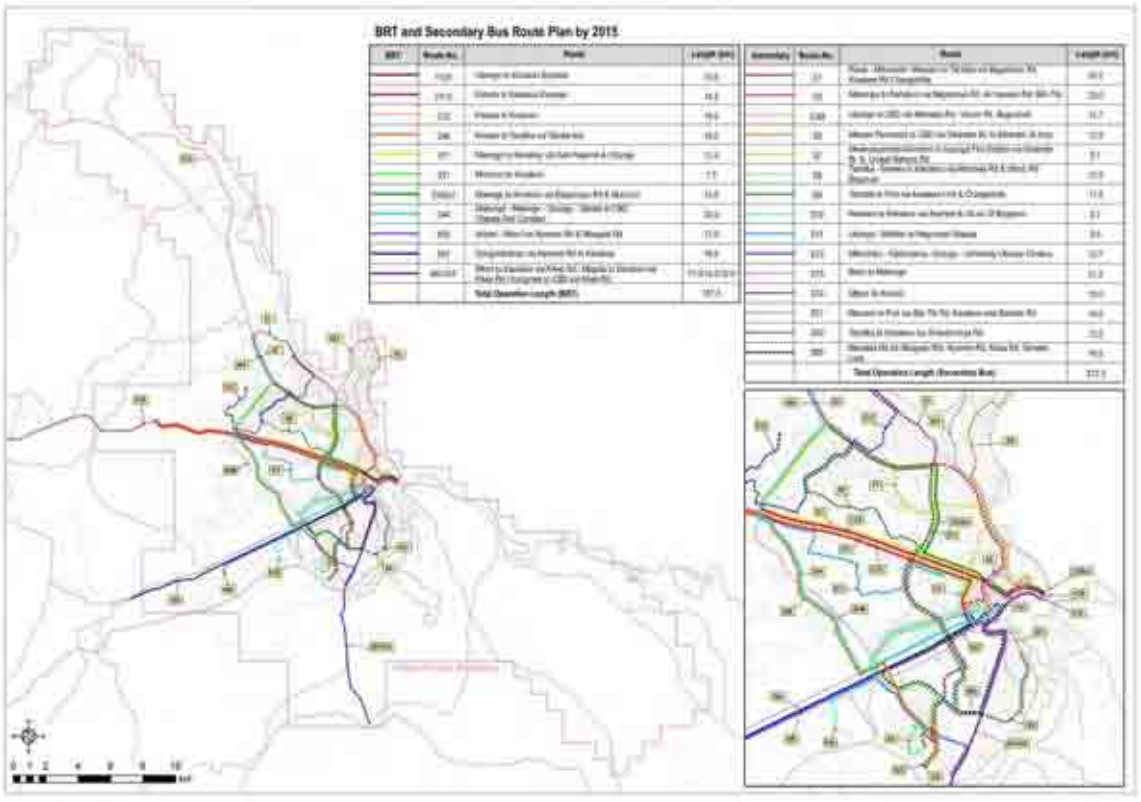
The BRT network plan is divided into five phases with the priority. BRT Phase 1 is under process for tendering the construction work. A proposed development program of the BRT is shown in Table 2.2.1.

Table 2.2.1 BRT Development Program

Phases	Road Space Availability	Completion of Project
Phase 1: Morogoro Road	2007 (Committed project)	2010
Phase 2: Nyerere Road	2007 (Available corridor)	2012
Phase 3A: Kilwa Road	March 2009, Requires elevated BRT to CDB	2012/13
Phase 3B: TRL Corridor	2009 (Subject to negotiation with TRL)	2014
Phase 4A: Sam Nujoma Road Phase 4B: Bagamoyo Road	2011 (Completing the network)	2015
Phase 5	Requires a bridge to be constructed to Vibijweni / Kigamboni - extension of Nelson Mandela Rd	2015-2020

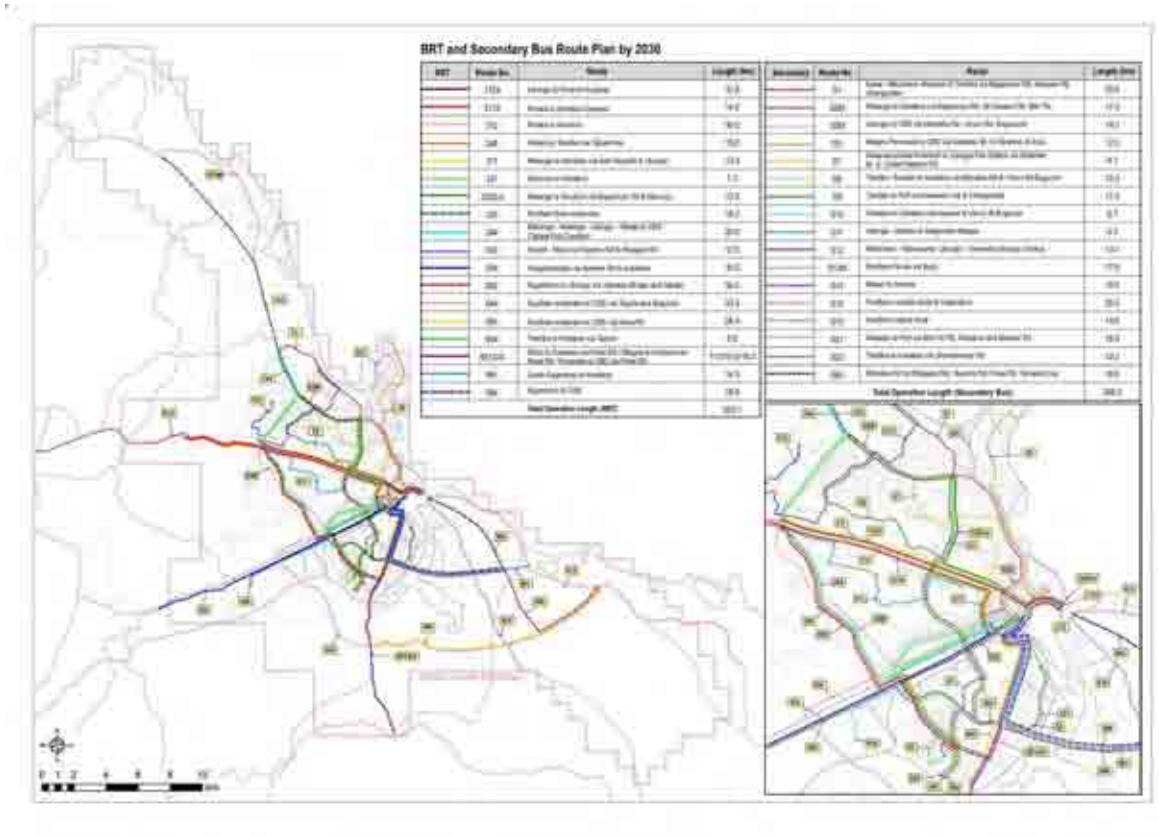
Source: Dar es Salaam Transport Policy and System Development Master Plan

Proposed BRT networks in 2015 and 2030 are shown in Figure 2.2.5 and Figure 2.2.6, respectively. Introduction of BRT on New Bagamoyo Road is planned in Phase 4 (by 2015).



Source: Dar es Salaam Transport Policy and System Development Master Plan

Figure 2.2.5 BRT Network in 2015



Source: Dar es Salaam Transport Policy and System Development Master Plan

Figure 2.2.6 BRT Network in 2030

2.2.6 Bagamoyo New Port

(1) Background

1) Response to future Container Transportation

In East Africa, there are two main ports: namely Dar es Salaam Port in Tanzania as the gateway of the Central Corridor and Mombasa Port in Kenya as the gateway of the North Corridor. These ports handle foreign-trade and provide a gateway to landlocked countries. Currently, the cargo volume of Mombasa Port is larger than that of Dar es Salaam Port since land transport in the North Corridor is better developed than that in the Central Corridor. As described in "Part I: Central Corridor Project Formulation Study", land transport by road and privatized railway in the Central Corridor has not been utilized efficiently although it is recognized that the Central Corridor has a high potential for development. Dar es Salaam Port is a bottleneck for the Central Corridor since holding time of the cargos at the port has been increasing due to the increase of cargo volume and the lack of yard space. In addition, vessels are currently getting larger to enhance the efficiency of containerized transport. The depth of the sea at the port should be at least 14 m, which is needed to handle large vessels as a hub port.

2) Necessity of a New Port

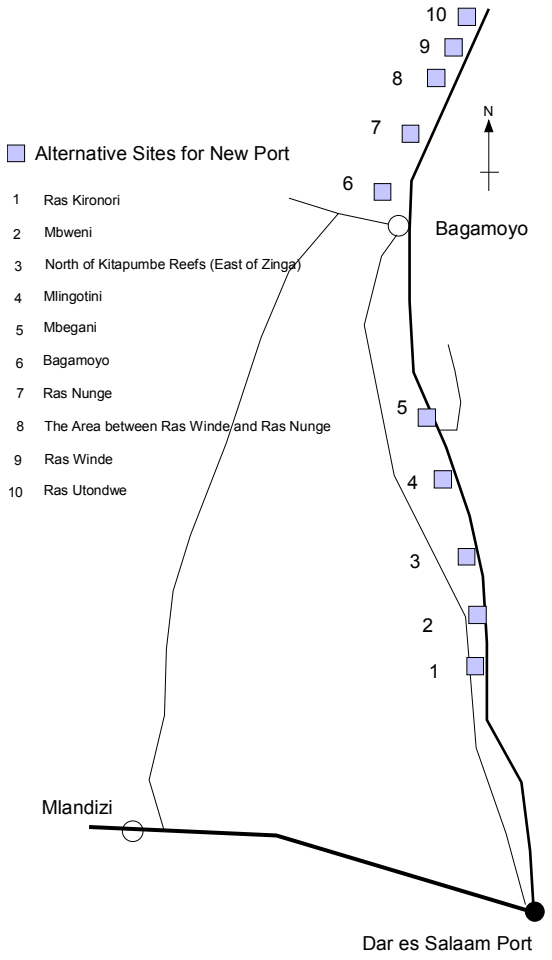
A deep-sea port is required to handle increasing cargo volume. However, it is difficult to secure the depth of over 10 m at Dar es Salaam Port even if the dredging is maintained. Accordingly, the development of the new port at Bagamoyo was proposed as a long-term solution in the TPA's Development Plan and Projects.

(2) Progress of Port Development Plan

TPA selected an appropriate project site for new port development after screening ten alternative sites in the area between northern area of Dar es Salaam Port and Bagamoyo City. Now, additional study is required to produce more detailed engineering and economic evaluation since the original screening was too general. The study of the site selection by TPA is summarized below.

1) Alternatives for New Port Site

The 10 alternative sites selected for the development of the new port are shown in Figure 2.2.7.



Source: TPA

Figure 2.2.7 New Port Alternative Sites

2) Preliminary Evaluation

The site evaluation criteria included site condition, requirement of breakwater, dredging, and land reclamation. As a result, Mbegani (No.5) was selected as the optimum site for new port development.

Table 2.2.2 Evaluation for New Port Site

No.	Location	Distance to 14m water depth (km)	Site condition	Construction of breakwater	Dredging to secure 14 m depth	Land reclamation is required	Evaluation
1	Ras Kironori	1	Good but area is already developed	Required	Dredging or a 1 km jetty is required	Required	No
2	Mbweni	2	Mangrove swamp area	Required	Required	Extensively required	No
3	North of Kitapumbe Reefs (East of Zinga)	2	Mangrove swamp area	Required	Required	Extensively required	No
4	Mlingotini	3	Mangrove swamp area	Required	Required	Extensively required	No
5	Mbegani	6	Good condition	No (sheltered)	Required	Minimally required	Yes
6	Bagamoyo	10	Good but area is already developed	Required	Extensively required	Required	No
7	Ras Nunge	9		Required	Extensively required	Required	No
8	The Area between Ras Winde and Ras Nunge	8		Required	Required	Extensively required	No
9	Ras Winde	8	Mangrove swamp area	Required	Required	Extensively required	No
10	Ras Utondwe	6	Mangrove swamp area	Required	Required	Extensively required	No

Source: TPA

3) Study Progress

TPA is now conducting a bathymetry survey at Mbegani and will conduct a boring survey. An area 4 km wide and 1 km long is reserved for the new port. In addition, EPZ Authority under the Ministry of Industry Development, Trade and Marketing is planning to develop a new EPZ, and is acquiring 8,000 ha in back of the proposed port site.

2.3 Outline of the Project and Issues for Implementation

2.3.1 Project Outline

In July 2007, the Government of Tanzania officially requested Japan Grant Aid for New Bagamoyo Road Widening Project, from 2-lane to 4-lane (plus 2-lane island) for 35-km road section from

Morocco Intersection to Mpiji, the boarder of Dar es Salaam City. The project components are summarized below.

Project Title	The Project for Widening of New Bagamoyo Road, including Improvement of Mwenge Bus Terminal
Upper Plan	Tanzania Development Vision 2025 gives priority to development of road network to promote rural development. Transport Sector Investment Programme (TSIP) accordingly prioritizes this Project as the short-term project.
Overall Objective	To reduce traffic congestion of the project road and to provide safe and faster access road between the city centre and suburban area.
Project Outline	- Road pavement construction (4-lane carriageway + 2-lane island space reserved for BRT, 35 km in total) - Rehabilitation and extension of 5 bridges and 5 box culverts - Construction of 5 box culverts - Construction of drainage structure - Improvement of Mwenge Bus Terminal - Construction of traffic safety devices at 8 intersections
Cost Estimated	8.16 billion Yen

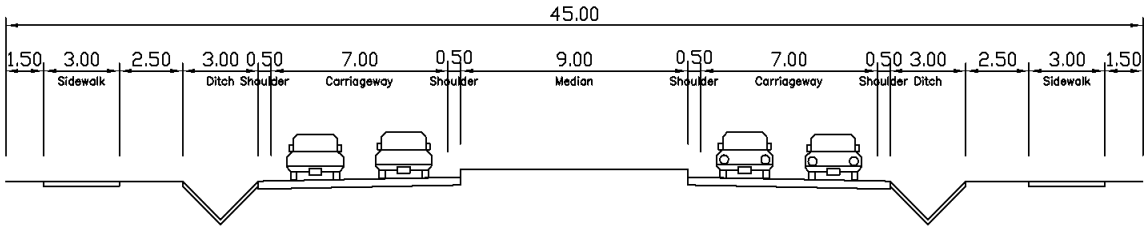


Figure 2.3.1 Typical Cross Section for the Project

2.3.2 Issues for Project Implementation

The following issues are identified from the technical, economic and environmental viewpoints in adopting this Project under Japan Grant Aid.

(1) Traffic and Cross Section

- The number of lanes for the Project is determined referring to the traffic volume surveyed at the most congested road section. This does not provide enough evidence to verify widening from 2-lane to 4-lane for the whole road section.

- In 2007, a series of traffic surveys were conducted in the Master Plan Study and traffic count surveys and travel speed survey were conducted along New Bagamoyo Road. The Master Plan Study also estimated future traffic demand with the target year of 2015 and 2030. This traffic information may be useful in determining the road function, future traffic demand, and cross section of the Project.

(2) BRT Project

- Two empirical studies on the BRT both of DART Agency and of the Master Plan Study have concluded the necessity and validity of the BRT project along New Bagamoyo Road and recommended installation of the BRT between Morocco Intersection and Tegeta or Boco. The request for the Project, however, plans to install the BRT for the whole stretch of the project road up to Mpiji, which is inconsistent with the said two studies.

(3) Alternatives and Environmental Consideration

- Following JICA Guidelines for Social and Environmental Considerations, the alternatives of the Project including zero-option need to be studied. Minimizing potential adverse impacts caused by the Project also need to be included in examining these alternatives.
- Comprehensive evaluation including technical, economic and environmental viewpoints was not conducted for the requested project as well as alternatives.

(4) Project Cost

- The same unit cost is applied in estimating the construction cost of 5 different types/lengths of bridges. Japanese signaling system is proposed for the Project. These indicate that the unit cost requested for the Project may not be well considered or may be overestimated.

Chapter 3 Traffic Conditions and Demand Forecast

3.1 Current Traffic Conditions and Related Issues

(1) Socio-economic and Traffic Condition in Dar es Salaam

A series of traffic surveys were carried out during the Master Plan Study to identify the urban transport problems and issues. The Master Plan Study also established the socio-economic framework and guidelines to accomplish sustainable urban development, considering the necessary amount of the transport infrastructure with the target year of 2030. The socio-economic and traffic conditions, explored in this Master Plan Study, and related issues are summarized below.

- The city of Dar es Salaam now has a population of 3.0 million (0.7 million households). The population of the city is expected to increases by 2.9% per annum and reach 5.8 million (1.5 million households) by 2030. The number of vehicles in Dar es Salaam now is 82,000 and the households with car ownership account for 10% of the total. The number of vehicles is projected to rapidly increase by 8.4% per annum and reach 520,000 vehicles by 2030.
- Highly urbanize area in the CBD and urban sprawl along the major radial roads contributes to high commuting demand between CBD and the outskirt area, and therefore, causes severe traffic congestion along the radial trunk roads. If the urban sprawl is not well controlled and the traffic/transport infrastructure is not sufficiently provided, traffic congestion and adverse impacts to poverty reduction and regional economy may become worse.
- The result of traffic simulation analysis indicates that the average travel speed of the vehicles in Dar es Salaam that was observed at 25.8 km/h in 2007 will decreases significantly to 8.5 km/h in 2030 without any improvement projects. It also indicates that the average travel speed can be maintained at the current level of service if all the proposed projects are implemented (see Table 3.1.1).
- The number of daladala passengers now exceeds 1.8 million and is projected to double by 2030. Traffic congestion will worsen and the passenger demand nearly exceed the capacity of current public transport (daladala) system. Accordingly, installation of the BRT (Bus Rapid Transit) is required to establish a sustainable public transport network in Dar es Salaam. (see Table 3.1.2)

Table 3.1.1 Result of Traffic Demand Forecast

Factors	YR 2007	YR 2015		YR 2030	
With/Without Project	-	Without Project	With Project	Without Project	With Project
Vehicle*hours (million per day)	0.19	0.65	0.26	2.38	0.87
Average travel speed (km/h)	25.6	15.5	30.3	10.0	25.2

Source: Dar es Salaam Transport Policy and System Development Master Plan

Table 3.1.2 Result of Traffic Demand Forecast and Vehicle and Bus Passenger Growth Rates

Factors	Year 2007	Year 2015	Year 2030
Number of vehicles (vehicles/day)	214,985	416,378	1,087,629
Average growth rate (% per annum)	-	8.6%	6.6%
Number of bus passengers (passengers/day)	1,844,010	3,100,989	3,777,667
Average growth rate (% per annum)		6.7%	1.3%

Source: Dar es Salaam Transport Policy and System Development Master Plan

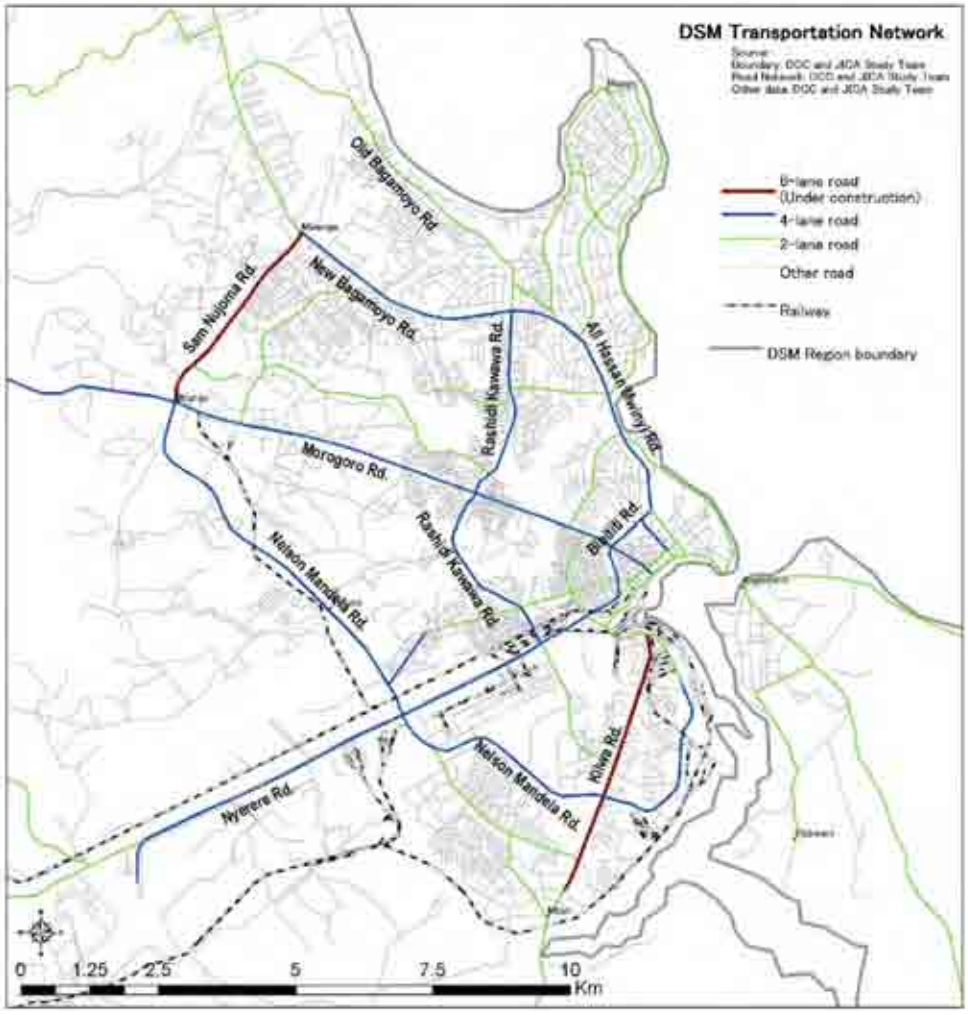
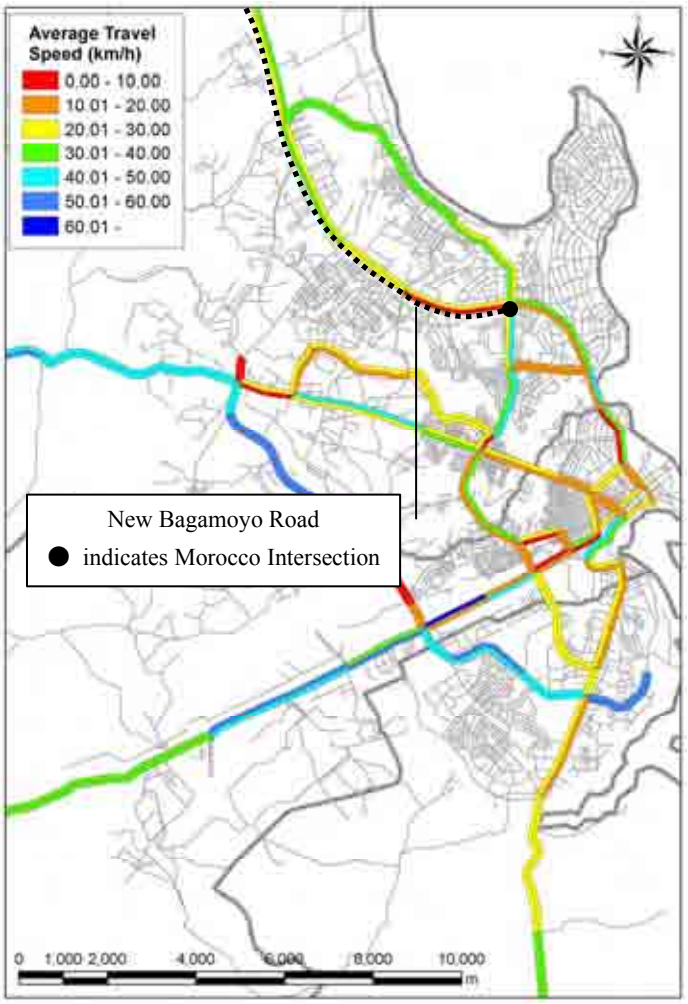


Figure 3.1.1 Road Network in Dar es Salaam

(2) Road Network of New Bagamoyo Road

Features of New Bagamoyo Road is summarized below.

- New Bagamoyo Road is a 2-lane road and passes through highly urbanized area where residential houses, commercial buildings and military base are located. Along New Bagamoyo Road, the houses and buildings are densely built at the road section between Morocco and Mwenge, Africana, Tegeta and Bunju.
- The bus terminal is located at Mwenge Intersection. The bus routes run along New Bagamoyo Road and link to the sub-urban cities, like Makongo, Africana, Tegeta and Bunju.
- The industrial area is also located at Africana and Wazo where a number of trucks and trailers are observed.
- Severe traffic congestion is observed at Morocco Intersection and Mwenge Intersection during the morning and evening peak hours. At the Morocco Intersection, for instance, the travel speed did not exceed 10 km/h in the evening peak hour when the traffic survey in the Master Plan Study was conducted (see Figure 3.1.2).



Source: Dar es Salaam Transport Policy and System Development Master Plan

Figure 3.1.2 Travel Speed Survey (July 2007)

Snapshots of New Bagamoyo Road are shown in Figure 3.1.3.

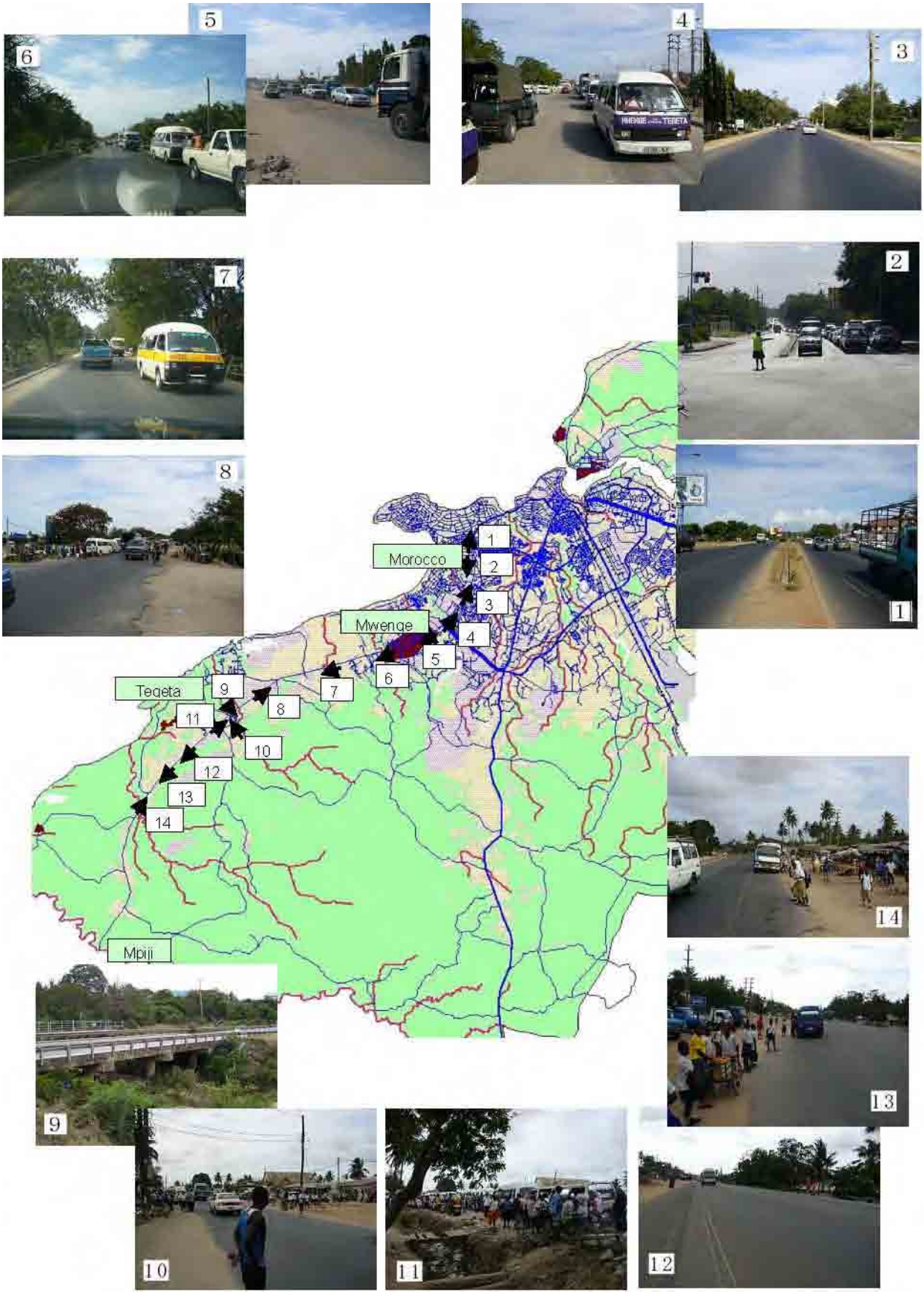


Figure 3.1.3 Snapshot of New Bagamoyo Road

3.2 Socio-economic Framework

(1) Population Projection

The country has experienced continued, steady population growth over the past three decades. In 1970s, annual population growth in the mainland of Tanzania was recorded at 3% or more and has maintained by nearly 3% until now. The 2002 population of Tanzania reached 33.5 million (see Table 3.2.1). Dar es Salaam has also exhibited strong population growth and it is the fastest growing region in Tanzania mainland. Annual population growth of Dar es Salaam City recorded at over 4% and 2002 population in Dar es Salaam reached 2.49 million (see Table 3.2.2).

Table 3.2.1 Population Tends in Tanzania Mainland, 1967, 1978, 1988 and 2002

Year	Tanzania Mainland	Average Annual Growth Rate (percent per annum)
1967	11,958,654	-
1978	17,036,499	3.27 (1967-1978)
1988	22,455,207	2.80 (1978-1988)
2002	33,461,849	2.89 (1988-2002)

Source: Population and Housing Census, National Bureau of Statistics

Table 3.2.2 Population Trends in Dar es Salaam, 1978, 1988 and 2002

Year	Tanzania Mainland Population	Dar es Salaam		
		Population	Average Annual Growth Rate	Percentage Share in Tanzania Mainland
1978	17,036,499	851,522	-	5.0%
1988	22,455,207	1,360,865	4.8% (1978-1988)	6.1%
2002	33,461,849	2,487,288	4.4% (1988-2002)	7.4%

Source: Population and Housing Census, National Bureau of Statistics

Dar es Salaam consists of administratively three Municipalities: Kinondoni, Ilala and Temeke Municipality. Kinondoni Municipality, where New Bagamoyo Road is located, has the largest population among the three municipalities and occupied 44% of the total population of Dar es Salaam in 2002. Kinondoni Municipality had the highest growth rate of 5.6% per annum during the period between 1978 and 1988 while it dropped to 4.0% per annum, which was 1.6% lower that that in the previous period. (see Table 3.2.3)

Looking at the labor force structure in Dar es Salaam (see Table 3.2.4), the total working population in Dar es Salaam was about 927,000 persons in 2002 and accounted for 37% of the total population. The tertiary sector (including electricity, sales, trade and commerce, transport, finance & insurance, and public administration & education) occupied 640,000 persons or 69.0% of the total working population.

The number of the students was 530,000 persons in 2002 and accounted for 21% of the total population. (see Table 3.2.5)

Table 3.2.3 Population Trends by Municipality in Dar es Salaam, 1978, 1988 and 2002

Municipality	Population			Average Annual Growth Rate	
	1978	1988	2002	(1978-1988)	(1988-2002)
Ilala	228,235	331,663	634,924	3.8%	4.7%
Temeke	258,581	401,786	768,451	4.5%	4.7%
Kinondoni	364,706	627,416	1,083,913	5.6%	4.0%
Total	851,522	1,360,865	2,487,288	4.8%	4.4%

Source: Population and Housing Census, National Bureau of Statistics

Table 3.2.4 Number of Labor Force by Economic Sector in Dar es Salaam, 2002

Municipality	Primary		Secondary		Tertiary		Total	
	No. of Workers	Share	No. of Workers	Share	No. of Workers	Share	No. of Workers	Share
Kinondoni	76,534	18.0%	51,704	12.2%	297,305	69.9%	425,543	100.0%
Ilala	32,511	14.6%	30,318	13.6%	160,332	71.8%	223,161	100.0%
Temeke	55,234	19.8%	40,994	14.7%	182,602	65.5%	278,830	100.0%
Total	164,279	17.7%	123,016	13.3%	640,239	69.0%	927,534	100.0%

Source: Population and Housing Census, National Bureau of Statistics

Table 3.2.5 Number of School Enrollments in Dar es Salaam by Municipality, 2002

Type	Kinondoni	Ilala	Temeke	Dar es Salaam Total
Primary	181,343	114,130	141,012	436,485
Training after Primary	752	234	235	1,221
Pre-Secondary	109		138	247
Secondary	32,857	20,898	19,375	73,130
Training after Secondary	2,158	1,377	784	4,319
University and Others	8,200	4,451	3,706	16,357
Total School Enrollment	225,419	141,090	165,250	531,759

Source: Population and Housing Census, National Bureau of Statistics

Figure 3.2.1 illustrates 2002 population density by sub-ward and Figure 3.2.2 illustrates the distribution of population growth from 1988 to 2002 by ward. Although there are some limitations, large population growth can be seen in the areas of 10 km radius in the city. The rapid urban development is observed along four major radial roads, namely Morogoro Road, Nyerere Road, Kilwa Road and New Bagamoyo Road.

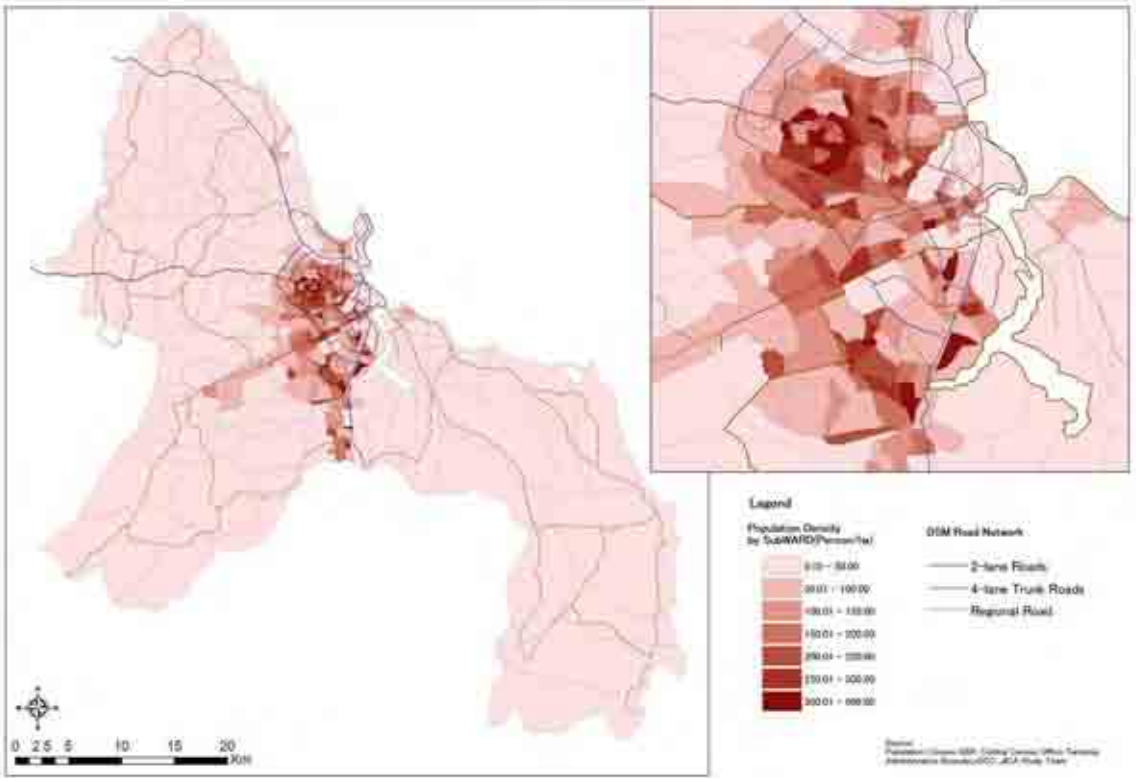


Figure 3.2.1 Population Density by Sub-ward in Dar es Salaam, 2002

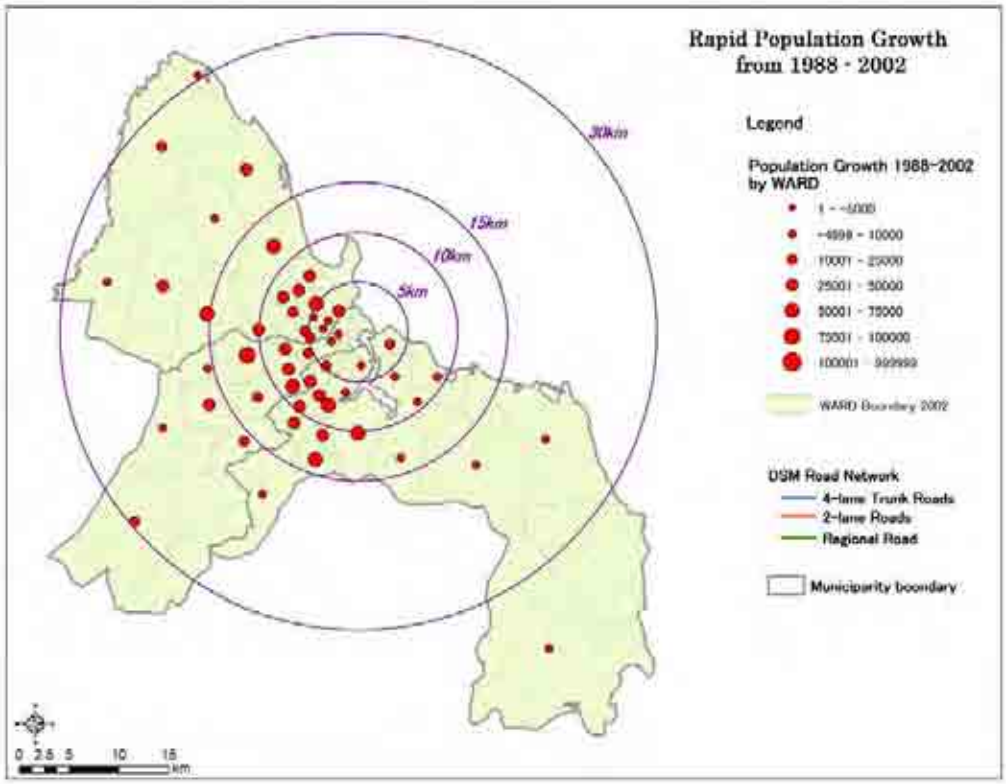
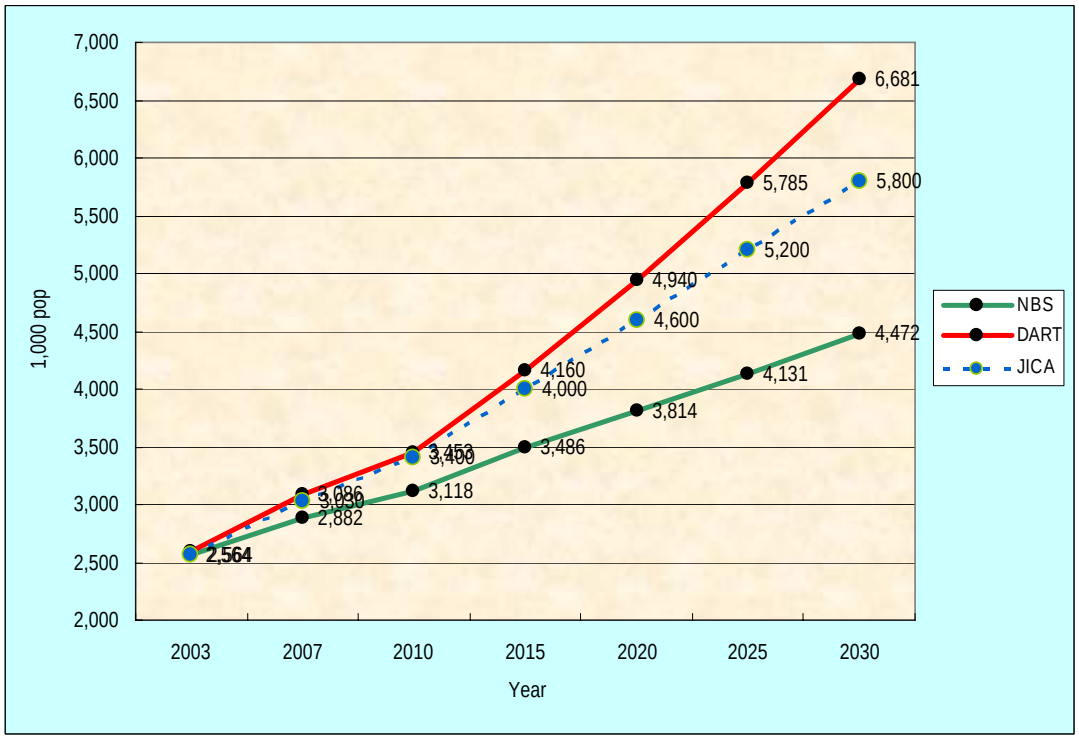


Figure 3.2.2 Population Growth from 1988 to 2002 by Ward in Dar es Salaam

The future population for Dar es Salaam City is one of the preconditions of the traffic demand forecast. There are three population projections for Dar es Salaam: i.e., in the year 2030, 4.5 million habitants by the NBS and 6.7 million habitants by the DART Study and 5.8 million habitants by the Master Plan Study. This Study adopts the future population prepared by the Master Plan Study (4.0 million in 2015 and 5.8 million in 2030). (see Figure 3.2.3)



Source: Dar es Salaam Transport Policy and System Development Master Plan

Figure 3.2.3 Comparison of Population Projections for Dar es Salaam made by NBS, DART Study and JICA Study, 2003-2030

(2) Macroeconomic Performance

Tanzanian economy grows steadily and the average annual economic growth maintains by nearly 5% after 2000. This figure shows that Tanzanian economy performed at relatively high economic growth compared to other sub-Sahara African countries (see Table 3.2.6) Looking at the economy in Tanzania by sector, primary industry occupied the largest share and accounted for 43% of the gross national product. Secondary industry showed the rapid economic growth (10.4% per annum in the period of 2005/06) followed by the tertiary industry (6% per annum) and primary industry (4.1% per annum).

Table 3.2.6 Annual Growth Rate of Real GDP in selected Sub-Sahara African Countries, 1989-2006

Country	Average 1989-98	1999	2000	2001	2002	2003	2004	2005	2006
Burundi	-1.0	-1.0	-0.9	2.1	4.4	-1.2	4.8	0.9	5.1
Ghana	4.3	4.4	3.7	4.2	4.5	5.2	5.6	5.9	6.2
Kenya	2.3	2.4	0.6	4.7	0.3	2.8	4.5	5.8	6.0
Malawi	3.7	3.5	0.8	-4.1	2.1	3.9	5.1	2.1	8.5
Mozambique	5.0	7.5	1.9	13.1	8.2	7.9	7.5	7.8	8.5
Rwanda	-1.8	7.6	6.0	6.7	9.4	0.9	4.0	6.0	4.2
S. Africa	1.4	2.4	4.2	2.7	3.7	3.1	4.8	5.1	5.0
Tanzania	**3.1**	**3.5**	**5.1**	**6.2**	**7.2**	**5.7**	**6.7**	**6.8**	**5.9**
Uganda	6.1	8.3	5.3	4.8	6.9	4.4	5.7	6.7	5.4
Zambia	-1.2	2.2	3.6	4.9	3.3	5.1	5.4	5.2	6.0
Zimbabwe	2.9	-3.6	-7.3	-2.7	-4.4	-10.4	-3.8	-5.3	-4.8

Source: IMF, World Economic Outlook 2007

Table 3.2.7 Percentage Share of Real GDP in Tanzania Mainland, 1992-2006 (at Constant 1992 Price)

Year	Primary		Secondary		Tertiary		Total	
	GDP (Billion Shilling)	Annual Growth Rate	GDP (Billion Shilling)	Annual Growth Rate	GDP (Billion Shilling)	Annual Growth Rate	GDP (Billion Shilling)	Annual Growth Rate
1992	612		188		533		1,333	
1995	682	3.7%	177	-2.0%	553	1.2%	1,412	1.9%
2000	797	3.2%	253	7.4%	688	4.5%	1,738	4.2%
2005	1,020	5.1%	405	9.9%	908	5.7%	2,333	6.1%
2006	1,062	4.1%	447	10.4%	968	6.6%	2,477	6.2%

Year	Primary		Secondary		Tertiary		Total	
	GDP (Billion Shilling)	% Share	GDP (Billion Shilling)	% Share	GDP (Billion Shilling)	% Share	GDP (Billion Shilling)	% Share
1992	612	45.9%	188	14.1%	533	40.0%	1,333	100.0%
1995	682	48.3%	177	12.5%	553	39.2%	1,412	100.0%
2000	797	45.9%	253	14.6%	688	39.6%	1,738	100.0%
2005	1020	43.7%	405	17.4%	908	38.9%	2,333	100.0%
2006	1,062	42.9%	447	18.0%	968	39.1%	2,477	100.0%

Source: National Bureau of Statistics, National Economy of Tanzania Mainland

Looking at the gross regional development product in Dar es Salaam, the share in the national GDP decreased and reached 15.5% of the GDP in 2006. Since the population in Dar es Salaam accounts

for only 7.4% of the national population, Dar es Salaam is still recognized as the focal point of the economic activities.

Table 3.2.8 GRDP of the Dar es Salaam Region, 1992-2006 (at Current Price)

Year	Tanzania Mainland	Dar es Salaam Region	
	GDP (billion Tshs)	GRDP (billion Tshs)	Percentage Share in the National GDP
1992	1,276	232	18.2%
1995	2,797	499	17.8%
2000	6,706	1,159	17.3%
2005	13,063	1,962	15.0%
2006	14,995	2,324	15.5%

Source: National Bureau of Statistics, National Accounts of Tanzania Mainland, 1992-2004, 2006

The Master Plan Study made an economic projection, assuming that Dar es Salaam economy will grow faster than the national average. Taking into consideration the dominance of tertiary economy in Dar es Salaam, the average annual growth rate of regional GDP is assumed to reach 7.6% between 2003 and 2010 and then it will gradually decrease to 6.1% between 2025 and 2030. Accordingly, the per capita income of Dar es Salaam will increase 2.65 times between 2003 and 2030 (Table 3.2.9). This Study also adopts the economic projection prepared in the Master Plan Study.

Table 3.2.9 Economic Growth Assumption

Year	TANZANIA			Dar es Salaam		
	GDP Growth Rate	GDP Per capita Growth Rate	Per capita GDP 2003=100	GRDP Annual Growth Rate	GRDP Per capita 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: Dar es Salaam Transport Policy and System Development Master Plan

3.3 Traffic Demand Forecast

(1) Traffic Count Survey

Traffic count survey was conducted at three locations in the course of the traffic survey conducted in the Master Plan Study. In this Study, supplemental traffic count survey was conducted at three locations (namely Africana, Tegeta and Bunju) in order to obtain the baseline data to examine and evaluate the project alternatives.

Locations: Africana, Tegeta and Bunju

Survey items: Traffic count at every 15 minutes classified into 13 vehicular types and

Survey method: 24-hour traffic count in Tegeta and 16-hour (6:00 – 22:00) traffic count in Africana and Bunju

Table 3.3.1 Traffic Count Surveys along New Bagamoyo Road

No	Location	Description	Survey Date	Survey Period
1	Mwenge	Makongo (300m north to Mwenge Intersection)	2007/6/21	16 hours
2	Africana	30m before Africana Junction	2008/5/6	16 hours
3	Tegeta	Tegeta Bridge	2008/5/8	24 hours
4	Bunju	Bunju A	2008/5/7	16 hours
5	Mpiji	Mpiji River	2007/7/12	16 hours
6	Old Bagamoyo Road	Kawe Bridge	2007/7/11	16 hours

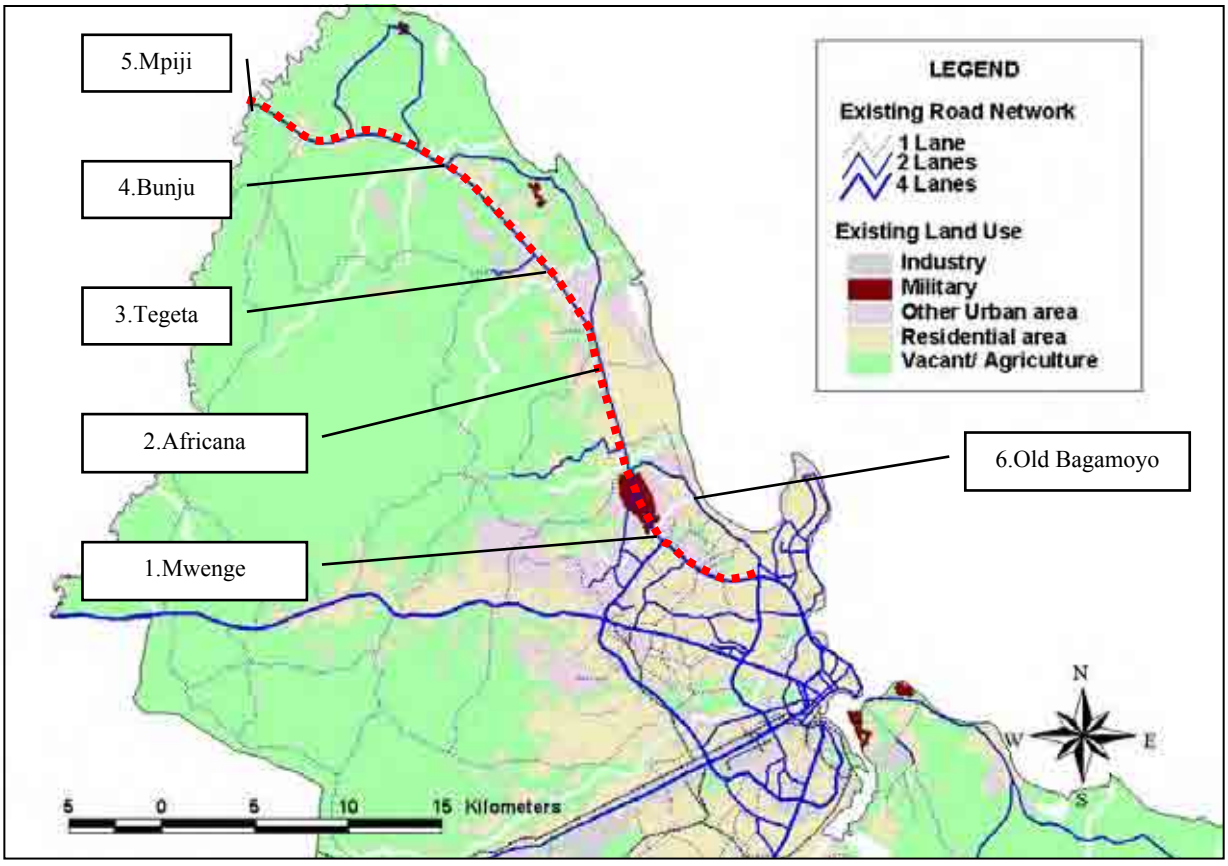


Figure 3.3.1 Location of Traffic Count Survey

The results of the traffic count survey are summarized in Tables 3.3.2 and 3.3.3 and are illustrated in Figures 3.3.2 to 3.3.4. The findings from the traffic count survey are listed below.

- A traffic volume differs significantly by the road section along New Bagamoyo Road. A considerable number of vehicles are observed at Mwenge (Makongo), Africana and Tegeta, where the daily traffic exceeds the traffic capacity of 16,800 PCU (passenger car unit). The traffic survey by the TANROADs also observed more than 24,000 PCU (2006) at Morocco Intersection, though classification of the vehicle is not yet disclosed.
- Looking at the hourly traffic volume, the morning peak hours are observed between 6:00 and 9:00 and evening peak hours between 16:00 and 18:00 at Mwenge and Africana. The number of vehicles at Africana decreased slightly between 6:00 and 7:00 since the bottom of the traffic jam reached Africana Intersection at 6:00. Also, less vehicles are observed in the peak hours at Tegeta. It may be because the traffic tends to generate in the off-peak hours, avoiding the traffic congestion in the peak hours.
- On the other hand, less traffic, ranging between 2,000 and 6,800 PCU per day, is observed at Bunju and Mpiji, where the vehicle capacity ratio ranges from 0.1 to 0.4 and is relatively small. The number of vehicles observed at Old Bagamoyo Road is 14,700 PCU and already over-saturates the traffic capacity of 10,400 PCU.

Table 3.3.2 Result of Traffic Count Survey (Unit: vehicles/day)

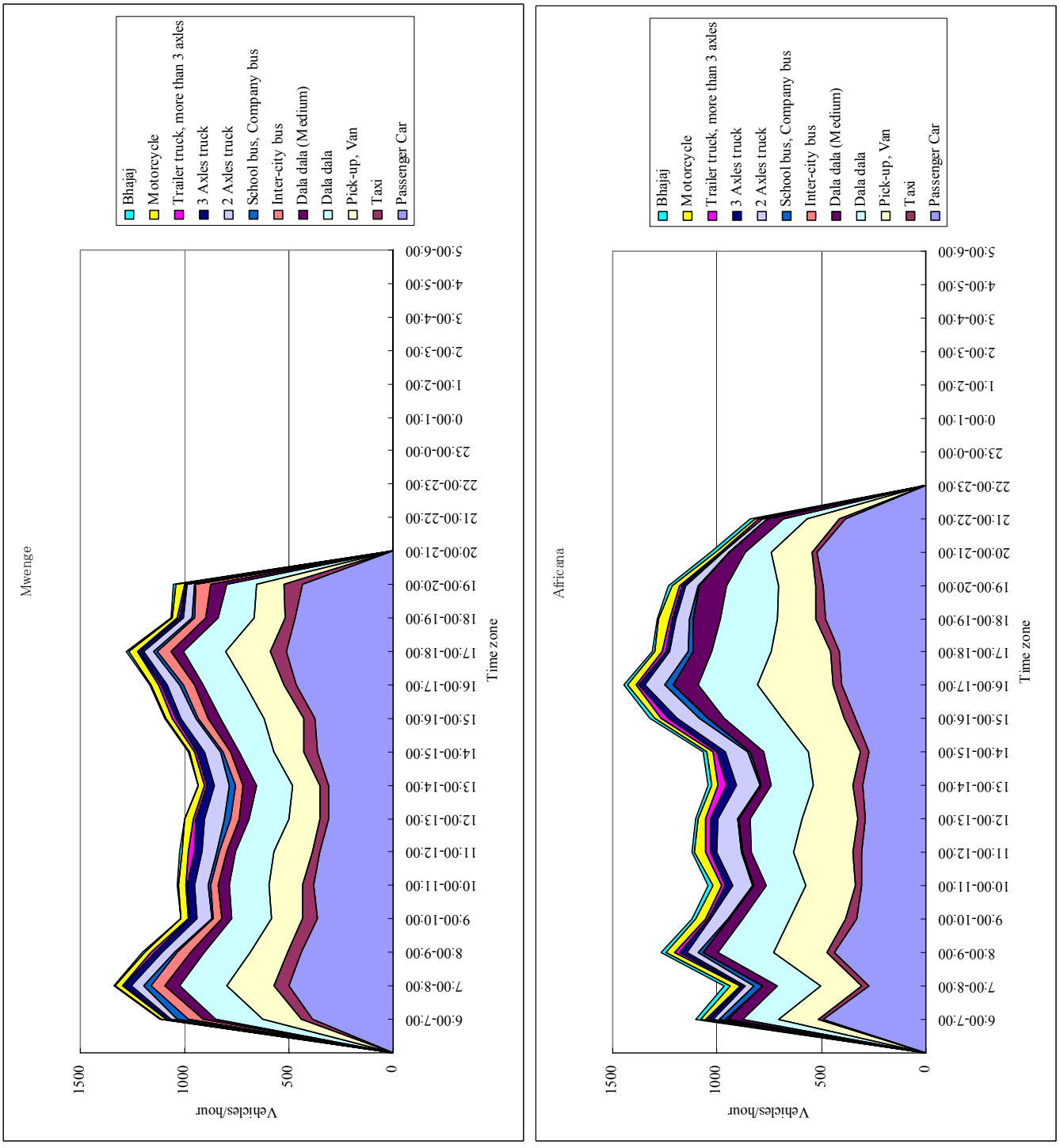
Location (Survey Year)	Motorcycle	Passenger Car	Bus	Truck	Total
Mwenge (2007)	598	10,178	5,061	1,533	17,370
Africana (2008)	1,011	11,978	5,573	2,035	20,597
Tegeta (2008)	698	7,291	4,187	1,890	14,066
Bunju (2008)	228	1,561	1,967	1,077	4,833
Mpiji (2007)	45	876	450	205	1,576
Old Bagamoyo (2007)	580	10,773	1,696	614	13,663

Source: JICA Study Team

Table 3.3.3 Result of Traffic Count Survey (Unit: PCU/day)

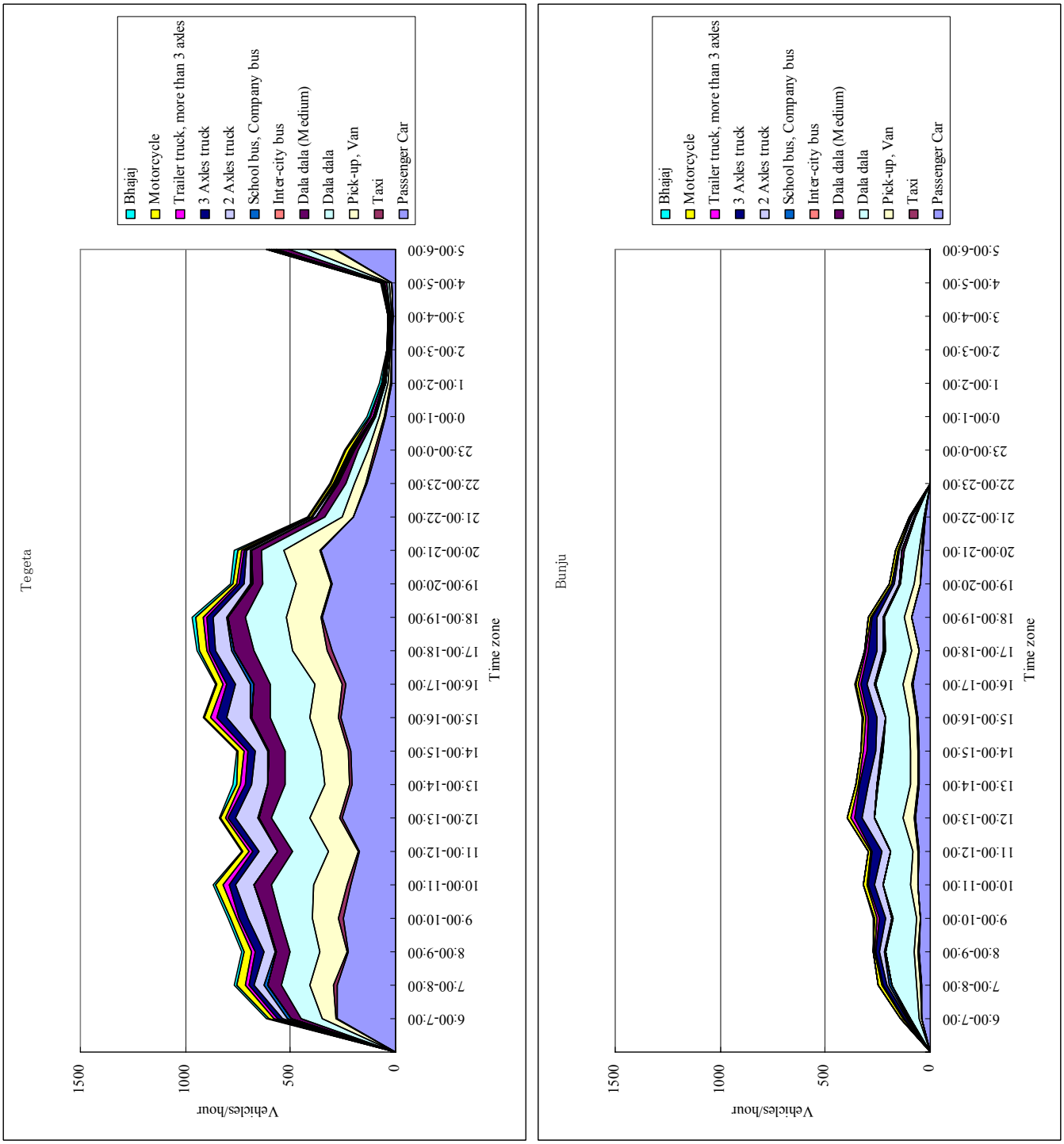
Location (Survey Year)	Motorcycle	Passenger Car	Bus	Truck	Total	V/C
Mwenge (2007)	179	10,178	7,592	3,164	21,113	1.26
Africana (2008)	303	11,978	8,360	4,230	24,871	1.48
Tegeta (2008)	209	7,291	6,281	3,944	17,725	1.06
Bunju (2008)	68	1,561	2,951	2,223	6,803	0.40
Mpiji (2007)	14	876	675	411	1,976	0.12
Old Bagamoyo (2007)	174	10,773	2,544	1,229	14,720	1.42

Source: JICA Study Team



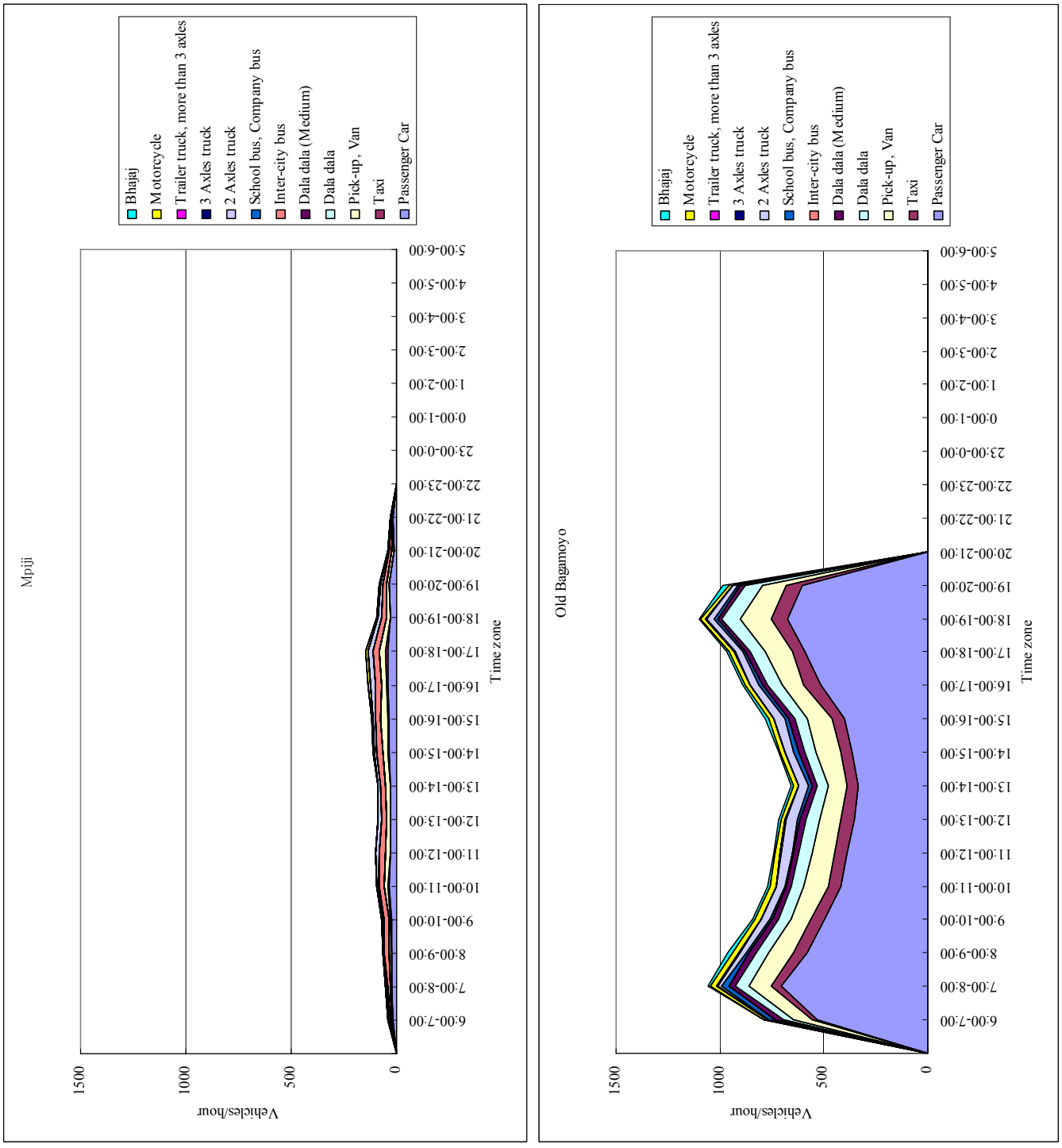
Source: JICA Study Team

Figure 3.3.2 Result of Traffic Count Survey (Left: Mwenge, Right: Africana)



Source: JICA Study Team

Figure 3.3.3 Result of Traffic Count Survey (Left: Tegata, Right: Bunju)



Source: JICA Study Team

Figure 3.3.4 Result of Traffic Count Survey (Left: Mpiji, Right: Old Bagamoyo)

(2) Traffic Demand Forecast

This section analyzes the future traffic demand in different timeframes (2015 and 2030) using the traffic demand forecast model prepared in the Master Plan Study. The future traffic demand is used as an input to determine the engineering design of the project road, such as the number of the lanes and to evaluate the project alternatives and economic feasibility of the Project. The following flowchart illustrates the methodology of the traffic demand forecast using the conventional four-step model.

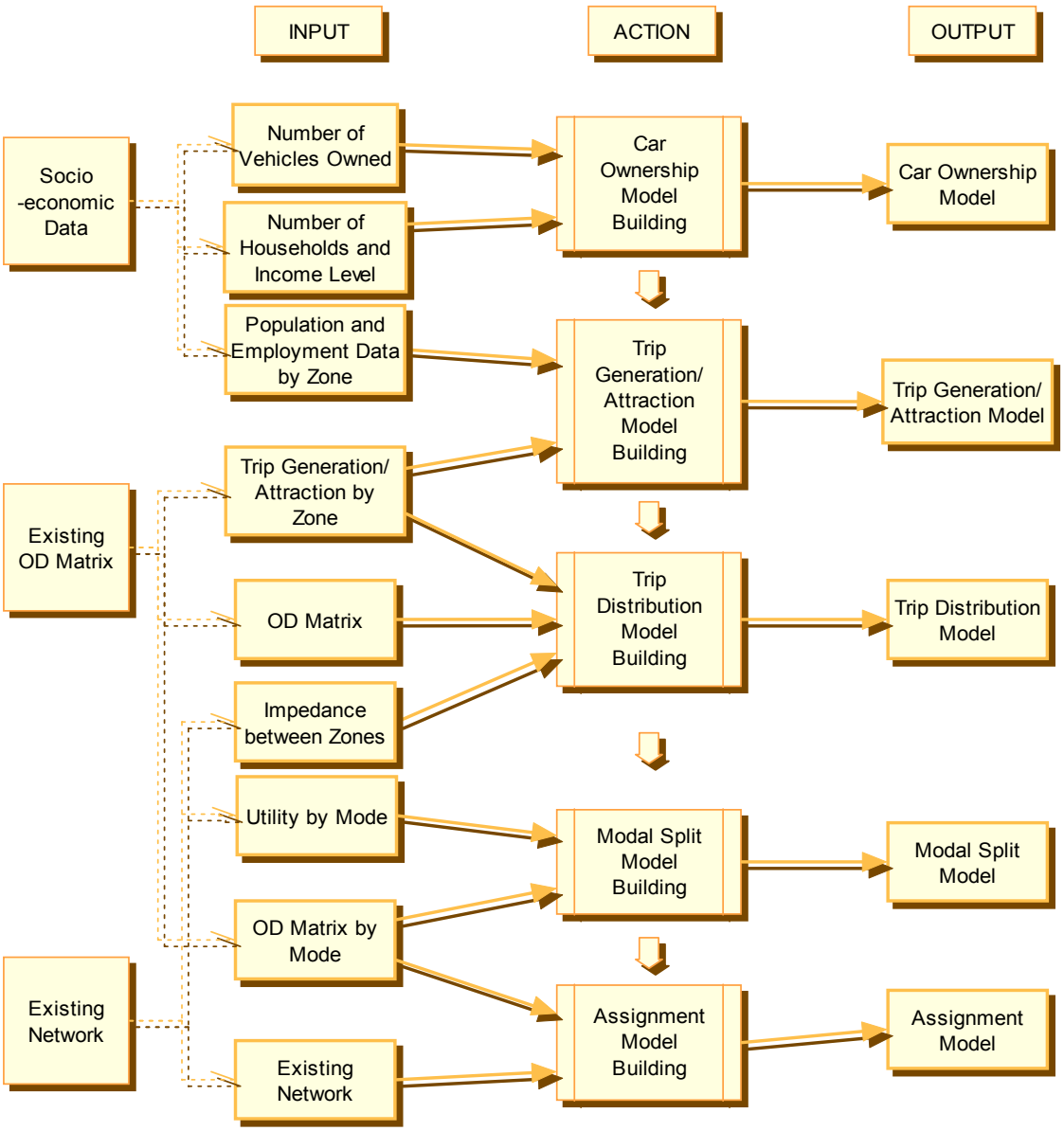


Figure 3.3.5 Flowchart of Traffic Demand Forecast

The four traffic demands by case were forecasted, considering the project alternatives: 4-lane widening + BRT (Case 1), 4-lane widening without BRT (Case 2), bypass (Case 3) and zero option (Case 4).

Table 3.3.4 Traffic Demand Forecast by Case

Alternatives		ROW	Case
Original	Alternative A: 4-lane widening + BRT space	45m	Case 1
Alternative Options	Alternative B: 4-lane widening + BRT space (Minimum cross section width)	30m	
	Alternative C: 4-lane widening + BRT space (Adopting open side ditch for cost saving)	34m	
	Alternative D: 4-lane widening	27m	Case 2
	Alternative E Bypass (Widening and extension of Old Bagamoyo Road)	27m	Case 3
Zero Option	Alternative F: Zero option	—	Case 4

The results of the traffic demand forecast are tabulated in Tables 3.3.5 and 3.3.6 and summarized below.

- The traffic demand between Morocco and Kawe is estimated to over-saturate the traffic capacity by 2015 even when the Project is implemented. The traffic demand between Kawe and Tegeta is estimated to remain less than the traffic capacity only when the 4-lane widening + BRT (Case 1) is implemented, and the level of service, such as travel speed, maintains or even becomes better than in other cases.
- The passenger demand of the public transport between Kawe and Tegata is estimated to reach 190,000 to 220,000 trips per day (7,200 to 8,200 PCU if all the trips are transferred to daladala). Therefore, the future traffic demand in this road section will soon become larger than the traffic capacity unless the BRT is installed.
- All the case studies show that the future traffic demand between Tegeta and Mpiji remains relatively small. The traffic demand in 2015 in this road section is estimated to remain less than the capacity. The traffic demand in 2030 between Tegeta and Bunju is estimated to be slightly larger than the capacity. Considering that there is no major intersection and the road surface condition maintains good, the level of service at this road section remains at an acceptable level.
- Also, comparing bypass option (Case 3) and zero option (Case 4), the number of diverted traffic to the bypass is estimated to be much less and therefore the bypass option will not stop the traffic congestion in New Bagamoyo Road.

The results of the traffic assignment are summarized in Figures 3.3.6 to 3.3.10

Table 3.3.5 2015 Traffic Demand Forecast (1/2)

Road Section	(1) 4-Lane with BRT			(2) 4-Lane without BRT		
	Volume (PCU/Day)	V/C	Travel Speed (km/h)	Volume (PCU/Day)	V/C	Travel Speed (km/h)
Morocco-Mwenge	36,200	1.08	6.0	37,100	1.10	6.0
Mwenge-Kawe	47,600	1.42	6.0	54,800	1.63	6.0
Kawe-Africana	31,500	0.94	16.2	39,700	1.18	6.0
Africana-Tegeta	32,300	0.96	15.7	39,700	1.18	6.0
Tegeta-Bunju	9,600	0.29	60.0	9,600	0.29	60.0
Bunju-Mpiji	5,700	0.17	60.0	5,700	0.17	60.0
Old Bagamoyo	15,000	1.44	4.0	15,000	1.44	4.0
Total/Average	**177,900**	**1.08**	**14.0**	**201,600**	**1.24**	**9.9**

Source: JICA Study Team

Table 3.3.5 2015 Traffic Demand Forecast (2/2)

Road Section	(3) Bypass			(4) Zero Option		
	Volume (PCU/Day)	V/C	Travel Speed (km/h)	Volume (PCU/Day)	V/C	Travel Speed (km/h)
Morocco-Mwenge	19,500	1.16	6.0	22,100	1.32	6.0
Mwenge-Kawe	44,100	2.63	6.0	51,000	3.04	6.0
Kawe-Africana	34,700	2.07	6.0	33,800	2.01	6.0
Africana-Tegeta	32,000	1.90	6.0	32,400	1.93	6.0
Tegeta-Bunju	9,300	0.55	44.8	9,400	0.56	44.3
Bunju-Mpiji	5,400	0.32	60.0	5,200	0.31	60.0
Old Bagamoyo	18,200	0.88	17.0	12,000	1.15	4.0
Total/Average	**163,200**	**1.80**	**11.2**	**165,900**	**2.02**	**9.7**

Source: JICA Study Team

Table 3.3.6 2030 Traffic Demand Forecast (1/2)

Road Section	(1) 4-Lane with BRT			(2) 4-Lane without BRT		
	Volume (PCU/Day)	V/C	Travel Speed (km/h)	Volume (PCU/Day)	V/C	Travel Speed (km/h)
Morocco-Mwenge	51,100	1.52	6.0	52,500	1.56	6.0
Mwenge-Kawe	75,700	2.25	6.0	84,300	2.51	6.0
Kawe-Africana	47,900	1.43	6.0	56,100	1.67	6.0
Africana-Tegeta	46,200	1.38	6.0	53,000	1.58	6.0
Tegeta-Bunju	26,900	0.80	29.8	26,900	0.80	29.8
Bunju-Mpiji	9,200	0.27	59.2	9,200	0.27	59.2
Old Bagamoyo	18,500	1.78	4.0	18,500	1.78	4.0
Total/Average	**275,500**	**1.59**	**10.0**	**300,500**	**1.76**	**9.6**

Source: JICA Study Team

Table 3.3.6 2030 Traffic Demand Forecast (2/2)

Road Section	(3) Bypass			(4) Zero Option		
	Volume (PCU/Day)	V/C	Travel Speed (km/h)	Volume (PCU/Day)	V/C	Travel Speed (km/h)
Morocco-Mwenge	32,900	1.96	6.0	40,800	2.43	6.0
Mwenge-Kawe	54,000	3.21	6.0	67,800	4.04	6.0
Kawe-Africana	35,600	2.12	6.0	45,400	2.70	6.0
Africana-Tegeta	33,500	1.99	6.0	40,900	2.43	6.0
Tegeta-Bunju	20,900	1.24	6.0	19,700	1.17	6.0
Bunju-Mpiji	8,300	0.49	54.8	7,300	0.43	57.7
Old Bagamoyo	33,100	1.59	4.0	14,600	1.40	5.0
Total/Average	**218,300**	**2.12**	**7.6**	**236,500**	**2.71**	**7.5**

Source: JICA Study Team

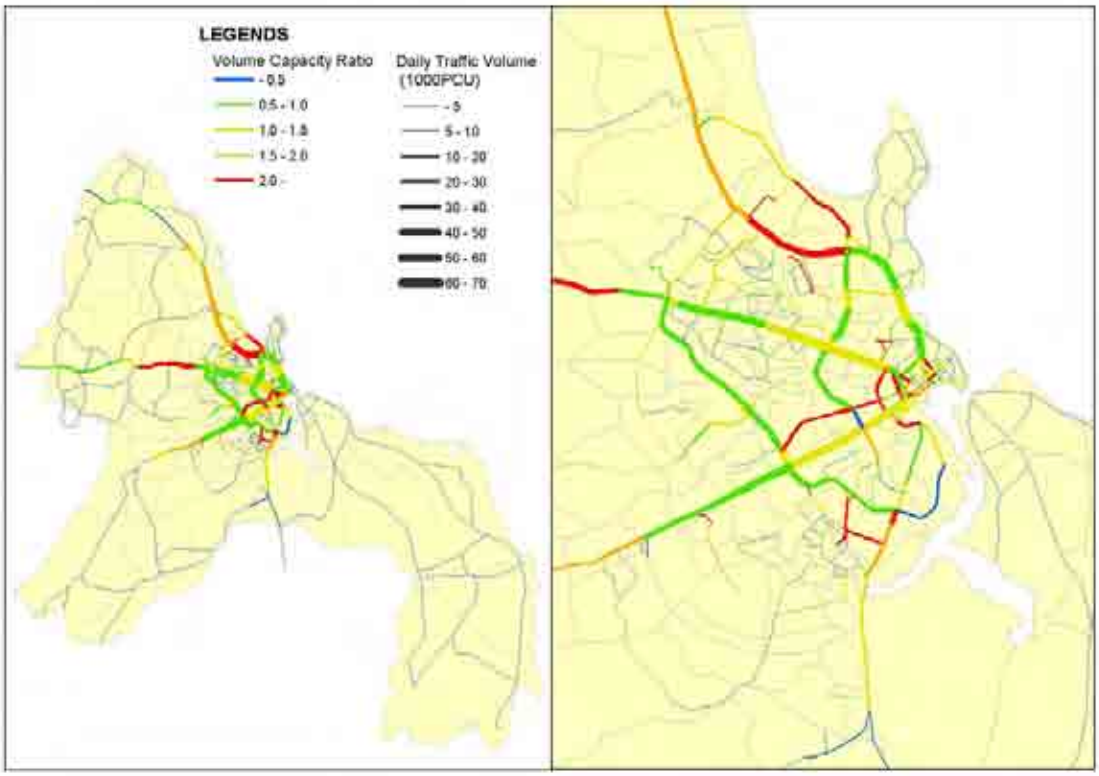


Figure 3.3.6 Traffic Assignment Result (Year 2007)

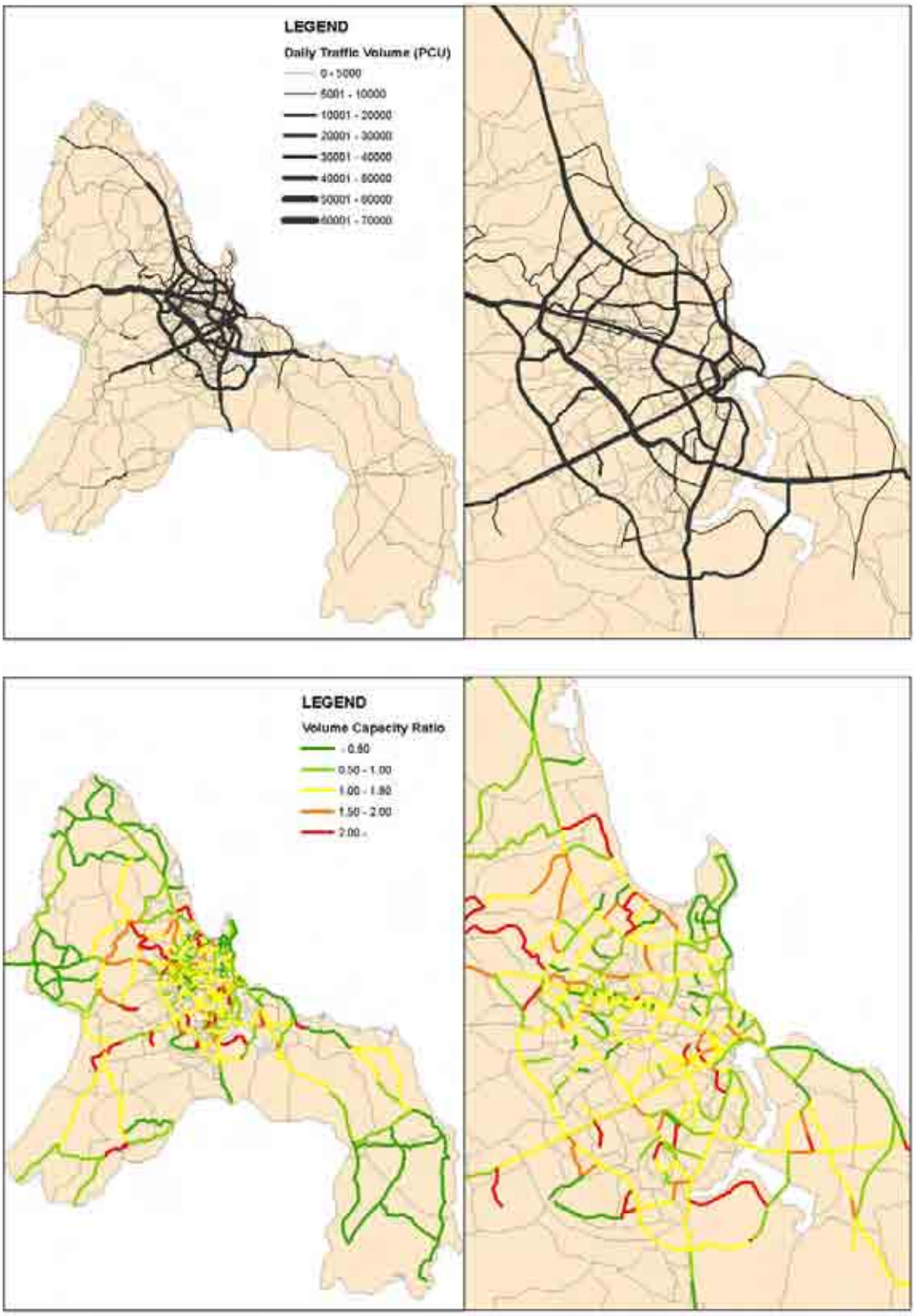


Figure 3.3.7 Traffic Assignment Result (Year 2015, with Project)

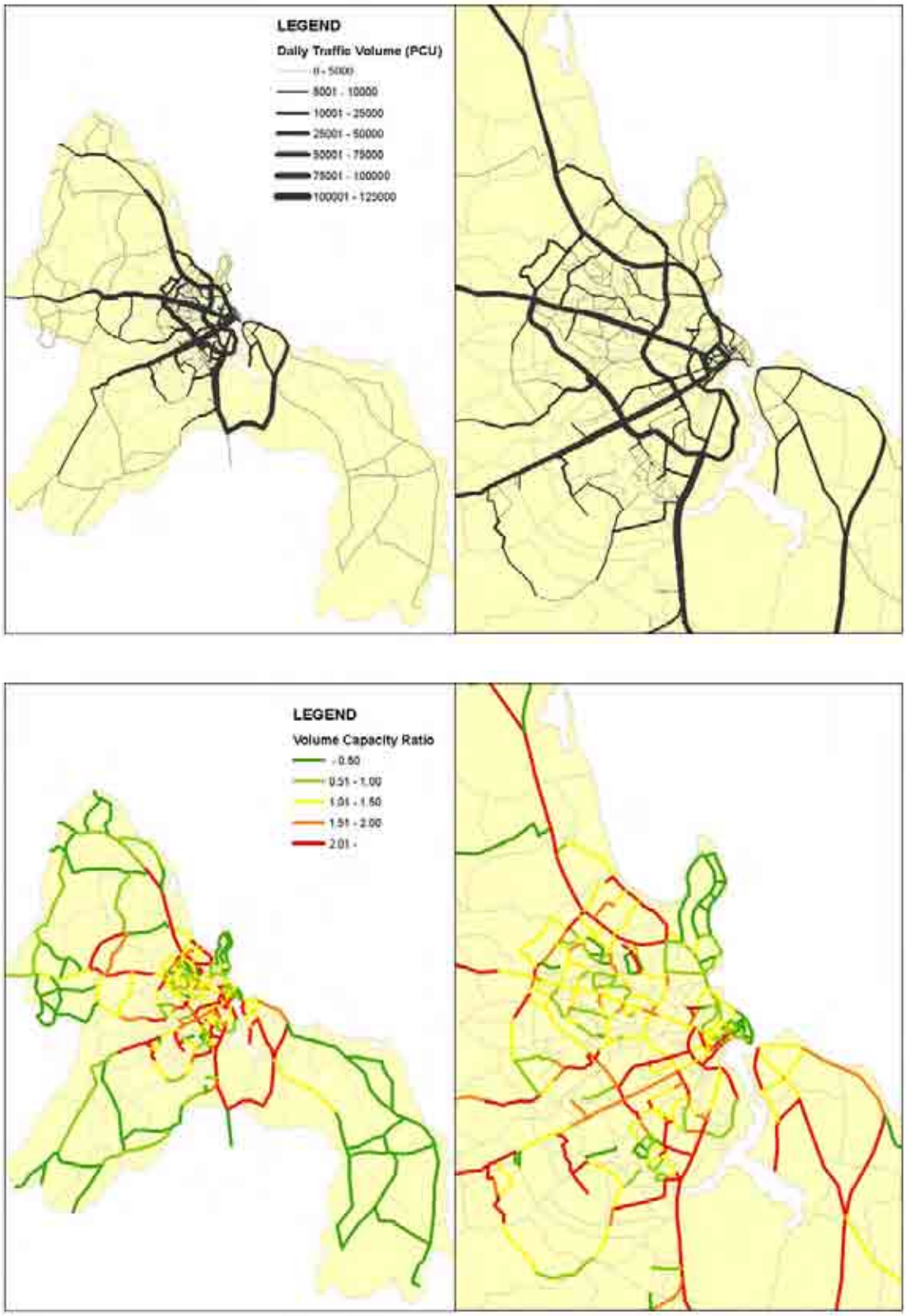


Figure 3.3.8 Traffic Assignment Result (Year 2015, without Project)

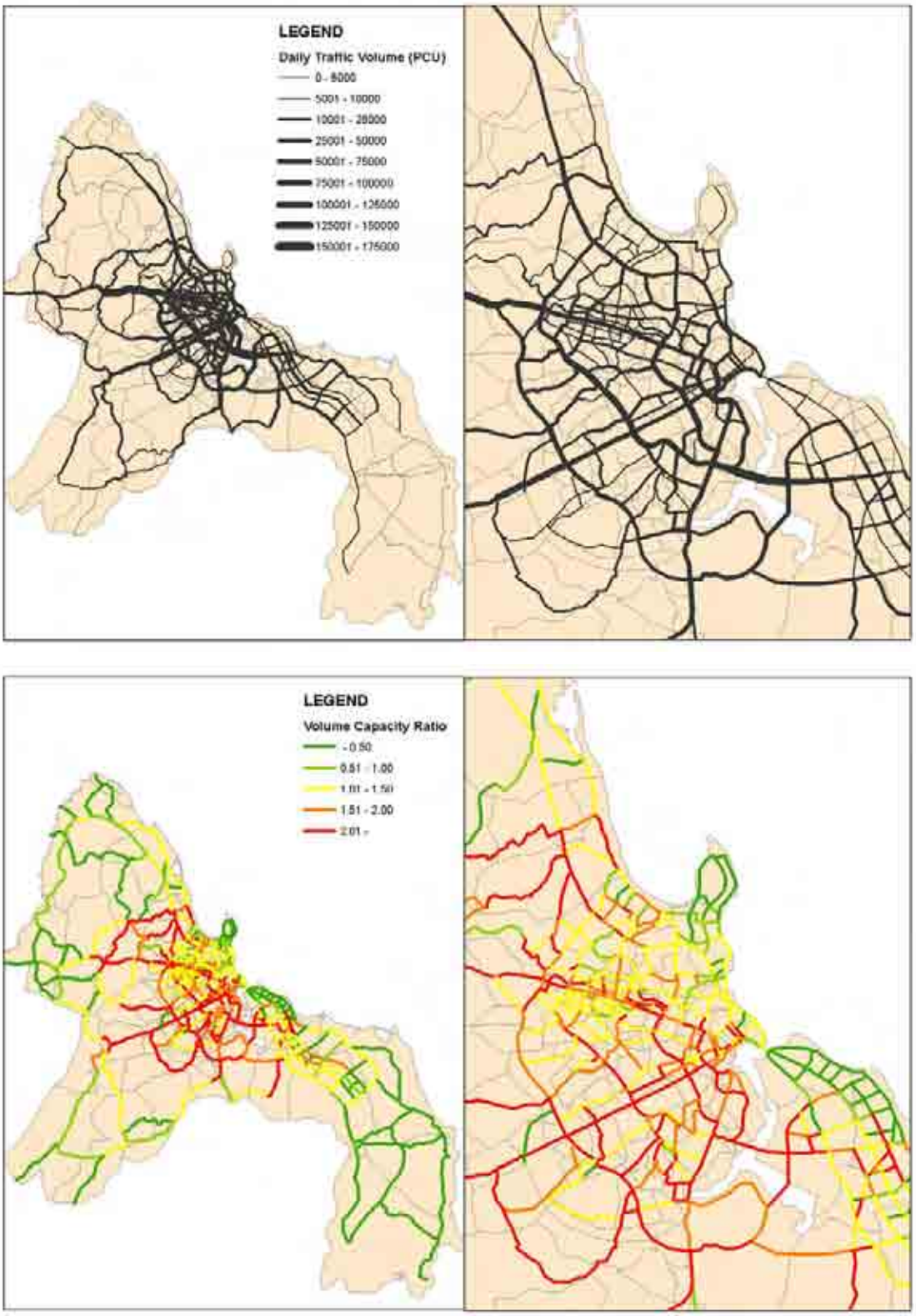


Figure 3.3.9 Traffic Assignment Result (Year 2030, with Project)

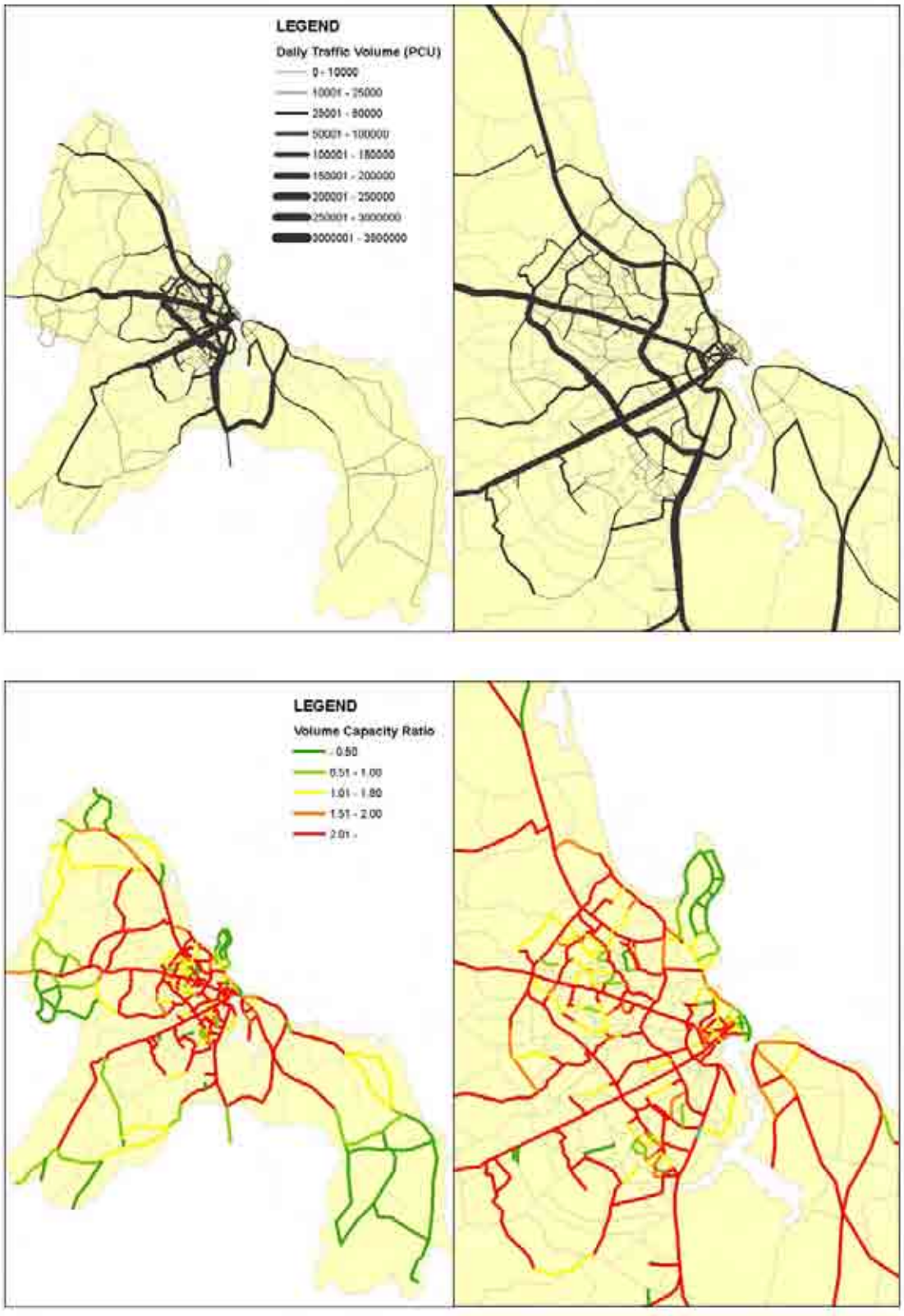


Figure 3.3.10 Traffic Assignment Result (Year 2030, with Project)

Chapter 4 Natural Conditions

4.1 Climate

The study area is close to the equator (7 degrees south in latitude) with the climate of tropical forest zone. Since Dar es Salaam City faces the Indian Ocean, it has the characteristics of a marine climate in which relatively comfortable wind (not extremely hot) blows from the sea.

4.1.1 Temperature

Temperature is relatively stable through the year. Average maximum and minimum temperature are 31°C and 19°C, respectively.

4.1.2 Rainfall

The annual rainfall totals 1,124 mm. The season is divided into two: namely rainy season and dry season. The rainy season starts in March and lasts till May. The rainfall in the rainy season accounts for approximately 55% of the annual rainfall.

On the other hand, the dry season starts from June and lasts to February. Days with the rainfall during dry season are 5 days in a month on average. Especially from June to September, it becomes very dry and rainfall in this season is less than 40 mm per month.

Table 4.1.1 Meteorological Date for Dar es Salaam

	1	2	3	4	5	6	7	8	9	10	11	12
Temperature (℃)												
Max	31.5	32.2	32.2	30.7	29.8	29.2	28.8	29.3	30.1	30.9	31.3	31.6
Min	23.2	23.1	22.6	22.4	21.1	19.0	18.2	18.1	18.4	19.7	21.3	22.8
Humidity (%)												
9:00 a.m.	79	78	82	87	86	84	85	84	78	74	75	78
3:00 p.m.	64	62	67	73	66	58	56	54	53	76	62	65
Rain Days (No.)												
	7	5	12	19	13	5	5	4	5	6	8	7
Rainfall (mm)												
	81.8	57.4	130.4	263.3	178.9	37.3	28.8	26.5	26.1	60.0	120.8	112.6
											Total	1,124

Source: Statistical Abstract 2002, National Bureau of Statistics (2003)

4.2 Topographical Conditions

The topographical conditions in Dar es Salaam are classified into the following five types.

(1) Lowland (elevation of lower than 5 m above sea level)

Lowlands spread at the bay area, river mouth and the hinterland along the coast. In these lowlands, marsh areas and swampy areas are widely spread where soft soil is deep and drainage conditions are rather poor.

(2) Plain / Terrace （5 to 20 m above sea level）

Flat plain and terrace areas are observed above sea level between 5 to 20 m. These areas with some minor local hollows extend several kilometers wide along the coast. Geologically, its origin was a coastal plain associated with the local terrace (Msasani Peninsula for example) which was formed due to past drop in sea level.

(3) Terrace / Hill (20 to 60 m above sea level)

Gentle hilly areas are observed in the area of above seal level between 20 to 60 m, which is the dominant part of the residential area of Dar es Salaam. Ground surface consists of residual weathered limestone. Many terrace areas of 500 to 1,000 m width are observed around banks of the rivers in Dar es Salaam. These are tracks of flood storage in the past.

(4) Hill (60 to 150 m above sea level)

The hilly zone extends in the southwest part of the study area. The origin of these hills is raised coral reefs. Undulation in these areas changes from gentle to steep in accordance with the weathering degree.

(5) Mountain (150 m or more above sea level)

Mountainous areas is observed in the western area of Dar es Salaam at around approximately 30 km inland area from the coast. This rather undulated mountainous area is composed of limestone associated with sandstone of an older geological era.

Topographical condition of the New Bagamoyo Road belongs to the coastal terrace type. New Bagamoyo Road runs on a flat plain in large part but on the gentle hill in some parts of the road.

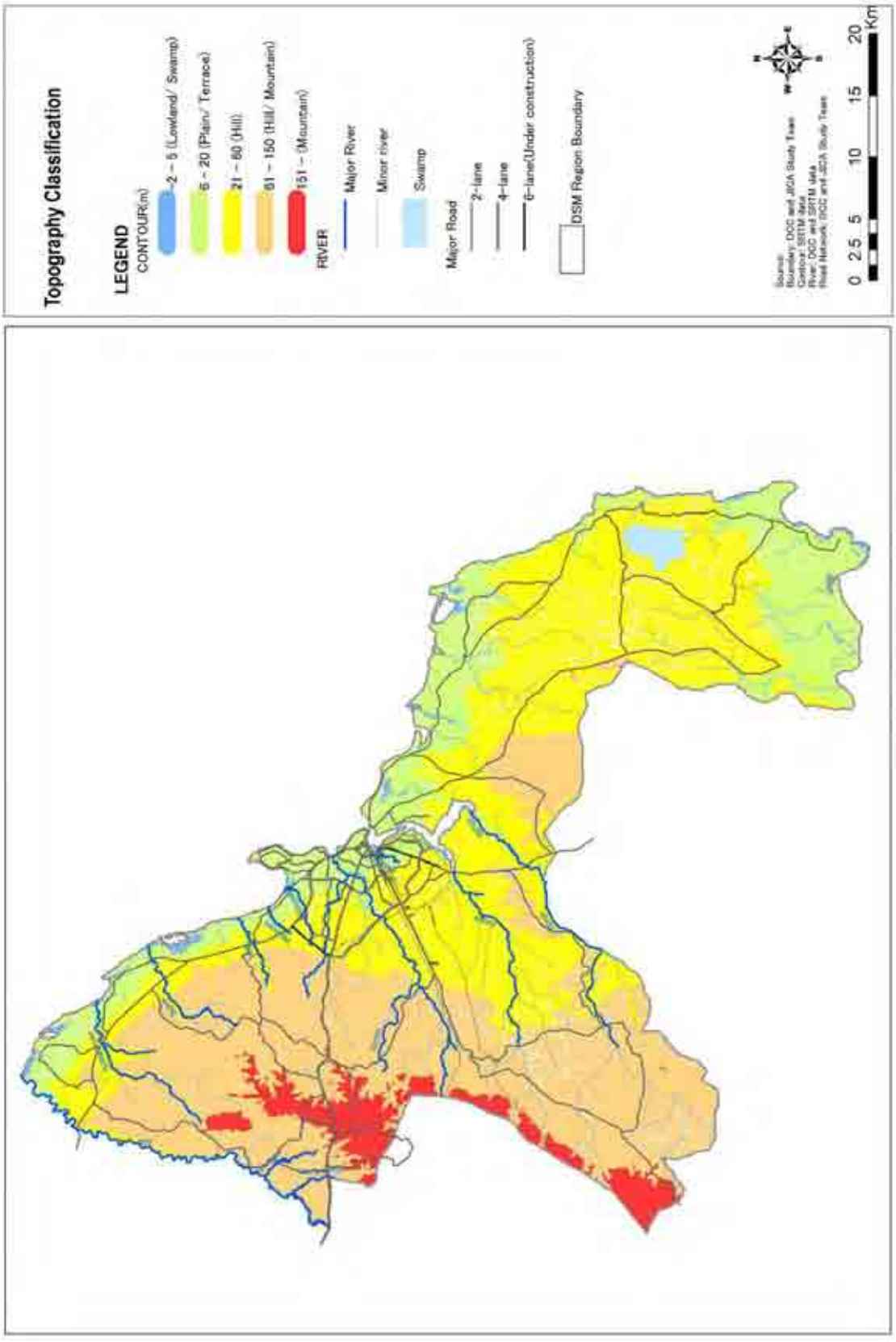


Figure 4.2.1 Topography Classification in Dar es Salaam

4.3 Geological Conditions

The geological basement of Tanzania consists of igneous, sedimentary and volcanic complex of an old geological era. It forms a backbone mountain range of inland Tanzania which connects to the tectonic line extending from Lake Victoria. Mt. Kilimanjaro is one of the representative localities.

The study area is located close to the coastline. The sandstone layer of Tertiary Geological era is the base in this region, and it occurs around the western mountain zone. A limestone layer (Old Quaternary Geological era) is widely distributed around the hinterland of the city from the coast to its back, forming terrace and hills. Msasani peninsula located in the west side of Oyster Bay is a typical terrace. Ground surface of the limestone hill decomposes into soil due to weathering, but the deeper layer is still fresh.

In addition to the limestone layer, alluvial layer is widely distributed in or around coastline and river basin. Beach-sand, back marsh deposit and flood plain sediment belong to this alluvial layer. White sand beach composed of fine sand mixed with coral fragment exists in some places, especially in the South West region, where much broader beaches are scattered. Marsh deposit and plain sediment are composed of fine soil. Major marsh deposits are found in the southwest region as well as broad sand beach, and plain sediment is found around the large rivers like Msimbaji, Kizinga and Mzinga.

According to the field reconnaissance conducted in the Master Plan Study and the boring survey conducted in the Dar es Salaam Road Development Plan (JICA, 1995), the geological layer on New Bagamoyo Road is composed of sand and gravel, and its major characteristic is fine grain sand.

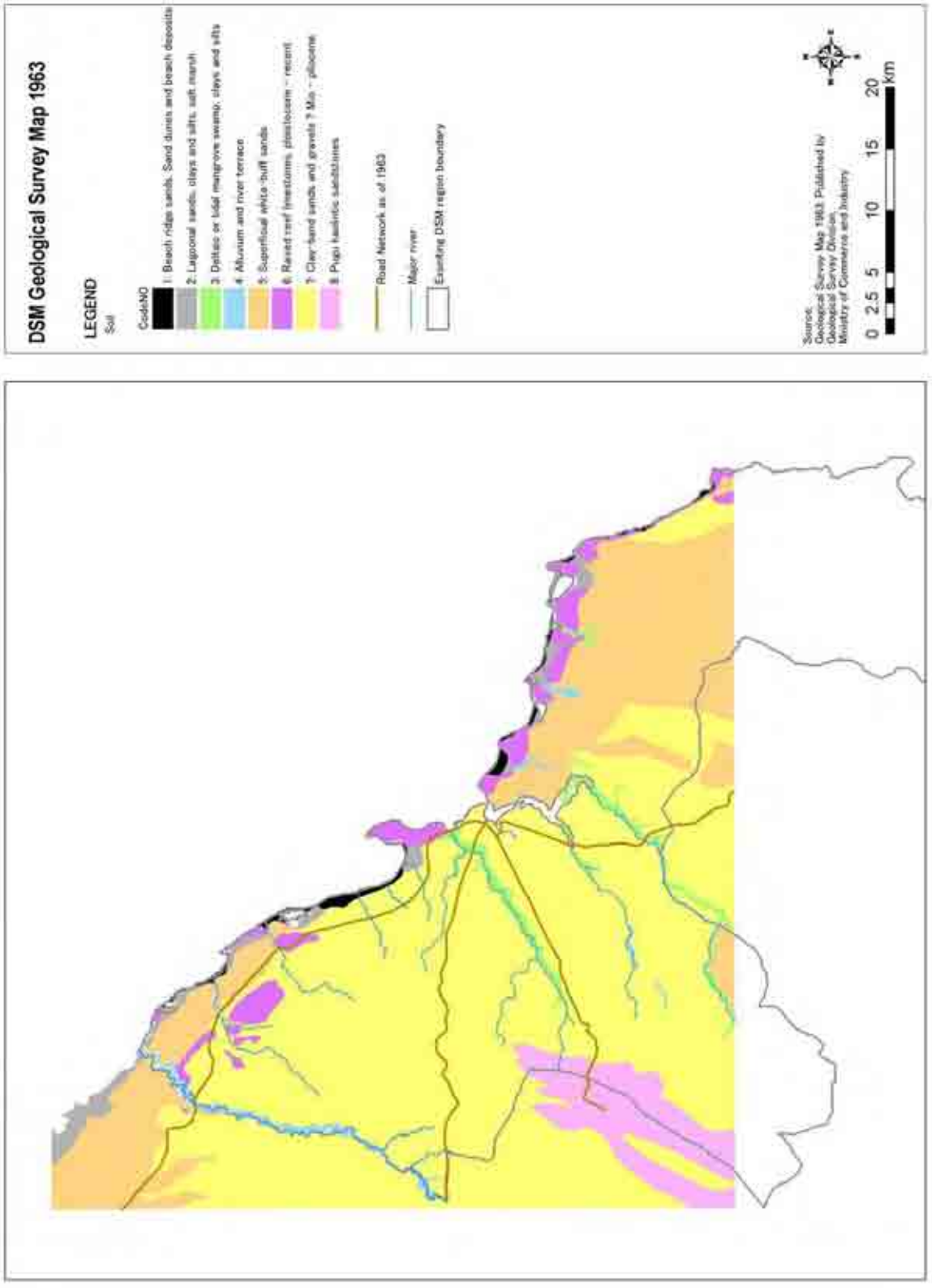


Figure 4.3.1 Geological Survey Map in Dar es Salaam

4.4 Hydrological Conditions

4.4.1 Flood

New Bagamoyo Road crosses six major rivers: namely Kijitonyama, Marakuwa, Mbezi, Tegeta, Nyakasangwe and Mpiji. An interview survey regarding the flooding of these rivers was conducted with local people. The results of the interview survey are summarized as follows.

- Kijitonyama River: Flood due to the rainfall has never been observed.
- Marakuwa River: Flood due to the rainfall has never been observed.
- Mbezi River: The water level rises in the rainy season, but the houses, field or road around New Bagamoyo Road has never been in the flooded area.
- Tegeta River: The houses and field are flooded (40 to 50 cm deep) in every rainy season. The flooding is often observed by heavy rainfall, but then the flood waters soon go down. El Nino in 1999 brought 1 m height of flooding and the flood waters remained for a week. At that time, the water flow was very high and New Bagamoyo Road was covered by the flood.
- Nyakasangwe River: The river width used to be very small but is becoming bigger by erosion. Flooding is often observed after heavy rainfalls but it subsides soon after the rain stops.
- Mpiji River: Flooding was often observed. However, there were no flood observed since 2005 when a new bridge was constructed.

4.4.2 Drainage

The drainage condition of New Bagamoyo Road is rather bad. In a rainy season having much rain in a short time, the rainwater remains on the road surface for a few days. This is caused by bad road surface condition, insufficient capacity of drainage, and decreased capacity of drainage facilities due to insufficient maintenance. During the basic design stage, more detailed studies for the drainage should be conducted since the bad drainage condition causes traffic congestion especially in the rainy season.

Chapter 5 Road Conditions

5.1 Road and Pavement

5.1.1 Traffic Lane Operations

The road section from Morocco to Mwenge has 3-lane carriageway including a reversible lane, and each lane has markings. However, the reversible lane does not operate properly. Although the direction of the reversible lane should be changed according to the time, e.g., towards CBD in the morning peak hours and towards the suburban area in the evening hours, traffic signs and markings show the direction is fixed towards CBD. Actual experience shows the reversible lane is very dangerous since drivers individually judge the direction of it.

The road section from Mwenge to Africana has 2-lane carriageway (one lane for each direction), as well as a climbing lane for a slow traffic on steep sections. The centreline marking from Mwenge to Kawe is visible, but that of other sections is not. The road section from Africana to Tegeta has 2-lane carriageway (one lane for each direction). However, there is no centerline marking along this section. The road section from Tegeta to Mpiji has 2-lane carriageway (one lane for each direction) and the surface is sometimes used as a shoulder. Markings are provided at the centre line and shoulder, but are not visible in some parts of the road section.

Figure 5.1.1 Reversible Lane

5.1.2 Road Surface Conditions

The road surface from Morocco to Mwenge is maintained in relatively good condition and has no cracks or potholes since this road section was improved in early 2008, although ruts are observed in some sections.

The road surface from Mwenge to Tegeta is in bad condition, since cracks and potholes are frequently observed and flatness is not secured. The rough road surface causes traffic congestion because drivers are forced to decelerate at the potholes. However, it seems that the base course and sub-grades are maintained in good condition since serious damage such as alligator cracks were not observed during the site visit.

Figure 5.1.2 Road Surface Condition from Mwenge, Africana to Tegeta

The road surface from Tegeta to Mpiji is maintained in good condition without any cracks and roughness since overly of this road section was carried out in 2002.

Figure 5.1.3 Road Surface Condition from Tegeta to Mpiji

5.2 Bridges

There are five bridges, namely Mlalakuwa, Lugalo, Tegeta, Boko and Mpiji, in New Bagamoyo Road from Morocco to Mpiji. Each superstructure and substructure has no fatal damage such as cracks and is maintained in relatively good condition. The inventory of the existing bridges are shown below.

Mwenge - Africana

Bridge Name	Mlalakuwa Bridge
Length	25.2 m
Span	12.6 m/span x 2
Width	7.7 m, 2-lane
Type	Steel I-girder
Construction Year	Unknown (Pedestrian bridge: 1995)
Condition	Relatively good condition; Each superstructure and substructure has no fatal damage such as cracks. Steel girder has no rusting or corrosion.
Photos	 

Bridge Name	Lugalo Bridge
Length	18.8 m
Span	18.8 m
Width	8.0 m, 2-lane
Type	Steel I-girder
Construction Year	Unknown
Condition	Relatively good condition; Each superstructure and substructure has no fatal damage such as cracks. Steel girder has no rusting or corrosion.
Photos	 

Africana - Tegeta

Bridge Name	Tegeta Bridge
Length	30.0 m
Span	7.5 m/span x 4
Width	9.4 m, 2-lane
Type	Concrete slab
Construction Year	1995
Condition	Relatively good condition; Each superstructure and substructure has no fatal damage such as cracks.
Photos	 

Tegeta - Mpiji

Bridge Name	Boko Bridge
Length	30.0 m
Span	30.0 m
Width	9.4 m, 2-lane
Type	Steel I-girder
Construction Year	2002
Condition	Relatively good condition; Each superstructure and substructure has no fatal damage such as cracks. Steel girder has no rusting or corrosion.
Photos	 

Bridge Name	Mpiji Bridge
Length	63.0 m
Span	21.0 m/span x 3
Width	9.4 m, 2-lane
Type	Concrete girder
Construction Year	2005
Condition	Relatively good condition; Each superstructure and substructure has no fatal damage such as cracks.
Photos	 

5.3 Intersections

5.3.1 Morocco Intersection

Morocco Intersection is where New Bgamoyo Road and Kawawa Road cross. The 3-lane carriageways including the right-turn lane are provided for each leg of both roads at the intersection (see Figure 5.3.1).

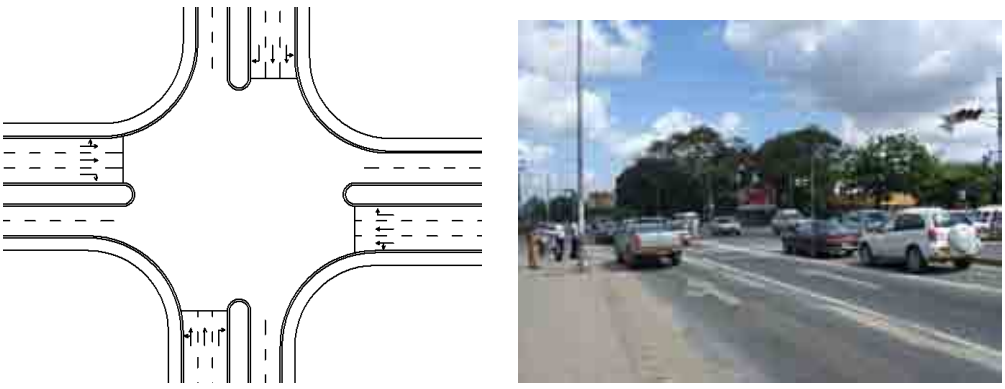


Figure 5.3.1 Morocco Intersection

This intersection is usually managed with traffic signals but is heavily congested in peak hours. Therefore, it is manually managed by the police officers in peak hours. Insufficient storage length for right-turning vehicles is one of the reasons which causes serious traffic congestion especially in peak hours. Accordingly, the appropriate storage length should be secured during the improvement of this intersection.

5.3.2 Mwenge Intersection

Mwenge Intersection is where New Bgamoyo Road and Sam Nujoma Road cross. This intersection is being signalized under the Sam Nujoma Road Widening Project.


Figure 5.3.2 Mwenge Intersection Improvement

However, further improvements will be required since the construction was implemented without the consideration of the future BRT space (see Figure 5.3.3).

Figure 5.3.3 Improvement of Mwenge Intersection in Sam Nujoma Road Widening Project

5.3.3 Africana Intersection

New Bagamoyo Road connects a paved road which terminates at White Sand Beach and an unpaved road which connects the residential area at Africana Intersection. These crossing roads have 2-lane paved carriageway and 1-lane unpaved carriageway, respectively. However, the number of lanes is not clear since markings are not visible.


Figure 5.3.4 Africana Intersection and Crossing Roads

5.3.4 Tegeta Intersection

New Bagamoyo Road connects two paved roads: one of which connects the residential area in the west and the other which connects the cement factory in the east at Tegeta Intersection. These crossing roads have 2-lane paved carriageway. Again, the number of lanes is not clear since markings are not provided.


Figure 5.3.5 Tegeta Intersection and Crossing Roads

5.4 Other Existing Facilities

5.4.1 Drainage Facilities

Drainage facilities such as the side ditches, pipe culverts and box culverts are installed along the New Bagamoyo Road. The side ditch, usually the concrete V-shape ditch or concrete U-shape ditch, or earth ditch, is installed along the road, but is not observed along the whole road section. In such sections where the side ditch is not installed, the road surface water often flows into the houses, or the rainwater from the roadside covers the road surface.

Pipe culverts and box culverts are installed as the traverse drainage facilities. However, the sizes and installation positions are not appropriate, and the rainwater can stay on the road surface for several days in the rainy season when there is a large amount of rainfall.

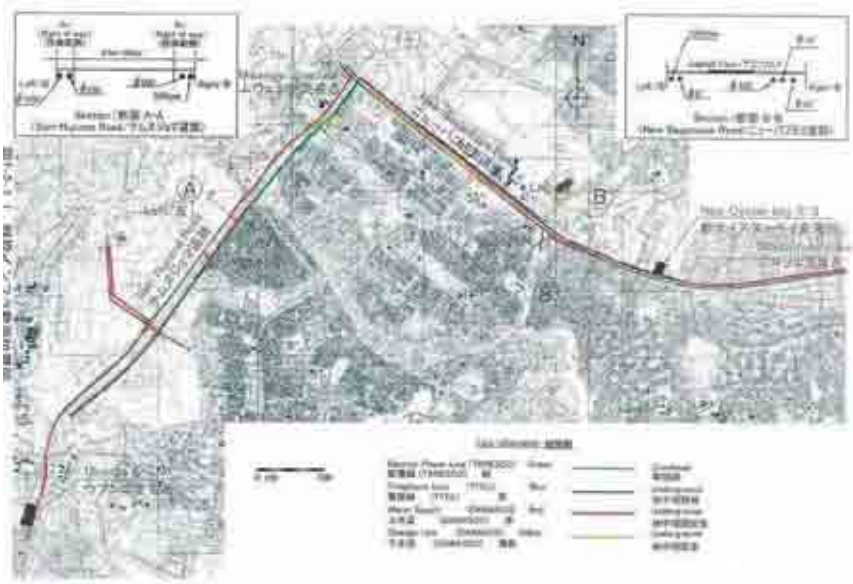
Figure 5.4.1 Drainage Facilities in New Bagamoyo Road

5.4.2 Road Safety Facilities

A sidewalk is installed in a few areas: namely a paved sidewalk around Morocco Intersection and an unpaved sidewalk in a road section from Mwenge to Africana. Without any sidewalk, it is dangerous for pedestrians since they are forced to walk in the shoulder where daladalas and cars run in peak hours. The sidewalk should be installed especially in the road section from Morocco to Africana where many pedestrians are currently observed. Pedestrian crossings which are installed at some intersections do not function properly since "yield to pedestrians" signage is not observed.

5.4.3 Underground Facilities

Underground facilities such as the pipelines and communication lines are expected to exist along the New Bagamoyo Road. During the site reconnaissance, water pipeline, sewage pipeline and telephone line were observed around Mwenge Intersection. They are also confirmed by the map prepared in the basic design study on the project for reinforcement of the transmission and distribution facilities in Oyster Bay substation (JICA, 2007) and various underground facilities are installed in the road section from Morocco to Mwenge (see Figure 5.4.2). In the basic design stage, an underground survey should be conducted in order to obtain full detailed information regarding underground facilities.



Source: Basic design study on the project for reinforcement of transmission and distribution facilities in Oyster Bay substation, JICA, 2007

Figure 5.4.2 Existing Infrastructure Layout

Chapter 6 Evaluation of Project Alternatives

6.1 Alternatives of the Project

In July 2007, the Government of Tanzania officially requested Japan Grant Aid for New Bagamoyo Road Widening Project, widening from 2-lane to 4-lane (plus 2-lane island) for 35 km road section from Morocco Intersection to Mpiji, the boarder of Dar es Salaam City. The typical cross section in the application of the Project is shown in Figure 6.1.1.

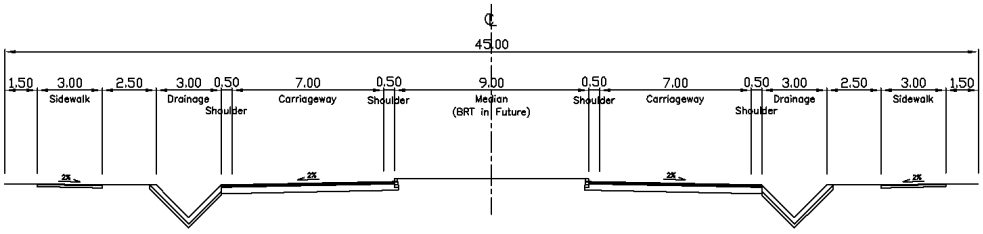


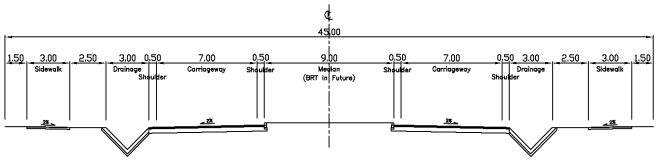
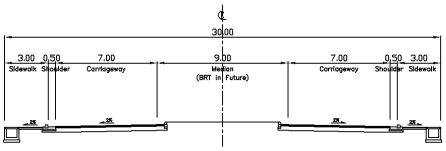
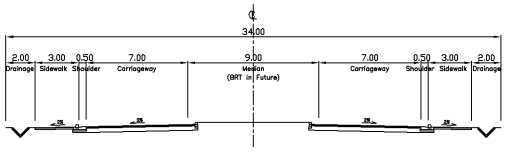
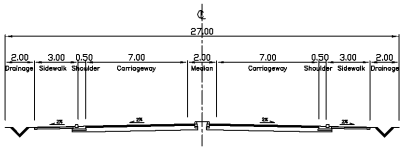
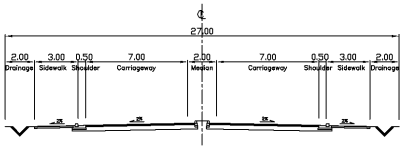
Figure 6.1.1 Typical Cross Section in the application of the Project

The typical cross section in the application, however, has a wide width of 45 m and gives negative impact to the economy and the social environment. Accordingly, the alternative options are studied in order to determine the optimum solution for the development of New Bagamoyo Road. The study was carried out with following viewpoints.

- Several alternative options including zero option are studied to meet the requirements of JICA Guidelines for Environmental and Social Considerations.
- Development of the bypass is also included as one of the alternative options, since Old Bagamoyo Road is planned to be widened and extended.

The alternative options in this study are shown in Table 6.1.1.

Table 6.1.1 Alternative Options for the Project

Alternatives		Width	Cross Section
Original	Alternative A: 4-lane widening + BRT space	45m	
Alternative Options	Alternative B: 4-lane widening + BRT space (Minimum cross section width)	30m	
	Alternative C: 4-lane widening + BRT space (Adopting open side ditch for cost saving)	34m	
	Alternative D: 4-lane widening	27m	
	Alternative E Bypass (Widening and extension of Old Bagamoyo Road)	27m	
Other	Alternative F: Zero option	—	—

Alternative options are also studied for the following road sections. (see Figure 6.1.2)

- Morocco – Mwenge : L=4.3 km
- Mwenge – Africana : L=7.5 km
- Africana – Tegeta : L=5.2 km
- Tegeta – Mpiji : L=17.8 km

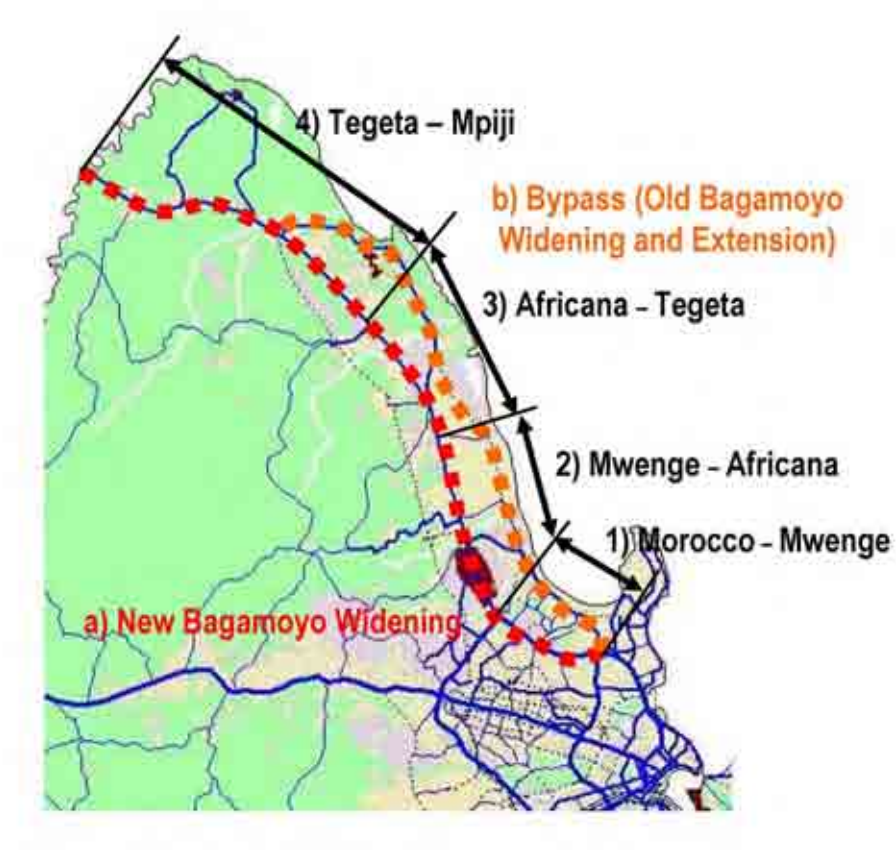


Figure 6.1.2 Alternative Options for the Project

6.2 Evaluation Method and Criteria

Six alternative options described in "6.1 Alternatives of the Project" are evaluated with various criteria shown in Table 6.2.1, and the optimum solution is proposed for each section of New Bagamoyo Road. The evaluation exercise is carried out with criteria such as technical, economic, environmental and policy relevance.

Table 6.2.1 Evaluation Criteria for Selection of Optimum Option

1st level criteria	2nd level criteria	3rd level criteria	Evaluation Items
Technical Criteria	Workability	Project size	Project cost
		Construction method	Construction method and its difficulty level
		Construction period	Construction period
	Sustainability	Easy maintenance	Maintenance
Economic criteria	Economy	Traffic demand	Volume capacity ratio
		Investment	Economic internal rate of return
		Impact to local economy	Net present value
Environmental	Natural	Noise and vibration	Level of noise and vibration

1st level criteria	2nd level criteria	3rd level criteria	Evaluation Items
criteria	environment	Traffic accident	Annual number of traffic accident
		Impact to global environment	CO2 emission
	Social environment	Involuntary relocation	Number of household affected by the project
		Impact to land use	Potential for new industrial development
		Impact to lifestyle	Trip rate
Policy criteria	Policy relevance (e.g., Poverty reduction)	Promotion of upper plan	Coherence of upper plans and related projects, e.g., BRT
		Increase of life quality for women	Reduction in travel cost to market, hospital, etc
		Increase of learning opportunities for children	Reduction in travel time to primary/secondary school

6.3 Evaluation

As the result of evaluation for each road section, Alternative C (ROW=34m): 4-lane widening + BRT space (adopting open side ditch for cost saving), was selected for road section from Morocco to Tegeta and Alternative F: Zero option, was selected for the road section from Tegeta to Mpiji.

In order to minimize the involuntary resettlement and mitigate the negative environmental impacts, Alternative B (ROW=30m) is also recommended to adopt. The proportion of Alternative B accounts for 20% of the road length in the road section from Morocco to Mwenge where many houses/shops are located and 5% of the road length in other road sections.

Table 6.3.1 Optimum Solution for the Project

Section	Optimum Solution
Morocco - Mwenge	Alternative C: - 4-lane widening + BRT space (Adopting open side ditch for cost saving) - ROW＝34m However, Alternative B is also adopted in order to minimize the involuntary relocation and mitigate the negative environmental impacts.
Mwenge - Africana	
Africana - Tegeta	
Tegeta - Mpiji	Alternative F: - Zero option

The evaluation details are shown in Tables 6.3.2 to 6.3.5.

Table 6.3.2 Evaluation of Alternative Options (Morocco - Mwenge)

Alternatives			Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F	
Evaluation Items (Score) \ Description			- W＝45m - Original - 4-lane widening with BRT space		- W＝30m - 4-lane widening with BRT space (Minimum cross section width)		- W＝34m - 4-lane widening with BRT space (Adopting open side ditch for cost saving)		- W＝27m - 4-lane widening with BRT space		- W＝27m - Bypass (Widening and extension of Old Bagamoyo Road)		- Zero Option	
Workability	Project Cost	10	- 12,859 million Tshs (1,150 million Yen) - Higher because of wide width - Cost compared with Alternative A (Original) : 1.00	B	- 13,785million Tshs (1,233 million Yen) - Highest because of the installation of “U-shape ditch with cover” to whole section - Cost compared with Alternative A (Original) : 1.07	C	- 12,545 million Tshs (1,122 million Yen) - Slightly lower because of narrow width - Cost compared with Alternative A (Original) : 0.98	B+	- 12,450 million Tshs (1,114 million Yen) - Slightly lower because of narrow width - Cost compared with Alternative A (Original) : 0.97	B+	- 13,253 million Tshs (1,186 million Yen) - Higher because of long section length - Cost compared with Alternative A (Original) : 1.03	C	- No Construction	A
	Construction method and its difficulty level	4	- Easy because no particular difficult construction method required	B	- Same to left	B	- Same to left	B	- Same to left	B	- Same to left	B	- No Construction	B
	Construction period	4	- Approximately 1 year	B	- Same to left	B	- Same to left	B	- Same to left	B	- Same to left	B	- No Construction	B
Sustainability	Maintenance	6	- Minor maintenance works are required, e.g., routine inspection and cleaning of road/drainage facilities.	B	- Minor maintenance works are required, e.g., routine inspection and cleaning of road/drainage facilities. - Required to open the cover for cleaning of side ditch, but not difficult.	B	- Minor maintenance works are required, e.g., routine inspection and cleaning of road/drainage facilities.	B	- Same to left	B	- Same to left	B	- Difficult for maintenance work since road facilities in New Bagamoyo Road are outdated and required for replacement.	C
Economy	Volume capacity ratio	6	- The current traffic volume already oversaturated the capacity. - A volume capacity ratio improves by the Project - It Maintains the same to the current ratio till 2030. 1.43 (2006) 1.08 (2015) 1.52 (2030)	A	- Same to left 1.43 (2006) 1.08 (2015) 1.52 (2030)	A	- Same to left 1.43 (2006) 1.08 (2015) 1.52 (2030)	A	- A volume capacity ratio improves by the Project - It maintains the same to the current ratio till 2030. - Traffic volume increases slightly because of no BRT installation. 1.43 (2006) 1.10 (2015) 1.56 (2030)	A	- A volume capacity ratio improves by the Project - It reaches the deteriorated level by 2030. 1.43 (2006) 1.16 (2015) 1.96 (2030) *Old Bagamoyo Road 0.88 (2015) 1.59 (2030)	B	- A volume capacity ratio maintains the same to the current ratio till 2015. - It exceeds 2.0 by 2030. 1.43 (2006) 1.32 (2015) 2.43 (2030)	C
	Internal rate of return	10	- A Project generates high economic return and benefits both car and BRT users. 24.2%	A	- Same to left 25.3%	A	- Same to left 26.9%	A	- A Project may generates high economic return even the BRT system is not introduced.	A	- A Project may not be economically viable and EIRR is smaller comparing to the other alternatives. 11.3%	B	- The severe congestion may hinter the economic growth.	C
	Net present value	8	- A Project generates a large amount of economic benefit 11.74 billion Tshs	A	- Same to left 12.25 billion Tshs	A	- Same to left 12.89 billion Tshs	A	- Same to left	A	- A Project generates negative benefits. (-) 1.91 billion Tshs	C	- The severe congestion may cause the negative economic impacts	C
Natural Environment	Level of noise and vibration	4	- Level of noise and vibration is better-off than Alternative E and F since the travel speed maintains.	A	- Same to left	A	- Same to left	A	- Same to left	A	- Level of noise and vibration worsens since the travel speed cannot maintain.	B	- Level of noise and vibration worsens since travel speed becomes lowered year by year.	C
	Annual number of traffic accident	6	- Minor traffic accident decreases since travel speed maintains. - Serious accident also decreases since safety facilities are introduced.	A	- Same to left	A	- Same to left	A	- Same to left	A	- Same to left	A	- Traffic accident (both minor and serious) increases since safety facilities are not introduced.	C
	CO2 emission	4	- CO2 emission decreases because travel speed maintains.	A	- Same to left	A	- Same to left	A	- Same to left	A	- More CO2 emission generates, comparing to Alternative A − D since the travel speed cannot maintain.	B	- CO2 emission increases since travel speed may decrease year by year.	C

Alternatives			Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F	
Social Environment	Number of household affected by the project	12	- Number of affected household is largest. Affected household: 76 Affected house/shop: 6	C	- Number of affected household is smaller. Affected household: 55 Affected house/shop: 1	B	- Number of affected household is larger. Affected household: 70 Affected house/shop: 4	B-	- Number of affected household is smaller. Affected household: 55 Affected house/shop: 1	B	- Negative environmental impact is ruinous since number of affected house/shop is too large. Affected household: 26	C	- No affected household	A
	Potential for new industrial development	4	- Potential for new industrial development increases.	B	- Same to left	B	- Same to left	B	- Same to left	B	- Same to left	B	- Industrial development is not induced since punctuality and fast travel time are not secured.	C
	Trip rate	4	- Trip rate increases since travel cost and travel time are reduced.	A	- Same to left	A	- Same to left	A	- Increase of trip rate is smaller than Alt A-C since travel time decreases but travel cost is maintained.	B	- Same to left	B	- Trip rate is decreased since travel time increases considerably.	C
Policy Relevance	Coherence of upper plans and related projects, e.g., BRT	6	- This road section is expected to install the BRT (Phase 4) which links highly populated areas such as Tegeta and Morocco.	A	- Same to left	A	- Same to left	A	- Although the estimated passenger volume of BRT in this road section is not so significant, the BRT network may be deteriorated if no BRT in this section.	C	- There is no space to accommodate future BRT along the New Bagamoyo Road.	C	- Same to left	C
	Reduction in travel cost to market, hospital, etc	6	- Travel cost may increase from 250 Tshs per trip (Daladala) to 400 Tshs (BRT). However, the travel cost by BRT may be minimized when fare collection system (distance based fare).	B	- Same to left	B	- Same to left	B	- The travel cost may increase since transferring BRT to daladala or the secondary bus is required.	C	- Same to left	C	- Same to left	C
	Reduction in travel time to primary/secondary school	6	- Both waiting and travel time will be considerably reduced if BRT is introduced.	A	- Same to left	A	- Same to left	A	- Both waiting and travel time will increase since transferring BRT to daladala or the secondary bus is required.	B	- Same to left	B	- Both waiting and travel time will increase since travel speed may decrease year by year.	C
Evaluation		**100**		**71**		**72**	**Recommended**	**77**		**65**		**32**		**26**

* Total score is calculated by multiplying the weight of each criteria and valuation (A, B+-, C), where A=1.0, B=0.5 (B+=0.7, B-=0.3), C=0

Table 6.3.3 Evaluation of Alternative Options (Mwenge - Africana)

Alternatives			Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F	
Evaluation Items (Score) \ Description			- W＝45m - Original - 4-lane widening with BRT space		- W＝30m - 4-lane widening with BRT space (Minimum cross section width)		- W＝34m - 4-lane widening with BRT space (Adopting open side ditch for cost saving)		- W＝27m - 4-lane widening with BRT space		- W＝27m - Bypass (Widening and extension of Old Bagamoyo Road)		- Zero Option	
Workability	Project Cost	10	- 23,413 million Tshs (2,094 million Yen) - Higher because of wide width - Cost compared with Alternative A (Original) : 1.00	B	- 24,941 million Tshs (2,231 million Yen) - Highest because of the installation of “U-shape ditch with cover” to whole section - Cost compared with Alternative A (Original) : 1.07	C	- 22,439 million Tshs (2,007 million Yen) - Slightly lower because of narrow width - Cost compared with Alternative A (Original) : 0.96	B+	- 22,006 million Tshs (1,969 million Yen) - Lower because of narrow width - Cost compared with Alternative A (Original) : 0.94	B+	- 23,049 million Tshs (2,062 million Yen) - Lower because of narrow width - Cost compared with Alternative A (Original) : 0.98	B+	- No Construction	A
	Construction method and its difficulty level	4	- Easy because no particular difficult construction method required	B	- Same to left	B	- Same to left	B	- Same to left	B	- Same to left	B	- No Construction	B
	Construction period	4	- Approximately 1 year	B	- Same to left	B	- Same to left	B	- Same to left	B	- Same to left	B	- No Construction	B
Sustainability	Maintenance	6	- Minor maintenance works are required, e.g., routine inspection and cleaning of road/drainage facilities.	B	- Minor maintenance works are required, e.g., routine inspection and cleaning of road/drainage facilities. - Required to open the cover for cleaning of side ditch, but not difficult.	B	- Minor maintenance works are required, e.g., routine inspection and cleaning of road/drainage facilities.	B	- Same to left	B	- Same to left	B	- Difficult for maintenance work since road facilities in New Bagamoyo Road are outdated and required for replacement.	C
Economy	Volume capacity ratio	6	- The current traffic volume already oversaturated the capacity. - It Maintains the same to the current ratio till 2015. 1.48 (2006) 1.42 (2015) 2.25 (2030)	A	- Same to left 1.48 (2006) 1.42 (2015) 2.25 (2030)	A	- Same to left 1.48 (2006) 1.42 (2015) 2.25 (2030)	A	- Public transport passengers (190,000 trips per day) remain to use daladala, which worsens the traffic congestion at this road section. 1.48 (2006) 1.63 (2015) 2.51 (2030)	B	- Less traffic diverts to the bypass and more traffic remains to use New Bagamoyo Road. 1.48 (2006) 2.63 (2015) 3.21 (2030) *Old Bagamoyo Road 0.88 (2015) 1.59 (2030)	C	- A volume capacity ratio reaches 3.0 by 2015. 1.48 (2006) 3.04 (2015) 4.04 (2030)	C
	Internal rate of return	10	- A Project generates high economic return and benefits both car and BRT users. 40.3%	A	- Same to left 39.4%	A	- Same to left 42.1%	A	- A Project may generates high economic return but limits to generate the benefit to the daladala users along New Bagamoyo Road.	B	- A Project may not be economically viable and EIRR is smaller comparing to the other alternatives. 11.3%	B-	- The severe congestion may hinter the economic growth.	C
	Net present value	8	- A Project generates a significant amount of economic benefit. 49.24 billion Tshs	A	- Same to left 48.77 billion Tshs	A	- Same to left 50.06 billion Tshs	A	- A project may generate a smaller amount of economic benefit since many public transport passengers have to use daladala.	B	- A Project generates negative benefits. (-) 1.91 billion Tshs	B-	- The severe congestion may cause the negative economic impacts	C
Natural Environment	Level of noise and vibration	4	- Level of noise and vibration is better-off than Alternative E and F since the travel speed maintains.	A	- Same to left	A	- Same to left	A	- Same to left	A	- Level of noise and vibration worsens since the travel speed cannot maintain.	B	- Level of noise and vibration worsens since travel speed becomes lowered year by year.	C
	Annual number of traffic accident	6	- Minor traffic accident decreases since travel speed maintains. - Serious accident also decreases since safety facilities are introduced.	A	- Same to left	A	- Same to left	A	- Same to left	A	- Minor traffic accident is worse-off than Alt A-D since the travel speed cannot maintain.	B	- Traffic accident (both minor and serious) increases since safety facilities are not introduced.	C
	CO2 emission	4	- CO2 emission decreases because travel speed maintains.	A	- Same to left	A	- Same to left	A	- Same to left	A	- More CO2 emission generates, comparing to Alternative A − D since the travel speed cannot maintain.	B	- CO2 emission increases since travel speed may decrease year by year.	C

Alternatives			Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F	
Social Environment	Number of household affected by the project	12	- Number of affected household is largest. Affected household: 6 Affected house/shop: 6	C	- No affected household Affected household: 0 Affected house/shop: 0	A	- No affected household Affected household: 0 Affected house/shop: 0	A	- No affected household Affected household: 0 Affected house/shop: 0	A	- Negative environmental impact is ruinous since number of affected house/shop is too large. Affected household: 16	C	- No affected household	A
	Potential for new industrial development	4	- Potential for new industrial development increases.	B	- Same to left	B	- Same to left	B	- Same to left	B	- Industrial development is not induced since punctuality and fast travel time are not secured.	C	- Same to left	C
	Trip rate	4	- Trip rate increases since travel cost and travel time are reduced.	A	- Same to left	A	- Same to left	A	- Increase of trip rate is smaller than Alt A-C since travel time decreases but travel cost is maintained.	B	- Same to left	B	- Trip rate is decreased since travel time increases considerably.	C
Policy Relevance	Coherence of upper plans and related projects, e.g., BRT	6	- This road section is expected to install the BRT (Phase 4) which links highly populated areas such as Tegeta and Morocco.	A	- Same to left	A	- Same to left	A	- There is no space to accommodate future BRT along the New Bagamoyo Road.	C	- Same to left	C	- Same to left	C
	Reduction in travel cost to market, hospital, etc	6	- Travel cost may increase from 250 Tshs per trip (Daladala) to 400 Tshs (BRT). However, the travel cost by BRT may be minimized when fare collection system (distance based fare).	B	- Same to left	B	- Same to left	B	- The travel cost may increase since transferring BRT to daladala or the secondary bus is required.	C	- Same to left	C	- Same to left	C
	Reduction in travel time to primary/secondary school	6	- Both waiting and travel time will be considerably reduced if BRT is introduced.	A	- Same to left	A	- Same to left	A	- Both waiting and travel time will increase since transferring BRT to daladala or the secondary bus is required.	B	- Same to left	B	- Both waiting and travel time will increase since travel speed may decrease year by year.	C
Evaluation		**100**		**71**		**78**	**Recommended**	**85**		**59**		**31**		**26**

* Total score is calculated by multiplying the weight of each criteria and valuation (A, B+-, C), where A=1.0, B=0.5 (B+=0.7, B-=0.3), C=0

Table 6.3.4 Evaluation of Alternative Options (Africana - Tegeta)

Alternatives			Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F	
Evaluation Items (Score) \ Description			- W＝45m - Original - 4-lane widening with BRT space		- W＝30m - 4-lane widening with BRT space (Minimum cross section width)		- W＝34m - 4-lane widening with BRT space (Adopting open side ditch for cost saving)		- W＝27m - 4-lane widening with BRT space		- W＝27m - Bypass (Widening and extension of Old Bagamoyo Road)		- Zero Option	
Workability	Project Cost	10	- 15,639 million Tshs (1,399 million Yen) - Slightly higher because of wide width - Cost compared with Alternative A (Original) : 1.00	B	- 16,801 million Tshs (1,503 million Yen) - Highest because of the installation of “U-shape ditch with cover” to whole section - Cost compared with Alternative A (Original) : 1.07	C	- 15,024 million Tshs (1,344 million Yen) - Slightly lower because of narrow width - Cost compared with Alternative A (Original) : 0.96	B+	- 14,765 million Tshs (1,321 million Yen) - Low because of narrow width - Cost compared with Alternative A (Original) : 0.94	B+	- 15,846 million Tshs (1,418 million Yen) - Higher because of long section length - Cost compared with Alternative A (Original) : 1.01	C	- No Construction	A
	Construction method and its difficulty level	4	- Easy because no particular difficult construction method required	B	- Same to left	B	- Same to left	B	- Same to left	B	- Same to left	B	- No Construction	B
	Construction period	4	- Approximately 1 year	B	- Same to left	B	- Same to left	B	- Same to left	B	- Same to left	B	- No Construction	B
Sustainability	Maintenance	6	- Minor maintenance works are required, e.g., routine inspection and cleaning of road/drainage facilities.	B	- Minor maintenance works are required, e.g., routine inspection and cleaning of road/drainage facilities. - Required to open the cover for cleaning of side ditch, but not difficult.	B	- Minor maintenance works are required, e.g., routine inspection and cleaning of road/drainage facilities.	B	- Same to left	B	- Same to left	B	- Difficult for maintenance work since road facilities in New Bagamoyo Road are outdated and required for replacement.	C
Economy	Volume capacity ratio	6	- The current traffic volume already oversaturated the capacity. - A volume capacity ratio improves by the Project - It Maintains the same to the current ratio till 2030. 1.06 (2006) 0.96 (2015) 1.38 (2030)	A	- Same to left 1.06 (2006) 0.96 (2015) 1.38 (2030)	A	- Same to left 1.06 (2006) 0.96 (2015) 1.38 (2030)	A	- Public transport passengers (220,000 trips per day) remain to use daladala, which worsens the traffic congestion at this road section. 1.06 (2006) 1.18 (2015) 1.58 (2030)	B	- Less traffic diverts to the bypass and more traffic remains to use New Bagamoyo Road. 1.06 (2006) 1.90 (2015) 1.99 (2030) *Old Bagamoyo Road 0.88 (2015) 1.59 (2030)	C	- A volume capacity ratio reaches almost 2.0 by 2015 1.06 (2006) 1.93 (2015) 2.43 (2030)	C
	Internal rate of return	10	- A Project generates high economic return and benefits both car and BRT users. 23.5%	A	- Same to left 23.7%	A	- Same to left 25.8%	A	- A Project may generates high economic return but limits to generate the benefit to the daladala users along New Bagamoyo Road.	B	- A Project may not be economically viable and EIRR is smaller comparing to the other alternatives. 11.3%	B-	- The severe congestion may hinter the economic growth.	C
	Net present value	8	- A Project generates a large amount of economic benefit. 10.23 billion Tshs	A	- Same to left 10.30 billion Tshs	A	- Same to left 11.22billion Tshs	A	- A project may generate a smaller amount of economic benefit since many public transport passengers have to use daladala.	B	- A Project generates negative benefits. (-) 1.91 billion Tshs	B-	- The severe congestion may cause the negative economic impacts	C
Natural Environment	Level of noise and vibration	4	- Level of noise and vibration is better-off than Alternative E and F since the travel speed maintains.	A	- Same to left	A	- Same to left	A	- Level of noise and vibration increases since travel speed cannot maintain and become worse-off than that of Alternative A-C.	B	- Level of noise and vibration worsens since travel speed becomes lowered year by year.	C	- Same to left	C
	Annual number of traffic accident	6	- Minor traffic accident decreases since travel speed maintains. - Serious accident also decreases since safety facilities are introduced.	A	- Same to left	A	- Same to left	A	- Traffic accident increases since travel speed cannot maintain and become worse-off than that of Alternative A-C.	B	- Traffic accident (both minor and serious) increases since safety facilities are not introduced.	C	- Same to left	C
	CO2 emission	4	- CO2 emission decreases because travel speed maintains.	A	- Same to left	A	- Same to left	A	- CO2 emission increases since travel speed cannot maintain and become worse-off than that of Alternative A-C.	B	- More CO2 emission generates, comparing to Alternative A − D since the travel speed becomes lowered year by year.	C	- Same to left	C

Alternatives			Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F	
Social Environment	Number of household affected by the project	12	- Number of affected household is largest. Affected household: 92 Affected house/shop: 84	C	- Number of affected household is smaller. Affected household: 3 Affected house/shop: 3	B	- Same to left Affected household: 7 Affected house/shop: 7	B-	- Same to left Affected household: 3 Affected house/shop: 3	B	- Negative environmental impact is ruinous since number of affected house/shop is too large. Affected household: 19	C	- No affected household	A
	Potential for new industrial development	4	- Potential for new industrial development increases.	B	- Same to left	B	- Same to left	B	- Industrial development is not induced since punctuality and fast travel time are not secured.	C	- Same to left	C	- Same to left	C
	Trip rate	4	- Trip rate increases since travel cost and travel time are reduced.	A	- Same to left	A	- Same to left	A	- Increase of trip rate is smaller than Alt A-C since travel time increases and travel cost is maintained.	B	- Same to left	B	- Trip rate is decreased since travel time increases considerably.	C
Policy Relevance	Coherence of upper plans and related projects, e.g., BRT	6	- This road section is expected to install the BRT (Phase 4) which links highly populated areas such as Tegeta and Morocco.	A	- Same to left	A	- Same to left	A	- There is no space to accommodate future BRT along the New Bagamoyo Road.	C	- Same to left	C	- Same to left	C
	Reduction in travel cost to market, hospital, etc	6	- Travel cost may increase from 250 Tshs per trip (Daladala) to 400 Tshs (BRT). However, the travel cost by BRT may be minimized when fare collection system (distance based fare).	B	- Same to left	B	- Same to left	B	- The travel cost may increase since transferring BRT to daladala or the secondary bus is required.	C	- Same to left	C	- Same to left	C
	Reduction in travel time to primary/secondary school	6	- Both waiting and travel time will be considerably reduced if BRT is introduced.	A	- Same to left	A	- Same to left	A	- Both waiting and travel time will increase since transferring BRT to daladala or the secondary bus is required.	B	- Same to left	B	- Both waiting and travel time will increase since travel speed may decrease year by year.	C
Evaluation				**71**		**72**	**Recommended**	**77**		**44**		**17**		**26**

* Total score is calculated by multiplying the weight of each criteria and valuation (A, B+-, C), where A=1.0, B=0.5 (B+=0.7, B-=0.3), C=0

Table 6.3.5 Evaluation of Alternative Options (Tegeta - Mpiji)

Alternatives			Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F	
Evaluation Items (Score) \ Description			- W＝45m - Original - 4-lane widening with BRT space		- W＝30m - 4-lane widening with BRT space (Minimum cross section width)		- W＝34m - 4-lane widening with BRT space (Adopting open side ditch for cost saving)		- W＝27m - 4-lane widening with BRT space		- W＝27m - Bypass (Widening and extension of Old Bagamoyo Road)		- Zero Option	
Workability	Project Cost	10	- 55,010 million Tshs (4,921 million Yen) - Slightly higher because of wide width - Cost compared with Alternative A (Original) : 1.00	B	- 58,260 million Tshs (5,212 million Yen) - Highest because of the installation of “U-shape ditch with cover” to whole section - Cost compared with Alternative A (Original) : 1.06	C	- 52,371 million Tshs (4,685 million Yen) - Slightly lower because of narrow width - Cost compared with Alternative A (Original) : 0.95	B+	- 51,143 million Tshs (4,57 million Yen) - Low because of narrow width - Cost compared with Alternative A (Original) : 0.93	B+			- No Construction	A
	Construction method and its difficulty level	4	- Easy because no particular difficult construction method required	B	- Same to left	B	- Same to left	B	- Same to left	B			- No Construction	B
	Construction period	4	- Approximately 1 year	B	- Same to left	B	- Same to left	B	- Same to left	B			- No Construction	B
Sustainability	Maintenance	6	- Minor maintenance works are required, e.g., routine inspection and cleaning of road/drainage facilities.	B	- Minor maintenance works are required, e.g., routine inspection and cleaning of road/drainage facilities. - Required to open the cover for cleaning of side ditch, but not difficult.	B	- Minor maintenance works are required, e.g., routine inspection and cleaning of road/drainage facilities.	B	- Same to left	B			- Minor maintenance works are required, e.g., routine inspection and cleaning of road/drainage facilities.	B
Economy	Volume capacity ratio	6	- The current and future traffic will not meet the road capacity in this road section. 0.40 (2006) 0.29 (2015) 0.80 (2030)	B	- Same to left 0.40 (2006) 0.29 (2015) 0.80 (2030)	B	- Same to left 0.40 (2006) 0.29 (2015) 0.80 (2030)	B	- Same to left 0.40 (2006) 0.29 (2015) 0.80 (2030)	B			- The future traffic in 2030 will slightly exceed the road capacity. 0.40 (2006) 0.56 (2015) 1.17 (2030)	B
	Internal rate of return	10	- A Project is not economically viable since EIRR is slightly lower than the discount rate. 10.9%	C	- Same to left 10.3%	C	- A Project may not be economically viable since EIRR is slightly larger than the discount rate. 11.3%	C	- Same to left	C			- There will be no severe traffic congestion, which may hinter economic growth.	B
	Net present value	8	- A Project generates negative economic impacts. (-)3.14billion Tshs	C	- Same to left (-) 4.81billion Tshs	C	- A Project generates small amount of benefit. (-) 1.78billion Tshs	B	- Same to left	B			- There will be no severe traffic congestion	B
Natural Environment	Level of noise and vibration	4	- Level of noise and vibration is almost same as that of other alternatives because there is no change in the traffic flow.	B	- Same to left	B	- Same to left	B	- Same to left	B			- Level of noise and vibration is almost same as that of “with project alternatives” because there is no change in the traffic flow.	B
	Annual number of traffic accident	6	- Number of traffic accident is almost same as that of other alternatives because there is no change in the traffic flow.	B	- Same to left	B	- Same to left	B	- Same to left	B			- Safety facilities (pedestrian crossing, shoulder and bus bay) are already introduced in the 2001 road improvement.	B
	CO2 emission	4	- CO2 emission is almost same as that of other alternatives because there is no change in the traffic flow.	B	- Same to left	B	- Same to left	B	- Same to left	B			- Same to left	B
Social Environment	Number of household affected by the project	12	- No affected household	B	- Same to left	B	- Same to left	B	- Same to left	B			- Same to left	B
	Potential for new industrial development	4	- Small impact	B	- Same to left	B	- Same to left	B	- Same to left	B			- Same as current situation	B
	Trip rate	4	- Trip rate is almost same as that of other alternatives because travel time maintains.	B	- Same to left	B	- Same to left	B	- Same to left	B			- Same as current situation	B

Alternatives			Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F	
Policy Relevance	Coherence of upper plans and related projects, e.g., BRT	6	- There is no plan to install BRT in this road section.	C	- Same to left	C	- Same to left	C	- Maintains consistency with BRT plan.	B			- Same to left	B
	Reduction in travel cost to market, hospital, etc	6	- Travel cost may increase from 250 Tshs per trip (Daladala) to 400 Tshs (BRT). However, the travel cost by BRT may be minimized when fare collection system (distance based fare).	B	- Same to left	B	- Same to left	B	- The travel cost may increase since transferring BRT to daladala or the secondary bus is required.	C			- Same to left	C
	Reduction in travel time to primary/secondary school	6	- Since there is no severe congestion, the level of service will remain same.	B	- Same to left	B	- Same to left	B	- Same to left	B			- Same to left	B
Evaluation				**38**		**33**		**44**		**44**			**Recommended**	**52**

* Total score is calculated by multiplying the weight of each criteria and valuation (A, B+-, C), where A=1.0, B=0.5 (B+=0.7, B-=0.3), C=0

Chapter 7 Preliminary Engineering Study

7.1 Introduction

In "Chapter 6 Evaluation of Project Alternatives", the options shown in Table 7.1.1 were selected as the optimum solutions for development of the respective road sections. This preliminary engineering study is conducted based on the selected options.

Table 7.1.1 Optimum Solution for Development of New Bagamoyo Road

Section	Optimum Solution
Morocco - Mwenge	Alternative C: - 4-lane widening + BRT space (Adopting open side ditch for cost saving) - ROW＝34 m However, Alternative B is adopted in limited areas in order to minimize involuntary relocations and mitigate negative environmental impacts.
Mwenge - Africana	
Africana - Tegeta	
Tegeta - Mpiji	Alternative F: - Zero option

7.2 Design Criteria and Standard

7.2.1 Design Speed

The design speed is determined based on the road functional classification proposed in the Master Plan Study. In the Master Plan Study, New Bagamoyo Road is classified as a primary arterial road (see Figure 7.2.1).

The design speed for the primary arterial ranges from 60 to 80 km/h, proposed in the Master Plan Study (see Table 7.2.1). As shown in Table 7.2.2, New Bagamoyo Road is classified as Type II for the road section from Morocco to Mwenge and Type III for the northern section from Mwenge. The BRT is expected to be installed in both these types. The design speed of New Bagamoyo Road is set to 60 km/h from the viewpoint of the current land use condition, traffic safety and comfortable driving.

Table 7.2.1 Road Functional Classification and its Service Level

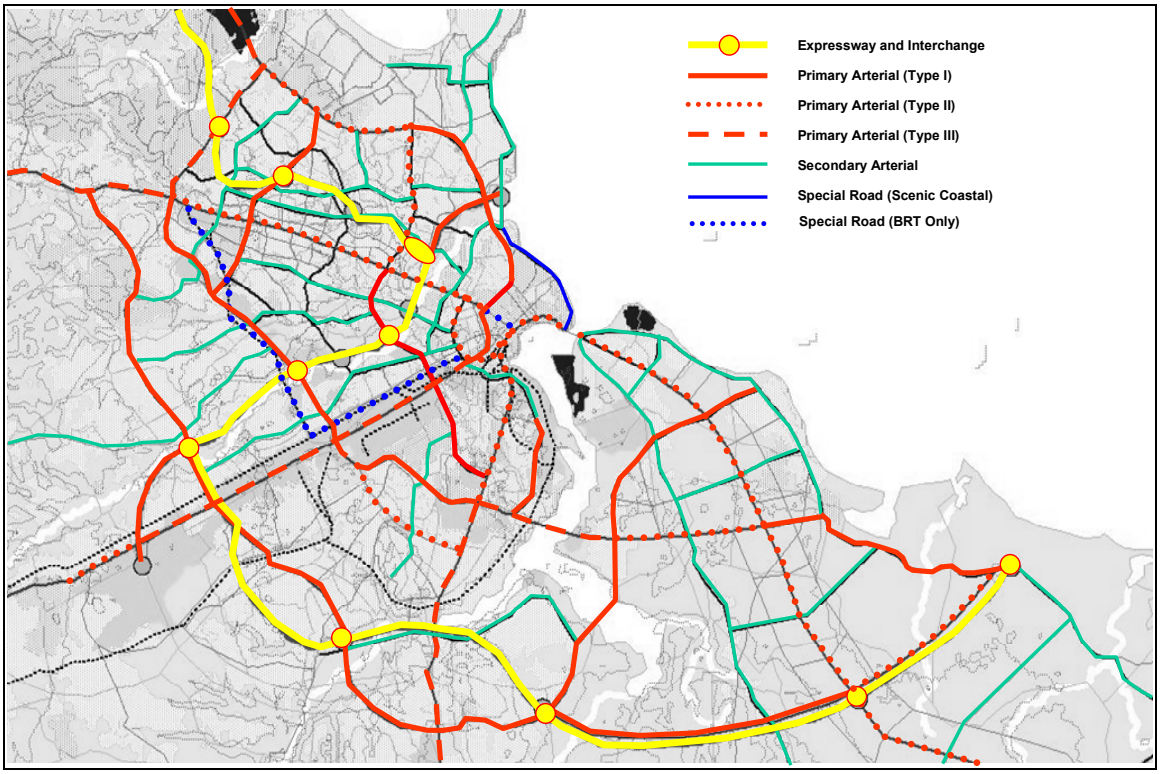
Road Functional Classification	Facility Stratification	Design Speed (km/hr)	Lane Width (meters)	Typical Number of Lanes
Expressway / Motorway	Tolled or non-tolled	80-100	3.50-3.75	4-6
Arterial Roads	Primary Arterial	60-80 (less with BRT busway)	3.25-3.50	4-8 (including BRT lanes)
	Secondary Arterial	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: Dar es Salaam Transport Policy and System Development Master Plan

Table 7.2.2 Vehicle Implications by Primary Arterial Types

Road Type	Implications by Vehicle Grouping		
	BRT Provision	Allowed Uses	Other Bus Network
Primary Type I	No BRT busway is 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 is 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 is 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: Dar es Salaam Transport Policy and System Development Master Plan, *Heavy commercial vehicles considered articulated trucks and truck-trailer combinations.



Source: Dar es Salaam Transport Policy and System Development Master Plan

Figure 7.2.1 Year 2030 "Do Maximum" Road Network Functional Classification

7.2.2 Design Criteria

The geometric design standard is established with reference to the design criteria adopted in road development projects in Dar es Salaam, the Standard Specification for Road Works (Ministry of Works, Tanzania, 2000) and the Draft Code of Practice for the Geometric Design of Trunk Roads (SATCC, 1998). AASHTO, European Standard and Japanese Standard are also referred to in the area where the above-mentioned standards are not sufficient. The geometric design standard for New Bagamoyo Road Widening Project is summarized in Table 7.2.3.

The maximum gradient in this project road is set to 8% although 7% is adopted in the Basic Design of Kilwa Road Project (JICA, 2006). The maximum gradients in the flat and rolling terrain are set to 6% and 7%, respectively.

Table 7.2.3 Geometric Design Standard for New Bagamoyo Road Widening Project

Elements		Unit	Values
Design Speed		km/h	60
Site Distance		m	80
Min. Curve Radius	Super Elevation 6%	m	140
	Super Elevation 8%	m	125
	Super Elevation 10%	m	110
Min. Curve Length	Suggested	m	300
	Minimum	m	150
Max. Curve Length		m	1,000
Min. Vertical Curve Radius (K Value)	Crest	m	16
	Sag	m	16
Min. Vertical Curve Length		m	100
Max. Gradient	Flat	%	6
	Rolling	%	7
	Mountain	%	8

7.3 Cross Section

The typical cross section for the earthwork is shown in Figure 7.3.1. It is comprised of 9.0 m of median, 3.5 m x 2 of carriageway, 0.5 m x 2 of shoulder and 3.0 m x 2 of sidewalk. The width of the median is determined in consideration of the future BRT space.

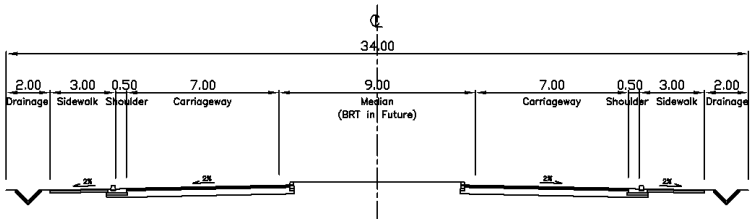


Figure 7.3.1 Typical Cross Section for Earthwork

The typical cross section for the bridge is shown in Figure 7.3.2. It is comprised of 3.5 m x 2 of carriageway, 0.5 m x 2 of shoulder and 3.0 m of sidewalk for one direction.

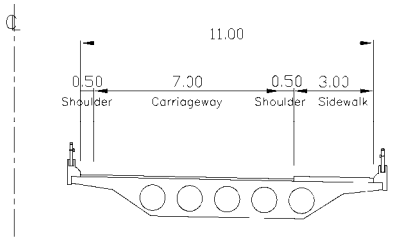


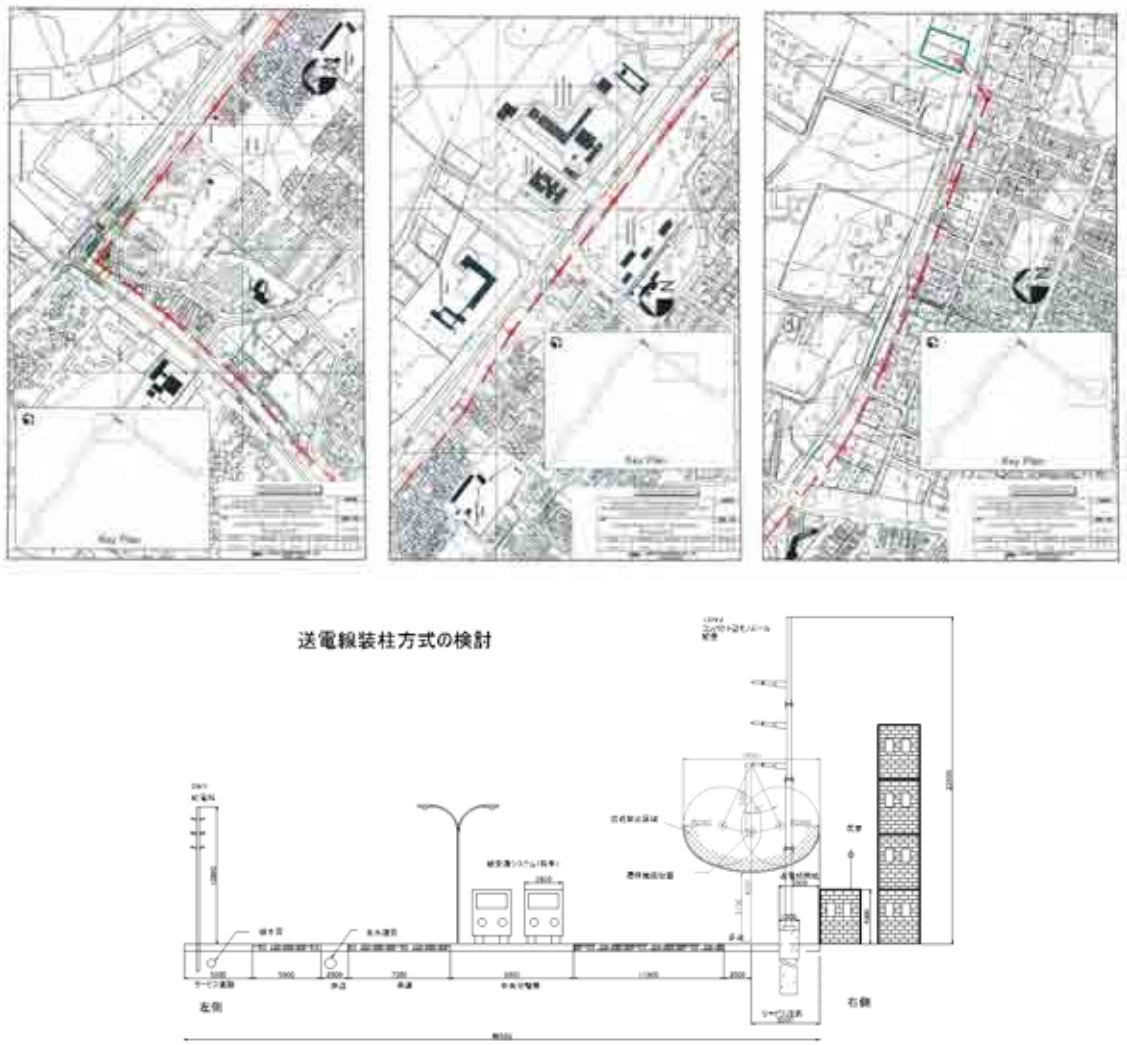
Figure 7.3.2 Typical Cross Section for Bridge

7.4 Horizontal and Vertical Alignment

The horizontal alignment of the project road is determined, referring to that of the existing road, and is

adjusted based on the study from the GIS and aerial photo and site reconnaissance in order to minimize the number of project-affected properties, including that of buildings, parking and fences. Additionally, the construction of power pylons is also taken into consideration (the detailed design of the project is completed in the road section form Morocco to Mwenge, see Figure 7.4.1). The vertical alignment is determined by setting the same alignment to the existing road. The maximum gradient is set to 7.9% which meets the geometric design standard.

Plan and Profile is shown in Figure 7.4.2.



Source: Basic design study on the project for reinforcement of transmission and distribution facilities in Oyster Bay substation, JICA, 2007

Figure 7.4.1 Location of Power Pylon Installation

7.5 Pavement Structure

The standard pavement structure in Tanzania comprises the surface (asphalt concrete), base course (crushed stones for the mechanical stabilization), and sub-base course (granular materials). The pavement structure of this project road is determined with reference to that applied to Kilwa Road

Widening Project (JICA, 2006) since the surveys necessary to determine the pavement design such as the traffic survey, axle load survey and soil survey are not conducted in this Study. Accordingly, the final pavement structure should be determined based on the results of the necessary surveys and pavement design in the basic design stage.

The pavement structure proposed to this project road is shown below.

Carriageway Pavement:

- Surface: Asphalt concrete, 7 cm
- Base course : Crushed stone for mechanical stabilization, 20 cm
- Sub-base course: Granular materials (with cement stabilization), 26 cm

Sidewalk Pavement:

- Surface: DBST
- Base course: Granular materials (with cement stabilization), 10 cm

7.6 Bridge Design

7.6.1 Bridge Widening Alternatives

There are three bridges in the road section from Morocco to Tegeta: namely Mulalakuwa, Lugalo and Tegeta Bridge. The following alternatives are studied to determine the optimum bridge type for the Project, considering that the existing bridges have only 2-lane carriageway.

- Alternative 1: Secure the 6-lane carriageway in the initial stage (Construct two 2-lane bridges at both sides of the existing bridge)
- Alternative 2: Secure the 6-lane carriageway in the initial stage (Construct a 4-lane bridge at one side of the existing bridge)
- Alternative 3: Secure the 6-lane carriageway in the initial stage (Demobilize the existing bridge, and construct two 3-lane bridges)
- Alternative 4: Secure the 4-lane carriageway in the initial stage and 6-lane in the future (Demobileze the existing bridge and construct a 4-lane bridge in the initial stage, and construct a 2-lane bridge in the future)
- Alternative 5: Secure the 4-lane carriageway in the initial stage and 6-lane in the future (Construct a 2-lane bridge at one side of the existing bridge in the initial stage, and construct a 2-lane bridge on the opposite side in the future)
- Alternative 6: Secure the 5-lane carriageway (only 4-lane is in service) in the initial stage and 6-lane in the future (Construct a 3-lane bridge at one side of the existing bridge in

the initial stage, and demobilize the existing bridge and construct a 3-lane bridge in the future)

A preliminary study proposes Alternative 5 as the most optimum option from the following viewpoints.

- The existing bridges are still durable based on the results of site inspections.
- 6-lane carriageway is not required at the initial stage since the timing when BRT is in service is proposed after 2013 (realistically after 2015).

However, the detailed surveys were not conducted in this Study. The durableness of the existing bridges should be further studied in the basic design stage.

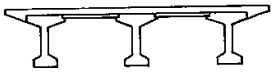
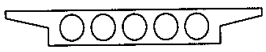
7.6.2 Bridge Type

The length of the new bridges is summarized as follows.

- Mulalakuwa Bridge: 25.2 m
- Lugalo Bridge: 18.8 m
- Tegeta Bridge: 30.0 m

The bridge type of existing Mulalakuwa Bridge and Lugalo Bridge is the steel I-girder. However, concrete bridge is more appropriate from the viewpoints of cost efficiency, availability of the material and maintenance. In this Study, PC hollow slab bridge (one span) is selected as the most optimum bridge structure for all three bridges considering the construction method. The details of the evaluation results are summarized in Table 7.6.1. However, the bridge lengths and types should be determined based on the hydrological survey/analysis in the basic design stage.

Table 7.6.1 Evaluation of Bridge Type

Types	PC-T girder	PC-I girder	PC hollow slab
Image			
Span Length	・20～40 m	・20～40 m	・20～30 m
Cost	・High	・High	・Low
Ease of Construction	・Easy for erection because of light weight ・Require land for fabrication of girder	・Easy for erection because of light weight ・Require land for fabrication of girder	・Require staging for construction
Maintenance	・Require periodic inspection for cracks	・Require periodic inspection for cracks	・Require periodic inspection for cracks
Aesthetic View	・Bad	・Bad	・Good
Evaluation			Recommended

The general views of the bridges are shown in Figures 7.6.1 to 7.6.3.

7.7 Intersection Design

7.7.1 Morocco Intersection

The improvement of Morocco Intersection is one of the project components of the New Bagamoyo Road Widening Project. A traffic signal at this intersection is proposed to be installed at the same location of the existing signal. The shortage of sufficient storage for right turning vehicles is one of the reasons of the serious traffic congestion especially in peak hours. Accordingly, the appropriate storage length should be secured during the improvement of this intersection. The project costs are estimated under the assumption that new traffic signals are to be installed since the existing traffic signals are out-of-date and a traffic signal for the pedestrians has been removed.

The proposed plan of Morocco Intersection is shown in Figure 7.7.1.

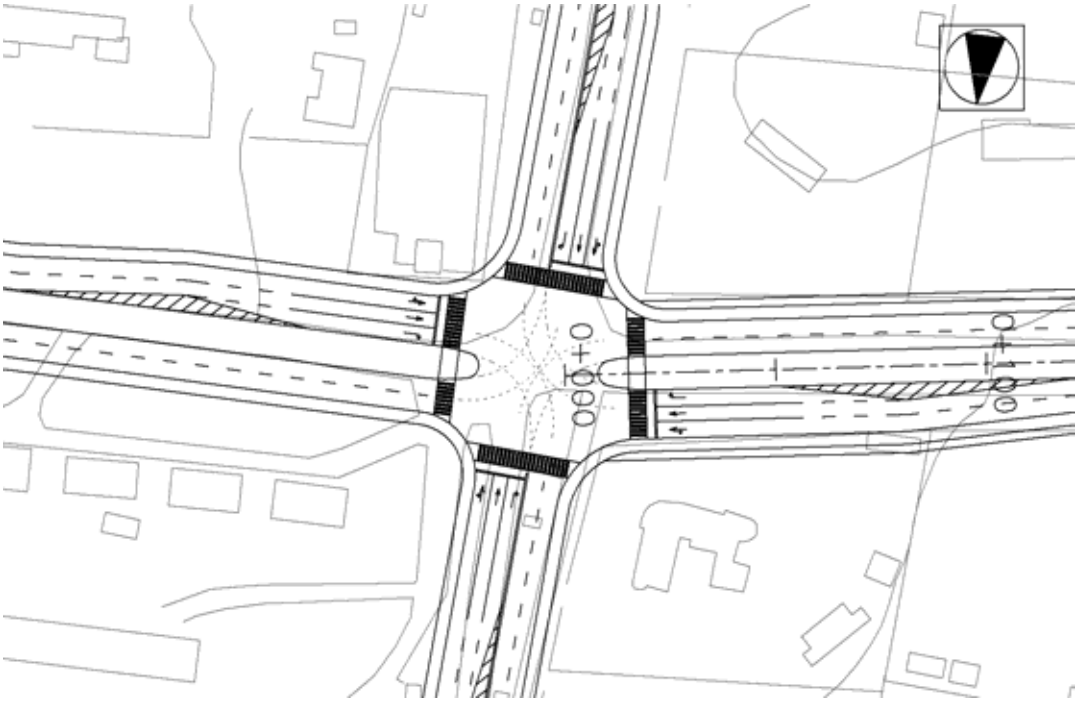


Figure 7.7.1 Plan of Morocco Intersection

7.7.2 Kijitonyama Intersection

Kijitonyama Intersection is located at the crossing between Morocco Intersection and Mwenge Intersection. A crossing road from the north terminates at Old Bagamoyo Road via Mikocheni area, and the crossing road from the south terminates at Morogoro Road via Kijitonyama area.

Traffic signals are not currently installed in this intersection. The Study proposes Kijitonyama Intersection should be improved to a signalized intersection since the daily traffic volume between Morocco and Mwenge reaches 24,000 vehicles/day and is too large to manage without traffic signals.

The proposed plan of Kijitonyama Intersection is shown in Figure 7.7.2.

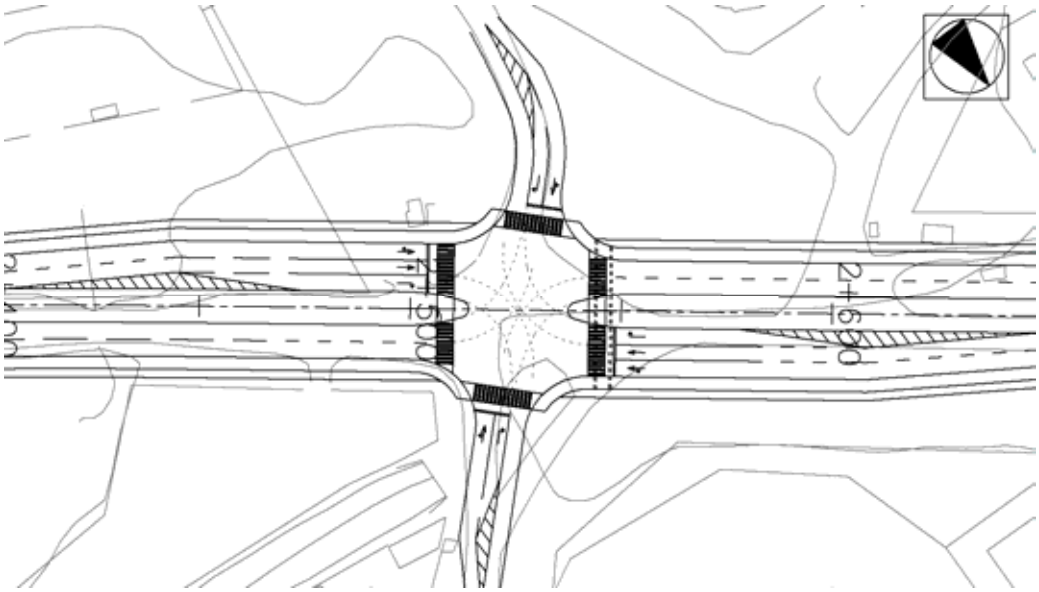


Figure 7.7.2 Plan of Kijitonyama Intersection

7.7.3 Shekilango Intersection

Shekilango Intersection is a T-shaped intersection located at 1.2 km east from Mwenge Intersection. A crossing road from the south terminates at Morogoro Road via Sinza area. The Study proposes Shekilango Intersection to be improved to a signalized intersection referring to the large traffic volume observed at this road section.

The proposed plan of Shekilango Intersection is shown in Figure 7.7.3.

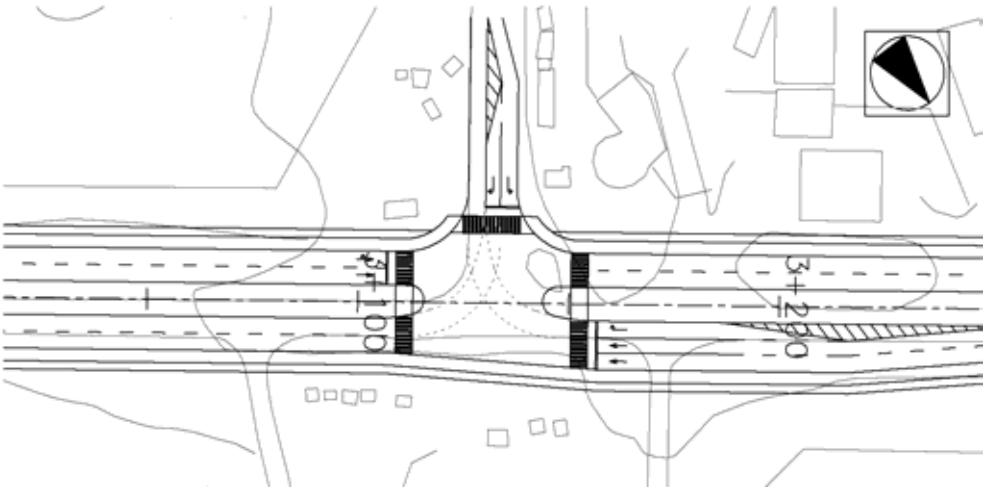


Figure 7.7.3 Plan of Shekilango Intersection

7.7.4 Mwenge Intersection

Mwenge Intersection is under construction and will be improved to a signalized intersection under the Sam Nujoma Road Widening Project. However, further improvement is required since the construction has been implemented without any consideration for the future BRT space. The project costs for the improvement of this intersection are estimated under the assumption that traffic signals which are installed in the Sam Nujoma Road Widening Project can be reutilized.

The proposed plan of Mwenge Intersection is shown in Figure 7.7.4.

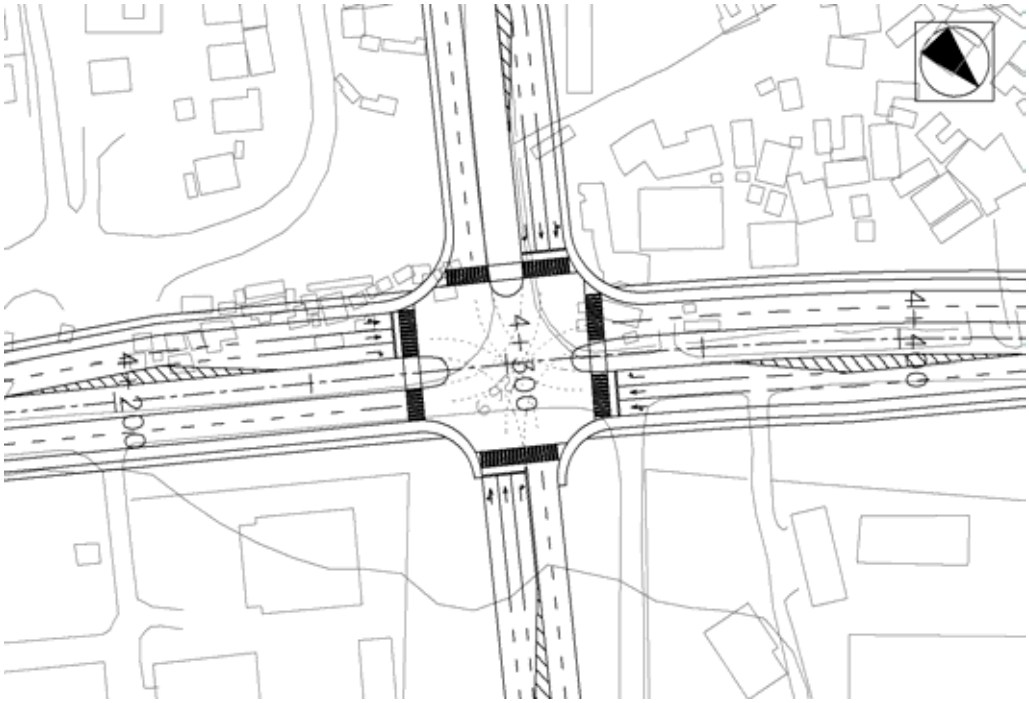


Figure 7.7.4 Plan of Mwenge Intersection

7.7.5 Kawe Intersection

Kawe Intersection is the intersection which connects New Bagamoyo Road with Old Bagamoyo Road. As of today, the traffic volume to/from Old Bagamoyo Road is relatively small, and traffic congestion is not observed at this intersection. Accordingly, the Study concludes that this intersection can be managed without traffic signals in this Project, and only markings (a stop line and pedestrian crossing) and a right turn lane will be provided in the Project. This intersection may be required to be upgraded to the signalized intersection in the future.

The proposed plan of Kawe Intersection is shown in Figure 7.7.5.

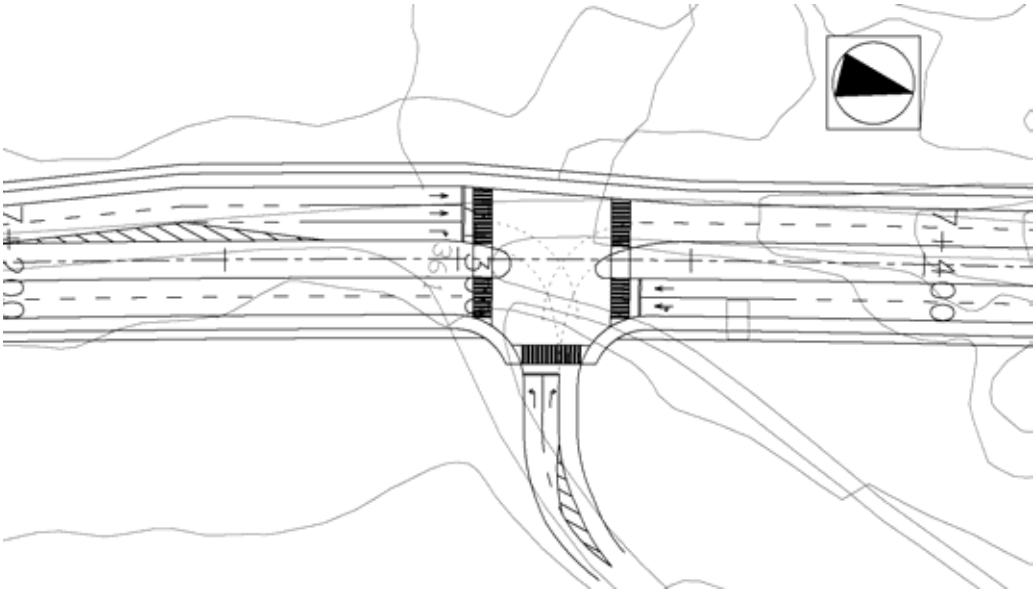


Figure 7.7.5 Plan of Kawe Intersection

7.7.6 Africana Intersection

Africana Intersection is also managed without a traffic signal and the traffic congestion is not currently observed in this intersection. In addition, the traffic volume will not rapidly increase since the area is already developed along the two crossing roads which connect to White Sand Beach and to residential area. Accordingly, the Study concludes that this intersection can be managed without traffic signals in this Project, and only markings (a stop line and pedestrian crossing) and a right turn lane shall be provided in the Project.

The proposed plan of Africana Intersection is shown in Figure 7.7.6.

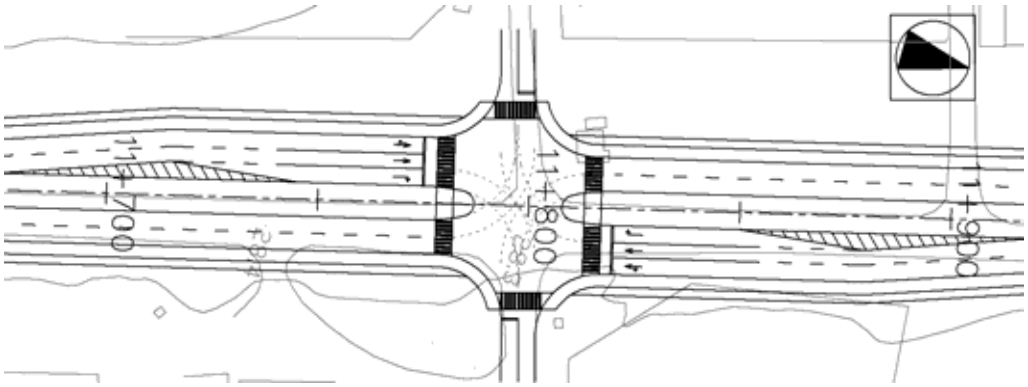


Figure 7.7.6 Plan of Africana Intersection

7.7.7 Kunduchi Intersection

Kunduchi Intersection is a T-shaped intersection located at 1.4 km north from Kawe Intersection. The crossing road from the east connects the residential and recreational area along the beach in Kunduchi. Currently, the traffic volume to/from the crossing road is relatively small, and traffic congestion is not frequently observed in this intersection. Accordingly, the Study concludes that only an open median will be provided for right/left turn and U-turn traffic in this Project.

7.7.8 Tegeta Intersection

Tegeta Intersection is currently managed without any traffic signals and the traffic congestion is not observed in this intersection as well. Accordingly, the Study concludes that this intersection can remain without any traffic signals, and only markings (a stop line and pedestrian crossing) and a right turn lane will be provided in the Project.

The proposed plan of Tegeta Intersection is shown in Figure 7.7.7.

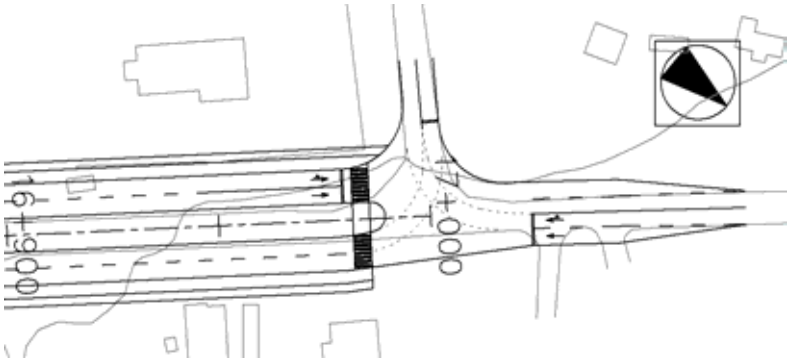


Figure 7.7.7 Plan of Tegeta Intersection

7.8 Road Safety Facilities

Along New Bagamoyo Road, a sidewalk is secured only in some road sections and so pedestrians are currently forced to walk in the shoulder along most of the road. In addition, the traffic speed shall increase by the improvement of New Bagamoyo Road. Accordingly, the Study proposes that a sidewalk needs to be provided along the whole section (from Morocco to Tegeta) in order to reduce conflicts between cars and pedestrians.

A pedestrian crossing is proposed to be provided at the major intersections and in the front of the large buildings and shops. In addition, center line, carriageway line and shoulder line are proposed to be installed to smooth the traffic flow of the project road.

7.9 Drainage

7.9.1 Side Ditch

The following two types of ditches are adopted for the side ditch in this Project.

- V-shape Ditch: Concrete, W1,000 x H500
- U-shape Ditch: Concrete, With Cover, W700 x H700

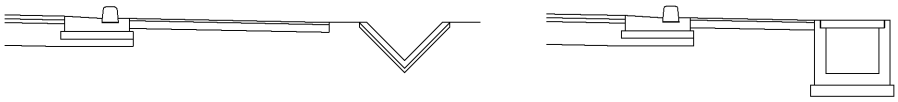


Figure 7.9.1 V-shape Ditch (Left) and U-shape Ditch (Right)

From the economical viewpoint, the V-shape ditch is adopted for the whole stretch of the project road except some road sections where U-shape is proposed to be installed. The U-shape ditch, which costs relatively more than the V-shape ditch, is adopted where the right of way is narrow and/or an access to the house/shop entrance should be secured.

At present, capacity of the drainages has been lowered by insufficient maintenance work. The maintenance work will consume less time and money by adopting the side ditch with a cover. This Study proposes the types and sizes of side ditches with reference to the existing ditches but without any detailed survey and investigation. Accordingly, detailed drainage study based on the hydrological survey/investigation should be conducted in the basic design stage.

7.9.2 Traverse Drainage

The following traverse drainage facilities are adopted for the Project.

- Box Culvert: W3.0 x H3.0 m
- Box Culvert: W4.0 x H4.0 m x 2
- Pipe Culvert: D＝900 mm

The types and sizes of culverts were, however, determined based on the existing culverts but without detailed survey and investigation in this Study. More detailed drainage study based on the hydrological survey/investigation should be conducted in the basic design stage.

7.10 Bus Stops

Along New Bagamoyo Road, daladala buses operate and will continue their services until 2013 (realistically 2015) when the BRT is newly introduced. The bus stops for daladala buses should be secured to smooth the traffic flow along New Bagamoyo Road. A conceptual image of the bus stop is

shown in Figure 7.10.1. Additional space is required to accommodate the bus stops and these spaces shall be utilized for the BRT stations in the future.

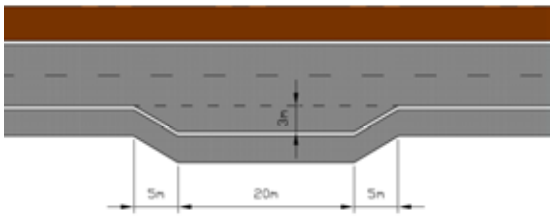
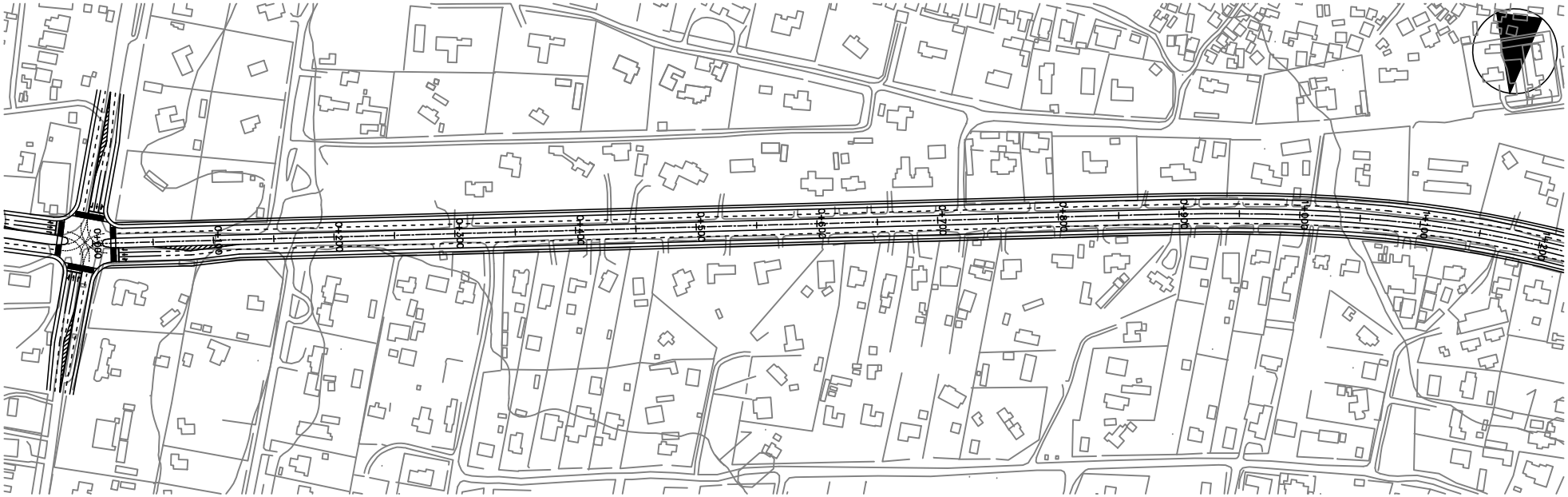
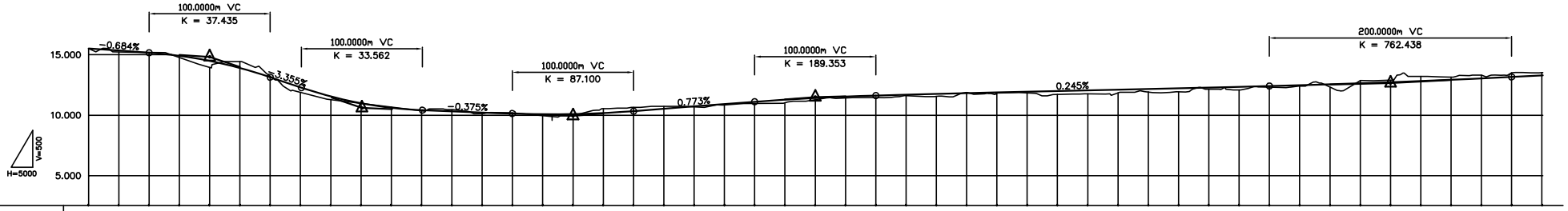


Figure 7.10.1 Bus Stop Concept for Daladala

The Study proposes to install bus stops at every 500 m between Morocco and Tegeta. During the basis design stage, the locations of the bus stops should be discussed and determined, based on the existing daladala stations and the BRT plan.

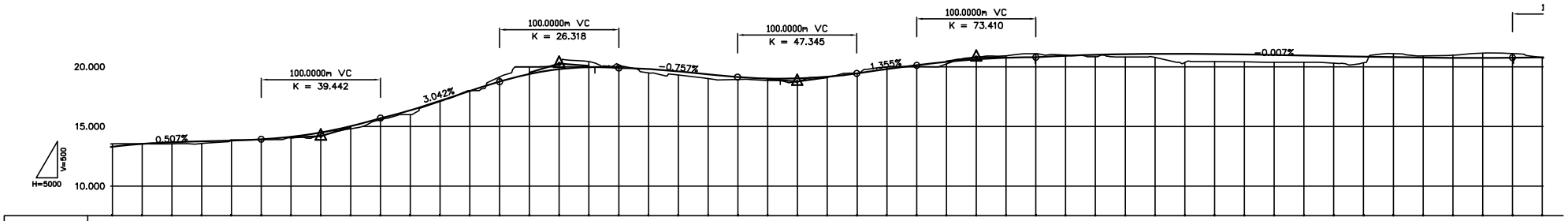




Station	0+000	0+050	0+100	0+150	0+200	0+250	0+300	0+350	0+400	0+450	0+500	0+550	0+600	0+650	0+700	0+750	0+800	0+850	0+900	0+950	1+000	1+050	1+100	1+150	1+200
Finished Grade	15.51	15.17	14.49	13.15	11.56	10.62	10.33	10.14	10.10	10.34	10.73	11.12	11.44	11.62	11.75	11.87	11.99	12.11	12.24	12.36	12.48	12.64	12.83	13.05	13.30
Original Ground	15.5	15.2	13.9	13.2	11.3	10.7	10.5	10.2	10.0	10.7	10.7	11.0	11.3	11.5	11.6	11.8	11.7	11.9	11.9	12.1	12.4	12.9	13.2	13.3	13.5

Figure7.4.2 Plan and Profile

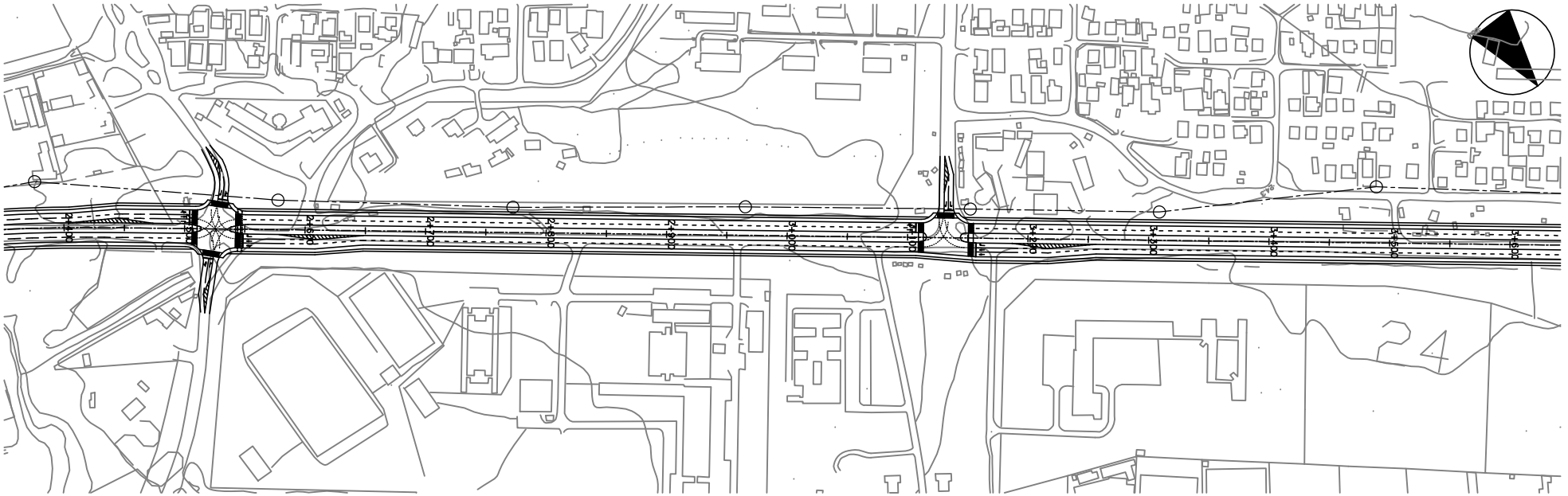
Pre-feasibility Study on New Bagamoyo Road Widening Project	
Japan International Cooperation Agency (JICA)	
Pacific Consultants International	
Drawing Title	Scale
Plan and Profile (1/15)	As Shown

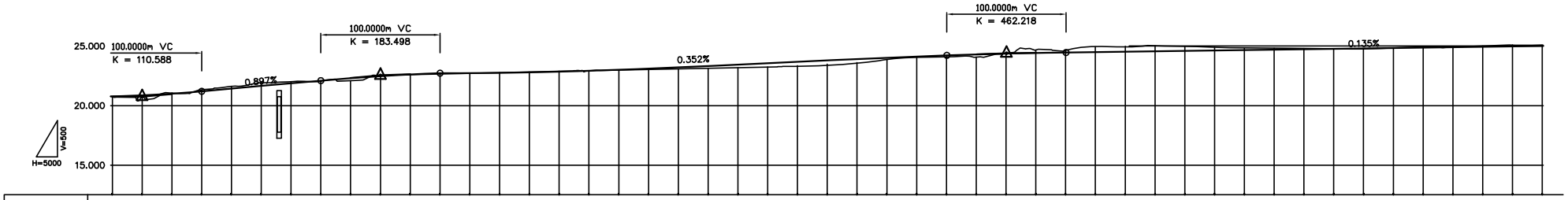


Station	1+200	1+250	1+300	1+350	1+400	1+450	1+500	1+550	1+600	1+650	1+700	1+750	1+800	1+850	1+900	1+950	2+000	2+050	2+100	2+150	2+200	2+250	2+300	2+350	2+400
Finished Grade	13.30	13.55	13.80	14.14	15.02	16.47	17.99	19.39	19.96	19.70	19.32	19.01	19.16	19.78	20.41	20.75	20.79	20.78	20.78	20.78	20.77	20.77	20.77	20.76	20.79
Original Ground	13.5	13.6	13.9	14.1	14.8	16.0	18.0	20.0	20.4	19.5	19.0	18.8	19.1	20.0	20.2	20.9	21.0	20.8	20.4	20.4	20.4	20.3	20.9	21.1	20.8

Figure7.4.2 Plan and Profile

Pre-feasibility Study on New Bagamoyo Road Widening Project	
Japan International Cooperation Agency (JICA)	
Pacific Consultants International	
Drawing Title	Scale
Plan and Profile (2/15)	As Shown

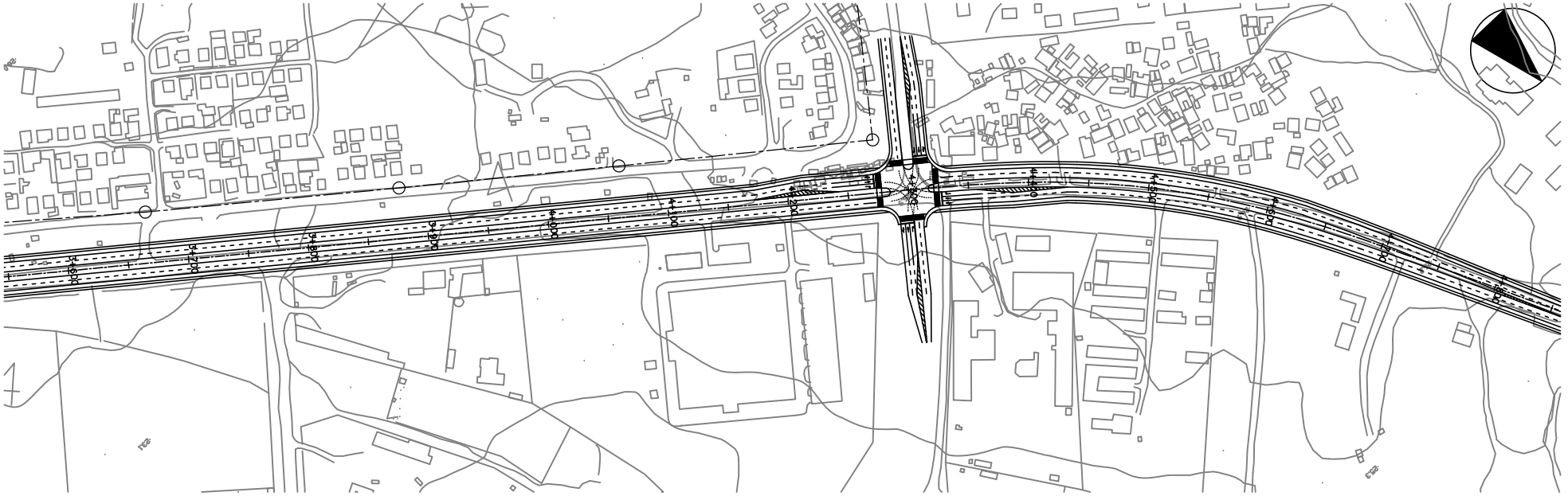


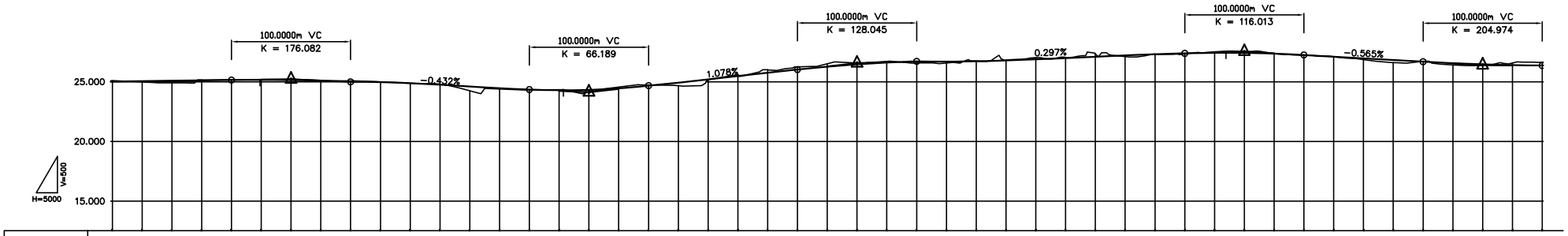


Station	2+400	2+450	2+500	2+550	2+600	2+650	2+700	2+750	2+800	2+850	2+900	2+950	3+000	3+050	3+100	3+150	3+200	3+250	3+300	3+350	3+400	3+450	3+500	3+550	3+600
Finished Grade	20.79	21.01	21.43	21.88	22.31	22.62	22.81	22.99	23.17	23.34	23.52	23.69	23.87	24.04	24.22	24.37	24.47	24.53	24.60	24.67	24.74	24.80	24.87	24.94	25.01
Original Ground	20.8	21.1	21.6	22.0	22.1	22.6	22.7	22.8	22.9	23.0	23.1	23.2	23.5	23.9	24.1	24.4	24.6	25.0	25.0	24.8	24.8	24.8	24.9	25.0	25.1

Figure7.4.2 Plan and Profile

Pre-feasibility Study on New Bagamoyo Road Widening Project	
Japan International Cooperation Agency (JICA)	
Pacific Consultants International	
Drawing Title	Scale
Plan and Profile (3/15)	As Shown

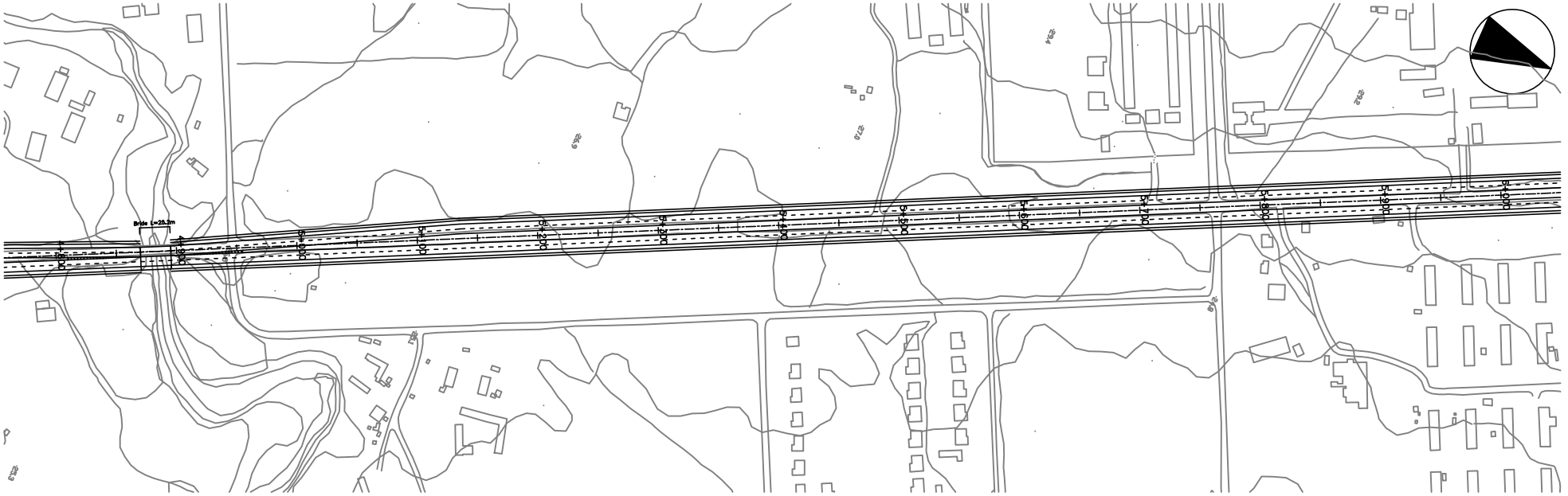


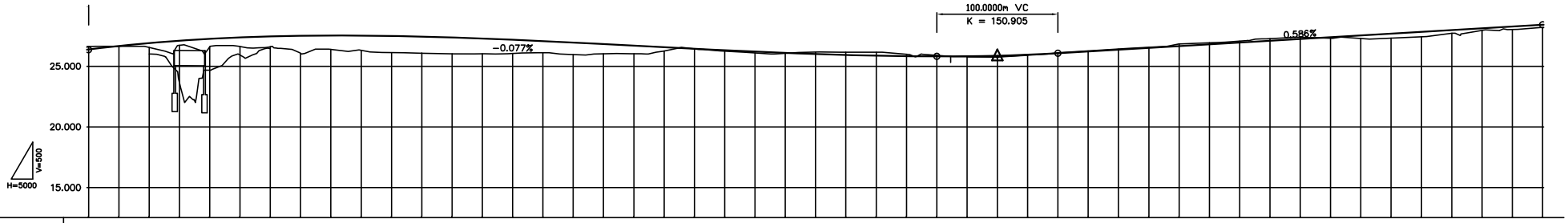


Station	3+600	3+650	3+700	3+750	3+800	3+850	3+900	3+950	4+000	4+050	4+100	4+150	4+200	4+250	4+300	4+350	4+400	4+450	4+500	4+550	4+600	4+650	4+700	4+750	4+800
Finished Grade	25.01	25.07	25.14	25.14	**24.99**	24.78	24.56	**24.35**	24.32	**24.67**	25.21	25.75	26.26	26.61	26.78	26.93	27.08	27.22	**27.37**	27.41	**27.24**	26.96	26.68	26.45	**26.35**
Original Ground	25.1	24.9	25.2	25.2	25.1	24.9	24.2	24.3	24.1	24.7	25.2	26.0	26.5	26.7	26.6	26.8	27.0	27.1	27.3	27.5	27.2	26.9	26.7	26.4	26.6

Figure7.4.2 Plan and Profile

Pre-feasibility Study on New Bagamoyo Road Widening Project	
Japan International Cooperation Agency (JICA)	
Pacific Consultants International	
Drawing Title	Scale
Plan and Profile (4/15)	As Shown

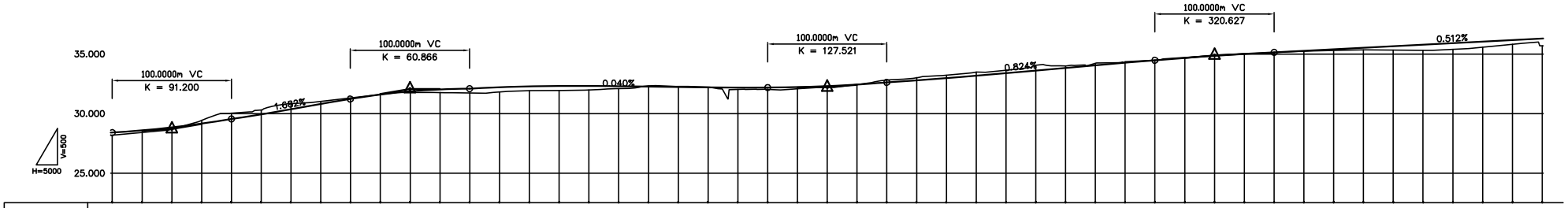




Station	4+800	4+850	4+900	4+950	5+000	5+050	5+100	5+150	5+200	5+250	5+300	5+350	5+400	5+450	5+500	5+550	5+600	5+650	5+700	5+750	5+800	5+850	5+900	5+950	6+000
Finished Grade	26.35	26.32	26.28	26.24	26.20	26.16	26.12	26.09	26.05	26.01	25.97	25.93	25.89	25.86	25.82	25.86	26.07	26.37	26.66	26.95	27.24	27.54	27.83	28.12	28.42
Original Ground	26.6	26.6	26.6	26.6	26.4	26.1	26.0	26.0	26.0	26.0	26.4	26.1	26.2	26.2	25.9	25.8	26.1	26.4	26.8	27.1	27.4	27.3	27.4	27.9	28.2

Figure7.4.2 Plan and Profile

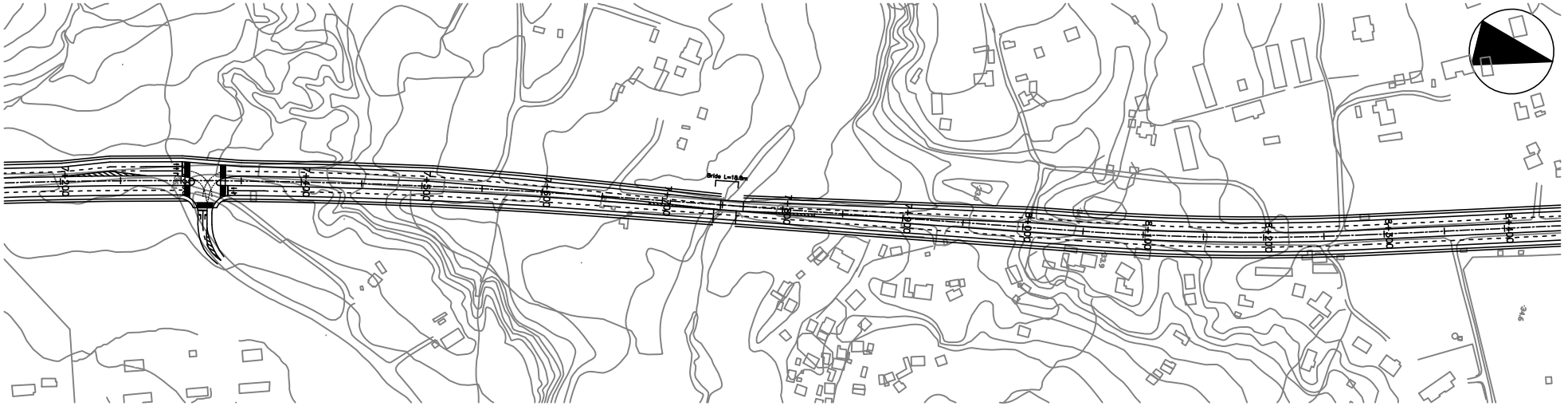
Pre-feasibility Study on New Bagamoyo Road Widening Project	
Japan International Cooperation Agency (JICA)	
Pacific Consultants International	
Drawing Title	Scale
Plan and Profile (5/15)	As Shown

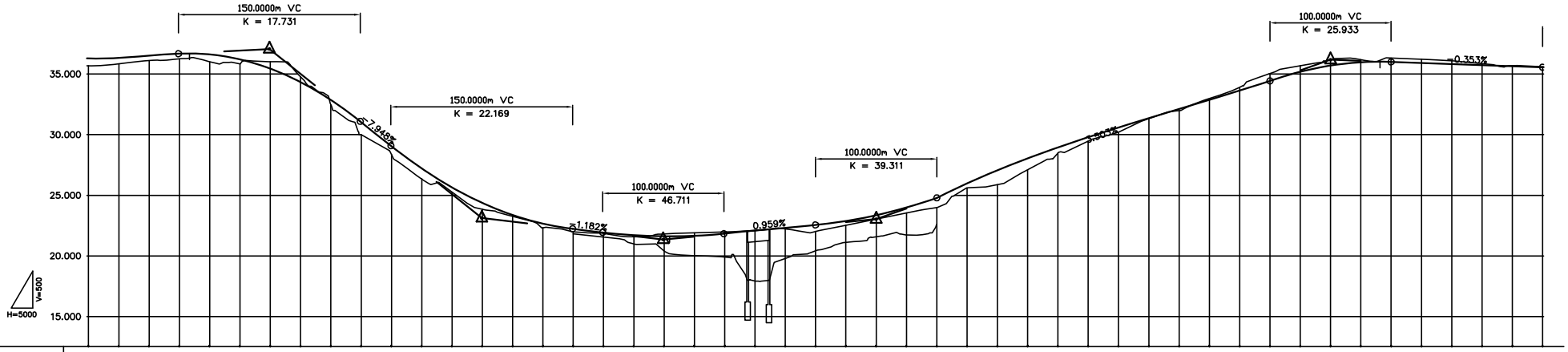


Station	6+000	6+050	6+100	6+150	6+200	6+250	6+300	6+350	6+400	6+450	6+500	6+550	6+600	6+650	6+700	6+750	6+800	6+850	6+900	6+950	7+000	7+050	7+100	7+150	7+200
Finished Grade	28.42	28.85	29.55	30.39	31.23	31.87	32.09	32.11	32.13	32.15	32.17	32.19	32.31	32.62	33.03	33.44	33.86	34.27	34.67	35.00	35.27	35.53	35.78	36.04	36.29
Original Ground	28.2	28.7	30.0	30.8	31.3	31.8	31.7	31.9	32.0	32.3	32.2	32.0	32.2	32.8	33.2	33.6	34.0	34.3	34.7	35.0	35.2	35.3	35.3	35.6	35.7

Figure7.4.2 Plan and Profile

Pre-feasibility Study on New Bagamoyo Road Widening Project	
Japan International Cooperation Agency (JICA)	
Pacific Consultants International	
Drawing Title	Scale
Plan and Profile (6/15)	As Shown

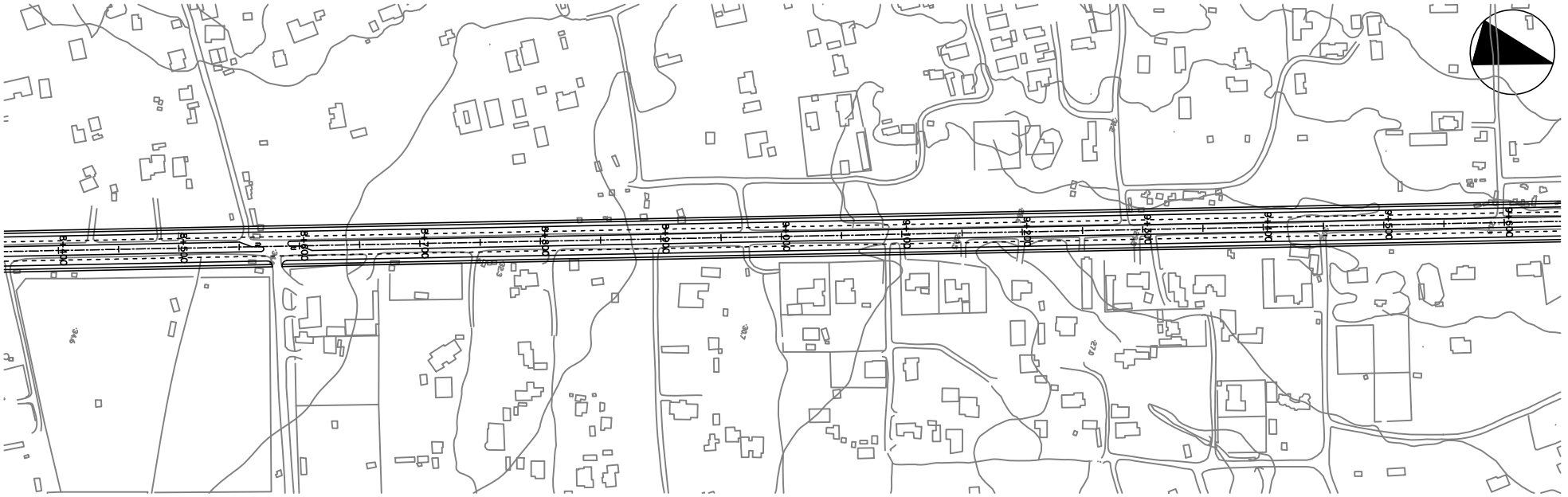


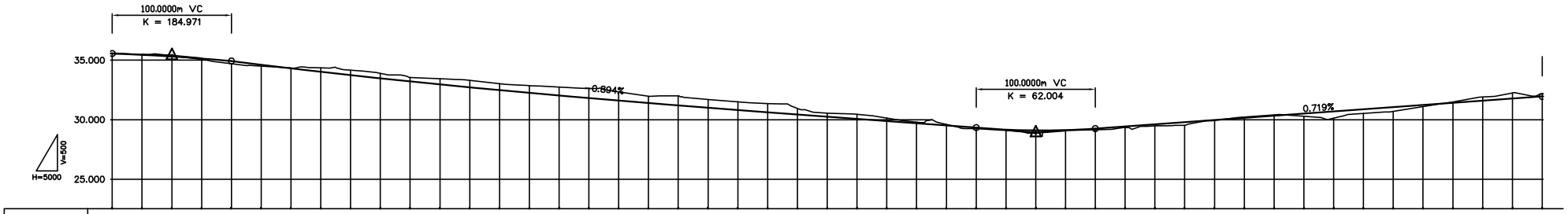


Station	7+200	7+250	7+300	7+350	7+400	7+450	7+500	7+550	7+600	7+650	7+700	7+750	7+800	7+850	7+900	7+950	8+000	8+050	8+100	8+150	8+200	8+250	8+300	8+350	8+400
Finished Grade	36.29	36.55	36.62	35.44	32.86	29.05	25.65	23.38	22.24	21.71	21.67	22.08	22.56	23.36	24.79	26.54	28.30	30.05	31.80	33.55	35.18	35.97	35.91	35.74	35.56
Original Ground	35.7	36.1	36.0	36.0	32.5	28.4	25.3	23.3	22.0	21.6	21.9	22.1	22.0	23.0	24.0	25.9	28.5	30.2	32.0	33.9	35.7	36.2	36.2	35.9	35.6

Figure7.4.2 Plan and Profile

Pre-feasibility Study on New Bagamoyo Road Widening Project	
Japan International Cooperation Agency (JICA)	
Pacific Consultants International	
Drawing Title	Scale
Plan and Profile (7/15)	As Shown

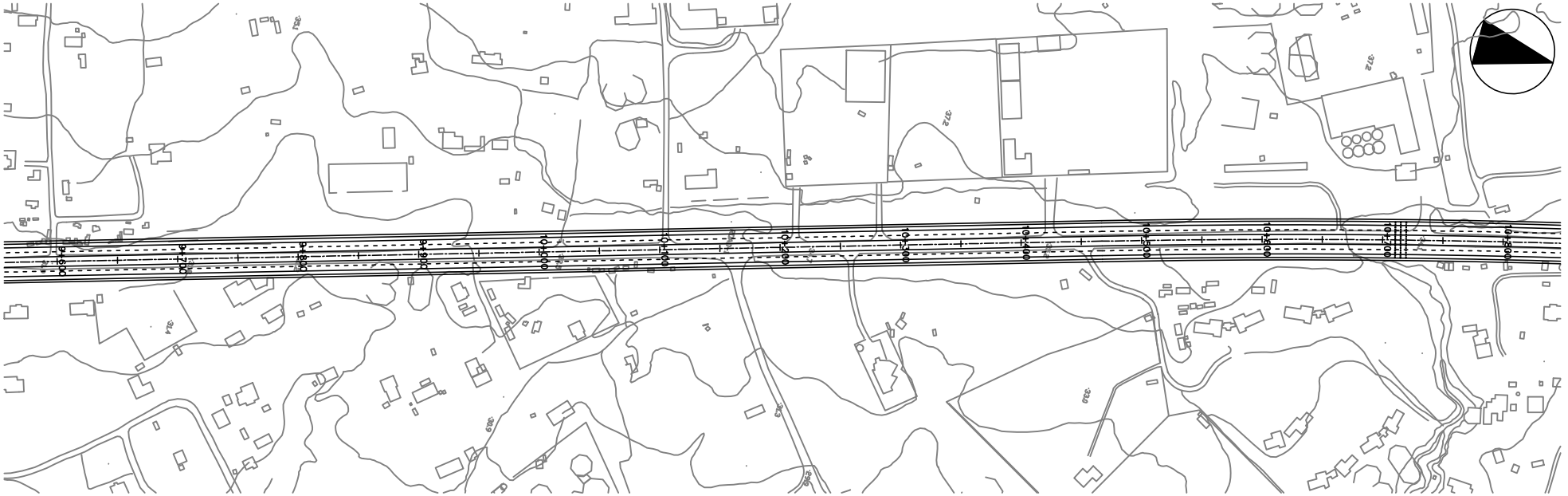


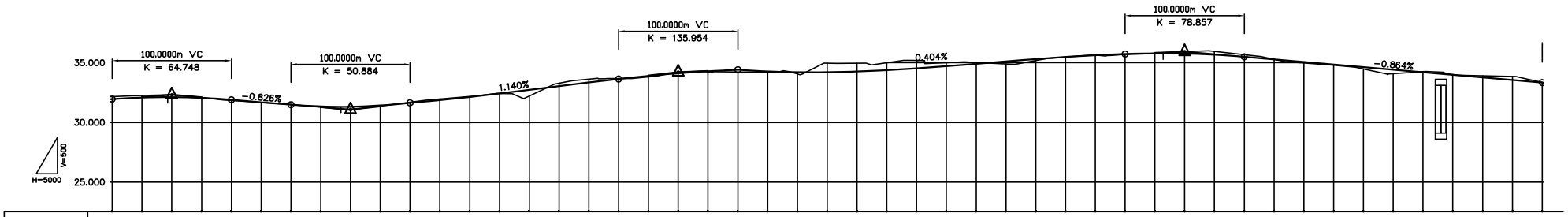


Station	8+400	8+450	8+500	8+550	8+600	8+650	8+700	8+750	8+800	8+850	8+900	8+950	9+000	9+050	9+100	9+150	9+200	9+250	9+300	9+350	9+400	9+450	9+500	9+550	9+600
Finished Grade	35.56	35.31	34.94	34.49	34.04	33.59	33.15	32.70	32.25	31.81	31.36	30.91	30.47	30.02	29.57	29.17	29.13	29.44	29.80	30.16	30.52	30.88	31.24	31.60	31.96
Original Ground	35.6	35.4	34.7	34.3	34.2	33.6	33.3	32.9	32.6	32.0	31.7	31.4	30.6	30.1	29.6	29.1	29.1	29.3	29.5	30.2	30.3	30.5	31.1	31.9	32.2

Figure7.4.2 Plan and Profile

Pre-feasibility Study on New Bagamoyo Road Widening Project	
Japan International Cooperation Agency (JICA)	
Pacific Consultants International	
Drawing Title	Scale
Plan and Profile (8/15)	As Shown

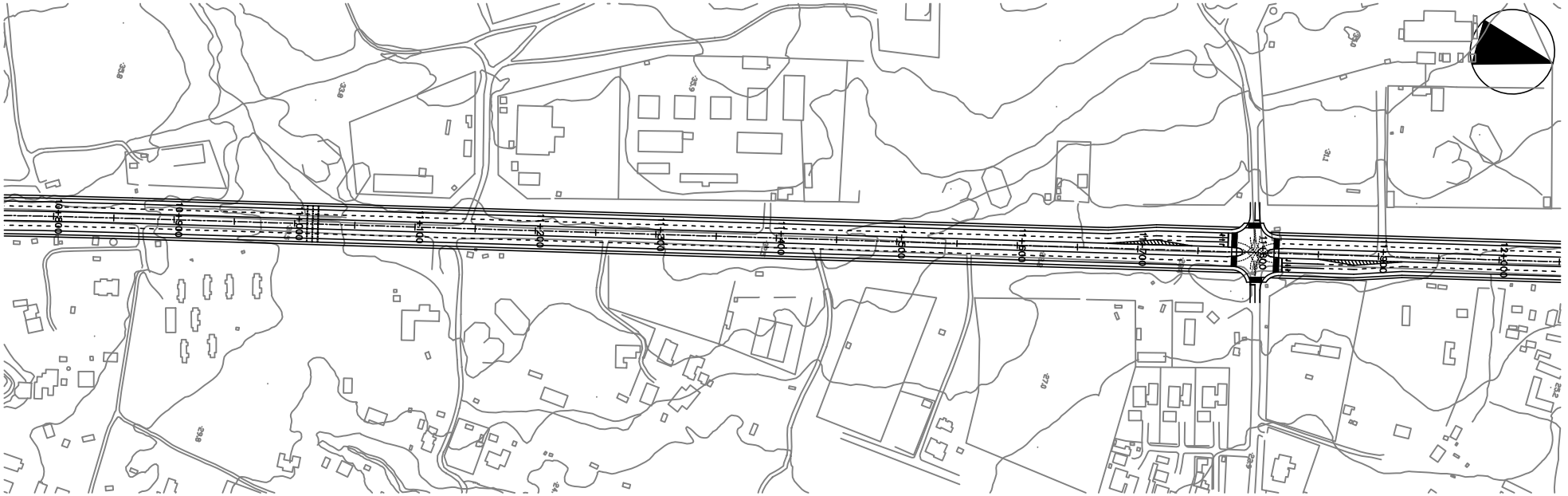


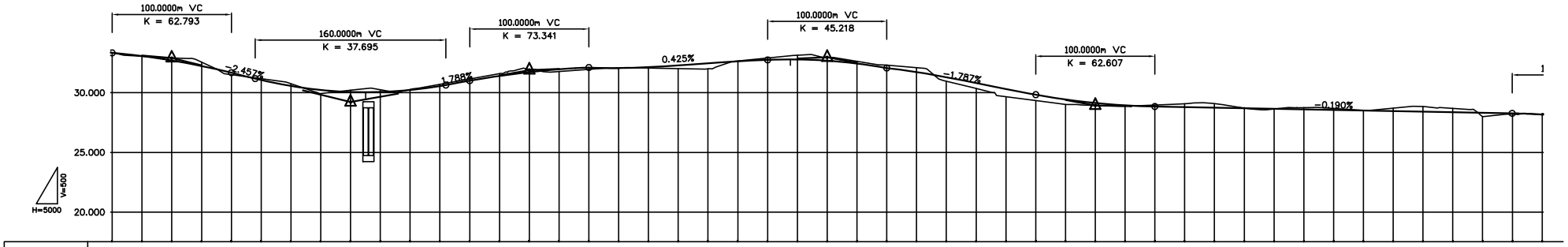


Station	9+600	9+650	9+700	9+750	9+800	9+850	9+900	9+950	10+000	10+050	10+100	10+150	10+200	10+250	10+300	10+350	10+400	10+450	10+500	10+550	10+600	10+650	10+700	10+750	10+800
Finished Grade	31.96	32.12	31.90	31.49	31.32	31.65	32.22	32.79	33.36	33.90	34.29	34.51	34.72	34.92	35.12	35.32	35.52	35.73	35.77	35.50	35.06	34.63	34.20	33.77	33.34
Original Ground	32.2	32.3	31.8	31.5	31.1	31.7	32.2	32.2	33.6	33.8	34.2	34.2	35.0	35.0	35.0	34.9	35.5	35.7	35.9	35.7	35.0	34.5	34.2	33.9	33.4

Figure7.4.2 Plan and Profile

Pre-feasibility Study on New Bagamoyo Road Widening Project	
Japan International Cooperation Agency (JICA)	
Pacific Consultants International	
Drawing Title	Scale
Plan and Profile (9/15)	As Shown

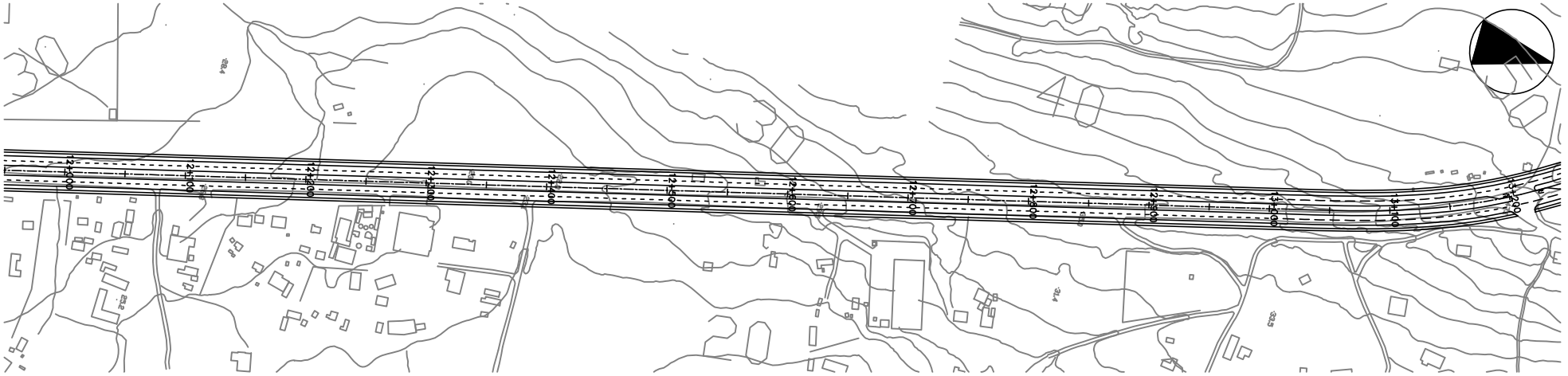


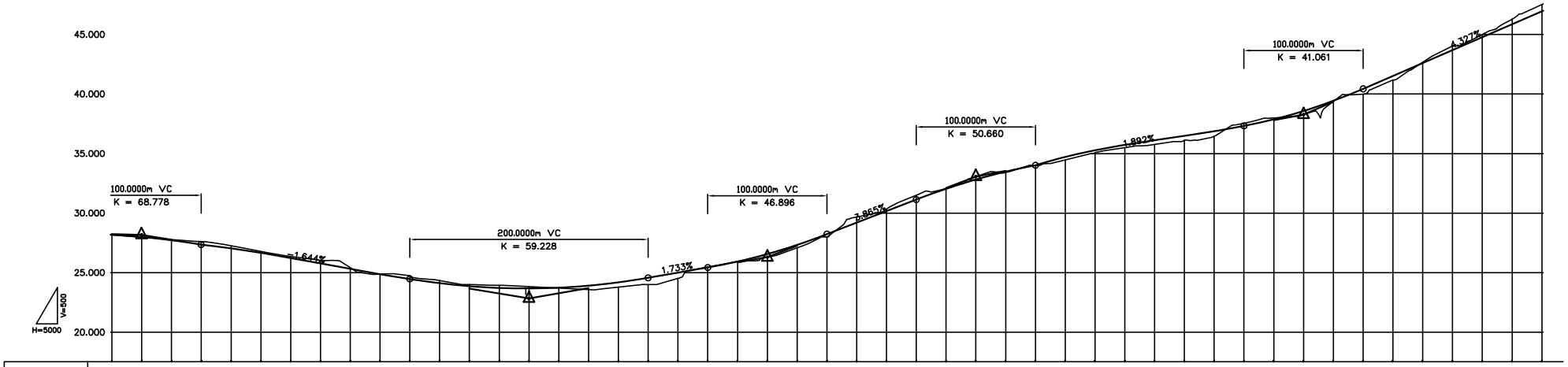


Station	10+800	10+850	10+900	10+950	11+000	11+050	11+100	11+150	11+200	11+250	11+300	11+350	11+400	11+450	11+500	11+550	11+600	11+650	11+700	11+750	11+800	11+850	11+900	11+950	12+000
Finished Grade	33.34	32.71	31.68	30.57	30.07	30.23	31.01	31.73	32.11	32.33	32.54	32.75	32.69	32.07	31.18	30.28	29.44	28.94	28.80	28.70	28.61	28.52	28.42	28.33	28.18
Original Ground	33.4	32.9	31.5	30.8	30.2	30.3	31.1	32.0	32.0	32.1	32.0	32.9	33.0	32.3	31.0	29.7	29.0	28.9	29.1	28.8	28.8	28.5	28.9	28.0	28.2

Figure7.4.2 Plan and Profile

Pre-feasibility Study on New Bagamoyo Road Widening Project	
Japan International Cooperation Agency (JICA)	
Pacific Consultants International	
Drawing Title	Scale
Plan and Profile (10/15)	As Shown

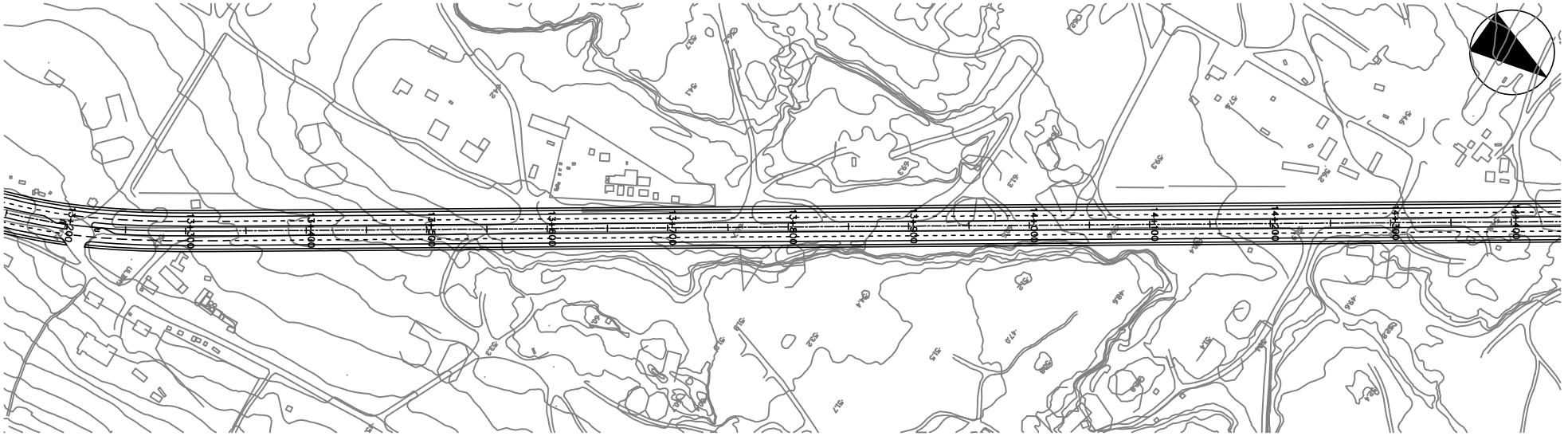


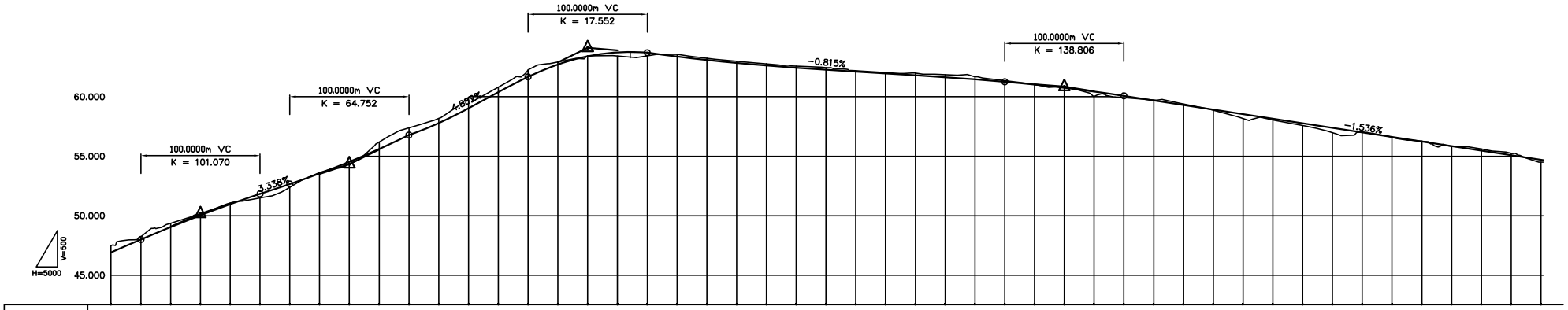


Station	12+000	12+050	12+100	12+150	12+200	12+250	12+300	12+350	12+400	12+450	12+500	12+550	12+600	12+650	12+700	12+750	12+800	12+850	12+900	12+950	13+000	13+050	13+100	13+150	13+200
Finished Grade	28.18	27.72	26.95	26.13	25.30	24.48	23.87	23.68	23.92	24.57	25.44	26.57	28.24	30.17	32.04	33.48	34.49	35.43	36.38	37.33	38.58	40.43	42.60	44.76	46.92
Original Ground	28.2	27.8	27.2	26.4	25.4	24.7	24.0	23.8	23.6	24.0	25.5	26.3	28.0	30.3	32.1	33.4	34.5	35.5	36.1	37.6	38.3	40.0	42.7	45.0	47.5

Figure7.4.2 Plan and Profile

Pre-feasibility Study on New Bagamoyo Road Widening Project	
Japan International Cooperation Agency (JICA)	
Pacific Consultants International	
Drawing Title	Scale
Plan and Profile (11/15)	As Shown

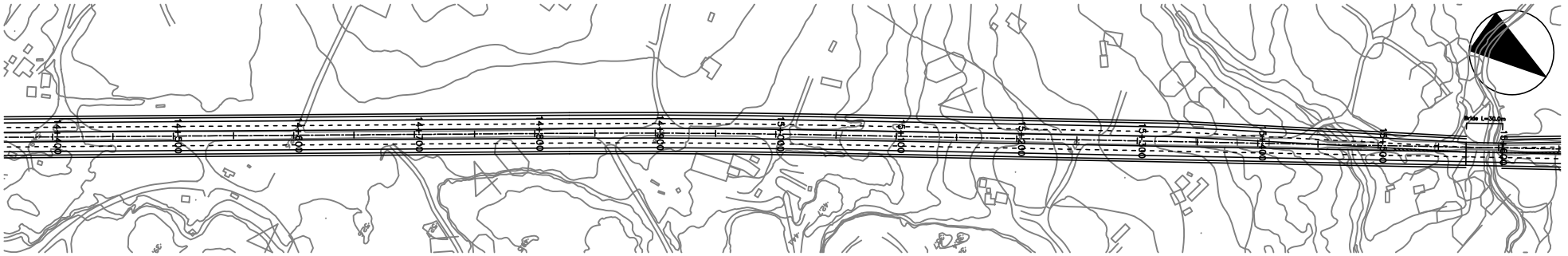


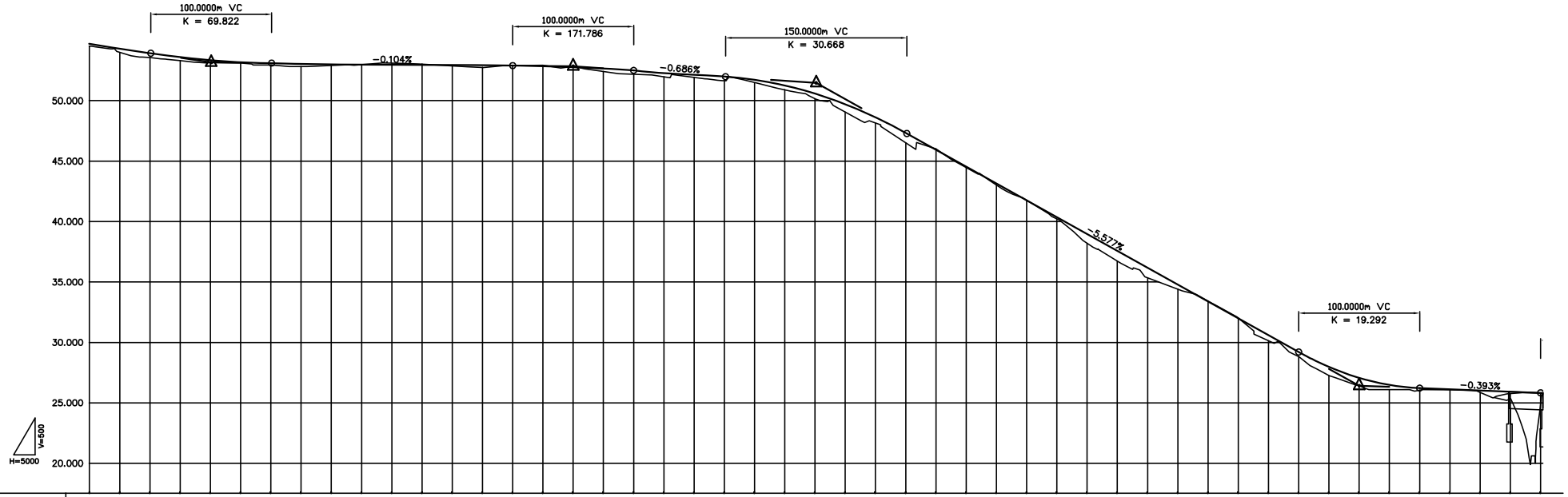


Station	13+200	13+250	13+300	13+350	13+400	13+450	13+500	13+550	13+600	13+650	13+700	13+750	13+800	13+850	13+900	13+950	14+000	14+050	14+100	14+150	14+200	14+250	14+300	14+350	14+400
Finished Grade	46.92	49.06	50.97	52.67	54.54	56.78	59.22	61.67	63.39	63.70	63.29	62.88	62.48	62.07	61.66	61.25	60.75	60.08	59.31	58.54	57.77	57.00	56.24	55.47	54.70
Original Ground	47.5	49.4	51.1	52.4	54.3	57.4	59.9	62.3	63.4	63.4	63.2	62.8	62.4	62.0	61.9	61.3	60.8	59.9	59.4	58.2	57.6	57.0	56.3	55.6	54.5

Figure7.4.2 Plan and Profile

Pre-feasibility Study on New Bagamoyo Road Widening Project	
Japan International Cooperation Agency (JICA)	
Pacific Consultants International	
Drawing Title	Scale
Plan and Profile (12/15)	As Shown

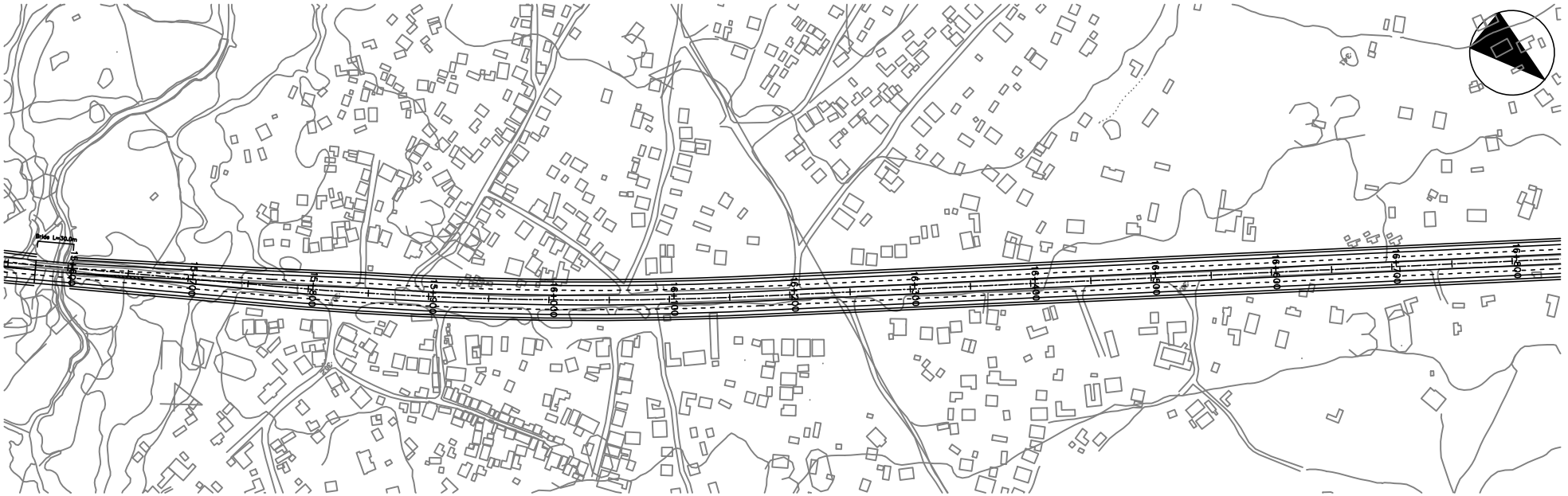


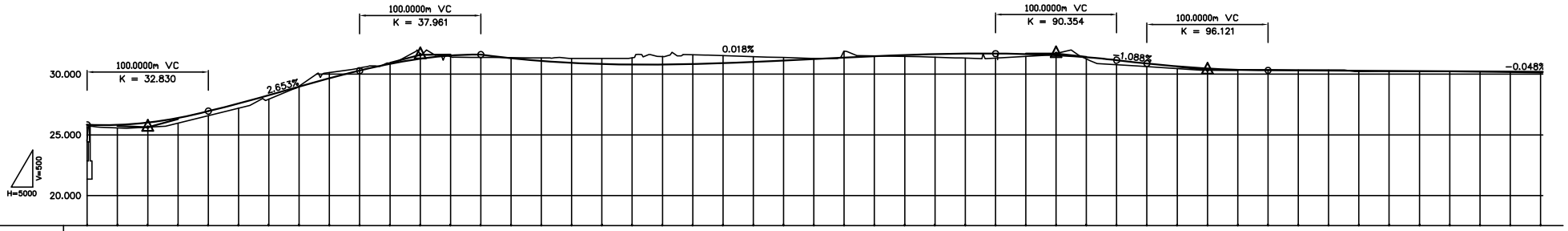


Station	14+400	14+450	14+500	14+550	14+600	14+650	14+700	14+750	14+800	14+850	14+900	14+950	15+000	15+050	15+100	15+150	15+200	15+250	15+300	15+350	15+400	15+450	15+500	15+550	15+600
Finished Grade	54.70	53.93	53.34	53.10	53.05	53.00	52.95	**52.90**	52.77	**52.50**	52.16	51.72	50.58	48.62	45.94	43.16	40.37	37.58	34.79	32.00	**29.21**	27.07	**26.23**	26.03	25.83
Original Ground	54.5	53.6	53.1	52.9	52.9	53.1	52.9	52.9	52.8	52.2	51.9	51.5	50.2	48.1	46.0	43.1	40.2	36.7	34.4	32.0	28.8	26.4	26.1	25.9	25.8

Figure7.4.2 Plan and Profile

Pre-feasibility Study on New Bagamoyo Road Widening Project	
Japan International Cooperation Agency (JICA)	
Pacific Consultants International	
Drawing Title	Scale
Plan and Profile (13/15)	As Shown

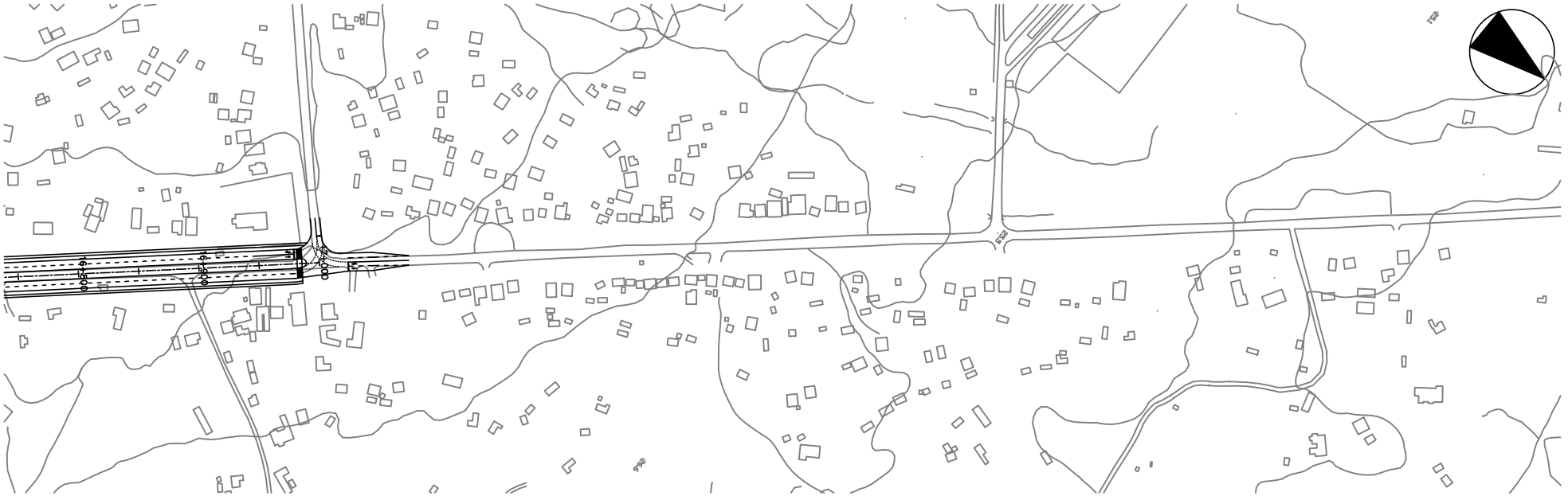


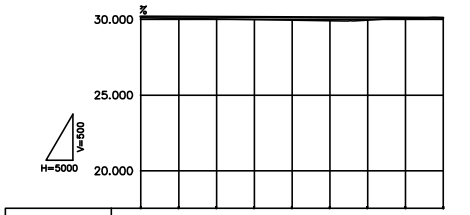


Station	15+600	15+650	15+700	15+750	15+800	15+850	15+900	15+950	16+000	16+050	16+100	16+150	16+200	16+250	16+300	16+350	16+400	16+450	16+500	16+550	16+600	16+650	16+700	16+750	16+800
Finished Grade	25.83	26.02	26.96	28.29	29.62	30.86	31.53	31.62	31.63	31.64	31.65	31.66	31.67	31.68	31.68	31.69	31.56	31.16	30.65	30.36	30.31	30.28	30.26	30.23	30.21
Original Ground	25.8	25.6	26.6	28.0	30.1	30.9	31.4	31.4	31.3	31.3	31.6	31.5	31.3	31.5	31.4	31.3	31.7	30.8	30.5	30.4	30.4	30.2	30.2	30.2	30.1

Figure7.4.2 Plan and Profile

Pre-feasibility Study on New Bagamoyo Road Widening Project	
Japan International Cooperation Agency (JICA)	
Pacific Consultants International	
Drawing Title	Scale
Plan and Profile (14/15)	As Shown

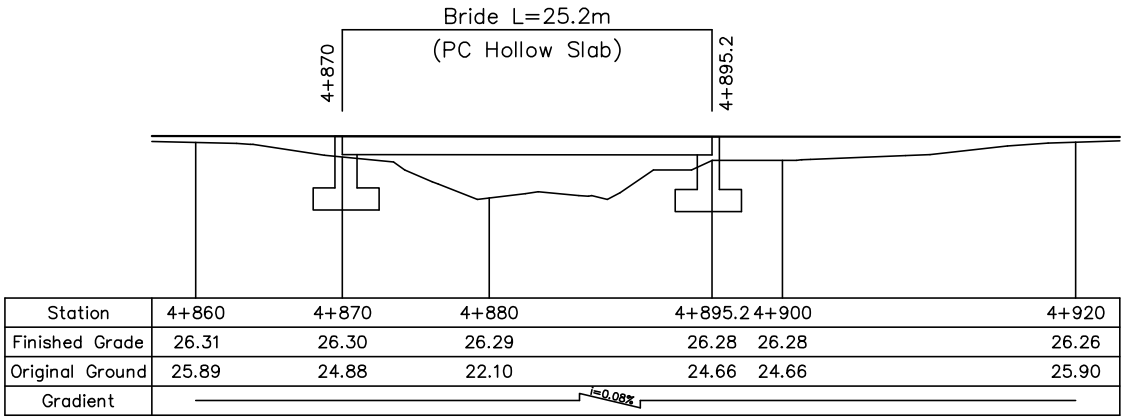




Station	16+800	16+850	16+900	16+950	17+000
Finished Grade	30.21	30.19	30.16	30.14	30.11
Original Ground	30.1	30.0	30.0	30.0	30.1

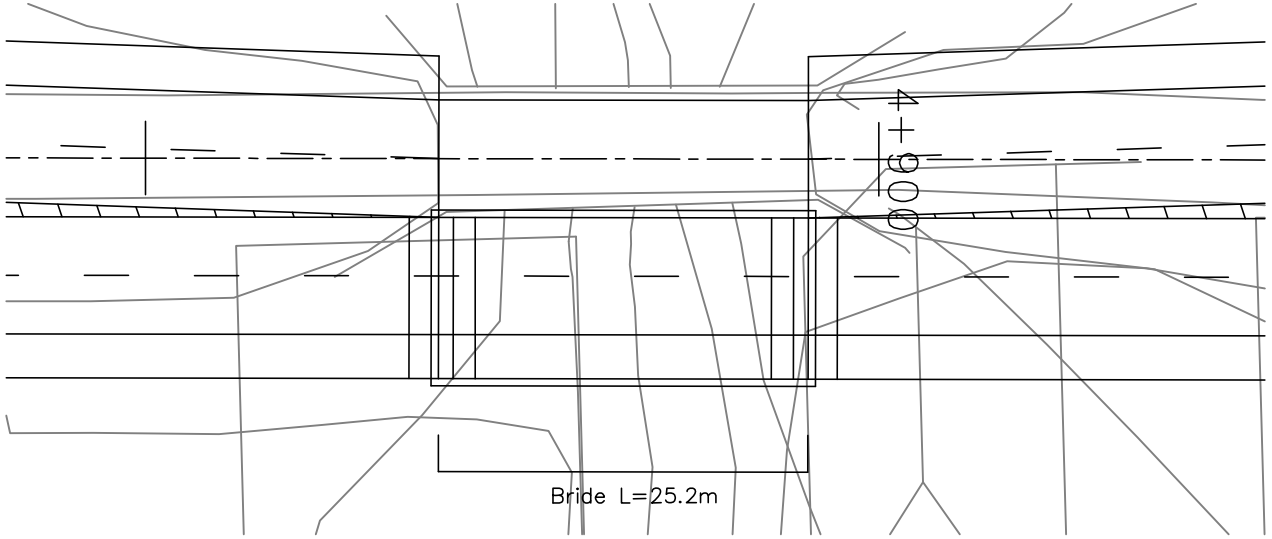
Figure7.4.2 Plan and Profile

Pre-feasibility Study on New Bagamoyo Road Widening Project	
Japan International Cooperation Agency (JICA)	
Pacific Consultants International	
Drawing Title	Scale
Plan and Profile (15/15)	As Shown

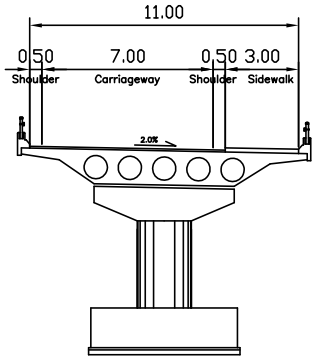


Station	4+860	4+870	4+880	4+895.2	4+900	4+920
Finished Grade	26.31	26.30	26.29	26.28	26.28	26.26
Original Ground	25.89	24.88	22.10	24.66	24.66	25.90
Gradient			I=0.08%			

Profile
S=1/500



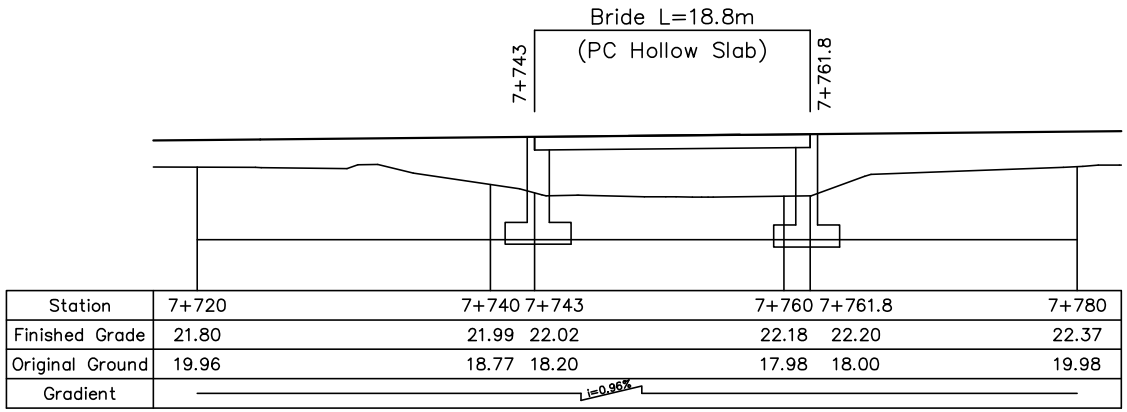
Plan
S=1/500



Typical Cross Section
S=1/300

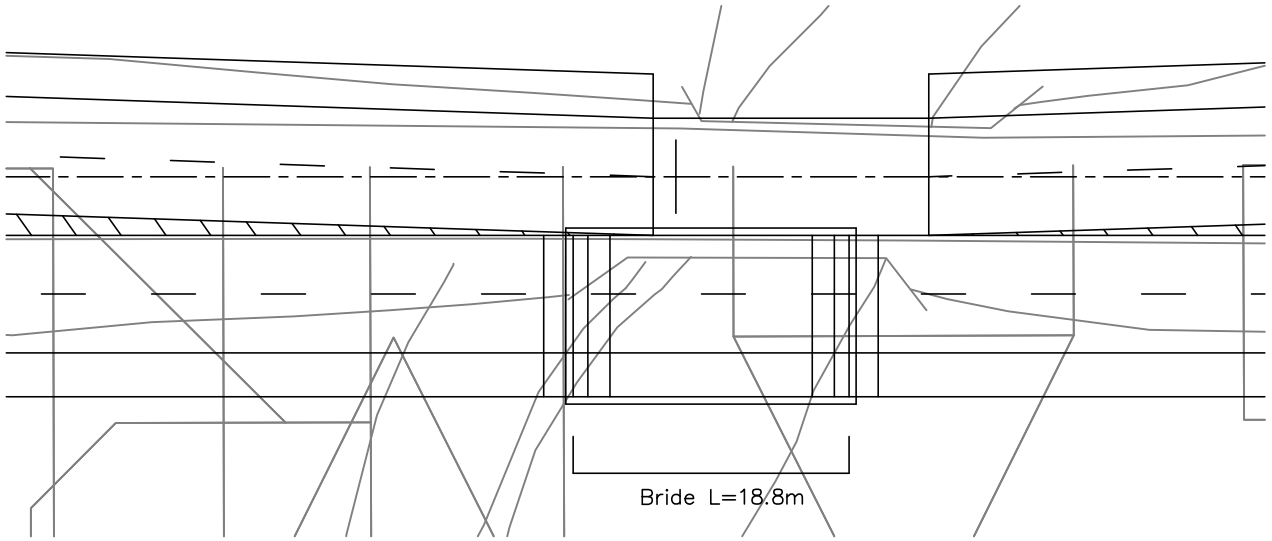
Figure7.6.1 General View of Mulalakuwa Bridge

Pre-feasibility Study on New Bagamoyo Road Widening Project	
Japan International Cooperation Agency (JICA)	
Pacific Consultants International	
Drawing Title	Scale
General View of Mulalakuwa Bridge	As Shown

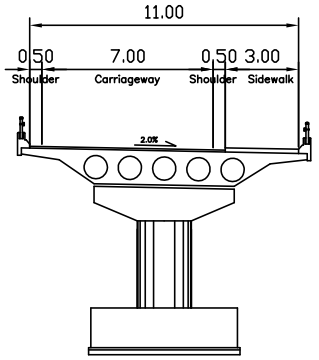


Station	7+720	7+740	7+743	7+760	7+761.8	7+780
Finished Grade	21.80	21.99	22.02	22.18	22.20	22.37
Original Ground	19.96	18.77	18.20	17.98	18.00	19.98
Gradient	i=0.96%					

Profile
S=1/500



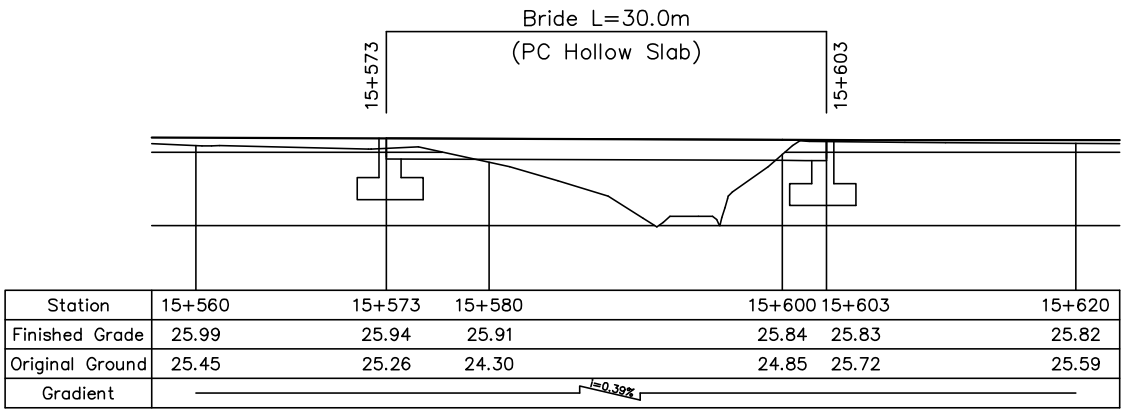
Plan
S=1/500



Typical Cross Section
S=1/300

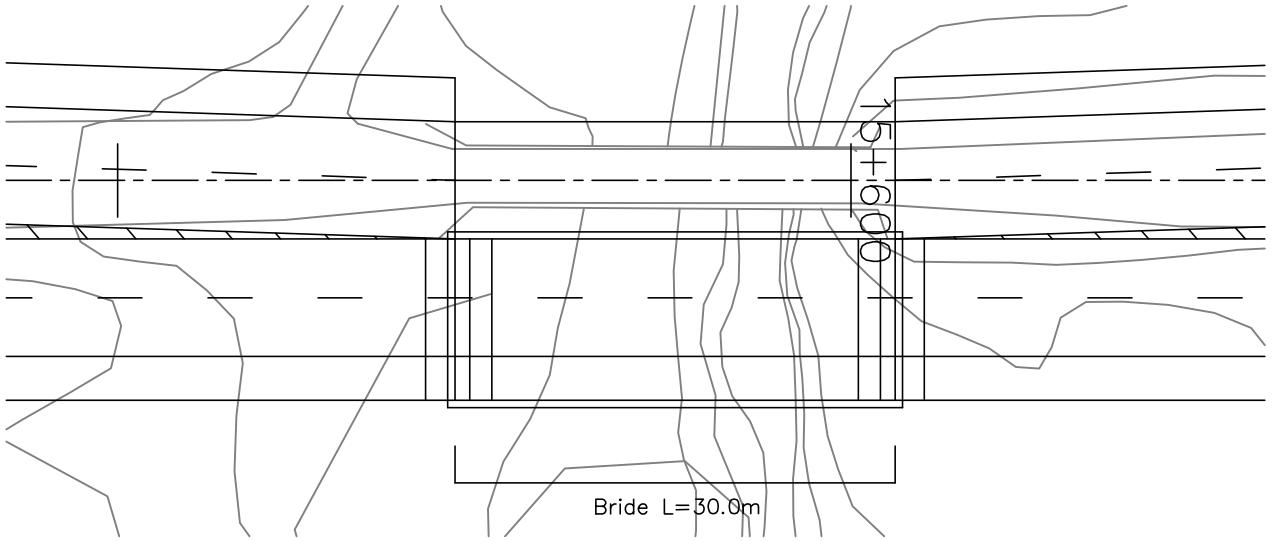
Figure7.6.2 General View of Lugalo Bridge

Pre-feasibility Study on New Bagamoyo Road Widening Project	
Japan International Cooperation Agency (JICA)	
Pacific Consultants International	
Drawing Title	Scale
General View of Lugalo Bridge	As Shown

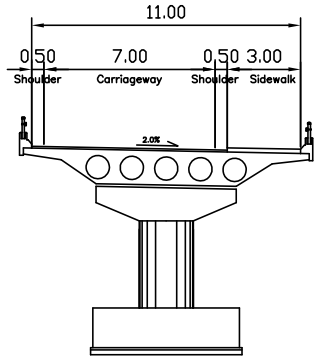


Station	15+560	15+573	15+580	15+600	15+603	15+620
Finished Grade	25.99	25.94	25.91	25.84	25.83	25.82
Original Ground	25.45	25.26	24.30	24.85	25.72	25.59
Gradient	i=0.39%					

Profile
S=1/500



Plan
S=1/500



Typical Cross Section
S=1/300

Figure7.6.3 General View of Tegeta Bridge

Pre-feasibility Study on New Bagamoyo Road Widening Project	
Japan International Cooperation Agency (JICA)	
Pacific Consultants International	
Drawing Title	Scale
General View of Tegeta Bridge	As Shown

Chapter 8 Preliminary Cost Estimates

8.1 Basic Conditions

8.1.1 Basic Conditions and Assumptions

The basic conditions and assumptions for the cost estimates of the Project are listed below.

- The total cost is comprised of the construction cost (direct cost and indirect cost), engineering service cost, contingency and government administration cost.
- The cost estimates are made in Tanzanian Shilling (Tshs) by both foreign and local currency components.
- The last 6-month average exchange rates is applied: US$ 1.0 = Tshs 1,182.27 = Yen 105.76 (from 1 December 2007 to 31 May 2008)
- The unit cost of the Project, including the labor wage and material cost, is estimated based on the current market price (May 2008) in Tanzania.
- No tax is included in the total cost estimates.

8.1.2 Material Procurement

The major construction materials can be procured at the following locations.

(1) Asphalt

Almost all the asphalt materials are being imported from Saudi Arabia through local distribution companies. Several suppliers are presently in business in Dar es Salaam, so such imported asphalt materials are available from the domestic market.

(2) Cement

Several local industrial companies produce the cement and so it is available from the domestic market.

(3) Reinforcement Bar

Although several local factories produce reinforcement bar, the quality of such domestic products are

still relatively low. However, quality reinforcement bar imported from South Africa, Egypt and Ukraine is available in the domestic market.

(4) Wood Materials

Wood materials such as plywood and timber are available from the domestic market.

8.2 Overall Cost Estimates Method

8.2.1 Construction Cost

The construction cost is comprised of direct cost and indirect cost. The direct cost is estimated by multiplying the quantity by the unit cost of each civil work.

(1) Unit Cost

The labor wage and material cost are estimated based on the current market price (May 2008) in Tanzania. The labor wage and material cost applied to this Project are shown in Table 8.2.1 and Table 8.2.2, respectively.

Table 8.2.1 Labor Wage

Unit: Tshs

Labor	Unit	Wage
Foreman	day	27,310
Skilled labor	day	20,217
Common labor	day	14,187
Unskilled labor	day	13,123
Operator for heavy equipment	day	23,291
Driver for light vehicle	day	20,217
Carpenter	day	23,291
Welder	day	23,291
Mechanic	day	27,310
Electrician	day	27,310

Table 8.2.2 Material Cost

Unit: Tshs

Material	Unit	Unit Cost
Gasoline	liter	1,537
Diesel	liter	1,419
Cement	ton	331,036
Reinforcement bar	ton	2,395,279
Fine aggregate	m3	114,917
Coarse aggregate	m3	114,917
Cut back asphalt	ton	1,773,405
Straight asphalt	ton	1,418,724
Plywood	m2	60,296
Timber	m3	354,681

(2) Indirect Cost

The indirect cost is comprised of temporary work expenses, site expenses and overhead expenses, and it is estimated at 26% of the direct cost based on the results of Kilwa Road Widening Project (JICA, 2006).

(3) Unit Costs of Major Work Items

The unit costs of the major work items are estimated referring to the result of Kilwa Road Widening Project (JICA, 2006), and based on labor wages and material cost. The unit costs of the major work items are summarized in Table 8.2.3.

Table 8.2.3 Unit Costs of Major Items

Unit: Tshs

Work Items	Unit	F.C.	L.C.	Total
1) Earth Work				
Excavation	m3	6,848	1,712	8,560
Embankment	m3	1,929	482	2,412
2) Pavement Work				
Carriageway	m2	11,797	66,848	78,645
Shoulder	m2	11,797	66,848	78,645
Sidewalk	m2	2,896	16,410	19,306
3) Drainage Work				
Box Culvert (3.0x3.0m)	m	720,354	2,881,418	3,601,772
Box Culvert (4.0x4.0m@2)	m	1,970,831	7,883,326	9,854,157
Pipe Culvert (d=900mm)	m	78,788	709,089	787,876
Side Ditch (0.7x0.7m)	m	21,899	197,093	218,992
Side Ditch (V-shaped)	m	6,575	59,171	65,746
Side Ditch (L-shaped)	m	6,419	57,767	64,185
4) Bridge Structure				
PC Hollow Slab	m2	1,460,694	626,012	2,086,706
5) Road Facilities				
Curb for Median	m	1,313	24,945	26,258
Traffic Signal	no.	83,585,674	9,287,297	92,872,971
Bus Stop	m2	11,797	66,848	78,645
Marking	m	51	977	1,029

8.2.2 Engineering Service Cost

The engineering service cost for the detailed design and supervision is estimated at 7% of the construction cost based on the result of Kilwa Road Widening Project (JICA, 2006).

8.2.3 Contingency

The contingency is estimated at 10% of the construction cost, which is comprised of physical contingency to cover the unforeseen changes of physical conditions and price contingency to compensate future price escalation.

8.2.4 Government Administration Cost

The government administration cost is comprised of (i) the cost for compensation to the affected properties and replacement of the public utilities and (ii) the administration cost of the project owner. The cost for compensation to the affected properties and that for replacement of public utilities are estimated based on the result of the property survey in this Study, conducted at the road section between Morocco and Mwenge and at Tegeta, and that of the aerial photo study along other road sections. The details of the property survey are described in 'Chapter 9 Environmental and Social Considerations'.

The administration cost of the project owner is estimated at 1% of the total construction cost.

8.3 Total Project Cost

The project costs for the 17 km road widening from Morocco to Tegeta are estimated at Tshs 50,009 million (4,474 million Yen) for the construction cost (including the engineering service cost and contingency), Tshs 1,272 million (114 million Yen) for the government administration cost and Tshs 51,281 million (4,588 million Yen) in total. The following tables summarize the project costs by road section.

8.3.1 Project Cost by Road Section

(1) Morocco to Mwenge

Table 8.3.1 Project Cost (Morocco – Mwenge)

Unit: Tshs

Work Items	Unit	Quantitiy	Unit Cost		Amount		
			F.C.	L.C.	F.C.	L.C.	Total
A. Construction Cost							
1) Earth Work							
Excavation	m3	38,177	6,848	1,712	261,424,833	65,356,208	326,781,041
Embankment	m3	16,928	1,929	482	32,661,964	8,165,491	40,827,455
2) Pavement Work							
Carriageway	m2	64,552	11,797	66,848	761,499,617	4,315,164,498	5,076,664,116
Shoulder	m2	4,300	11,797	66,848	50,725,746	287,445,894	338,171,640
Sidewalk	m2	22,962	2,896	16,410	66,497,244	376,817,714	443,314,958
3) Drainage Work							
Box Culvert (3.0x3.0m)	m	34	720,354	2,881,418	24,492,051	97,968,204	122,460,256
Box Culvert (4.0x4.0m@2)	m	0	1,970,831	7,883,326	0	0	0
Pipe Culvert (d=900mm)	m	272	78,788	709,089	21,430,233	192,872,099	214,302,332
Side Ditch (0.7x0.7m)	m	1,720	21,899	197,093	37,666,586	338,999,276	376,665,862
Side Ditch (V-shaped)	m	6,880	6,575	59,171	45,233,253	407,099,276	452,332,529
Side Ditch (L-shaped)	m	8,600	6,419	57,767	55,199,454	496,795,084	551,994,538
4) Bridge Structure							
PC Hollow Slab	m2	0	1,460,694	626,012	0	0	0
5) Road Facilities							
Curb for Median	m	8,600	1,313	24,945	11,291,028	214,529,540	225,820,569
Traffic Signal	no.	3	83,585,674	9,287,297	250,757,022	27,861,891	278,618,914
Bus Stop	m2	645	11,797	66,848	7,608,862	43,116,884	50,725,746
Marking	m	10,750	51	977	552,859	10,504,317	11,057,176
Sub-total of 1) to 5)					1,627,040,752	6,882,696,377	8,509,737,129
6) Indirect Cost					423,030,595	1,789,501,058	2,212,531,654
Toral Construction Cost					2,050,071,347	8,672,197,435	10,722,268,782
B. Engineering Service Cost							
Detail Design and Supervision (7% of A)					143,504,994	607,053,820	750,558,815
C. Contingency							
Price Escalation and Physical Change (10% of A)					205,007,135	867,219,744	1,072,226,878
Grand Total (A+B+C)					2,398,583,476	10,146,470,999	**12,545,054,475**

D. Government Administration Cost							
Cost for House Compenstaion and Replacement of Public Utilities					0	789,360,000	789,360,000
Administration Cost (1% of A)					0	107,222,688	107,222,688
Total Government Administration Cost					0	896,582,688	**896,582,688**

(2) Mwenge to Africana

Table 8.3.2 Project Cost (Mwenge – Africana)

Unit: Tshs

Work Items	Unit	Quantitiy	Unit Cost		Amount		
			F.C.	L.C.	F.C.	L.C.	Total
A. Construction Cost							
1) Earth Work							
Excavation	m3	90,708	6,848	1,712	621,141,622	155,285,406	776,427,028
Embankment	m3	43,211	1,929	482	83,374,062	20,843,515	104,217,577
2) Pavement Work							
Carriageway	m2	105,924	11,797	66,848	1,249,552,074	7,080,795,085	8,330,347,159
Shoulder	m2	7,500	11,797	66,848	88,475,138	501,359,117	589,834,256
Sidewalk	m2	40,050	2,896	16,410	115,983,564	657,240,199	773,223,763
3) Drainage Work							
Box Culvert (3.0x3.0m)	m	0	720,354	2,881,418	0	0	0
Box Culvert (4.0x4.0m@2)	m	68	1,970,831	7,883,326	134,016,538	536,066,152	670,082,690
Pipe Culvert (d=900mm)	m	510	78,788	709,089	40,181,687	361,635,185	401,816,872
Side Ditch (0.7x0.7m)	m	750	21,899	197,093	16,424,384	147,819,452	164,243,835
Side Ditch (V-shaped)	m	14,250	6,575	59,171	93,688,060	843,192,541	936,880,602
Side Ditch (L-shaped)	m	15,000	6,419	57,767	96,278,117	866,503,054	962,781,171
4) Bridge Structure							
PC Hollow Slab	m2	484	1,460,694	626,012	706,975,883	302,989,664	1,009,965,547
5) Road Facilities							
Curb for Median	m	15,000	1,313	24,945	19,693,654	374,179,431	393,873,085
Traffic Signal	no.	0	83,585,674	9,287,297	0	0	0
Bus Stop	m2	1,125	11,797	66,848	13,271,271	75,203,868	88,475,138
Marking	m	18,750	51	977	964,289	18,321,483	19,285,771
Sub-total of 1) to 5)					3,280,020,343	11,941,434,151	15,221,454,493
6) Indirect Cost					852,805,289	3,104,772,879	3,957,578,168
Toral Construction Cost					4,132,825,632	15,046,207,030	19,179,032,662
B. Engineering Service Cost							
Detail Design and Supervision (7% of A)					289,297,794	1,053,234,492	1,342,532,286
C. Contingency							
Price Escalation and Physical Change (10% of A)					413,282,563	1,504,620,703	1,917,903,266
Grand Total (A+B+C)					4,835,405,989	17,604,062,225	**22,439,468,214**

D. Government Administration Cost							
Cost for House Compenstaion and Replacement of Public Utilities					0	0	0
Administration Cost (1% of A)					0	191,790,327	191,790,327
Total Government Administration Cost					0	191,790,327	**191,790,327**

(3) Africana to Tegeta

Table 8.3.3 Project Cost (Africana – Tegeta)

Unit: Tshs

Work Items	Unit	Quantitiy	Unit Cost		Amount		
			F.C.	L.C.	F.C.	L.C.	Total
A. Construction Cost							
1) Earth Work							
Excavation	m3	77,248	6,848	1,712	528,971,513	132,242,878	661,214,392
Embankment	m3	28,614	1,929	482	55,209,678	13,802,420	69,012,098
2) Pavement Work							
Carriageway	m2	73,507	11,797	66,848	867,138,933	4,913,787,284	5,780,926,217
Shoulder	m2	5,200	11,797	66,848	61,342,763	347,608,988	408,951,751
Sidewalk	m2	27,768	2,896	16,410	80,415,271	455,686,538	536,101,809
3) Drainage Work							
Box Culvert (3.0x3.0m)	m	0	720,354	2,881,418	0	0	0
Box Culvert (4.0x4.0m@2)	m	0	1,970,831	7,883,326	0	0	0
Pipe Culvert (d=900mm)	m	340	78,788	709,089	26,787,791	241,090,123	267,877,915
Side Ditch (0.7x0.7m)	m	520	21,899	197,093	11,387,573	102,488,153	113,875,726
Side Ditch (V-shaped)	m	9,880	6,575	59,171	64,957,055	584,613,495	649,570,550
Side Ditch (L-shaped)	m	10,400	6,419	57,767	66,752,828	600,775,451	667,528,278
4) Bridge Structure							
PC Hollow Slab	m2	330	1,460,694	626,012	482,029,011	206,583,862	688,612,873
5) Road Facilities							
Curb for Median	m	10,400	1,313	24,945	13,654,267	259,431,072	273,085,339
Traffic Signal	no.	0	83,585,674	9,287,297	0	0	0
Bus Stop	m2	780	11,797	66,848	9,201,414	52,141,348	61,342,763
Marking	m	13,000	51	977	668,573	12,702,895	13,371,468
Sub-total of 1) to 5)					2,268,516,670	7,922,954,507	10,191,471,178
6) Indirect Cost					589,814,334	2,059,968,172	2,649,782,506
Toral Construction Cost					2,858,331,005	9,982,922,679	12,841,253,684
B. Engineering Service Cost							
Detail Design and Supervision (7% of A)					200,083,170	698,804,588	898,887,758
C. Contingency							
Price Escalation and Physical Change (10% of A)					285,833,100	998,292,268	1,284,125,368
Grand Total (A+B+C)					3,344,247,276	11,680,019,535	**15,024,266,810**

D. Government Administration Cost							
Cost for House Compenstaion and Replacement of Public Utilities					0	55,660,000	55,660,000
Administration Cost (1% of A)					0	128,412,537	128,412,537
Total Government Administration Cost					0	184,072,537	**184,072,537**

(4) Whole Section（Morocco to Tegeta）

Table 8.3.4 Project Cost (Whole Section, Morocco – Tegeta)

Unit: Tshs

Work Items	Unit	Quantitiy	Unit Cost		Amount		
			F.C.	L.C.	F.C.	L.C.	Total
A. Construction Cost							
1) Earth Work							
Excavation	m3	206,133	6,848	1,712	1,411,537,968	352,884,492	1,764,422,460
Embankment	m3	88,753	1,929	482	171,245,703	42,811,426	214,057,129
2) Pavement Work							
Carriageway	m2	243,983	11,797	66,848	2,878,190,624	16,309,746,868	19,187,937,492
Shoulder	m2	17,000	11,797	66,848	200,543,647	1,136,413,999	1,336,957,646
Sidewalk	m2	90,780	2,896	16,410	262,896,079	1,489,744,450	1,752,640,530
3) Drainage Work							
Box Culvert (3.0x3.0m)	m	34	720,354	2,881,418	24,492,051	97,968,204	122,460,256
Box Culvert (4.0x4.0m@2)	m	68	1,970,831	7,883,326	134,016,538	536,066,152	670,082,690
Pipe Culvert (d=900mm)	m	1,122	78,788	709,089	88,399,712	795,597,407	883,997,119
Side Ditch (0.7x0.7m)	m	2,990	21,899	197,093	65,478,542	589,306,881	654,785,423
Side Ditch (V-shaped)	m	31,010	6,575	59,171	203,878,368	1,834,905,313	2,038,783,681
Side Ditch (L-shaped)	m	34,000	6,419	57,767	218,230,399	1,964,073,588	2,182,303,987
4) Bridge Structure							
PC Hollow Slab	m2	814	1,460,694	626,012	1,189,004,893	509,573,526	1,698,578,419
5) Road Facilities							
Curb for Median	m	34,000	1,313	24,945	44,638,950	848,140,044	892,778,993
Traffic Signal	no.	3	83,585,674	9,287,297	250,757,022	27,861,891	278,618,914
Bus Stop	m2	2,550	11,797	66,848	30,081,547	170,462,100	200,543,647
Marking	m	42,500	51	977	2,185,721	41,528,694	43,714,415
Sub-total of 1) to 5)					7,175,577,765	26,747,085,035	33,922,662,800
6) Indirect Cost					1,865,650,219	6,954,242,109	8,819,892,328
Toral Construction Cost					9,041,227,984	33,701,327,144	42,742,555,128
B. Engineering Service Cost							
Detail Design and Supervision (7% of A)					632,885,959	2,359,092,900	2,991,978,859
C. Contingency							
Price Escalation and Physical Change (10% of A)					904,122,798	3,370,132,714	4,274,255,513
Grand Total (A+B+C)					10,578,236,741	39,430,552,759	**50,008,789,500**

D. Government Administration Cost							
Cost for House Compenstaion and Replacement of Public Utilities					0	845,020,000	845,020,000
Administration Cost (1% of A)					0	427,425,551	427,425,551
Total Government Administration Cost					0	1,272,445,551	**1,272,445,551**

8.3.2 Project Cost by Alternative

(1) Morocco to Tegeta

Table 8.3.5 Project Cost by Alternative (Morocco – Tegeta)

Section		Morocco - Mwenge			
Road Length (m)		4,300			
Road Width (m)		45.0	30.0	34.0	27.0
Cost (Tshs)	Construction Cost	10,990,762,656	11,782,120,336	10,722,268,782	10,640,716,490
	Engineering Service Cost	769,353,386	824,748,424	750,558,815	744,850,154
	Contingency	1,099,076,266	1,178,212,034	1,072,226,878	1,064,071,649
	Total Cost	**12,859,192,307**	**13,785,080,794**	**12,545,054,475**	**12,449,638,293**
	(Total Cost Converted to J.Yen)	1,150,347,976	1,233,175,413	1,122,246,069	1,113,710,400
	Cost / Km	2,990,509,839	3,205,832,743	2,917,454,529	2,895,264,719
	(Cost / Km Converted to J.Yen)	267,522,785	286,784,980	260,987,458	259,002,419
Government Administration Cost		**2,828,392,627**	**907,181,203**	**896,582,688**	**895,767,165**

* 1 Tshs = 0.089 J.Yen

Section		Mwenge - Africana			
Road Length (m)		7,500			
Road Width (m)		45.0	30.0	34.0	27.0
Cost (Tshs)	Construction Cost	20,011,449,323	21,316,984,874	19,179,032,662	18,808,373,972
	Engineering Service Cost	1,400,801,453	1,492,188,941	1,342,532,286	1,316,586,178
	Contingency	2,001,144,932	2,131,698,487	1,917,903,266	1,880,837,397
	Total Cost	**23,413,395,708**	**24,940,872,303**	**22,439,468,214**	**22,005,797,548**
	(Total Cost Converted to J.Yen)	2,094,497,984	2,231,141,839	2,007,373,109	1,968,578,124
	Cost / Km	3,121,786,094	3,325,449,640	2,991,929,095	2,934,106,340
	(Cost / Km Converted to J.Yen)	279,266,398	297,485,579	267,649,748	262,477,083
Government Administration Cost		**821,229,493**	**213,169,849**	**191,790,327**	**188,083,740**

* 1 Tshs = 0.089 J.Yen

Section		Africana - Tegeta			
Road Length (m)		5,200			
Road Width (m)		45.0	30.0	34.0	27.0
Cost (Tshs)	Construction Cost	13,366,343,520	14,360,099,504	12,841,253,684	12,619,715,177
	Engineering Service Cost	935,644,046	1,005,206,965	898,887,758	883,380,062
	Contingency	1,336,634,352	1,436,009,950	1,284,125,368	1,261,971,518
	Total Cost	**15,638,621,918**	**16,801,316,419**	**15,024,266,810**	**14,765,066,757**
	(Total Cost Converted to J.Yen)	1,398,988,104	1,502,999,557	1,344,029,586	1,320,842,262
	Cost / Km	3,007,427,292	3,231,022,388	2,889,282,079	2,839,435,915
	(Cost / Km Converted to J.Yen)	269,036,174	289,038,376	258,467,228	254,008,127
Government Administration Cost		**1,499,863,435**	**199,260,995**	**184,072,537**	**181,857,152**

* 1 Tshs = 0.089 J.Yen

Section		Whole Section (Morocco - Tegeta)			
Road Length (m)		17,000			
Road Width (m)		45.0	30.0	34.0	27.0
Cost (Tshs)	Construction Cost	44,368,555,498	47,459,204,714	42,742,555,128	42,068,805,639
	Engineering Service Cost	3,105,798,885	3,322,144,330	2,991,978,859	2,944,816,395
	Contingency	4,436,855,550	4,745,920,471	4,274,255,513	4,206,880,564
	Total Cost	**51,911,209,933**	**55,527,269,516**	**50,008,789,500**	**49,220,502,598**
	(Total Cost Converted to J.Yen)	4,643,834,064	4,967,316,809	4,473,648,764	4,403,130,786
	Cost / Km	3,053,600,584	3,266,309,972	2,941,693,500	2,895,323,682
	(Cost / Km Converted to J.Yen)	273,166,710	292,195,106	263,155,810	259,007,693
Government Administration Cost		**5,149,485,555**	**1,319,612,047**	**1,272,445,551**	**1,265,708,056**

* 1 Tshs = 0.089 J.Yen

(2) Tegeta to Mpiji

Table 8.3.6 Project Cost by Alternative (Tegeta – Mpiji)

Section		Tegeta - Mpiji			
Road Length (m)		17,800			
Road Width (m)		45.0	30.0	34.0	27.0
Cost (Tshs)	Construction Cost	47,017,054,139	49,794,641,353	44,761,946,201	43,712,348,732
	Engineering Service Cost	3,291,193,790	3,485,624,895	3,133,336,234	3,059,864,411
	Contingency	4,701,705,414	4,979,464,135	4,476,194,620	4,371,234,873
	Total Cost	**55,009,953,343**	**58,259,730,383**	**52,371,477,055**	**51,143,448,017**
	(Total Cost Converted to J.Yen)	4,921,039,127	5,211,755,242	4,685,008,295	4,575,152,195
	Cost / Km	3,090,446,817	3,273,018,561	2,942,217,812	2,873,227,417
	(Cost / Km Converted to J.Yen)	276,462,872	292,795,238	263,202,713	257,031,022

Government Administration Cost	470,170,541	497,946,414	447,619,462	437,123,487

* 1 Tshs = 0.089 J.Yen

(3) Bypass

Table 8.3.7 Project Cost by Alternative (Bypass)

Section		Bypass
Road Length (m)		18,100
Road Width (m)		27.0
Cost (Tshs)	Construction Cost	44,570,946,592
	Engineering Service Cost	3,119,966,261
	Contingency	4,457,094,659
	Total Cost	**52,148,007,513**
	(Total Cost Converted to J.Yen)	4,665,017,324
	Cost / Km	2,881,105,387
	(Cost / Km Converted to J.Yen)	257,735,764

Government Administration Cost	5,920,629,466

* 1 Tshs = 0.089 J.Yen

Chapter 9 Environmental and Social Considerations

9.1 Outline of Baseline Environmental and Social Conditions

In May and June 2008, several interview-based technical site visits were conducted along New Bagamoyo Road between Morocco and Mpiji (the road length of 35 km), and baseline information of current regional environmental and social conditions were collected. Based on the study results, the initial environmental examination ("IEE") of the proposed road improvement project was carried out. Table 9.1.1 summarizes this IEE result. More detailed descriptions of this IEE are attached in Appendix 9.1.

Table 9.1.1 Summary of IEE

Factors	Descriptions of Potential Impacts
Topography, geology, climate and flora/fauna	No steep slope/or cliff that would cause landslides exist around project site. Note that several quarries are located around Africana at both sides of current New Bagamoyo Road. Some slopes of those quarries do not have any slope-stabilization measures such as vegetations while have several minor on-going erosions. These unprotected slopes are very near to current New Bagamoyo Road and may cause some landslide event that would affect proposed road improvement project.
Eco-system, protected area	No rare and/or important flora/fauna species occur around project site. No important national parks/reserves exist either.
Noise/vibration	No environmental standards for noise/vibrations are implemented, yet. Roadside noise/vibration environment may be deteriorated during construction phase, mainly due to temporary increase of traffic volume to be caused by frequent delivery of construction material and/or traffic diversion. Similarly, roadside noise/vibration environment may be worsened after construction due to increase of traffic volume.
Air quality	No environmental standard for ambient air quality except emission standards from factory and/or vehicle is implemented, yet. Roadside air quality may be deteriorated during construction phase, mainly due to temporary increase of traffic volume to be caused by frequent delivery of construction material and/or traffic diversion. Similarly, roadside air quality may be worsened after construction due to increase of traffic volume. In the past, there was one regional air pollution problem, caused by dust emitted from cement factory of Tegeta.
Water quality	No large-scale river work (e.g., construction of new bridge/pier/or abutment and/or relevant river bank protection facilities) is to be carried out within this proposed road improvement project. Minor temporary water quality degradation may occur at nearby tributaries during construction phase.

Factors	Descriptions of Potential Impacts
Hydrology	No large-scale earthwork that would affect current regional drainage system around project site is to be carried out. The project will have a positive impact to reduce regional inundation/or flood events, in particular, roadside inundation events that occur around Tegeta during every rainy season, mainly due to current inadequate regional drainage system and rapid run-off water from nearby mountain. Note that riverside residential areas of Tegeta River, including current road bridge of New Bagamoyo Road, crossing Tegeta River, was severely flooded during El Nino of 1999.
Expropriation	Between Morocco and Mwenge (bar Lugaro Barracks), many houses/offices/shops and restaurants exist on both sides of current New Bagamoyo Road. Similar observation is made around Tegeta. No large-scale agricultural land exists around entire project site. It is likely that certain amounts of land expropriation shall be taken for this proposed road improvement project, in particular, area between Morocco and Mwenge. New Bagamoyo Road runs through Lugaro Barracks, and it is highly likely that some land expropriation shall be taken from this military base, too. A preliminary land expropriation study was conducted around both Morocco-Mwenge and Tegeta areas within this project formation study, and land expropriation impacts of each road improvement options（i.e., RoW=27m、30m、34m and 45m）are evaluated quantitatively. From this study, it is found that approximately 60 – 80 properties will be expropriated between Morocco and Mwenge (Note that complete demolition of house/office buildings are relatively less).
Current social infrastructures and services	New Bagamoyo Road, connecting CBD of Dar Es Salaam and Kinondoni Municipality, is one of key arterial roads around Dar Es Salaam. Most popular commuting mode is daladala bus, and several taxi and/or rick-show sub stations exist around major bus stops and/or bus terminals. Current traffic volume of New Bagamoyo Road between Morocco and Mwenge is huge (i.e., beyond road capacity) and chronic traffic congestion is one of the important issues to be solved promptly. Overall socio-economic activities along this road are very active, and it is imperative to prepare appropriate mitigation measures not to disturb these activities during construction phase. According to study results of socio-cultural opinion survey, conducted within Urban Transport M/P Study of 2007 (JICA), it was found that approximately 70% of interviewees complained that crossing wide roads such as Morogoro Road is very dangerous for pedestrians. So, safe road crossing measures shall be prepared within this road improvement project. Malaria is rampant around project site, so it is essential to prepare appropriate Malaria-prevention program for the construction workforce. Rehabilitation project of high voltage power cable line (JICA) is in progress between Morocco and Mwenge. It is essential to establish engineering integrity with this on-going power cable project.
Cultural Heritage, indigenous people and/or minority.	No important archeological/historical/cultural and/or monument exist. No community of minorities/or ethnic tribes exist around the project site.

9.2 Preliminary Land Expropriation Study

9.2.1 Outline

A preliminary land expropriation study was carried out in order to quantitatively evaluate the order of the magnitude of the land expropriation impacts to be caused by this road improvement project. From the technical site visits, mentioned earlier, it was found that certain amounts of private properties such as fences and/or lands (i) from Morocco to Mwenge and (ii) at Tegeta will be expropriated for this proposed road improvement project. Table 9.2.1 summarizes the project design alternatives, prepared within this road improvement study (see Chapter 6 for more detailed descriptions of each alternative). Table 9.2.2 summarizes the survey outline of this study.

First of all, the initial review of entire roadside properties of New Bagamoyo Road excluding Tegeta-Mpiji was carried out, using the latest aerial photographs (L = 17 km, pictures taken in 2004), and the significance of possible land expropriation impacts to be caused by the proposed project were checked.

Based on this reconnaissance work and remarks obtained from technical site visits, survey sites for the measurement-based study were chosen. In this survey, direct measurements of each roadside property from the road centerline were carried out around two targeted road sections such as (i) Morocco – Mwenge and (ii) Tegeta mentioned above, and the inventory of private properties (e.g., owners, schematic diagram and features of properties to be expropriated) was summarized.

Table 9.2.1 Project Alternatives

Alternatives	Engineering Options	ROW (m)
A	4-lane widening + BRT space	45
B	4-lane widening + BRT space (Minimum cross section width)	30
C	4-lane widening + BRT space (Adopting open side ditch for cost saving)	34
D	4-lane widening	27
E	Bypass (Widening and extension of Old Bagamoyo Road)	27
F	Zero option	-

Table 9.2.2 Outline of this Preliminary Land Expropriation Study

Survey Team Member	1 Lead Consultant and 4 Assistant Surveyors
Survey Area	Morocco－Mwenge（Approximately 100 properties）, Tegeta（170 properties）
Survey Period	Morocco－Mwenge（June/02 – June/06, June/20 – June/26） Tegeta（June/09 – June/13）

9.2.2 Results

Table 9.2.3 summarizes the number of roadside properties to be affected by this proposed project. It is noted that ”all affected properties”, summarized in this table, covers all properties such as houses and/or office buildings as well as surrounding fences and/or walls. Currently, the rehabilitation project of the high-voltage power cable lines, connecting Msasani Peninsula and Mwenge Power Substation, is on-going and the new power cable line will partially run through the roadside between Victoria and Mwenge along New Bagamoyo Road. In this power-cable rehabilitation project, it is highly likely that several roadside private houses and/or properties will be expropriated. The grid-related expropriation process is to be implemented before the implementation of this proposed project. Hence, the partial valuation of the area to be affected by the power cable rehabilitation project is not counted within this preliminary land expropriation study（see Section 7.4 for more detailed information of the power-cable rehabilitation project）.

From this table, it can be seen that certain roadside properties around Morocco – Mwenge and Africana – Tegeta will be affected by the proposed project. In particular, 45 m – design alternative option will affect 76 and 92 properties around Morocco – Mwenge and Africana – Tegeta, respectively.

Also, it is found that most of affected properties around Morocco – Mwenge and Mwenge - Africana are classified as fences and/or walls, and direct impacts on house/or offices buildings therein are

relatively less. This may be due to the fact that most private estates around those areas have approximately 10 meters-wide open space and/or garden around the houses and/or office buildings, and those building are constructed at relatively distant places from the current New Bagamoyo Road. On the other hand, land expropriation impacts on private properties around Africana – Tegeta for 45-m road design alternative option are significant. Most of affected properties therein are classified as roadside kiosks and/or shops around Tegeta.

Table 9.2.3 Roadside Affected Properties

ROW		27/30 m	34 m	45 m
Morocco－Mwenge	All Affected Properties	55	70	76
	House/Office Building	1	2	4
	Kiosk	0	2	2
Mwenge－Africana	All Affected Properties	0	0	6
	House/Office Building	0	0	1
	Kiosk	0	0	5
Africana－Tegeta	All Affected Properties	3	7	92
	House/Office Building	1	2	10
	Kiosk	2	5	74

9.2.3 Expropriation-related Cost Estimate

Based on the inventory of roadside properties affected by the proposed road improvement project, summarized in previous section, a preliminary valuation of the compensation cost required for entire expropriation was carried out. Note that the Morogo BRT-related compensation unit cost, described in Section 9.4.3 later, is used for this valuation. Also, allowances for disturbances, transportation, accommodation as well as the temporary profit loss for kiosks are not calculated within this valuation due to the lack of relevant information. Table 9.2.4 summarizes valuation results for each design alternative.

Table 9.2.4 Preliminary Valuation for Expropriation

(Tsh million)

	27/30 m	34 m	45 m
Morocco － Mwenge	624	1,168	2,149
Mwenge －Africana	0	0	491
Africana － Tegeta	44	124	1,080
Total	668	1,292	3,720

Note 1: Compensation unit cost of Tsh 500,000/m^2 (used in BRT project) is used for the demolition of houses/buildings

Note 2: Compensation unit cost of Tsh 100,000/m^2 (used in BRT project) is used for the demolition of kiosk.

Note 3: Compensation unit cost of Tsh 180,000/m (used in BRT project) is used for the demolition of fences/or walls.

Note 4: Compensation unit cost of Tsh 50,000/m^2 (used in BRT project) is used for the expropriation of land/or open space (e.g., parking space).

9.3 Environmental Legal Framework and Administration

9.3.1 Environmental Administration System

(1) Outline

The highest organizations responsible for environmental administration in Tanzania are National Environmental Advisory Committee (NEMC) and the Minister of State Responsible for Environment. Those two belong to Vice President's Office. It should be noted that no ministry directly responsible for the environmental administration on the national level exists in Tanzania. Instead, the Minister of State Responsible for Environment commands and supervises following two environmental subsections: (i) Division of Environment, and (ii) National Environment Management Council (NEMC). Major roles and functions of relevant environmental organizations are briefly described below. Minutes of interviews with each environmental organization, carried out within this project formation study, are attached as Appendix 9.3.1.

(2) National Environmental Management Committee（NEMC)

This Council, established in 1993, has approximately 50 environmental staff. NEMC is responsible for undertaking of enforcement, compliance, review and monitoring of the environmental impact assessment (EIA), and, in that regard, they facilitate public participation for environmental decision-making, and exercise general supervision and coordination for all environmental issues. There are seven major directorates as follows:

1) Directorate of General
2) Directorate of EIA
3) Directorate of Environmental Planning and Research
4) Directorate of Environmental Compliance and Enforcement
5) Directorate of Environmental Information, Communication and Outreach
6) Legal Affair
7) Finance and Administration

Source）http://www.nemctan.org

(3) Environmental Division of Vise President's Office

This Division has responsibility for the coordination of various environmental management activities being taken by other agencies. This Division integrates environmental considerations into development policies, plans, programs, strategies and projects, and undertakes the strategic environmental assessment (SEA). No interview or discussion with this division, regarding the proposed project was conducted within this project formation study, since this is a road improvement project of an existing road.

(4) Environmental Section of MoID

There is one environmental section within the Ministry of Infrastructure and Development (MoID). Basically, one permanent environmental staff with four part-time staff from Policy and Planning

Section of MoID are in charge of all EIA-related issues associated with infrastructure development projects, supervised by MoID.

(5) TANROADS

No official environmental section or unit exists within the current organization chart of TANROADS, but five permanent environmental staff (including one sociologist) are working at the planning division and are in charge of all EIA-related issues associated with road development projects, supervised by TANROADS.

(6) Dar Es Salaam University, Institute of Resources Assessment (IRA)

This Institute is the successor of the former Bureau of Resource Assessment and Land Use Planning (BRALUP), which was established as an applied research wing within the University of Dar es Salaam (UDSM) in 1967. Its main objective was to support the Government of Tanzania in planning and assessment of both human and natural resources in 1967. In July 1982, BRALUP was upgraded to an institute of the UDSM, and then, IRA was established in accordance with the UDSM Act of 1970. Currently, this institute is in charge of the research and the development of the sustainable development of natural resources in Tanzania as well as consultation for the improvement of relevant environmental legal framework (e.g., implementation of EIA, SEA and environmental standards).

9.3.2 Environmental Laws and Guidelines

Basically, GN. No. 20 of 2004 is the core environmental code in Tanzania (see Appendix 9.3.2 for more detailed descriptions about this code). Based on this code, two relevant environmental laws (GN. No. 348 of 2005 and GN. No.349 of 2005) were created. Recently, several environmental standards such as emission and effluents were approved in December of 2007 in Tanzania. More detailed descriptions of those newly approved environmental standards are attached in Appendix 9.3.2.

9.4 Land Laws

9.4.1 Expropriation-related Legal System

In Tanzania, the Land Expropriation Act of 1967 is a key land code for development-related expropriation. Land Act of 1999 declares that all lands in Tanzania are regarded as public properties. Beside this code, there is another law, entitled as “Tanzania Village Land Act of 1999”, that regulates the management of land properties of rural areas. Outline of relevant land expropriation law, implemented in Tanzania, is described in Appendix 9.4.1.

9.4.2 Land Expropriation Process

Relevant information of a recent land expropriation process, implemented in Tanzania, was collected through a series of consultation processes with the Ministry of Lands, Housing and Human Settlements

Development and Dar Es Salaam City Council. Based on this information, the latest land expropriation procedure, implemented in Tanzania, is described as follows:

1. Identify PAPs based on B/D
2. Meeting with Ward/Sub-ward Leaders and owners of PAPs in each Ward.
3. Valuation of PAPs
4. Preparation of Valuation Report and Compensation Plan.
5. Joint Review of Valuation Report by Consultant and Municipal Valuers.
6. Submission of Valuation Report to Chief government Valuer for the approval.
7. Returning of Approved Report to relevant Municipal Council.
8. Submission of Report to Land Officers and Ward Executive Officers for their approval.
9. Submission of report to relevant District Commissioner for the approval.
10. Submission of Report to Dar Es Salaam Regional Commissioner for the approval.
11. Returning of fully-signed report to relevant Municipal Land Officers and the payment for the compensation is made ready.
12. Issue of permission to start the payment.
13. Payment of Compensation starts.
14. Completion of expropriation-related Negotiation

Large-scale expropriation has taken place within the Morogoro BRT Project, supervised by DART（Dar Es Salaam Rapid Transit） Agency. From the interview with DART, it was found that it took approximately 1 year to complete all relevant land expropriation processes required for this BRT project (see Appendix 9.4.2 for more detailed descriptions about this BRT-related expropriation schedule).

9.4.3 Cost Units for Compensation

As described in relevant land expropriation law (see Appendix 9.4.1 for more detailed information of this law), it is legally declared that unit costs to be used for the valuation of the compensation shall accurately reflect current real estate market prices around the project site. As mentioned earlier, unit costs, used in Morogoro BRT project, were used for the valuation of the land expropriation required for the proposed road improvement project. Compensation unit prices, used within Morogoro Road BRT project are relatively higher than other usual compensation cases of the similar scale of development projects carried out in Tanzania.

9.5 Environmental Screening and Scoping

9.5.1 Project Outline and Site Descriptions

Tables 9.5.1 and 9.5.2 summarize Project Description (PD) and Site Description (SD), respectively.

Table 9.5.1 Project Description (PD)

Item	Descriptions
Background	Need to alleviate chronic traffic congestion, improve regional transport system and re-vitalize regional economy around northern part of DSM.
Objectives	To improve overall road functions of New Bagamoyo Road, one of key arterial urban road across DSM.
Site	Kinondoni Municipality of Dar Es Salaam
Project Owner	Ministry of Infrastructure Development (MoID)
Population to be benefitted.	Population of DSM = 3 million (approximately) Population of Kinondoni Municipality = 1 million (approximately)
Project Outline	
Type of Project	Road improvement
Type of Road	Arterial Road connecting CBD and Kinondoni Municipality
Target Year／Traffic Demands	Year 2007: 21,100 PCU/day （at Mwenge） Year 2015: 47,600 PCU/day （at Mwenge, under Do-project scenario） Year 2030: 75,700 PCU/day （at Mwenge, under Do-project scenario）
Distance／Width／Vehicle Lane	Total Distance = 35 km Road Width = 27－45 m (5 alternatives) Number of Vehicle Lanes = 4 or 6 lanes
Relevant Facilities	Interchange: N/A Toll Gate: N/A Others: 1 bus terminal (Mwenge Bus Terminal)
Miscellaneous	BRT projects at several major arterial roads such as New Bagamoyo Road are under consideration and WB-funded BRT Project for Morogoro Road is in progress. Improvement work of Mwenge Intersection, part of EU-funded San-Nujoma Road Improvement Project, is in progress. New Bagamoyo Road runs through Lugaro Military Barracks.

Table 9.5.2 Site Descriptions (SD）

Item	Descriptions
Socio-Cultural Environment	
Community (residents /minority/ awareness to the proposed project and others)	Existence of the poor and/or ethnic minority is not reported around entire project site. People commute from Kinondoni (e.g., Tegeta) to CBD of Dar Es Salaam, via New Bagamoyo Road and usually spend about three hours for one-way commuting due to chronic traffic congestion.
Land Use (urban/ rural/historical sites/ scenic places/ hospitals and others)	No illegal squatters stay within current RoW of New Bagamoyo Road. Between Morocco and Mwenge, many houses/offices/shops/hospital/GS and restaurants exist on both sides of current New Bagamoyo Road (land use type is classified as residential/commercial mixed one). Lugaro Military Barracks exists on both sides of road between Mwenge and Mbezi. Land use between Mbezi and Tegeta is also classified as residential/commercial mixed type. No large-scale agricultural land exists around entire project site. One resort place (e.g., White Sand Beach), exists at the coastline of Mbezi. No important archeological/historical/cultural/monumental place exist around project site.
Regional economy/ transport condition (commercial / agricultural activities, industrial park/ bus terminal and others)	Many houses/offices/shops and/or restaurants exist on both sides of current New Bagamoyo Road. One bus terminal exists at the corner of Mwenge Intersection. Several taxi and rick-show sub stations exist around major bus stops, intersection and bus terminal.

Item	Descriptions
Bio-Physical Environment	
Topography/Geology (e.g., Cliff, Steep slope, floodplain, marsh, wetland/fault lines)	Most project routes run through coastal hilly terrain. Between Mwenge and Tegeta, several mountainous areas exist. Abundant greenery areas exist around Lugaro Military Barracks. Several quarries are located around Africana on both sides of current New Bagamoyo Road. Slopes of those quarries do not have any slope-stabilization measures such as vegetations and have several minor on-going erosions. Several tributaries run across project site and large amount of deposition, mainly consisting of fine sand, are recognized. It is recommended to carry out relevant hydrological study for the design of appropriate bridge clearance for safe passing of river flows during rainy season. Occurrence of temporal roadside inundation/or flood events are recognized along entire project site during the rainy season. In particular, significant regional flood/or inundation, mainly due to poor regional drainage system and rapid run-off from nearby mountains, are reported around Tegeta during rainy season. Several on-going erosions are recognized at several road shoulders/or cutting slopes around Mpiji.
Important flora/fauna (e.g., national parks, occurrence of rare/or endangered species).	N/A
Pollutions	
Complaints	Chronic traffic congestion
Mitigations	N/A
Miscellaneous	Construction of continuous roadside walls along New Bagamoyo Road, inside of Lugaro Barracks, is under consideration.

9.5.2 Environmental Screening and Scoping

Preliminary environmental studies including environmental screening and scoping for the proposed road improvement project were conducted based on JICA Guideline for Social and Environmental Considerations ("JICA Guideline"). Note that quantitative evaluation and comparative studies for all design alternative options (i.e., Options A - E, summarized in Table 9.2.1), regarding major environmental issues except expropriation, are difficult at this early planning stage of this project cycle. Hence, the environmental screening and scoping work are carried out for common environmental features to be associated with each design alternative options. Tables 9.5.3 and 9.5.4 summarize environmental screening results. Based on this, the environmental scoping was carried out in order to identify possible environmental negative impacts to be caused by this proposed project (see Table 9.5.5). Those identified potential environmental issues will be addressed within relevant EIA study to follow in the next stage of this proposed project. Table 9.5.6 summarizes results of overall preliminary environmental evaluation for this proposed project. Environmental checklist (JBIC-format) for this proposed project is attached as Appendix 9.5.

Table 9.5.3 Natural Environmental Screening for New Bagamoyo Road Improvement Project

Factor	Descriptions	Evaluation	Remarks
1. Air Quality	Increased roadside air pollution during and/or after construction phase.	Yes	Roadside A/Q would be deteriorated due to traffic volume increases during/after construction phase.
2. Water Quality	Risk of pollution to major tributaries.	Unknown	Minor temporary water quality degradation may occur around nearby tributaries during construction phase.
3. Soil and Sedimentation	Potential for soil erosion. Occurrence of new sedimentation at downstream side.	Yes	Soil erosion may cause accidental spill of mud and/or soil from construction sites into nearby tributaries and cause additional sedimentation.
4. Waste Disposal	Generation of large amounts of construction wastes.	Yes	Likely to have large amounts of construction wastes.
5. Noise/Vibration	Increased roadside noise and vibration during and/after construction phase	Yes	Roadside noise/vibration would increase due to traffic volume increases during/after construction phase.
6. Ground Subsidence	Potential of large-scale consolidation due to earthwork	No	N/A
7. Bad Smell	Potential of new creation of bad smell.	Unknown	Detection of obnoxious decaying vegetation smell, originating from long-term inundated places.
8. Topography/Geology	Partial road inundation due to poor drainage of road surface run-off water. Disturbance of local drainage system	Unknown	Slopes of quarries, located around Africana, do not have any slope-stabilization measures and have several minor on-going erosions. These unprotected slopes are very near to current New Bagamoyo Road and may cause some landslide event that would affect the proposed project. Several tributaries run across project route and regional flood events have occurred during past rainy seasons. Frequent roadside inundations occur (in particular around Tegeta) during rainy season.
9. Riverbed	Disturbance to riverbed condition.	Unknown	There may be minor change in riverbed condition caused by accidental spill of mud and/or soil from construction sites into nearby tributaries.
10. Flora/Fauna	Destruction of roadside vegetation and/or habitat	No	N/A
11. Water Resources	Disturbance to regional groundwater flow.	No	No important groundwater recharge area/or wells exist.
12. Accidents	Potential of increased traffic accidents	Unknown	N/A
13. Global Warming	Increased CO_2 emission.	Unknown	N/A

Table 9.5.4 Social Environmental Screening for New Bagamoyo Road Improvement Project

Factor	Descriptions	Evaluation	Remarks
14. Involuntary Resettlement	Temporary use of land space during construction phase. Land expropriation due to construction. Demolition of roadside houses.	Yes	Many houses/offices/shops and/or restaurants as well as military barracks exist on both sides of current New Bagamoyo Road. It is likely that certain amounts of land expropriation shall be conducted for this proposed project.
15. Local Economy	Possible impact on local employment and livelihood (e.g., street vendors).	Yes	Regional economic/social activities maybe hampered due to temporary traffic congestion during construction phase.
16. Land use and Utilization of local Resources	Conflict with current local land use or development plans.	No	N/A
17. Social Institutions	Possible Impact on social infrastructure and local decision-making institutions.	No	N/A
18. Existing social infrastructures and services	Conflict with current local transport (e.g., daladala bus) system. Conflict with current local energy/ communication/water supply system.	Yes	Service level of existing infrastructure as well as activities of Lugaro Barracks may be hampered due to temporary traffic congestion during construction phase. Many cables, water pipes and other important lifeline facilities are buried along New Bagamoyo Road. Rehabilitation Project of high voltage power cable line is in progress along New Bagamoyo Road between Victoria and Mwenge.
19. The poor, indigenous ethnic group	Existence of ethnic minority around the site.	No	N/A
20. Misdistribution of benefit and damage	Risk of possible damages/or negative impacts concentration/or localization.	No	N/A
21. Local Conflict of interests	Conflicts between regional environmental conservation and development.	No	N/A
22. Gender	Risk of WID-related issues	No	N/A
23. Children's Rights	Risk of illegal child laborers (e.g., street vendors).	No	N/A
24. Cultural Heritages	Conflict with setting of historical, cultural or monument sites.	No	N/A
25. Infectious Diseases (e.g., HIV/AIDS)	Risk of HIV/AIDS, Dengue, Malaria and other Insect-borne diseases for construction workers.	Unknown	Malaria is rampant and need to prepare anti-Malaria program for construction workforce.

Table 9.5.5 Environmental Scoping for New Bagamoyo Road Improvement Project

Factor	Evaluation	Descriptions
1. Air Quality	B	Roadside A/Q would be deteriorated due to traffic volume increases during/after construction phase.
2. Water Quality	C	Minor temporal water quality degradation may occur around nearby tributaries during construction phase.
3. Soil and Sedimentation	B	Minor sedimentation at nearby tributaries may occur during construction phase.
4. Waste Disposal	B	It is highly likely to have large amounts of construction wastes.
5. Noise/Vibration	B	Roadside noise/vibration would be deteriorated due to traffic volume increases during/after construction phase.
6. Subsidence	D	N/A
7. Bad Smell	B	There may be new obnoxious decaying vegetation - related smell problem due to additional long-term roadside inundations.
8. Topography/ geology	B	Slopes of quarries, located around Africana, do not have any slope-stabilization measures and have several minor on-going erosions. These unprotected slopes are very near to current New Bagamoyo Road and may have negative impacts on proposed road improvement project. Frequent roadside inundations due to both rapid run-off water from nearby mountains poor regional drainage system occur around Tegeta during rainy season. Run-off water collected from regional drainage system including road surface of New Bagamoyo Road is to be discharged into nearby tributaries around Tegeta, it may worsen regional floods during rainy season. It is essential to integrate drainage of road surface run-off water into appropriate regional drainage system as well as carry out relevant hydrological study to examine river section and/or flow capacities of nearby tributaries.
9. Riverbed	B	Minor changes in regional riverbed condition may occur due to accidental spill of soil and/or mud from construction site during construction phase.
10. Flora/Fauna	D	N/A
11. Water Resources	D	N/A
12. Accidents	C	Entire transport condition along New Bagamoyo Road will be improved, but severe traffic accidents due to unsafe driving (e.g., frequent violation of speed limit as side effect of road improvement) may be increased. Road crossing for pedestrian would be difficult and unsafe due to road widening to be carried out within this road improvement project, so it is essential to prepare safe road crossing measures.
13. Global Warming	C	It is essential to carry out regional CO2 emission loading study for New Bagamoyo Road Improvement Project.
14. Involuntary Resettlement	B	Many houses/offices/shops and/or restaurants exist at both sides of current New Bagamoyo Road. It is likely that certain amounts of expropriation shall be conducted for this proposed road improvement project. Note that most of properties to be expropriated are wall and/or fence.
15. Local Economy	B	Regional economic/social activities maybe hampered due to temporal traffic congestion, expropriation, resettlements of key facilities during construction phase.
16. Land use and Utilization of local Resources	D	N/A
17. Social Institutions	D	N/A
18. Existing social infrastructures and services	B	Service level of existing infrastructure as well as activities of Lugaro Barracks may be hampered due to temporal traffic congestion during construction phase. Many cables, water pipe and other lifeline facilities are buried along New Bagamoyo Road. It is essential to prepare appropriate relocation schedule of those facilities to minimize impacts on surrounding communities.
19. The poor, indigenous of ethnic group	D	N/A

Factor	Evaluation	Descriptions
20. Misdistribution of benefit and damage	D	N/A
21. Local Conflict of interests	D	N/A
22. Gender	D	N/A
23. Children's Right	D	N/A
24. Cultural Heritage	D	N/A
25. Infectious Disease	B	Malaria is rampant, and infections of those insect-borne diseases to construction workers may cause several delays to entire construction activities.

Note A: Significant, B: Minor, C: Unknown and need further relevant studies for its evaluation, D: Less significant or None (i.e., no need to carry out IEE and/or EIA Study).

Table 9.5.6 Overall Environmental Evaluation for proposed New Bagamoyo Road Improvement Project

Factor	Evaluation	Remarks
1. Air Quality	B	Carry out field A/Q study to obtain baseline A/Q condition. Carry out periodical roadside A/Q monitoring study while proper I/M of construction machinery/or trucks shall be conducted during construction phase.
2. Water Quality	C	Carry out field W/Q study to obtain baseline W/Q (surface/sub-surface waters) condition. Carry out periodic W/Q monitoring study during construction phase. Prepare appropriate sedimentation ponds around construction sites.
3. Soil and Sedimentation	B	Carry out field soil survey to obtain baseline soil data and check if soil-contaminated sites exist or not. Prepare appropriate sedimentation ponds around construction sites.
4. Waste Disposal	B	Establish appropriate waste disposal program (e.g., adequate location of disposal sites and treatment program).
5. Noise/Vibration	B	Carry out field noise study to obtain baseline noise condition. Establish sound construction schedule that avoid any nighttime construction activities.
7. Bad Smell	B	Lessen/or eliminate the occurrence of long-term inundation that may be additional source of decaying vegetation-related obnoxious smell by establishing proper regional drainage system.
8. Topography/ Geology	B	Implement proper slope-stabilization measures at quarries to minimize risk of landslide to be caused by on-going erosion. Carry out relevant hydrological study to check if regional river systems have enough capacity to discharge run-off water collected from river basin including road surface around Mwenge – Tegeta region. Design appropriate regional drainage system around Tegeta to alleviate roadside inundation issues.
9. River bed	B	Prepare appropriate sedimentation ponds around construction sites (same to second remark of Factor 3).
12. Accidents	C	Establish appropriate traffic management and driver education programs. Also, need to prepare safe road crossing measures for pedestrians.
13. Global Warming	C	Carry out regional CO2 emission loading study for New Bagamoyo Road Improvement Project.
14. Involuntary Resettlement	B	Carry out comprehensive DMS based on finalized B/D and prepare appropriate RAP and compensation program.
15. Local Economy	B	Carry out comprehensive socio-cultural-economic studies to obtain baseline information of current socio-cultural-economic activities along New Bagamoyo Road (e.g., regional employment structure, access to markets, school, hospital and others). Based on these study results, relevant mitigation measures to minimize temporal negative impacts on those activities shall be prepared. Prepare appropriate engineering designs and construction plans to avoid interrupting activities of Lugaro Barracks.
18. Existing social infrastructures and services	B	
25. Infectious Disease	B	Prepare appropriate health awareness program (e.g., HIV/AIDS, Malaria) for construction workforce.

9.6 Outline of EIA Examination Process

9.6.1 EIA Examination Process for New Bagamoyo Road improvement Project

Basically, entire EIA examination process in Tanzania consists of following four (4) steps:

(i) Project registration and screening by NEMC.
(ii) Selection of EIA consultants, ToR development and its approval by NEMC
(iii) Relevant environmental studies and the preparation of EIS report
(iv) EIS evaluation and its environmental license approval by NEMC

The following are the outline of the IEE/EIA Examination steps.

1) Submit an official application form for an environmental impact assessment certificate to NEMC with three (3) copies of the project brief that summarizes the project outline and its surrounding bio-physical and socio-cultural environment. EIA application fee is Tsh 20,000.

2) NEMC starts the screening of submitted project brief and qualitatively evaluates the magnitude of possible negative impacts caused by the proposed project. This project brief evaluation takes at most forty five (45) days.

3) Then, the project owner (i.e., MoID) shall submit both scoping report and ToR (draft) for EIA-related study to NEMC. The scoping report and EIA-ToR shall be prepared by the registered EIA consultant/or experts (see Appendix 9.6 for more detailed information about the list of EIA consultants/or experts registered at NEMC). This means that the project owner shall select appropriate EIA consultants at the early stage of this EIA application process.

4) Once the draft ToR of relevant EIA-related environmental studies is approved by NEMC, the project owner can initiate EIA study based on this approved ToR. This EIA-related study shall be conducted by selected EIA consultants/or experts.

5) During the EIA study period, the project owner shall conduct relevant PAPs identification work and discuss the necessity of public meetings with NEMC.

6) Based on study results of EIA study, the project owner shall prepare the Environmental Impact Statement ("EIS"). This EIS shall be signed by each of individuals involved with all assessment works. The project owner shall submit fifteen (15) sets of original copies and one (1) electronic copy of an EIS to NEMC.

7) Examination of submitted EIS report is conducted by a cross-sectoral technical advisory committee, set up by NEMC. Within the fourteen (14) days of the receipt of the EIS report, NEMC submit a copy to any relevant Ministries and public institutes. Also, the project owner shall prepare for the public reviews of submitted EIS reports in order to collect questions/ opinions/comments and/or advices from all relevant stakeholders.

8) Comments from line ministries and public institutes are to be summarized within thirty (30) days of the receipt of the EIS report. Upon considering the overall features of the proposed project, this examination period may be extended by NEMC.

9) NEMC will undertake the review of submitted EIS. Meantime, NEMC may arrange on-site technical visits with the project owner. It shall be noted that its travel expense and the per diem shall be paid by the project owner.

10) Based on comments and study results obtained from the technical site visits, the technical advisory committee may order the project owner to revise the submitted EIS report and/or to conduct supplemental environmental studies. After completing those supplemental works and/or revising, the project owner shall prepare the EIS (Final) report, and then, submit it to NEMC.

11) NEMC will prepare the review report of submitted EIS (Final) report, and then, forward this report to the Minister. Within thirty (30) days of receiving this review report from NEMC, the Minister will give his decision if the environmental license of the development project of interest is approved or not.

Figure 9.6.1 shows the schematic diagram of the entire environmental license approval process for the infrastructure development project. Table 9.6.1 summarizes a tentative schedule of EIA examination process for this road improvement project. As shown in this table, it is assumed to take approximately ten (10) months to complete entire EIA application process. Within this time, both EIA study and EIS documentation process would take about four (4) months.

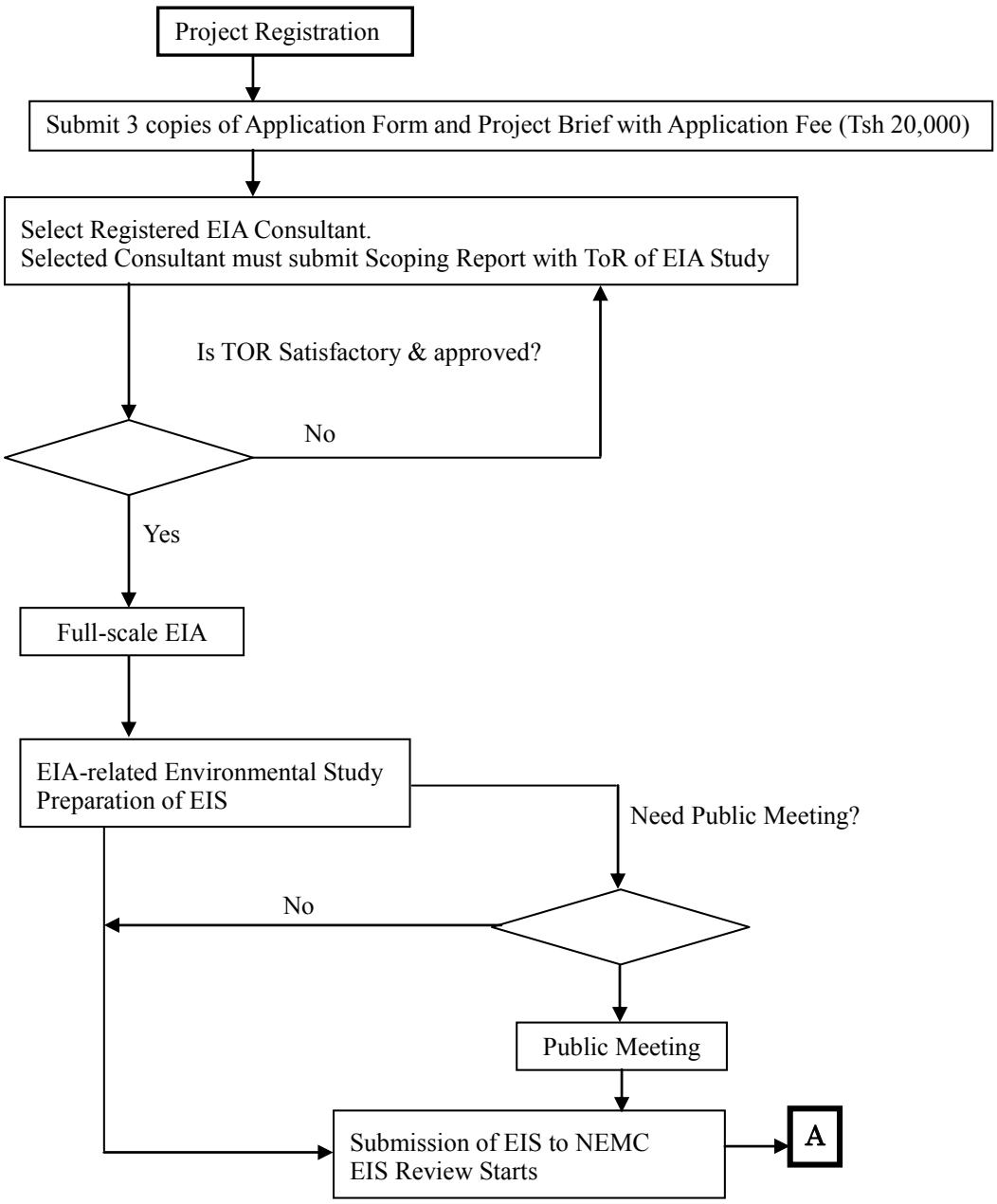


Figure 9.6.1 Environmental License Approval Process in Tanzania

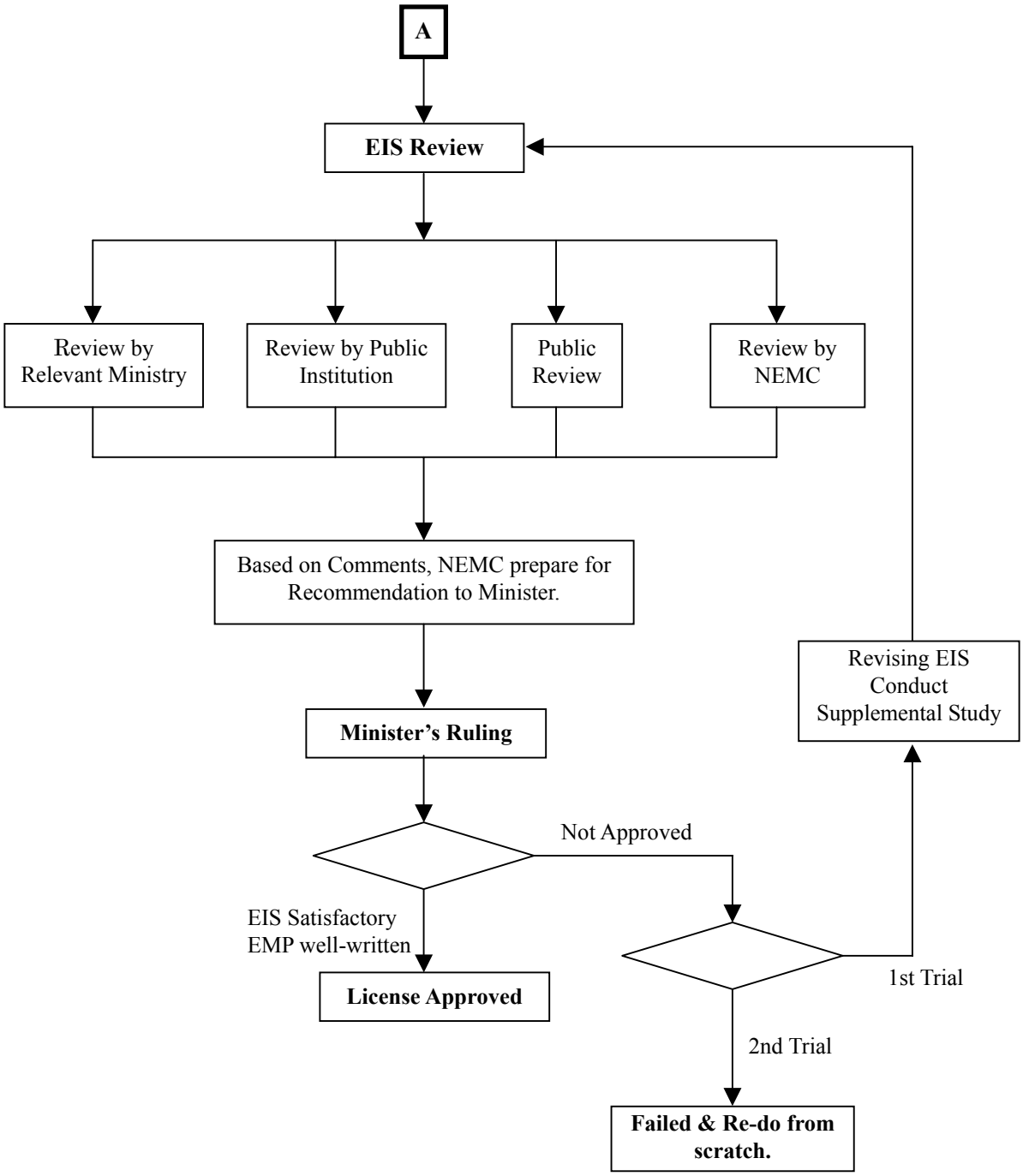


Figure 9.6.1 Environmental License Approval Process in Tanzania (Continued)

Table 9.6.1 Tentative Schedule of Environmental License Application Process

	2008			2009								
	10	11	12	1	2	3	4	5	6	7	8	9
1. Project registration & environmental screening	―											
2. Selection of EIA experts		―										
3. Preparation of scoping report				―								
4. Development of ToR for EIA Study				―								
5. EIA-related Study				- - -	- - -	- - -	- - -	- - -				
6. Public Involvement					☆			☆				
7. Submission of EIS（D/F） Report, and its examination starts.									―			
8. NEMC Site Visit										―		
9. Revising of EIS（D/F） Report, Supplemental Study if necessary. Preparation of EIS Final Report.											―	
10.Approval of Environmental License												―

＊1: EIA-related study shall be conducted based on EIA - ToR (final) approved by NEMC. Here, it is assumed that entire EIA study, covering from the initiation of EIA studies to preparation/submission of EIS Report (D/F) takes about four (4) months. Also, it is assumed that it takes about one (1) month for revising submitted EIS (D/F) Report and implementation of supplemental environmental studies if requested and preparation of EIS (Final) Report (note: this process usually takes one (1) – two (2) months within similar EIA application processes conducted in other countries).

＊2: Outline and exact schedule of JICA Guideline-based stakeholder meetings and relevant PI-related activities shall be determined through consultations with NEMC, MoID, JICA and line Ministries. Note that the 1st stakeholder meeting was held in June of 2008 within this project formation study.

9.6.2 Technical Supports for EIA Application Process (as of June, 2008)

Major technical assistances, conducted within the EIA application process of this New Bagamoyo Road Improvement Project, are described as follows:

1. Discussion with MoID C/P about a successful EIA application process of this road improvement project
2. Briefing of this proposed road improvement project at NEMC as well as collection of the latest information of EIA application process in Tanzania
3. Preparation of EIA Application Form (draft)
4. Development of ToR (draft) for EIA-related studies.

As described earlier, the environmental scoping report and ToR for EIA studies（Steps 3 and 4 of Table 9.6.1）, required for the official EIA evaluation, shall be prepared by EIA experts/or consultants, registered at NEMC. According to the memorandum exchanged between MoID and JICA Study Team (dated on June 26, 2008), it is documented that MoID will take responsibility for all relevant

works required for the environmental approval process (e.g., the project registration, selection of EIA experts, implementation of EIA studies and other relevant works) of this road improvement project. Hence, after MoID obtain the budget for the EIA-related studies, including EIA application fee, MoID is to select EIA experts/or consultant and initiate all relevant works, based on the flowchart described in Table 9.6.1. The following are key components of ToR (draft) for EIA-related studies, prepared by the JICA Study Team:

- Development of ToR (final) through consultations with NEMC
- Collection of the baseline environmental information
- Field environmental studies (e.g., roadside noise, air quality, soil, water quality and others)
- Impact assessment
- Preparation of EMP including the mitigation program
- Preparation of the public involvement
- Preparation of EIA（D/F）
- All relevant consultations/discussions and/or paper works with NEMC and/or relevant agencies until the approval of the environmental license.

ToR (Draft) for EIA-related studies, prepared by the JICA Study Team, is attached as Appendix 9.6.2.

9.7 Stakeholder Meeting

9.7.1 Outline

The first stakeholder meeting was conducted on June 24 (Tue) 2008, based on JICA Guideline. Major objectives of this stakeholder meeting are to enhance the public participation from various stakeholders, establish comprehensive information disclosure system, share common knowledge and understanding about the proposed road improvement projects among stakeholders, and to support a smooth establishment of project consensus.

Originally, 43 stakeholders were selected from various organizations/agencies/schools/groups/ communities (11 wards exist along New Bagamoyo Road) and others. The list of stakeholder was developed through a series of consultations with MoID and JICA Tanzania Office. Then, invitation letters were sent to those selected stakeholders. A total of 35 stakeholders attended the first stakeholder meeting. The following is the outline of this first stakeholder meeting.

Meeting Place: Kinondoni Municipality, Millennium Tower

9:30 a.m.	1. Registration
10:00 a.m.	2. Opening Remarks (MoID)
10:15 a.m.	3. Project Outline of Widening of New Bagamoyo Road (JICA Study Team)
	4. Guideline for Environmental and Social Considerations (JICA Study Team)
	5. ToR of Relevant Environmental Studies (JICA Study Team)
11:00 p.m.	6. Question and Answer Session
	7. Closing Remarks (MoID/JICA Study Team)
	Coffee Break

9.7.2 Summary of Questions and Answers (1st stakeholder meeting)

During entire Q/A sessions, there were 18 questions and/or comments about the proposed road improvement project. Detailed descriptions of this Q/A session and photo records are attached in Appendices 9.7.1 and 9.7.2, respectively. Table 9.7.1 summarizes the outline of this Q/A session.

Table 9.7.1 Summary of Q/A session of 1st stakeholder meeting

Topics	Number of question/comments
Project Outline	2
Road improvement, engineering	4
Regional Transport	5
Financial and/or economic aspects	1
Environment	6

Chapter 10 Economic Analysis

10.1 Basic Assumption

Economic evaluation of New Bagamoyo Road Widening Project using cost benefit analysis is based on the comparison of the case "with Project" and the case "without Project". The baseline data and input data, prepared during the Master Plan Study, are applied to the economic evaluation. The following tables summarize the vehicle operating cost and time value applied to the economic evaluation of New Bagamoyo Road Widening Project.

Table 10.1.1 Vehicle Operating Cost by Vehicle Type (Unit: Tshs/km)

Type	Motor-cycle	Passenger Car	4WD (Jeep)	Pickups	Mini-Bus	Bus	Short-body Truck
Direct Cost							
Fuel	59.2	123.3	140.0	116.7	140.0	280.0	200.0
Oil	2.5	5.0	4.5	4.5	4.5	9.0	18.0
Tyres	4.0	10.0	14.5	9.0	11.3	35.0	35.0
Maintenance	10.0	11.0	12.0	13.0	14.0	15.0	16.0
Crew	-	-	40.0	30.8	45.0	25.7	22.5
Overhead	-	-	50.0	25.6	37.5	35.0	47.3
VOC (Tshs/km)	75.7	149.3	261.0	199.6	252.3	399.7	338.8

Source: Dar es Salaam Transport Policy and System Development Master Plan

Table 10.1.2 Value of Time by Vehicle Type

Type	Unit	Passenger Car	Bus	Truck	Trailer
Average Monthly Income	Tshs/person	679,833.4	223,993.4	231,562.7	142,679.7
Monthly Working Hours	hours/month	186.0	186.0	186.0	186.0
Average Hourly Income	Tshs/hour	3,654.1	1,204.0	1,244.6	766.9
Adjustment factor (*)		0.5	0.5	0.5	0.5
Average Hourly Income after adjustment	Tshs/hour	1,827.0	602.0	622.3	383.4
Vehicle Occupancy	person	1.9	29.0	3.0	3.0
Time Value by Vehicle	Tshs/hour	3,507.9	17,472.7	1,867.0	1,150.3

Note: The adjustment factor is applied assuming that the home-based work, school, non-home-based business trips account for 50% of the total trips.
Source: Dar es Salaam Transport Policy and System Development Master Plan

Also, the Standard Conversion Factor of 0.869, prepared in the Master Plan Study, is also applied to the economic analysis for the Project, in converting the financial price to economic price of the Project.

10.2 Economic Analysis

(1) Project Cost

'Chapter 8 Preliminary Cost Estimates' estimated the project cost for 17 km road section from Morocco to Tegeta. The construction cost was estimated at Tshs 50,009 million (4,474 million Yen) (including the engineering service cost and contingency), and the government administration cost at Tshs 1,272 million (114 million Yen) and Tshs 51,281 million (4,588 million Yen) in total project cost.

Assuming that the foreign currency portion of the Project amounts to Tshs 10,578 million and local currency portion to Tshs 40,703 million, and applying the Standard Conversion Factor of 0.869, the economic cost of the Project is estimated at Tshs 45,949 million.

Table 10.2.1 Financial and Economic Project Cost (Morocco-Tegeta, Unit: million Tshs)

Financial Cost	Foreign Portion	Local Portion *SCF	Economic Cost	Economic Cost (million USD)
51,281	10,578	35,371	45,949	38.9

Source: JICA Study Team

(2) Cost Benefit Analysis

Based on the economic costs and benefits, annual flows of these cost and benefit are estimated as shown in Table 10.2.3 and the economic evaluation results are summarized in Table 10.2.2. All three indicators of the economic evaluation ensure economic feasibility of the project investment: 35% EIRR, 3.9 B/C Ratio, and sufficiently positive NPV.

Table 10.2.2 Result of Cost Benefit Analysis

Indicator	Result
Net Present Value (at discount rate of 12%)	Tshs 76,824 million
EIRR	35.3%
B/C (at discount rate of 12%)	3.94

Source: JICA Study Team

Table 10.2.3 Annual Flow of Cost and Benefit

Year	Investment Cost (in billion Tshs)			Vehicle Operating Cost (in billion Tshs)								Travel Time (in billion Tshs)								Travel Time (in billion Tshs)		Benefit (in billion Tshs)				B-C
				(Without)				(With)				(Without)				(With)				(Without)	(With)					
	Initial Investment	O&M	Total	Car	Truck	Trailer	Total	Car	Truck	Trailer	Total	Car	Truck	Trailer	Total	Car	Truck	Trailer	Total	Bus	Bus	VOC Saving	Time Saving	Time Saving (Bus)	Total	
2008																										
2009																										
2010	2		2																							-2
2011	11		11																							-11
2012	11		11																							-11
2013	11		11																							-11
2014	11		11																							-11
2015		0.3	0.3	274	83	13	371	270	82	13	365	222	16	2	240	209	15	1	226	169	161	5	14	8	27	27
2016		0.3	0.3	293	85	14	392	289	84	14	387	244	17	2	262	230	16	2	247	175	167	5	15	8	28	28
2017		0.3	0.3	313	87	16	416	310	86	15	411	267	17	2	286	253	16	2	271	182	174	5	16	8	28	28
2018		0.3	0.3	335	89	17	440	331	88	17	436	293	18	2	313	278	17	2	297	189	181	5	16	8	29	29
2019		0.3	0.3	358	91	18	467	355	90	18	462	321	19	2	342	305	18	2	325	196	188	5	17	8	29	29
2020		0.3	0.3	383	93	19	495	380	92	19	491	352	20	3	374	335	19	2	356	204	196	4	18	8	30	30
2021		0.3	0.3	409	95	21	525	406	94	21	521	385	21	3	409	368	20	3	391	211	203	4	18	8	30	30
2022		0.3	0.3	438	97	22	557	435	96	22	553	422	22	3	447	404	21	3	428	219	212	4	19	8	30	30
2023		0.3	0.3	468	99	24	591	466	98	24	588	463	23	3	489	444	22	3	470	228	220	3	19	8	30	30
2024		0.3	0.3	500	101	26	627	498	101	26	625	507	24	4	535	488	23	4	515	237	229	3	20	8	30	30
2025		0.3	0.3	535	103	28	666	533	103	28	664	556	25	4	585	536	24	4	565	246	238	2	20	8	30	30
2026		0.3	0.3	572	106	30	708	571	105	30	706	609	26	5	640	589	26	4	619	255	248	1	20	8	29	29
2027		0.3	0.3	612	108	32	752	611	108	32	751	667	28	5	700	648	27	5	679	265	257	1	21	8	29	28
2028		0.3	0.3	654	110	35	799	654	110	35	799	731	29	6	766	711	28	5	745	275	268	-0	21	8	28	28
2029		0.3	0.3	699	113	37	849	700	113	38	850	801	30	6	838	782	30	6	817	286	278	-1	20	7	26	26
2030		0.3	0.3	747	115	40	903	749	116	40	905	878	32	7	917	859	31	7	897	297	290	-2	20	7	25	25
2031		0.3	0.3	747	115	40	903	749	116	40	905	878	32	7	917	859	31	7	897	297	290	-2	20	7	25	25
2032		0.3	0.3	747	115	40	903	749	116	40	905	878	32	7	917	859	31	7	897	297	290	-2	20	7	25	25
2033		0.3	0.3	747	115	40	903	749	116	40	905	878	32	7	917	859	31	7	897	297	290	-2	20	7	25	25
2034		0.3	0.3	747	115	40	903	749	116	40	905	878	32	7	917	859	31	7	897	297	290	-2	20	7	25	25
2035		0.3	0.3	747	115	40	903	749	116	40	905	878	32	7	917	859	31	7	897	297	290	-2	20	7	25	25
2036		0.3	0.3	747	115	40	903	749	116	40	905	878	32	7	917	859	31	7	897	297	290	-2	20	7	25	25
2037		0.3	0.3	747	115	40	903	749	116	40	905	878	32	7	917	859	31	7	897	297	290	-2	20	7	25	25
2038		0.3	0.3	747	115	40	903	749	116	40	905	878	32	7	917	859	31	7	897	297	290	-2	20	7	25	25
2039		0.3	0.3	747	115	40	903	749	116	40	905	878	32	7	917	859	31	7	897	297	290	-2	20	7	25	25
2040		0.3	0.3	747	115	40	903	749	116	40	905	878	32	7	917	859	31	7	897	297	290	-2	20	7	25	25
2041		0.3	0.3	747	115	40	903	749	116	40	905	878	32	7	917	859	31	7	897	297	290	-2	20	7	25	25
2042		0.3	0.3	747	115	40	903	749	116	40	905	878	32	7	917	859	31	7	897	297	290	-2	20	7	25	25
2043		0.3	0.3	747	115	40	903	749	116	40	905	878	32	7	917	859	31	7	897	297	290	-2	20	7	25	25
2044		0.3	0.3	747	115	40	903	749	116	40	905	878	32	7	917	859	31	7	897	297	290	-2	20	7	25	25
	25	1	26	1,645	351	85	2,081	1,637	349	85	2,070	1,656	80	12	1,749	1,596	77	12	1,685	801	773	10	64	28	103	77

Chapter 11 Project Implementation Plan

11.1 Implementation Agency

The Ministry of Infrastructure Development (MOID) together with Tanzania National Roads Agency (TANROADs) is the implementation agency of the Project since New Bagamoyo Road is categorized as a trunk road. TANROADs is responsible for not only the construction but also for the maintenance work. The organization charts of the MOID and TANROADs are shown in Figures 11.1.1 and 11.1.2, respectively.

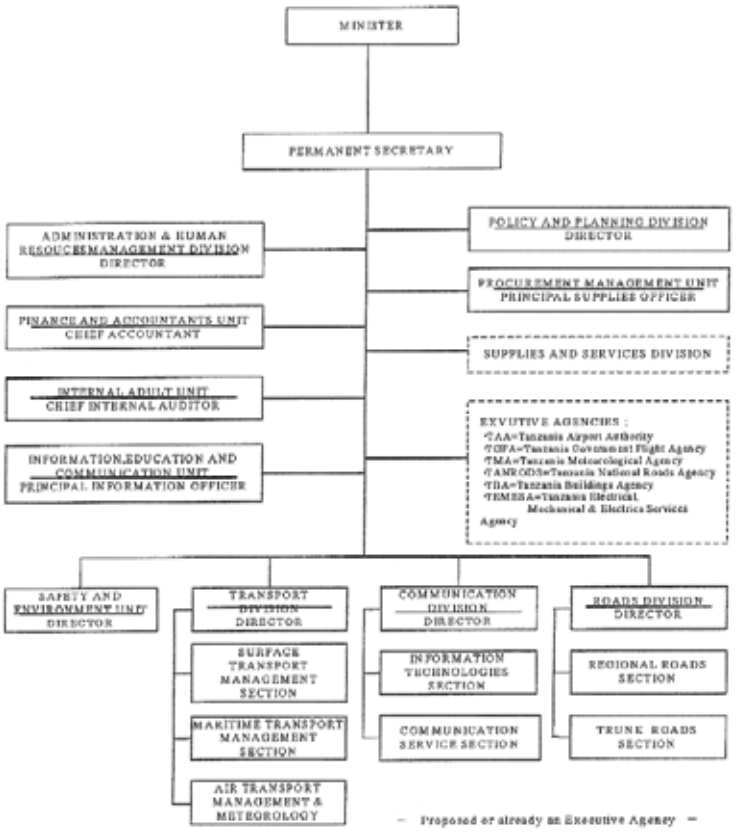


Figure 11.1.1 Organization Chart of MOID

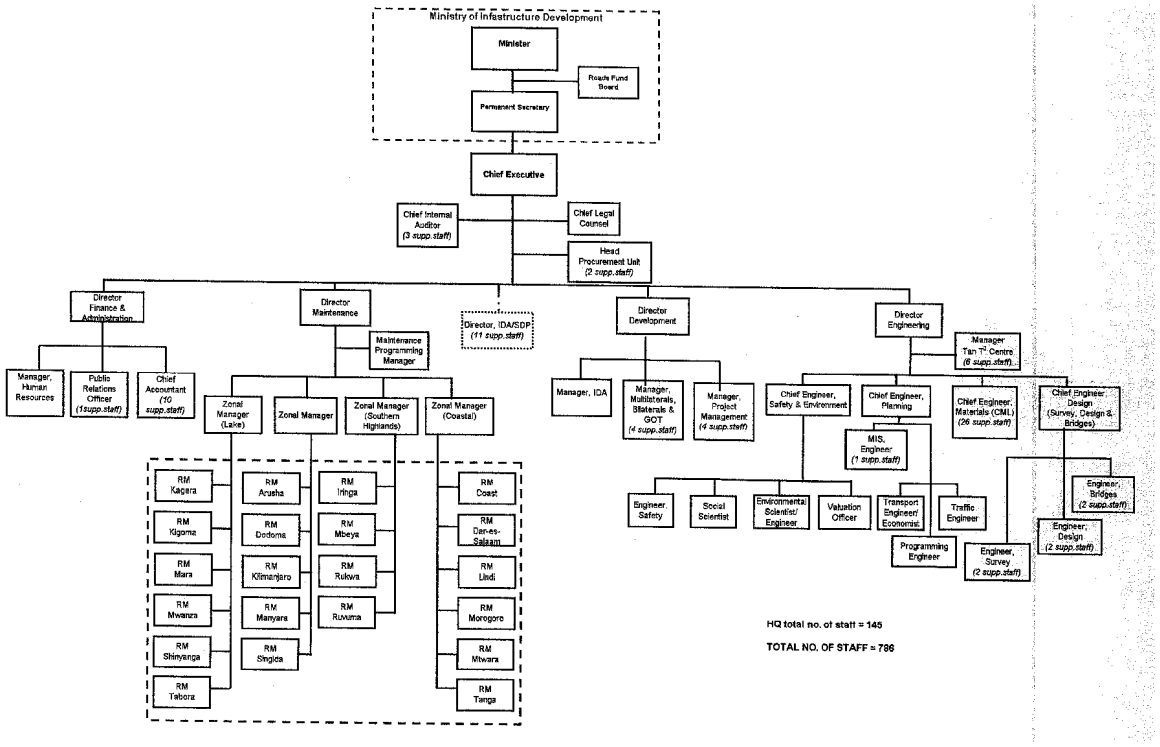


Figure 11.1.2 Organization Chart of TANROADs

11.2 Implementation Schedule

After completion of this Study, the Project will be implemented in the following stages: (i) basic design, (ii) detailed design, (iii) tender and contract, and (iv) construction.

For widening the New Bagamoyo Road at the 17 km road section from Morocco to Tegeta by Japan Grant Aid, the construction period of this Project is estimated be 3 to 4 years, considering the size of the project, the amount of the budget by Japan Grant Aid and the implementation schedule of Kilwa Road Widening Project. The proposed implementation schedule for the Project is shown in Table 11.2.1.

Table 11.2.1 Proposed Implementation Schedule

Work Item	1st year				2nd year				3rd year				4th year				5th year				6th year				7th year			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Basic Design					■	■	■																					
Exchange of Notes (E/N)									■																			
Detailed Design										■	■																	
Tender and Contract												■																
Construction													■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	

11.3 Annual Disbursement Schedule

The annual disbursement schedule for the implementation of 17 km road widening from Morocco to Tegeta is prepared based on the project cost and implementation schedule. The proposed annual disbursement schedule is shown in Table 11.3.1.

Table 11.3.1 Proposed Annual Disbursement Schedule

Work Items	F.C. (million Tshs)								L.C. (million Tshs)							
	1st year	2st year	3st year	4st year	5st year	6st year	7st year	Total	1st year	2st year	3st year	4st year	5st year	6st year	7st year	Total
A. Construction Cost	0	0	565	2,260	2,260	2,260	1,695	9,041	0	0	2,106	8,425	8,425	8,425	6,319	33,701
B. Engineering Service Cost	0	0	336	79	79	79	59	633	0	0	1,253	295	295	295	221	2,359
C. Contingency	0	0	57	226	226	226	170	904	0	0	211	843	843	843	632	3,370
D. Government Administration Cost	0	0	0	0	0	0	0	0	0	635	353	71	71	71	71	1,272
Total	0	0	958	2,565	2,565	2,565	1,924	10,578	0	635	3,923	9,634	9,634	9,634	7,243	40,703

11.4 Project Operation and Maintenance Plan

11.4.1 Periodical Inspection and Maintenance

The schedule of the periodical inspection and maintenance for the road and bridges is proposed in Table 11.4.1.

Table 11.4.1 Periodical Inspection and Maintenance

Facilities		Inspection and Maintenance	Period
Road	Road surface	Patching and sealing	1 month
	Slope	Surface treatment	1 month
	Side ditch	Removal of garbage and sediment	1 month
	Marking	Repainting	1 month
	Culvert	Removal of garbage and sediment	1 month
Bridge	Drainage pipe	Removal of sediment	3 months
	Expansion joint	Repair of damaged members	1 year
	Handrail	Repair of damage be traffic accident	1 year
	Bearing	Removal of sediment	1 year
	Slab and curb	Repair of crack and stripping	1 year
	Pavement	Patching and sealing	1 year
	Girder	Repair of damaged members	1 year
	Substructure	Repair of crack and stripping	1 year
	Revetment	Repair of damage	1 year

11.4.2 Maintenance for Asphalt Pavement

The maintenance of road consists of minor maintenance work such as patching and leveling on the periodical inspection and major maintenance work such as overlaying that is required every 7 years in general. The cost for the overly is estimated at Tshs 2,032 million for the 17 km road section from Morocco to Tegeta.

11.4.3 Operation and Maintenance Cost for Road

The operation and maintenance cost for the project road is required mainly for the periodic inspection and maintenance works such as patching and sealing. The cost for this operation and maintenance work is estimated at Tshs 11 million a year for the 17 km road section from Morocco to Tegeta.

Cost for patching and sealing:	261,000m2 x 0.1％ x 36,343Tshs/m2＝	9,485,523 Tshs
Miscellaneous:		1,897,105 Tshs
Total		11,382,628 Tshs

11.4.4 Operation and Maintenance Cost for Bridge

Large-scale repair will not be required unless the bridge is damaged by a traffic accident. Accordingly, the operation and maintenance cost for the bridge is required only for the daily inspection and maintenance work such as the cleaning of drainage pipes. The cost for this maintenance work is estimated at Tshs 1 million a year for the three bridges located at 17 km road section from Morocco to Tegeta.

Personnel expenses:	27,310Tshs/day x 12months＝	327,720 Tshs
Miscellaneous:		491,580 Tshs
Vehicle operation cost:		163,860 Tshs
Total		983,160 Tshs

Chapter 12 Conclusions and Recommendations

12.1 Conclusions of the Study

The Project Formulation Study on Road Transport Network - New Bagamoyo Road includes the Pre-feasibility Study to justify the appropriate road section of New Bagamoyo Road Widening Project by Japan Grand Aid, which has been officially requested for Japanese assistance by the Government of Tanzania.

'Chapter 2 Project Appreciation' identified the issues from the technical, economic and environmental viewpoints in implementing this Project by Japan Grant Aid. These issues include (i) the number of lanes for the project road that was determined based on the traffic volume surveyed at the most congested road section, (ii) the request for the Project as being inconsistent with the future BRT network, (iii) the alternatives of the Project not having been studied, and therefore not meeting the requirement by the JICA Guidelines for Social and Environmental Considerations, and (iv) the unit costs applied to the cost estimates of the Project may be overestimated.

'Chapter 3 Traffic Conditions and Demand Forecast' initially discussed and identified the urban transport issues in Dar es Salaam. It determined the socio-economic framework, including the future population and economic growth and forecasted the future traffic demand along the project road in order to evaluate the alternatives of the Project. As a result, the traffic flow at the road section between Morocco and Tegeta would be optimized when the 4-lane widening plus BRT space option is implemented. The future traffic volume between Tegeta and Mpiji was estimated as relatively small, and the traffic flow at the said road section is maintained even when the Project is not implemented.

'Chapter 4 Natural Conditions' discussed the climate, topographical condition, geological condition and hydrological condition in Dar es Salaam. As a consequence, it proposed that detailed studies for drainage are required in the basic design stage since the drainage condition of New Bagamoyo Road is observed as being relatively poor.

'Chapter 5 Road Conditions' investigated the existing conditions of roads, bridges, and intersections in New Bagamoyo Road; the results are input into the baseline information for Preliminary Engineering Study explored in Chapter 7.

'Chapter 6 Evaluation of Project Alternatives' tested six alternative options with various criteria such as technical, economic, environmental and policy relevance for the four respective road sections. As a result of the evaluation exercise, Alternative C: 4-lane widening plus BRT space (adopting an open side ditch for cost saving), was selected as the most optimum solution for the road section from Morocco to Tegeta and Alternative F: Zero option, was selected for the road section from Tegeta to Mpiji.

'Chapter 7 Preliminary Engineering Study' explored the engineering study for the most optimum option selected in the previous chapter and studied the design criteria, cross section, horizontal/vertical alignment of the project road.

'Chapter 8 Preliminary Cost Estimates' estimated the project cost for 17 km road section from Morocco to Tegeta. The construction cost was estimated at Tshs 50,009 million (4,474 million Yen) (including the engineering service cost and contingency), and the government administration cost at Tshs 1,272 million (114 million Yen) and Tshs 51,281 million (4,588 million Yen) for total project cost.

In 'Chapter 9 Environmental and Social Considerations', a preliminary land expropriation study was carried out in order to quantitatively evaluate the order of the magnitude of the land expropriation impacts caused by this Project. As a result of the survey, direct impacts on house/or offices buildings therein are found relatively low since most of affected properties are classified as fences and/or walls. At the same time, this chapter explored the IEE study on the Project, and the Terms of Reference for the EIA-related study was prepared according to the result of the IEE study.

'Chapter 10 Economic Analysis' evaluated the economic feasibility of the Project and concluded that the projected EIRR for the Project was 35% and that a large amount of economic benefits will be derived from the proposed project.

In 'Chapter 11 Project Implementation Plan', the implementation schedule as well as the operation and maintenance plan were studied.

12.2 Recommendations for Implementation of Japan Grant Aid Project

12.2.1 Obligation by the Government of Tanzania

In implementing the Project by Japan Grant Aid, the obligations by the Government of Tanzania are summarized as follows.

Obligation before E/N

- To register the project for the EIA examination, to conduct related studies for the full scale EIA, and to obtain the EIA license for the Project
- To secure the budget for land acquisition, compensation and the construction works covered by

the Government of Tanzania

Obligation after E/N

(1) General Matters

- To set up the project banking arrangement (B/A)
- To advise the commission of authorization to payment (A/P) and make the payment for the commission

(2) Project Implementation Matters

- To secure the land necessary for the sites of the project, compensate for resettlement, and remove/relocate the obstructions by utilities
- To secure all the expenses and prompt execution of customs clearance at the port of disembarkation for unloading products purchased under the Grant Aid
- To accord the work permits to Japanese nationals whose services may be required in connection with supply of the products and the services under the verified contracts
- To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts
- To provide electricity, water supply, drainage and other incidental facilities to the vicinities of the site
- To maintain and use properly and effectively the facilities constructed under the Grant Aid

(3) Others

- To acquire the land, compensate and relocate facilities
- To contract with a Japanese consulting firm for detail design (D/D) and construction supervision
- To contract with a Japanese contractor for construction

As mentioned above, the Government of Tanzania is required to complete all the necessary procedures to obtain the EIA license by the time of E/N in implementing the Project by Japan Grant Aid. The Study Team exchanged a memorandum of the undertaking with MOID officials. In this regard, the obligation by the Government of Tanzania, such as registering the Project and implementing the EIA study of the Project, and the schedule regarding the procedure of EIA examination were confirmed. (see Appendix 12)

12.2.2 Proposed Schedule for EIA Procedure

The schedule for the EIA licensing and compensation for resettlement was prepared considering following critical paths.

- To complete EIA report by August 2008
- To obtain the EIA license for the Project by the time of E/N
- To obtain the agreement for compensation from the PAPs by the time of E/N
- To complete the compensation and relocation by commencement of construction

It is estimated that it takes 12 months for the approval of EIA and 12 months for land acquisition and compensation, from the results of similar project as well as discussion with Government of Tanzania. The project implementation schedule, work flow for the EIA licensing and work flow for land acquisition and compensation are shown in Table 12.2.1, Table 12.2.2 and Table 12.2.3, respectively.

Table 12.2.1 Tentative Schedule till Commencement of the Project

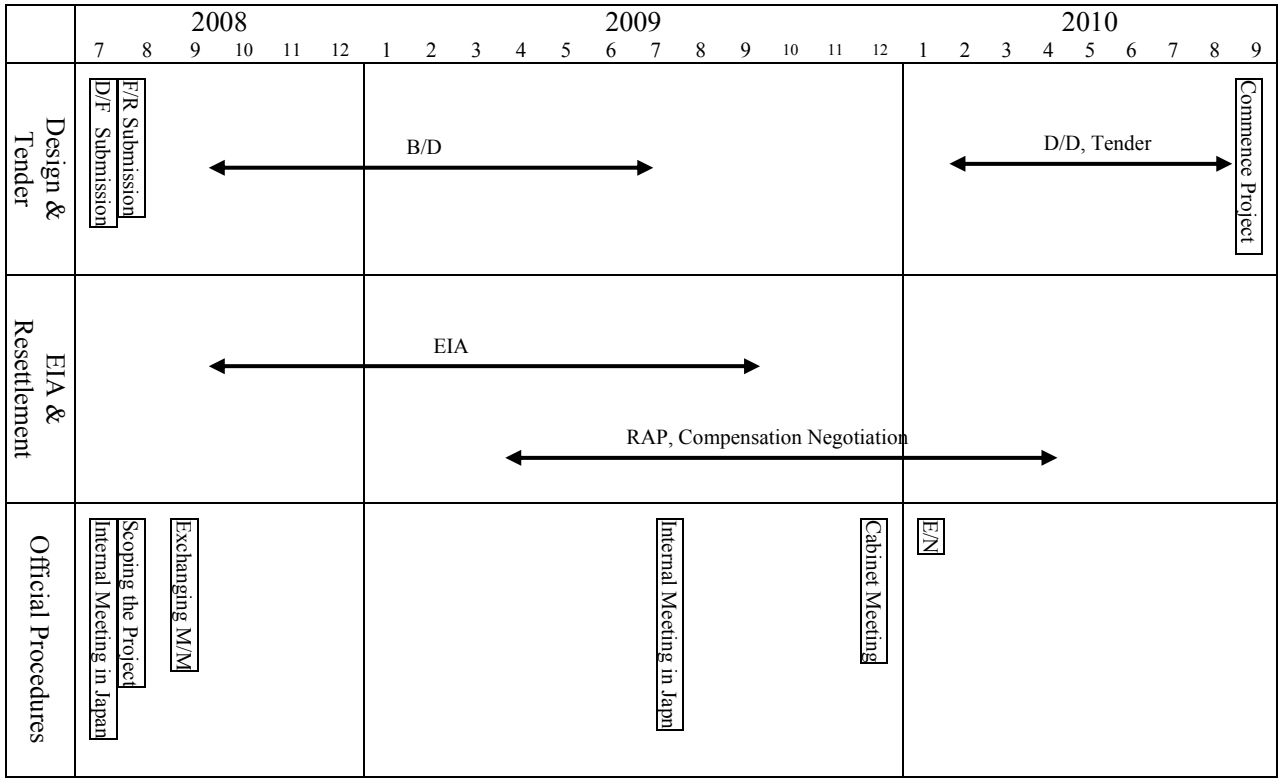


Table 12.2.2 Tentative Schedule of Environmental License Application Process

Activities	1	2	3	4	5	6	7	8	9	10	11	12
1. Project registration & environmental screening		—										
2. Selection of EIA experts			—									
3. Preparation of scoping report				—								
4. Development of ToR for EIA Study				—								
5. EIA-related Study				- - -	- - -	- - -	- - -	- - -				

Activities	1	2	3	4	5	6	7	8	9	10	11	12
6. Public Involvement						☆		☆				
7. Submission of EIS（D/F） Report, and its examination starts.									—	—		
8. NEMC Site Visit										—	—	
9. Revising of EIS（D/F） Report, Supplemental Study if necessary. Preparation of EIS Final Report.											—	—
10. Approval of Environmental License												—

*1 : EIA-related study shall be conducted based on EIA - ToR (final) approved by NEMC. Here, it is assumed that entire EIA study, covering from the initiation of EIA studies to preparation/submission of EIS Report (D/F) takes about four (4) months. Also, it is assumed that it takes about one (1) month for revising submitted EIS (D/F) Report and implementation of supplemental environmental studies if requested and preparation of EIS (Final) Report (note: this process usually takes one (1) – two (2) months within similar EIA application processes conducted in other countries).

*2 : Outline and exact schedule of JICA Guideline-based stakeholder meetings and relevant PI-related activities shall be determined through consultations with NEMC, MoID, JICA and line Ministries. Note that the 1st stakeholder meeting was held in June of 2008 within this project formation study.

Table 12.2.3 Tentative Schedule of Land Acquisition and Compensation Process

Activities	1	2	3	4	5	6	7	8	9	10	11	12
1. Identify PAPs based on B/D	—	—										
2. Meeting with Ward/Sub-ward Leaders and owners of PAPs in each Ward.		—	—									
3. Valuation of PAPs			—	—	—	—						
4. Preparation of Valuation Report and Compensation Plan.						—						
5. Joint Review of Valuation Report by Consultant and Municipal Valuers.							—	—				
6. Submission of Valuation Report to Chief government Valuer for the approval.								—				
7. Returning of Approved Report to relevant Municipal Council.								—	—			
8. Submission of Report to Land Officers and Ward Executive Officers for their approval.									—			
9. Submission of report to relevant District Commissioner for the approval.									—	—		
10. Submission of Report to Dar Es Salaam Regional Commissioner for the approval.									—	—		
11. Returning of fully-signed report to relevant Municipal Land Officers and the payment of the compensation is ready.										—	—	
12. Issue of permission to start payment.										—	—	—
13. Payment of Compensation starts.											—	—
14. Completion of expropriation-related Negotiation												X

12.2.3 Further Considerations

In order to realize the Project by Japan Grant Aid, further considerations necessary to be discussed are summarized below.

(1) Negotiation on Appropriate Road Section by Japan Grant Aid

The Government of Tanzania officially requested Japan Grant Aid for New Bagamoyo Road Widening Project for 35-km road section from Morocco Intersection to Mpiji. As a result of the evaluation exercise, Alternative C: 4-lane widening plus BRT space, was selected as the most optimum solution for the road section from Morocco to Tegeta and Alternative F: Zero option, was selected for the road section from Tegeta to Mpiji. The meeting among the relevant officials needs to be held, aiming to confirm the appropriate road section by Japan Grant Aid and the improvement strategy for the remaining road section.

(2) Project Cost

The project cost was estimated based on the unit cost prepared referring to the current market price (May 2008) in Tanzania. It may change by the price escalation of crude oil, materials and labor, since the construction of the Project is to commence in late 2010 at earliest. Other factors which may affect the project cost can be summarized below.

- For the cost estimates in this Study, the bridge lengths were assumed to be the same to the existing bridge lengths. Accordingly, the cost of bridges may be affected when the detailed bridge design is conducted with hydrological survey/investigation in the basic design stage. However, it should be noted that the total project cost will not change significantly since the total bridge length of three bridges along the project road is relatively short, and the bridge cost accounts for only a small portion of the total project cost.
- Change of the asphalt and concrete volume significantly affects the project cost since the costs of pavement and concrete structures account for a large portion of the project cost. The asphalt volume shall not change unless the number of carriageways changes. The concrete volume shall increase if the number of culverts increases or size of culverts becomes larger. In this study, the number or size of culverts is assumed to be almost the same as the existing conditions.
- The pavement structure was determined based on the local standards which is higher than that of other countries. Accordingly, the project cost may decrease if the Government of Tanzania agrees to apply, for instance, Japanese standards or AASHTO to the pavement design.
- It may be possible to install the sidewalk only at one side of the road sections where pedestrians are observed to be relatively few, such as at the northern section of Mwenge. In that case, the project cost shall decrease by only 2% since the cost of sidewalk accounts for a small portion of the project cost.

(3) Proposed Surveys during Basic Design Stage

In this Study, the types and sizes of culverts were determined assuming the same as the existing ones without the detailed survey and investigation. Accordingly, the detailed drainage study together with the hydrological survey/investigation should be conducted in the basic design stage. The pavement structure in this Study was determined with reference to that of Kilwa Road Project (JICA, 2006) since the surveys necessary to pavement design such as traffic survey, axle load survey and soil survey are not conducted in this Study. Accordingly, the pavement structure should be determined with necessary surveys and pavement design in the basic design stage.

The project cost was also estimated under the assumption that bus stops are installed at every 500 m between Morocco and Tegeta. The locations of the bus stops should be determined in accordance with the future BRT network and the existing daladala stations. Considering these, the following surveys are proposed to be conducted in the basic design stage.

Topographic Survey

Topographic survey should be conducted in order to obtain the topographic information for the plan, design, cost estimates and construction in the Project. The survey is comprised of the centerline survey, profile leveling survey, cross sectioning survey, and plane-table survey.

Geological and Material Survey

Geological and material survey should be conducted in order to obtain the geological information for the plan, design, cost estimates and construction in the Project. The survey is comprised of the boring survey at the locations where the box culvert is installed, standard penetration test, CBR test, soil tests, and material tests.

Hydrological Survey

Hydrological survey should be conducted in order to obtain the hydrological condition for the plan, design and construction in the Project. The alignment, width, water level, quantity of water, flow velocity, flow direction, riverbed evolution, and river channel change should be surveyed or investigated at Kijitonyama River, Malakuwa River, Mbeji River and Tegeta River.

Traffic Survey

Traffic survey should be conducted in order to obtain the traffic data to assess the validity of the Project and also to be utilized for the pavement design. In this survey, traffic count by vehicle type should be measured at various locations along New Bagamoyo Road and its crossing roads.

Underground Survey

The location and type of underground facilities along New Bagamoyo Road should be identified by the interview to the concerned authorities and site survey.

Bridge Soundness Survey

Bridge soundness survey will evaluate if the existing bridges are still durable based on the result of the visual inspection. The soundness of the existing bridges should be studied in the basic design stage.

EIA-related Survey

In order to obtain the EIA license for the Project, EIA related surveys should be carried out in order to obtain the baseline data at the project site. The Terms of Reference proposed in this Study suggests to conduct field environmental studies such as roadside noise, air quality, soil and water quality.

(4) Other Considerations

Mwenge Bus Terminal

Mwenge Bus Terminal located near Mwenge Intersection is required to be relocated and/or expanded in implementation of the Project. According to the discussion with the officials of Dar es Salaam City Council and those of DART Agency, three alternatives need to be considered for the improvement of Mwenge Bus Terminal: (i) expansion of the existing bus terminal in the open space near Mwenge Bus Terminal, (ii) relocation to the existing bus terminal near Morocco Intersection, and (iii) construction of new bus terminal near Mwenge Intersection (open space in the industrial area on the north side of the intersection). The relocation or expansion of Mwenge Bus Terminal should be studied through the discussion with related agencies in the basic design stage.

Bagamoyo New Port Plan

The Port Master Plan Study is underway under the support of the World Bank, and the Government of Tanzania (TPA) is expected to implement a detailed study on new port development. Accordingly, it may be too early to conduct the detailed traffic analysis to estimate the derived traffic generated from the new port project and to estimate the impact to the New Bagamoyo Road Widening Project. However, the information regarding port development should be continuously gathered.