The United Republic of Tanzania
Ministry of Infrastructure Development
Tanzania National Roads Agency

PREPARATORY SURVEY REPORT

ON

THE PROJECT FOR

WIDENING OF NEW BAGAMOYO ROAD

IN

THE UNITED REPUBLIC OF TANZANIA

NOVEMBER 2009

JAPAN INTERNATIONAL COOPERATION AGENCY

INGÉROSEC CORPORATION

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PREFACE

Japan International Cooperation Agency (JICA) conducted the preparatory survey on The Project for Widening of New Bagamoyo Road in The United Republic of Tanzania.

JICA sent to Tanzania a survey team from March 17 to May 13, 2009.

The team held discussions with the officials concerned of the Government of Tanzania , and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Tanzania in order to discuss a draft outline design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of The United Republic of Tanzania for their close cooperation extended to the teams.

November 2009

Toshiyuki KUROYANAGI

Director General,
Economic Infrastructure Department
Japan International Cooperation Agency

November 2009

LETTER OF TRANSMITTAL

We are pleased to submit to you the preparatory survey report on The Project for Widening of New Bagamoyo Road in The United Republic of Tanzania .

This survey was conducted by Ingérosec Corporation, under a contract to JICA, during the period from March to November, 2009. In conducting the survey, we have examined the feasibility and rationale of the project with due consideration to the present situation of Tanzania and formulated the most appropriate outline design for the project under Japan's Grant Aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

Jiro Koyama
Project manager,
Preparatory Survey team on
The Project for Widening of New Bagamoyo Road
Ingérosec Corporation

SUMMARY

SUMMARY

1. Overview of the Country

The United Republic of Tanzania (hereinafter referred to as "Tanzania") is situated in the central part of the African continent's east coast, facing the Indian Ocean. It has a total land area of approximately 945,000 km^2 and a population of some 40.43 million. Highlands with an elevation of 1,000 ~ 2,000 m dominate the inland and Mt. Kilimanjaro (EL. 5,895 m) rises high in the north.

New Bagamoyo Road, one section of which is the subject of improvement under the Project, runs along the coastal terrace which is some 2 km away from the coastline and has an elevation ranging from 20 m to 60 m. The prevailing climate is a high temperature and high humidity which is typical of coastal regions in Tanzania. There are two rainy seasons: a major rainy season from late March to late May and a minor rainy season from the end of November to early December. The period from June to September is relatively cool but extremely hot weather continues from December to February. Rainfall is observed all year round although half of the annual rainfall is recorded during the three months of the major rainy season.

After independence, Tanzania actively implemented socialist economic policies but its economy reached a crisis point in the 1980's due to oil shocks, the war with Uganda and severe drought. To improve the situation, the Government of Tanzania commenced economic reform in 1986 with the assistance of the World Bank and IMF. The economic growth rate in recent years at a level of 6 - 7% has been favourable (7.1% in FY 2007 according to the World Bank). The GNP per capita has been steadily increasing from US$ 210 in 1992 to US$ 400 in 2007.

2. Basic Concept of the Project

In 2003, the Government of Tanzania formulated the National Transport Policy and the 10 Year Transport Sector Investment Programme (TSIP) Phase I as a medium-term investment programme aimed at concretely implementing the National Transport Policy. The TSIP identified the following issues as key components of a concrete transport sector development strategy.

① Achievement of smooth transport by means of developing seamless transport infrastructure

② Elimination of areas with poor transport facilities through the improvement of transport infrastructure

③ Facilitation of economic growth in such sectors as agriculture, manufacturing, mining, tourism

Dar es Salaam plays a central role in the economy and physical distribution in Tanzania. As the city is the starting point for all transport systems, including the road, rail, air and maritime transport systems, it is truly a strategic point for transport in Tanzania.

Urban development in Dar es Salaam has been taking place along four trunk roads, i.e. Morogoro Road, Nyerere Road, Kilwa Road and New Bagamoyo Road albeit in a disorderly manner. In the last 10 years, the number of registered vehicles in the city has grown at an annual rate of 7% which is higher than the population growth rate. As a result, the traffic congestion along trunk roads has been worsening every year, hampering economic activities in the city.

To alleviate the situation, projects of various donors as well as Tanzania's own funding to expand the trunk roads to dual two lane roads (four lanes in total) have commenced or have been completed. Meanwhile, the Bus Rapid Transit (BRT) Programme has been formulated and the tender process is already in progress for Phase 1 with the assistance of the World Bank. The Project for Widening of New Bagamoyo Road, the target road of the Project for which Japanese assistance has been requested by the Government of Tanzania, is part of this BRT Programme.

Major Road Projects in Dar es Salaam and Their Costs

Subject Road	Donor	Brief Description	Project Cost (Construction Cost)
Nelson Mandela Road (2003 - 2009: in progress)	FED (Grant)	L = 15.6 km Widening to four lanes, etc.	approx. ¥3.34 billion
Sam Nujoma Road (2005 - 2009: completed)	Domestic funding	L = 4.0 km Widening to four lanes, etc.	approx. ¥1.12 billion

Source : Findings of the field survey by the Survey Team

Phases of the BRT Programme

Phase	Section (Road Name)	Length (km)
1	Morogoro Road; Kawawa Road	20.9
2	Kilwa Road	19.3
3	Nyerere Road	23.6
4	New Bagamoyo Road	16.1
5	Nelson Mandela Road and other	22.8
6	Old Bagamoyo Road	27.6
Total		130.3

Source : Dar Rapid Transit Agency (DART)
Note : The BRT Programme will be implemented in the order of the six phases shown in this table featuring six trunk roads in Dar es Salaam.

Route Map for the BRT Programme for Dar es Salaam

New Bagamoyo Road, the subject road of the Project, is one of the major trunk roads forming the strategic road transport network in Dar es Salaam which is the most important economic base in Tanzania. The alleviation of traffic congestion on this road, which has been worsening every year, will make a major contribution to the socioeconomic development of the city. A project for the section of New Bagamoyo Road was evaluated as a high priority project by the JICA development study conducted from 2007 to 2008 on the planned widening of existing roads into four lane roads.

The project formulation study conducted from April to June, 2008 confirmed that the inclusion of the central zone earmarked for the BRT Programme as part of the project to widen the existing road into four lanes promised the best travelling performance for vehicles, contributing to the alleviation of traffic congestion. This road rehabilitation/improvement project, which takes the BRT Programme for the subject section into consideration, will not only alleviate the current severe traffic congestion but will also prevent the emergence of transport bottlenecks in the future as a result of an increased traffic volume.

3. Outline of the Study Results and the Project Contents

The JICA dispatched the Preparatory Survey Team to Tanzania from 17th March to 13th May, 2009. The team members were engaged in discussions with various government officials in Tanzania, conducted a field survey in the project area, examined the present state of the target section as well as progress situation of infrastructure development by other donors and confirmed the necessity and

urgency for road improvement of the requested section. Based on the domestic work conducted after the return of the team to Japan, it was decided to rehabilitate the requested section of the road in the manner outlined in the table below. The contents of the summary of the outline design for the Project were exampled to the Tanzanian side from 14th to 24th October, 2009 and the Tanzanian side basically agreed with the planned contents of the Project.

Outline of the Project

Planned Item		Description/Specifications
Target Section		12.9 km (Sta. 4.3 km ~ Sta. 17.2 km)
Road Paving Work	Surface Course	Asphalt concrete 5 cm (carriageway) or 3 cm (footpath)
	Binder Course	Asphalt concrete 5 cm
	Base Course	Base course 10 cm (asphalt stabilised: DBM)
		Sub-base course: 12.5 cm ~ 33 cm (cement stabilised)
	Protective Shoulder	Cement stabilisation + bitumen sealing
Underground Drainage Work		Sta. 8.2 km ~ Sta. 9.5 km subsoil drain
Width		Carriageways 7.5 m x 2; BRT central reservation 9.0 m; footpaths 1.5 m
Bridge Work	Mlalakuwa Bridge	PC-T girder bridge (post tension); 30 m long with pile foundations
	Lugalo Bridge	PC-T girder bridge (post tension); 30 m long with spread foundations
	Tegeta Bridge	PC-T girder bridge (post tension); 30 m long with pile foundations and spread foundations
Drainage Work		▪ Concrete block open drains: newly constructed along the entire route ▪ Road crossing culvert : 28 locations (box culvert of 900 mm x 900 mm or other specifications) ▪ U-shaped side drain : 400 mm x 300 mm at cut sections, etc. ▪ Inlet/outlet : 52 locations ▪ Catch basin : 43 locations
Auxiliary Road Structures		▪ Kerbstone work ▪ Road markings ▪ Guard rails ▪ Road signs ▪ Bus bays

4. Project Schedule and Estimated Project Cost

As a result of the field survey, the length of time required to implement the Project and the Tanzanian portion of the cost are now estimated to be 30 months for the construction work plus three months for the tender and some ¥518 million respectively provided that the Project is implemented under Japan's grant aid scheme.

5. Relevance of the Project

The implementation of the Project will improve the road conditions of the target section and will also secure smooth and safe traffic flow, benefiting some three million residents of Dar es Salaam. The expected positive effects of the Project are briefly described next.

(1) Direct Effects

- The improvement of the target road section will increase the average travelling speed to 42 km/hr during the two peak periods of eight hours in total (from 06:00 to 09:00 in the morning and from 15:00 to 20:00 in the evening) due to commuting to work or school from the current 6.5 km/hr, greatly shortening the travelling time. The traffic capacity will increase from the current some 825 vehicles/hr/lane to 1,740 vehicles/hr/lane.
- The introduction of proper road drainage facilities capable of handling the level of rainfall during the rainy season means that the road will not be flooded, ensuring smooth traffic.
- With the completion of the planned construction work, vehicles travelling at the design speed will be separated from vehicles travelling at a slower speed, resulting in smooth traffic flow.

(2) Indirect Effects

- The shortening of the travelling time will reduce the transportation cost.
- The upgrading of the subject road to a four lane road will separate vehicles travelling at the standard speed from slower vehicles, ensuring smooth traffic flow.

The Project is expected to produce the various positive effects described above. It also intends to partly finance the funds required for the implementation of a national development project of the recipient country as this kind of assistance reflects the true philosophy of grant aid. The rehabilitation of the road section which urgently requires such work will not only ease the traffic congestion but will also secure a means of smooth and safe urban transport. This will facilitate industrial activities in Dar es Salaam and further vitalise the economic activities of local communities, widely contributing to the betterment of the lives and livehoods of local residents. In view of such positive effects, the Project is highly relevant to the purpose of Japan's grant aid scheme. Meanwhile, the TANROADS is judged to have sufficient manpower and funding to conduct the maintenance of the road in a sufficient manner after the implementation of the Project.

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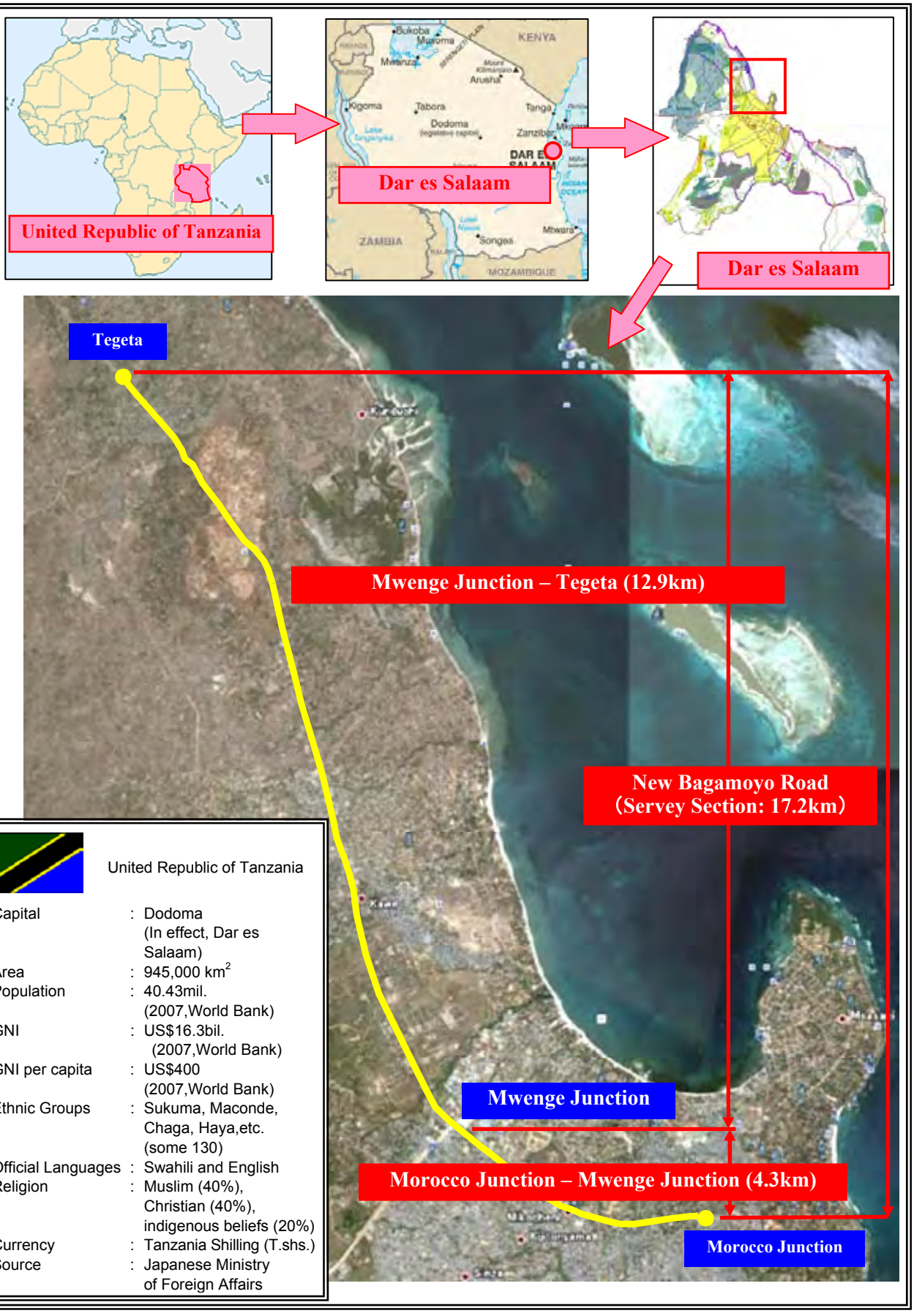
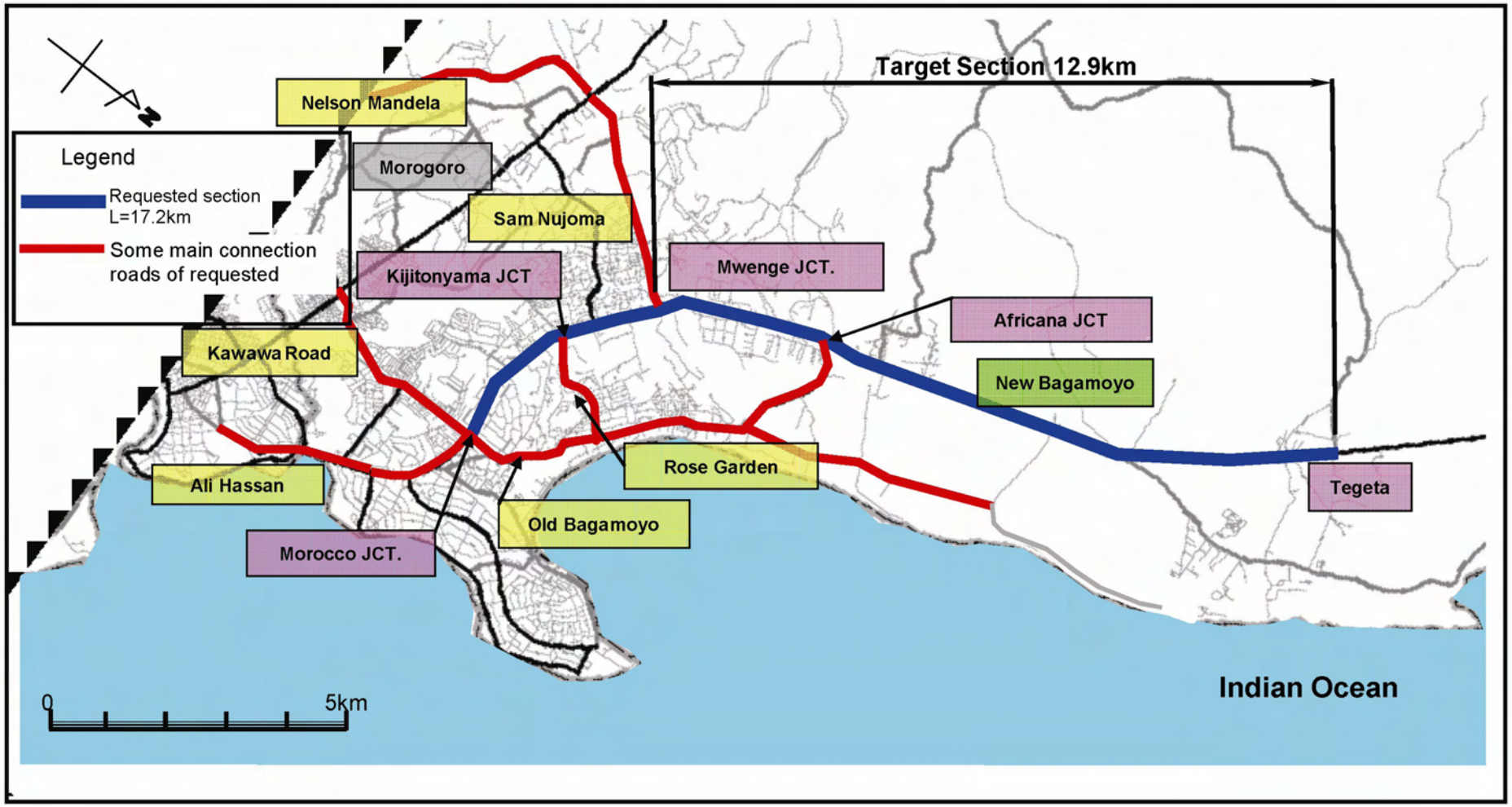


LOCATION MAP/ ROUTE MAP



TARGET SECTION

PERSPECTIVE

(TOP: NEAR TEGETA BRIDGE;

BOTTOM: SOME 8 KM POINT FROM THE MWENGE JUNCTION)

LIST OF FIGURES AND TABLES

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ABBREVIATIONS

AfDB	African Development Bank
BS	British Standard
BRT	Bus Rapid Transit
CBR	California Bearing Ration
CRB	Contractor Registration Board
DANIDA	Danish International Development Assistance
DART	Dar es Salaam Rapid Transit Agency
DAWASA	Dar es Salaam Water & Sewerage Authority
DAWASCO	Dar es Salaam Water & Sewerage Company
DBST	Double Bituminous Surface Treatment
DCP	Dynamic Cone Penetration
DBM	Dense Bitumen Macadam
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
EU	European Union
FED	Fund of European Development
GNI	Gross National Income
GDP	Gross Domestic Product
GNP	Gross National Product
GOT	Government of Tanzania
JICA	Japan International Cooperation Agency
M/D	Minutes of Discussion
MoID	Ministry of Infrastructure Development
NTP	National Transport Policy
NDC	National Development Cooperation
NEMC	National Environmental Management Council
RAP	Resettlement Action Plan
RC	Reinforced Concrete
ROW	Right of Way
SADC	Southern African Development Community
SATCC	Southern African Transport and Communications Commission
TANESCO	Tanzania Electric Supply Company
TANROADS	Tanzania National Roads Agency
TEMESA	Tanzania Electrical, Mechanical and Electronics Services Agency
TSIP	Transport Sector Investment Programme
TLC	Traffic Load Class
Tshs	Tanzania Shillings

CHAPTER 1

BACKGROUND OF THE PROJECT

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BACKGROUND OF THE PROJECT

1.1 Background and Outline of the Request for Grant Aid

In August, 2004, the Government of Tanzania requested the Government of Japan's provision of grant aid for the Project. This request clearly indicated the upgrading of the target 17.2 km long section to four lanes. Later in August, 2007, the Government of Tanzania revised the road length for upgrading to 35 km based on its 2004 request and submitted a new request to the Government of Japan.

During these years, the JICA conducted the Study for the Formulation of Master Plan for Urban Transport System (hereinafter referred to as the "Urban Transport Master Plan"; this study lasted from April, 2007 to June, 2008) under its development study scheme. This Urban Transport Master Plan identified the annual trend of population concentration towards Dar es Salaam and predicted that the population of the city would increase from the some 2.6 million in the 2003 census to 4 million in 2015 and 5.8 million in 2030. The same plan also predicted the steady economic growth of the city. While the city's income per capita in 2030 will be 2.65 times the 2003 level, the number of registered vehicles for private use will increase from some 78,000 in 2007 to 180,000 in 2015 and 515,000 in 2030.

Against the background of an estimated increase of the some 3 million population of Dar es Salaam in 2007 to some 5.8 million in the not very distant future, urban planning for the city identified two urgent tasks: land to accommodate the extra 2.8 million people and viable measures to deal with an increase of the vehicle traffic. In response, the Urban Transport Master Plan recommended the upgrading of a 17 km section of New Bagamoyo Road as a priority project up to 2015. This led to the implementation of a project formulation study for road development by the JICA (from April to June, 2008; hereinafter referred to as the "Project Formulation Study"), confirming that the two way traffic section with a single lane each way from the end point to the 35 km point towards Bagamoyo of the road had already been upgraded in 2008 by the TANROADS (with the financial assistance of the EU, primarily Italy). Consequently, it was finalised through consultations with the Tanzanian side that the 17 km section would be upgraded with Japan's grant aid.

The principal purpose of the request for the Project was to alleviate the severe traffic congestion on the current two lane road over the target section of some 17 km where the traffic volume has sharply increased in recent years by means of widening the road to four lanes. The field survey confirmed the necessity and viability of the scope of the Project.

The field survey also found the necessity for a follow-up survey and monitoring as described below for the some 4.3 km long section from the Morocco Intersection to the Mwenge Intersection of the subject road.

Such underground structures as large diameter water mains are buried along existing houses within the ROW at the some 1.6 km point from the Morocco Intersection. It is necessary to clearly establish their burial location and depth to determine the optimal road alignment.

Because of the need to conduct a survey to determine the exact burial location and depth of large diameter water mains, etc., some time will be required to complete the necessary procedures to acquire the land and to remove the existing fencing for this particular section. It has been clarified that at least one year or more will be required to complete the work to relocate such water mains as a result of the survey and subsequent analysis.

There are plans to expand Old Bagamoyo Road connected to New Bagamoyo Road at the Morocco Intersection and Rose Garden Road connected to New Bagamoyo Road at the Kijitonyama Intersection and the TANROADS is currently in the process of selecting a consultant for the implementation of these plans.

Partial widening of the section between the Morocco Intersection and Mwenge Intersection to four lanes without proper finalisation of the overall road alignment will lead to further congestion because of the continuation of some non-widened sections. Such an approach would, therefore, leave doubt concerning the achievement of the positive effects of the widening of the section concerned and also concerning the overall relevance of the Project.It is judged that planning of the work to expand the section between the Morocco Intersection and Mwenge Intersection should take place based on the findings of an additional survey at a suitable time while monitoring the progress of the necessary procedures, including that for land acquisition, and plans/projects to expand the neighbouring sections.

In view of the above judgement, the design policies for this preparatory survey deal with only the some 12.9 km long section between Mwenge Intersection and Tegeta Intersection.

1.2 Natural Conditions

(1) Natural Conditions of the Project Area

1) Topography

Tanzania is situated in the central part of the African continent's east coast, facing the Indian Ocean. It has a total land area of approximately 945,000 km^2 and a population of some 40.43 million. Highlands with an elevation of 1,000 ~ 2,000 m dominate the inland and Mt.

Kilimanjaro (EL. 5,895 m) rises high in the north. New Bagamoyo Road in Dar es Salaam, one section of which is the subject of improvement under the Project, runs along the coastal terrace running parallel to the coastline at a distance of some 2 km from the Indian Ocean coast and has an elevation ranging from 20 m to 60 m.

2) Meteorological Conditions

The prevailing climate is a high temperature and high humidity which is typical of coastal regions in Tanzania. There are two rainy seasons: a major rainy season from late March to late May and a minor rainy season from the end of November to early December. The period from June to September is relatively cool but extremely hot weather continues from December to February. Rainfall is observed all year round although half of the annual rainfall is recorded during the three months of the major rainy season.

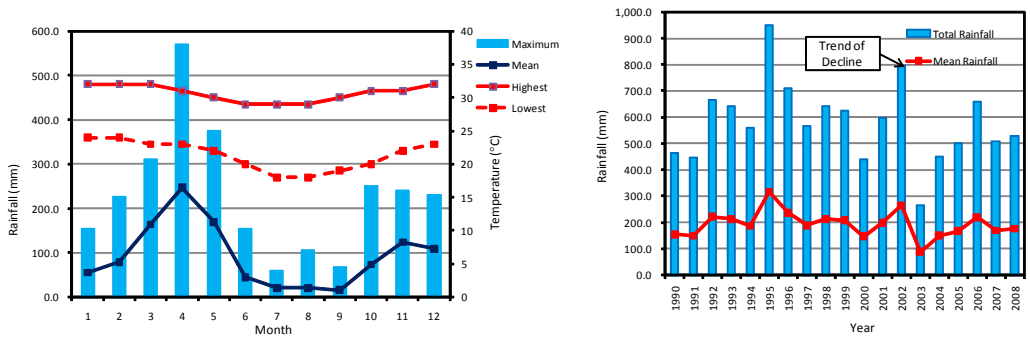


Fig. 1-1 Temperature and Rainfall at Dar es Salaam

3) Geology

The field survey confirmed that the ground supporting the target section of the road generally consists of sandy soil mixed with silt throughout with the ground at some points being fragile to support the planned road because of the clayey sand.

(2) Natural Conditions Survey

As part of the field survey, a natural conditions survey was conducted featuring a topographical survey, geological survey, soil survey, traffic volume survey and a survey on existing underground structures. In addition, the team members directly checked the soundness of the existing road bridges.

1) Topographical Survey

The surveying of the target section involved longitudinal surveying to check the actual elevation at each control point set up at 20 m intervals throughout the total length of 17.0 km and horizontal surveying over the width of 50 m each site of the central point of each control point. Further details of this work are given in Table 1-1.

Table 1-1 Work Items of the Topographical Surveying

Work Item	Quantity	Remarks
(1) Establishment of control points	18 points	One point per km
(2) Control point surveying	18 points	Control points for the traverse surveying of the target section
(3) Surveying of the centre line	17.0 km	Checking of the longitudinal and horizontal alignment of the existing road centre line
(4) Cross-sectional surveying of the road	850 cross-sections	50 m intervals
(5) Planimetric surveying	85 ha	Total length: 17 km Width: 50 m

2) Geological Survey (Boring)

A boring survey, standard penetration test and laboratory soil test were conducted for the planning and design of new road bridges so that the physical and mechanical characteristics of the foundation ground could be established. Four boring sites were selected for three bridges, i.e. Mlalakuwa Bridge, Lugalo Bridge and Tegeta Bridge (two sites). The boring results are outlined in Table 1-2.

Table 1-2 Outline of the Boring Results

Boring Site	Boring Results
Mlalakuwa Bridge	Up to a depth of -3 m, borrow material with a N value of 14 is used for the banking. Below this depth to a depth of -16 m, sandy soil with a N value of 20 to more than 30 is found, offering good compaction.
Lugalo Bridge	From a depth of -1 m to -15 m, sandy soil with a N value of 20 to more than 30 is found, offering good compaction.
Tegeta Bridge	From a depth of -1 m to -6 m, fine sandy soil with a N value of 9 to 30 is found.

3) Soil Survey

Some details of the soil survey are given in Table 1-3.

Table 1-3 Work Quantities of the Soil Survey

Survey Item	Quantity
① DCP test (every 1 km)	17 sites
② Test pit (every 500 m)	34 sites
③ Soil test	
• Subgrade material from the test pit	34 sites
• Aggregates from the quarry	1 site
• Borrow material from the borrow pit	2 sites

The test results for the subgrade material from the test pits were used for examination of the cross-section of the pavement configuration shown in Fig. 2-3.

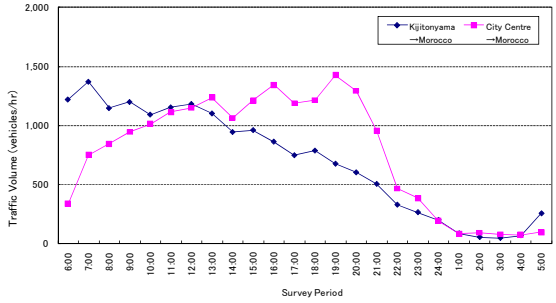
4) Traffic Volume Survey

A 24 hour traffic survey was conducted from 06:00 on 15th April, 2009 (Wednesday) to 06:00 on the following day along with a traffic congestion survey over a period of 12 hours from 06:00 to 18:00. This traffic volume survey was conducted at eight major intersections shown on the map for comparison with corresponding data gathered for the Project Formulation Study in 2008.

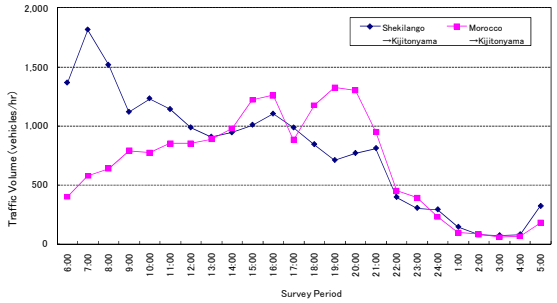
The hourly traffic volume fluctuations in the target road section and situation of the traffic flow at each intersection are shown in Table 1-4 and Table 1-5 respectively.

Table 1-4 Hourly Fluctuations of the Traffic Volume on New Bagamoyo Road
(Cross-Sectional Total)

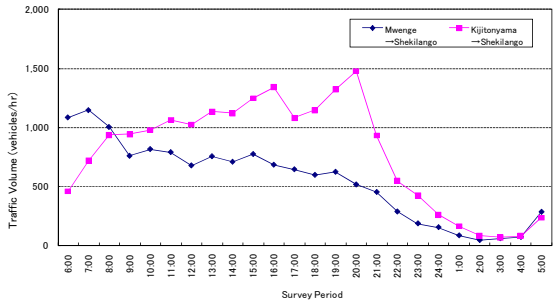
1. Morocco Intersection



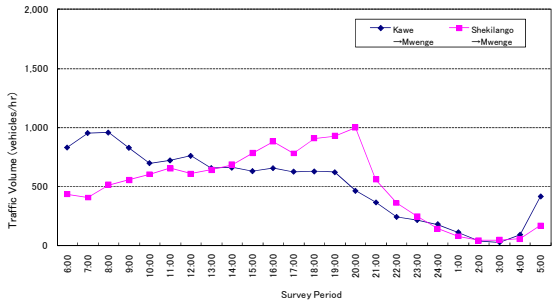
2. Kijitonyama Intersection



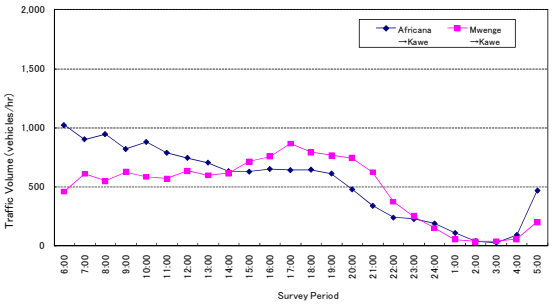
3. Shekilango Intersection



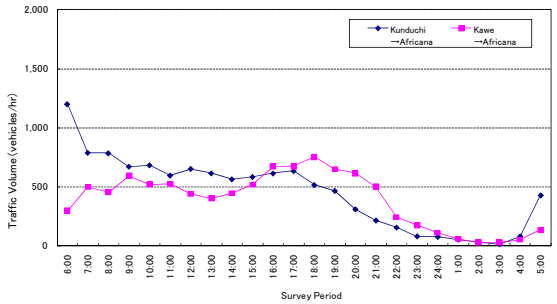
4. Mwenge Intersection



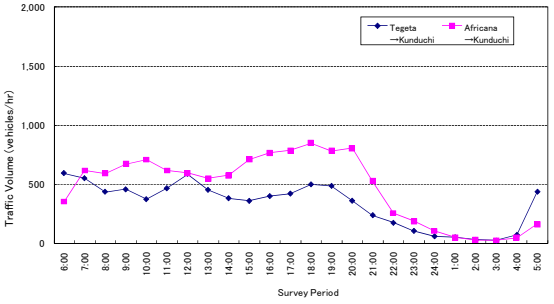
5. Kawe Intersection



6. Africana Intersection



7. Kunduchi Intersection



8. Tegeta Intersection

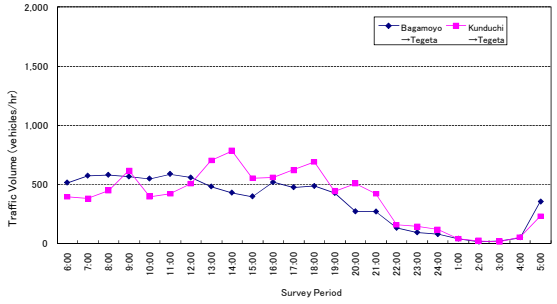
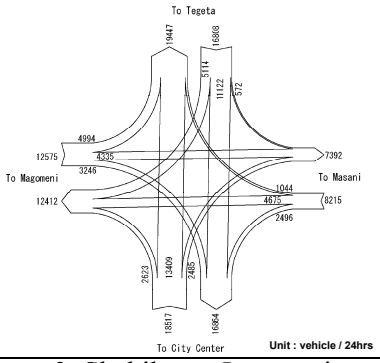
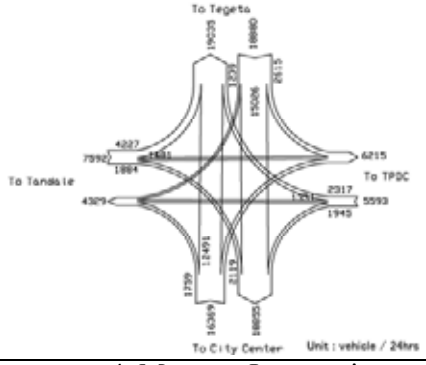
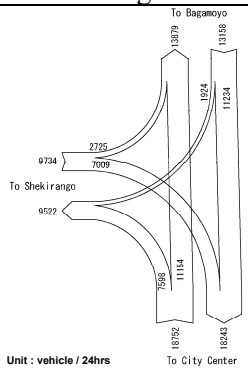
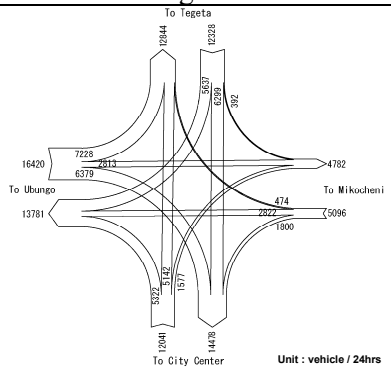
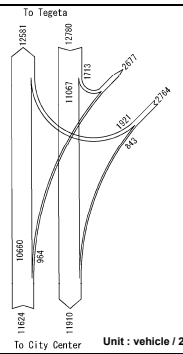
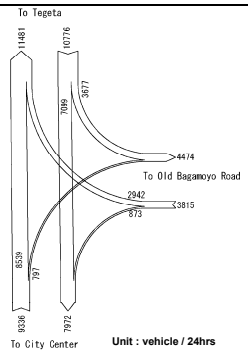
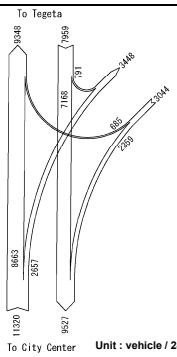
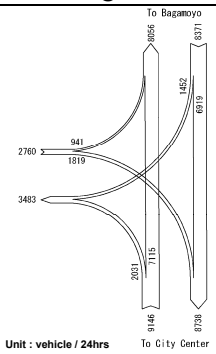


Table 1-5 Situation of the Traffic Flow at Major Intersections on New Bagamoyo Road

1. Morocco Intersection	2. Kijitonyama Intersection
	
3. Shekilango Intersection	4. Mwenge Intersection
	
5. Kawe Intersection	6. Africana Intersection
	
7. Kunduchi Intersection	8. Tegeta Intersection
	

5) Survey of Existing Underground Structures

As part of the field survey, a survey on existing underground structures was conducted for a period of 29 days from 14th April to 12th May, 2009.

Along with the acquisition and analysis of the drawings for existing underground pipes, a proposal was made to the TANROADS to organize a meeting of the Steering Committee so that all stakeholders could be made aware of the issues involved. Joint on-the-spot visits were then made by representatives of the stakeholders and the concept of the planned road alignment was explained to them in a concrete manner for the exchange of opinions. Some of the opinions expressed would be further examined on the grounds that they could be useful for the road planning. In addition, useful materials for the outline planning of relocation and budget planning were provided to the relevant departments.

The above work was followed by actual checking of the type, location and depth of the pipes by opening the existing manholes. While verifying such data with the drawings, test drilling points were determined by an electromagnetic iron pipe detector at those sites which would be especially important for bridge planning and design. Test drilling was conducted to visually confirm the state of burial.

Fig. 1-2 shows the situation of obstacles, including underground structures, in the target section.

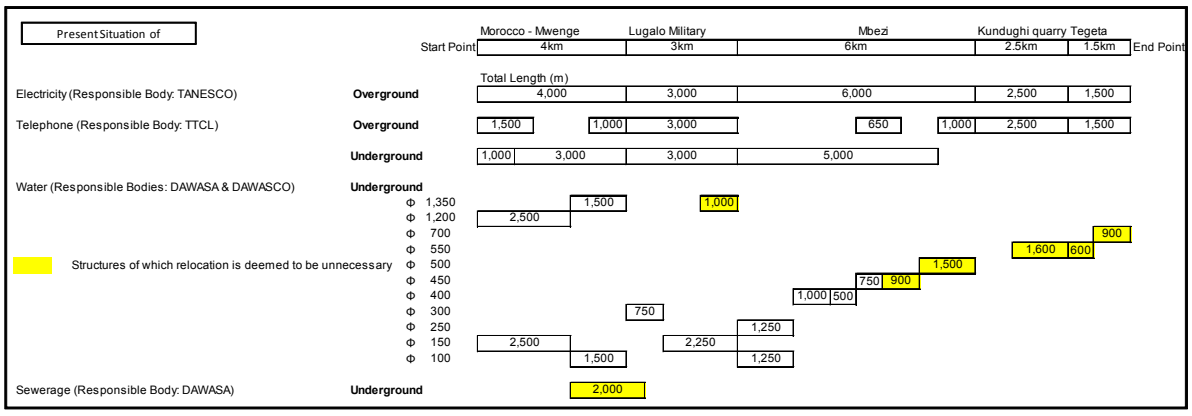


Fig. 1-2 Situation of Obstacles in the Target Section

According to a local expert of the relevant department, the principal work alone would require at least one year to complete in the case of the relocation of large water mains of 1,200 ~ 1,350 mm in diameter. The survey to check the exact location and depth of the existing water main (ϕ1,200 mm) running between the Morocco Intersection and Mwenge Intersection was hampered because part of this water main runs through privately owned land. It was, therefore, found to be necessary to make allowance for some time to complete the procedures to acquire the land and to remove the fencing, etc. so that a survey could be conducted to determine the exact location and depth of the water main. Meanwhile, the visual check during the test drilling confirmed that the actual location and depth of the buried pipes greatly differed from those on the drawings in some cases. This discovery raised the question of who would ensure the accurate location and depth of the relocated buried pipes, especially large diameter pipes, as part of the undertakings of the Government of Tanzania so that the relocated pipes would not adversely affect the planned road.

6) Soundness Survey of Existing Bridges

The target section has three bridges: Mlalakuwa Bridge, Lugalo Bridge and Tegeta Bridge. These are located near the 4.9 km point, 7.8 km point and 15.6 km point from the Morrocco Intersection respectively. Tegeta Bridge is a concrete bridge and the other two are steel bridges. All of them are relatively small as their length is less than 30 m.

The TANROADS was set up in July, 2007 and inherited the work of the Road Bureau of the Ministry of Public Works, the predecessor of the present Ministry of Infrastructure Development. The only available document regarding these three bridges is a Bridge Register prepared in 1998. Because of the absence of the original design documents, etc., no details have been obtained except for the year of construction and restrictions on the axial load. Consequently, the soundness survey only featured the present conditions of these bridges.

The survey results for these three bridges are explained next.

① Present Conditions of Existing Bridges

i) Mlalakuwa Bridge

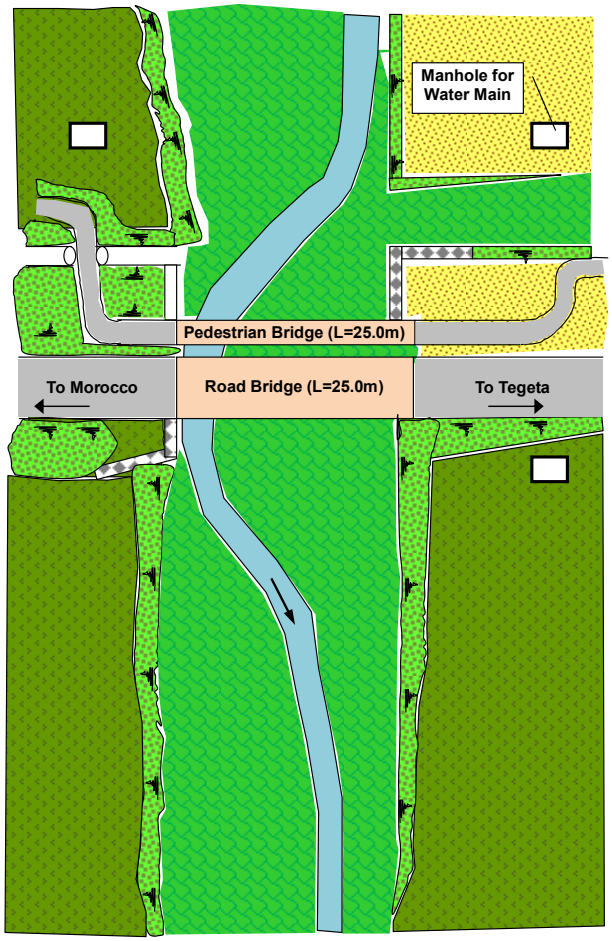
Name	Mlalakuwa Bridge		Distance from the Start Point	Approx. 4.9km		Year of Construction	1995
Type	Composite girder		Maximum Axial Load	10t		Slab Type	RC slab
Length	25.0m	Span	12.5+12.5m	Total Lane Width	7.0m	Footpath Width	1.5m
Location	Mwenge ~ Kawe			Highest Water Level Recorded		1.0m above the road surface due to an El Nino effect in 1996	

Photograph of the Existing Bridge

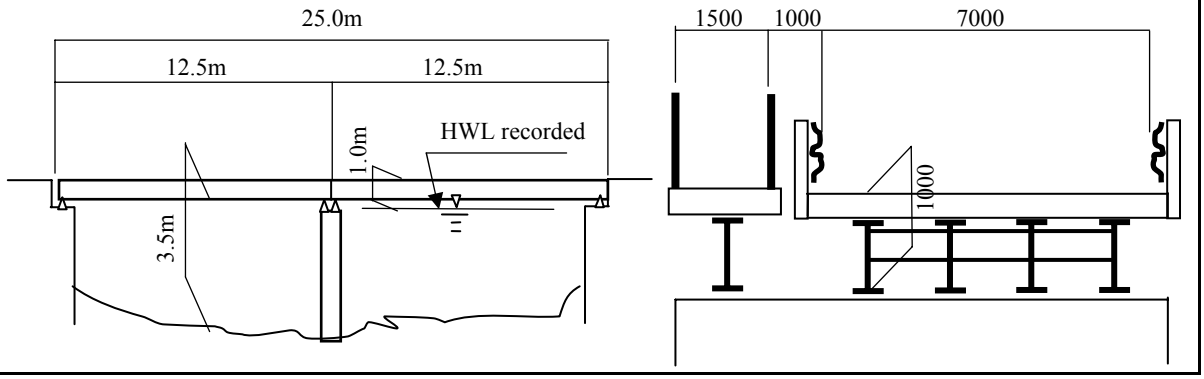
Side View

Cross Sectional View

Site Map



Structural Outline



ii) Lugalo Bridge

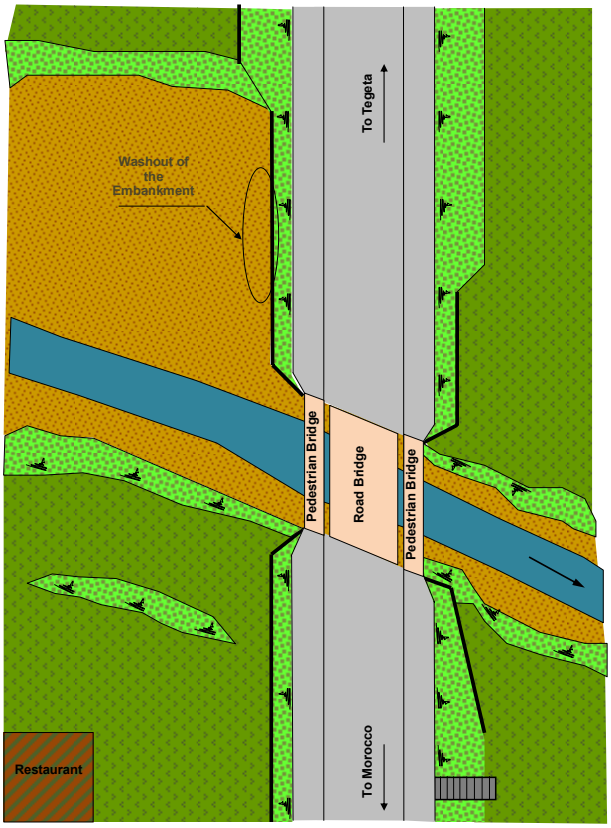
Name	Lugalo Bridge		Distance from the Start Point	Approx.7.8km		Year of Construction	Unknown
Type	Composite girder (Skew angle: some 60°left)		Maximum Axial Load	10t		Slab Type	RC slab
Length	19.0m	Span	17.85m	Total Lane Width	7.5m	Footpath Width	1.36m
Location	Kawe			Highest Water Level Recorded	3.0m from the riverbed due to an El Nino effect in 1996		

Photograph of the Existing Bridge

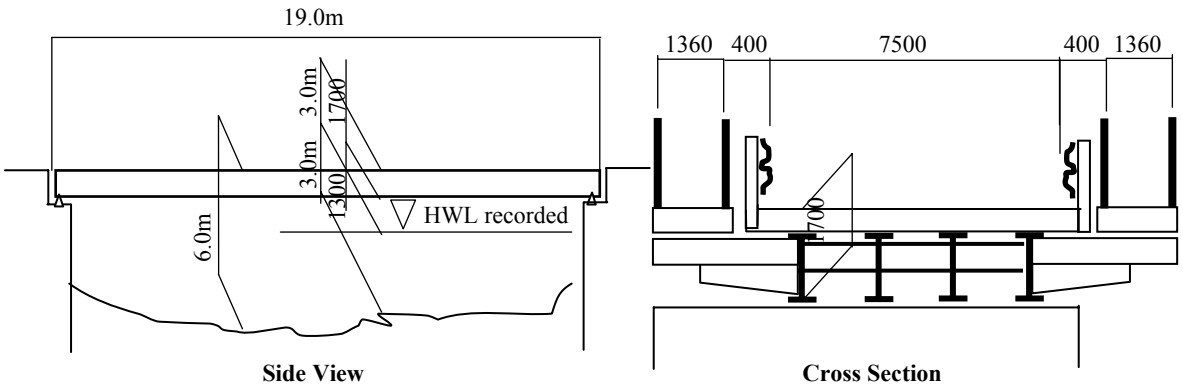
Side View

Cross Sectional View

Site Map



Structural Outline



Side View **Cross Section**

iii) Tegeta Bridge

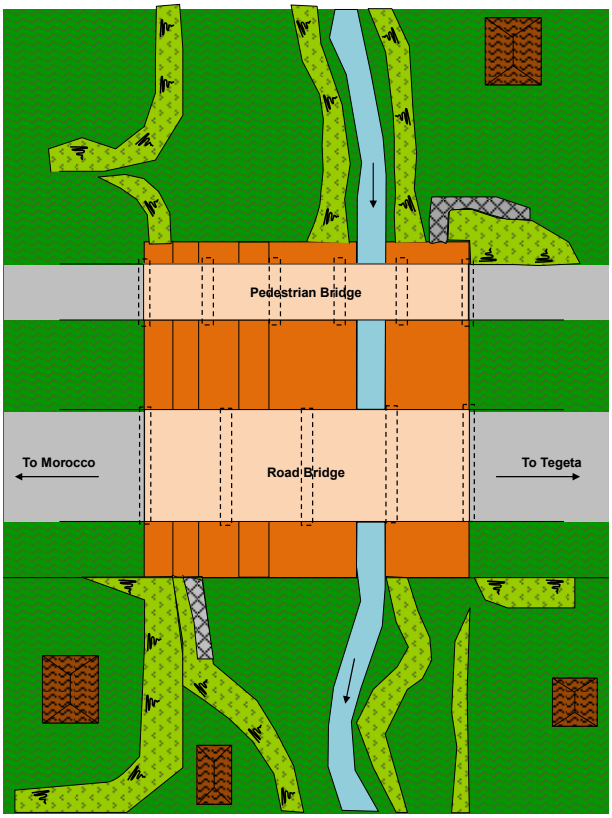
Name	Tegeta Bridge		Distance from the Start Point	Approx. 15.6km		Year of Construction	1995
Type	Concrete slab bridge		Maximum Axial Load	10t		Slab Type	RC slab
Length	30.0m	Span	4@7.5m	Total Lane Width	8.2m	Footpath Width	3.65m
Location	Kunduchi～Wazo Hill			Highest Water Level Recorded		Flooded by an El Nino effect in 1996	

Photograph of the Existing Bridge

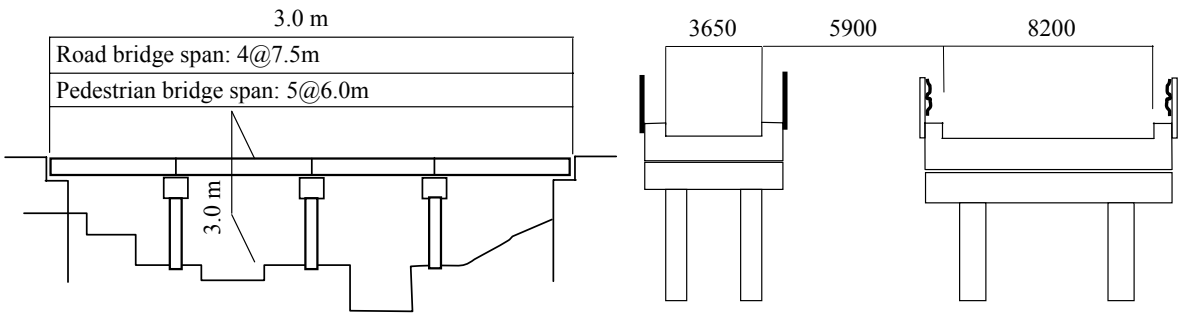
Side View

Road Surface

Site Map



Structural Outline



② Soundness Evaluation

The soundness of the existing three bridges was evaluated in terms of the following items by means of visual inspection and a Schmidt hammer.

Table 1-6 Bridge Soundness Evaluation Items

Floor Slabs	Steel Girders	Concrete Girders
• Water leakage; free lime • Cracking • Standing water on the surface • Other	• Abnormal sound • Deteriorated paintwork • Corrosion • Loose bolts • Cracking • Deformation; loss	• Deteriorated concrete • Cracking • Loose concrete • Water leakage; free lime • Exfoliation • Exposed reinforcing bars
Substructure	Auxiliary Structures	
• Cracking • Honeycombing • Exfoliation • Sinking of the foundations • Shifting of the foundations • Tilting of the foundations • Scouring of the foundations	• Abnormality of the shoes • Abnormality of the expansion devices • Abnormality of the drainage system • Abnormality of the footpath • Abnormality of the embankment	

Table 1-7 describes the prominent damage and other findings for each bridge.

Table 1-7 Soundness Judgement Results

	Mlalakuwa Bridge	Lugalo Bridge	Tegeta Bridge
Damage	• The paintwork of the steel girders has completely deteriorated, causing rust on the steel surface. • The cross-sectional area of the longitudinal stiffeners at the end sections of the main girder has substantially decreased to a dangerous extent. • Harmful honeycombing is observed on the walls of the substructure. • The concrete at the crown of the abutment beam of the shoe has exfoliated due to shearing. • The foundations for the footpath have been scoured to a dangerous extent. • The guardrail has been substantially deformed due to collisions and the posts have become detached from the floor slabs. • The steel plates at the shoe are not functioning due to corrosion.	• Water leakage marks and free lime are observed on the lower face of the floor slabs of the flared section. • The paintwork of the steel girders has completely deteriorated, causing rust on the steel surface. However, no significant loss of the cross-sectional area is observed. • Harmful honeycombing is observed on the walls of the substructure. • Harmful scouring is taking place at the abutment foundations. • The shallow concrete cover has led to exfoliation, exposing the reinforcing bars. • Standing water on the footpath after rain makes walking difficult for pedestrians. • The change of the river course has made the side of the approach road a water colliding front, causing the fall of the gabions protecting this section.	• The concrete protecting the foundations of the piers is suffering from major cracking.

	Mlalakuwa Bridge	Lugalo Bridge	Tegeta Bridge
Restrictions on axial load	• 10 tons (based on the Bridge Register)	• 10 tons (based on the Bridge Register)	• 10 tons (based on the Bridge Register)
Schmidt hammer test results	• Abutment concrete strength: 27.4 N/mm^2 > required strength (21 N/mm^2) Acceptable	• Abutment concrete strength: 18.2 N/mm^2 < required strength (21 N/mm^2) Not Acceptable	• Abutment concrete strength: 28.1 N/mm^2 > required strength (21 N/mm^2) Acceptable
Effective width	• Vehicle lanes: 7.0 m (required effective width: 8.0 m) • Footpath: 1.5 m (required width: 1.5 m)	• Vehicle lanes: 7.5 m (required effective width (8.0 m) • Footpath: 1.36 m (required width: 1.5 m)	• Vehicle lanes: 8.2 m (required effective width 8.0 m) • Footpath: 3.65 m (required width: 1.5 m)
Highest water level in the past	• 1.0 m above the road surface	• 3.0 m above the riverbed	• Up to the road surface
Overall evaluation results	• The damage to the steel girders is very serious, requiring either bridge replacement work or large-scale reinforcement work which will necessitate the suspension of bridge use. • The present width is narrower than the required width, necessitating either widening work or bridge replacement.	• The insufficient strength of the abutment concrete and other defects demand large-scale repair/reinforcement work if the bridge is to be safely used for the next decade or so. However, no data is available for reinforcement computation. • The present width is narrower than the required width, necessitating either widening work or bridge replacement.	• There are no grave defects. • While the bridge can continue to be used as it is because of the sufficient width, there are no footpaths. • Because of the past record of the water level rising to the road surface, raising of the road surface will be necessary.
Conclusion	• Bridge replacement	• Bridge replacement	• Bridge replacement

1.3 Social and Environmental Considerations

As the Project aims at the rehabilitation and improvement of the existing road using its alignment, it should not have much impact on the natural environment or social environment. Nevertheless, careful attention will be paid to the following points in the project planning and design with a view to minimising any environmental and/or social impacts.

① Application of a construction method with the minimum dust, noise and vibration, particularly in urban areas

② Installation of plant, etc. producing noise and dust at sites where there are no adjacent houses

③ Transportation and disposal of construction waste at suitable sites

④ Adequate treatment and discharge of waste water from plants to rivers or other

For the implementation of the Project, it is necessary to obtain approval for an EIA from the agency responsible for the environment. The procedure to obtain such approval is described next along with the unique background of the Project.

(1) Environmental Administration in Tanzania

The supreme body and person responsible for environmental administration in Tanzania are the National Environmental Advisory Committee of the Office of the Vice-President and the Minister for the Environment. While there is no environment ministry responsible for environmental administration at the national level, the Environment Bureau of the Vice-President's Office and the National Environmental Management Council (NEMC) function under the Minister for the Environment.

The Environment Bureau is responsible for the coordination of the environmental management policies of various ministries and agencies and also for the review of strategic environmental assessments, including master plans.

The NEMC is responsible for the coordination of public participation in environmental issues at the national level, supervision of the compliance of development projects with the EIA procedure, review of EIAs and monitoring. The NEMC also issues environment-related licences.

(2) Procedure for Environmental and Social Considerations

In Tanzania, the Environmental Management Act enforced in 2004 (Gazette Number: No. 20 of 2004) is the fundamental act on which other environment-related laws and regulations are based.

According to the Environmental Assessment and Management Guidelines for the Road Sector in Tanzania (July, 2004), the Project is classified as a Category B project with few environmental impacts as the width of the RoW and the total road length under the Project are less than 45 m and less than 30 km respectively.

However, as the implementation of an EIA is a compulsory requirement for all road projects, it is necessary to conduct an EIA for the Project.

(3) EIA Procedure for the Project

The MoID, the responsible ministry for the Project, applied for the commencement of the EIA procedure for the Project in 2008 and the MoID was informed by the NEMC in October, 2008 that the registration of the Project featuring the target section at the NEMC had been completed.

The original subject section of the Project as requested by the Tanzanian side stretched some 17 km from the Morocco Intersection to the Tegeta Intersection and a field survey covering this section was conducted. Accordingly, the EIA implementation schedule in consideration of this 17 km section as shown in Fig. 1-3 was agreed between the Tanzanian and Japanese sides in March, 2009 following

the field survey for the Project. At present, the TANROADS (project implementing agency) is engaged in the necessary procedure based on this schedule.

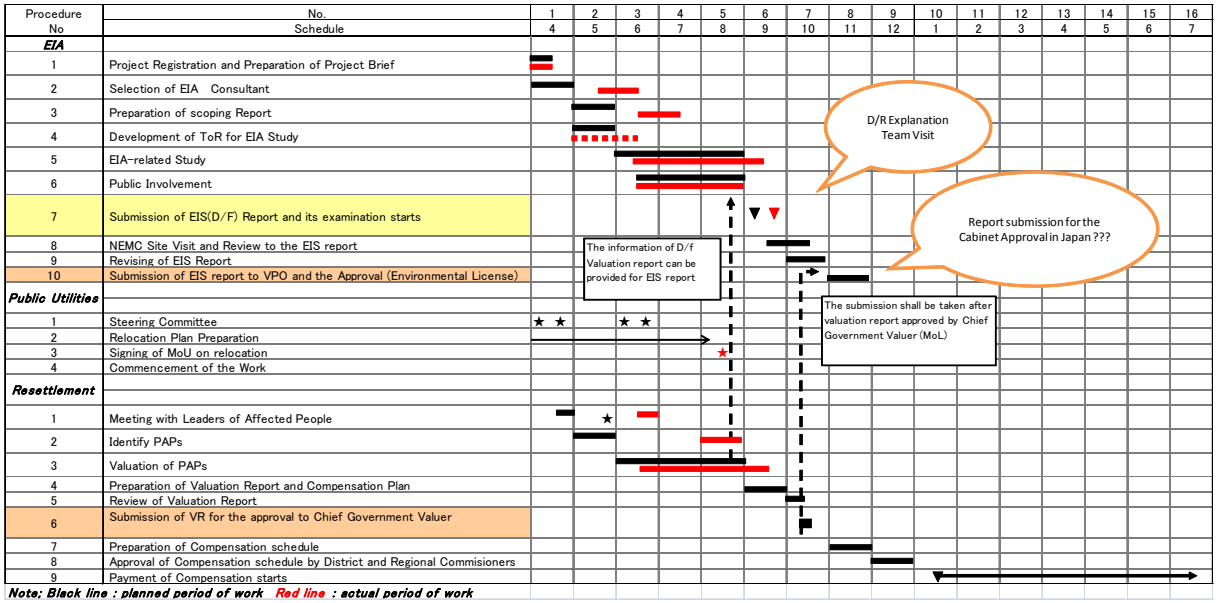


Fig. 1-3 Schedule of the EIA Procedure

The above EIA schedule was prepared after explanations by the field survey team of the concept of the alignment of the subject road being given to those in charge of environmental issues at the TANROADS as well as those in charge of public services (water, electricity and telephone). The concept of the overall road construction plan and outline project implementation schedule were also explained to the staff members of the TANROADS through joint field reconnaissance work prior to the preparation of the schedule in question.

At the end of June, the Japanese side showed the locations and quantities of the land, houses, fencing and obstructing public utilities which would be affected by the planned road alignment in the subject section to the TANROADS together with the submission of the relevant digital data.

Following the analysis conducted in Japan, the Japanese side judged that the work to widen the some 4.3 km section between the Morocco Intersection and Mwenge Intersection to four lanes should wait for an additional survey and planning to be conducted at an appropriate time in the future due to the reasons given in 2.2.1-(1) Basic Policies while proceeding with the procedure to acquire land and the monitoring of other road widening projects in neighbouring areas. This judgement was agreed by the TANROADS in July, 2009.

Because of the above-described development, the EIA procedure went ahead to obtain an approval of the EIA for the target 12.9 km section of the Project from the NEMC

(4) History of the EIA-Related Work for the Project.

In mid-June, 2009, the TANROADS selected an environmental consultant. In accordance with the TOR, this consultant organized stakeholder meetings involving community leaders and heads of local administrative bodies at Kijitonyama (2.5 km from the Morocco Intersection), Kawe (7.3 km from the Morocco Intersection), Mbezi (10 km from the Morocco Intersection) and Kunduchi (13.2 km from the Morocco Intersection) from June to August to discuss issues relating to the likely impacts of the Project. In parallel with these meetings, the TANROADS conducted the preparatory work for an EIA report and a compensation plan.

In August, 2009, the total cost of the relocation of public utility facilities (water, electricity and telephone) in the entire 17 km section was estimated to be Tshs 13,959 million (¥983 million). The total cost of the said relocation for the target 12.9 km section of the Project was estimated to be Tshs 6,874 million in October, 2009.

At present, the Tanzanian side has secured Tshs 1,690 million (¥120 million) for this relocation work. Although this falls far short of meeting the relocation cost for the 12.9 km section, it is confirmed that the Tanzanian side will obtain additional budget as judged necessary in accordance with the progress of the Project.

In September, 2009, based on the interim report on the obstacles posed by various public services and the need to purchase land, the TANROADS prepared the draft environmental and social impacts assessment (ESIA) report and submitted it to the NEMC. However, the original schedule that the report would be reviewed in October and an environmental license would be granted before the end November could be delayed, subject to normal administrative procedures taken by the government of Tanzania.

(5) Land Acquisition and Resettlement

The household which would be affected by land acquisition in the subject area is gathered between Morocco intersection and Mwenge intersection. According to the ownership map, the household in the subject area is railed off by fence along with streets. There are some facilities mostly like fences, garden and parking yards in the affected area and some buildings in a part of the area. The area as well as the number of the affected facilities might be slightly changed subject to required adjustment of the alignment, however, acquisition of certain area and some facilities as well as the almost same number will be required.

There are 27 households (25 on the left and 2 on the right) which will be finitely affected by land acquisition between Morocco intersection and Mwenge intersection, but those households can remain there and involuntary resettlement might not be required for any household. On the other hand, and acquisition of two households is required between Mwenge intersection and Tegeta

intersection. These household buildings are facilities for water supply and their owner is DAWASA (Dar es Salaam Water and Sewage Authority).

Regarding involuntary resettlement, besides of the above, it is confirmed that there are 67 barracks in total in the subject area, 57 of which are between Morocco intersection and Mwenge intersection and 10 of which are between Mwenge intersection and Tegeta intersection. Those barracks are facilities for stall keepers to sell small plants and potteries, and portable facilities to sell sundry goods. Some of those barracks are not recorded on the topographic survey map made in May, 2009, while they are recorded on the ownership map, as these two maps were made in different years. It means that locations of the barracks are not totally identified.

The conclusion is that the above mentioned 10 barracks, which are seen in the subject area between Mwenge intersection and Tegeta intersection, are not the subject for involuntary resettlement, as nobody lives in the facilities. On the other hand, the EIA guidelines of Tanzania require an action of involuntary resettlement, if more than 100 households are impacted by a subject project, therefore; the full EIA is not required for the subject project and an environmental license for the project can be granted by submission and assessments of the ESIA Report. At the same time, the environmental and social impact on the subject project is less than one in Category A, according to the EIA Guidelines by JICA, therefore, the subject project is categorized as B same as a JICA project formation study is.

(6) Environmental Check List and Monitoring Plan

During the session between 14th and 24th October, 2009 to explain the survey results, the contents of the environmental check list and monitoring plan were confirmed with the TANROADS. As part of the agreed items in the M/D, the Government of Tanzania agreed to take the necessary measures based on the environmental and social consideration items. Table 1-8 and Table 1-9 below list the subject environmental items for check list and monitoring.

Table 1-8 Environmental Check List

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
1 Permits and Explanation	(1) EIA and Environmental Permits	① Have EIA reports been officially completed? ② Have EIA reports been approved by authorities of the host country's government? ③ Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? ④ In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	① DRAFT ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT(Draft ESIA Report) was prepared in September 2009. ②,③ Draft ESIA Report was submitted to National Environmental Management Council: NEMC) by TANROADS in September 2009. NEMC is to conduct site surveys based on the report and instruct TANRODS to review it. And thereafter TANROADS will submit an evaluation report on PAPs to NEMC in October 2009, and receive the certificate in November the same year. ④ Not necessary
	(2) Explanation to the Public	① Are contents of the project and the potential impacts adequately explained to the public based on appropriate procedures, including information disclosure? Is understanding obtained from the public? ② Are proper responses made to comments from the public and regulatory authorities?	① In June, 2008, a meeting of stakeholders was held in the city of Kunduchi and explanations were given on the project and opinions were exchanged. ② Between June and August, 2009, public consultations were held at 16 venues to stakeholders including local leaders, officers from local governments and public utility agencies. The opinions of these relevant people were reflected to the Draft ESIA Report.
2 Mitigation Measures	(1) Air Quality	① Is there a possibility that air pollutants emitted from various sources, such as vehicle traffic will affect ambient air quality? Does ambient air quality comply with the country's ambient air quality standards? ② Where industrial areas already exist near the route, is there a possibility that the project will make air pollution worse?	① The present situation complies with the vehicle emission standards under Tanzania's environmental standards. But there's no standard for monitoring environment along the road. As the Project aims at eliminating the current traffic congestion, the quantity of extra air pollutants originating from traffic congestion will be improved from the present level. ② There is a cement factory approximately 5 km away from the end of the objective road. The project will not affect adversely the cement factory.
	(2) Water Quality	① Is there a possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas? ② Is there a possibility that surface runoff from roads will contaminate water sources, such as groundwater? ③ Do effluents from various facilities, such as stations and parking areas/service areas comply with the country's effluent standards and ambient water quality standards? Is there a possibility that the effluents will cause areas that do not comply with the country's ambient water quality standards?	① Because the Project aims at improving an existing road, there will be neither large-scale change of the existing topography nor massive civil engineering work. Therefore, water quality may be somehow concerned only during the bridge/culvert work at crossing of these rivers. ② The surface runoff from the road will, in principle, be guided to the intended destination by such drainage facilities as side ditches. ③ No parking or service areas are planned in the Project.
	(3) Noise and Vibration	① Do noise and vibrations from vehicle and train traffic comply with the country's standards?	① There is no environmental standard governing noise and vibration. Noise and vibration are concerned due to vehicles engaged with the construction work. The noise and vibration are to be measured before and during the construction, and their impacts are monitored in accordance with ESIA Report.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
3 Natural Environment	(1) Protected Areas	① Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	① No important natural reserve or national park is situated in areas along the route in question.
	(2) Ecosystem	① Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g. coral reefs, mangroves, or tidal flats)? ② Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? ③ If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? ④ Are adequate protection measures taken to prevent impacts, such as disruption of migration routes, habitat fragmentation, and traffic accident of wildlife and livestock? ⑤ Is there a possibility that installation of roads will cause impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystems due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered? ⑥ In cases where the project site is located at undeveloped areas, is there a possibility that the new development will result in extensive loss of natural environments?	①-⑥ No inhabitation of rare fauna or flora has been reported in areas along the route in question.
	(3) Hydrology	① Is there a possibility that alteration of topographic features and installation of structures, such as tunnels will adversely affect surface water and groundwater flows?	① As the Project aims at improving an existing road, there will be no major change of the existing topography. The planned cross-section of the target road for improvement involves low banking of approximately 1 m in height at most sections. Drainage facilities are planned along the route to swiftly drain rainwater from the road surface. At some cut sections, side ditches are planned at the top and toe of the slopes to properly guide surface water. The replacement bridges will have no piers in the river channel and the clearance height of the girders is planned taking the recorded flood water level in the past into consideration.
	(4) Topography and Geology	① Is there a soft ground on the route that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed? ② Is there a possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides? ③ Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?	①②No steep slopes liable to collapse or landslide have been found in areas along the route in question. ③ The existing route in the target section runs near open cast quarries at Kunduchi. At present, no serious land collapse or soil runoff is taking place and no signs of these have been detected. One reason for this is that the toe of the present road is away from the top of the cut slopes at open cast quarries. Accordingly, the Project will maintain the present situation while planning the introduction of suitable drainage facilities. Materials are extracted from the existing borrow pits and quarries.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
4 Social Environment	(1) Resettlement	① Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? ② Is adequate explanation on relocation and compensation given to affected persons prior to resettlement? ③ Is the resettlement plan, including proper compensation, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? ④ Does the resettlement plan pay particular attention to vulnerable groups or persons, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? ⑤ Are agreements with the affected persons obtained prior to resettlement? ⑥ Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? ⑦ Is a plan developed to monitor the impacts of resettlement?	① As a result of selecting road alignments which will minimize the involuntary resettlement of local residents, the removal of only two houses which are situated within the RoW will be required. As one of these is a water by tank station, this is not a case of involuntary resettlement, and resettlement has been agreed among the persons involved (Item to be confirmed). The other house is situated almost at the middle of the planned widened road and any change of the planned road alignments to avoid the removal will cause a significant adverse impact on other houses along the route. As such, the resettlement is essential. Therefore, it will be resettled under proper compensation by the Government of Tanzania (Item to be confirmed). ②-⑦ In the Environmental and Social Management Plan (ESMP) described in the ESIA report, it is recommended to compensate them where involuntary resettlement is not avoidable by designing. Also monitoring is recommended at pre-construction stage, construction stage and operation stage.
	(2) Living and Livelihood	① Where roads or railways are newly installed, is there a possibility that the project will affect the existing means of transportation and the associated workers? Is there a possibility that the project will cause significant impacts, such as extensive alteration of existing land uses, changes in sources of livelihood, or unemployment? Are adequate measures considered for preventing these impacts? ② Is there a possibility that the project will adversely affect the living conditions of inhabitants other than the affected inhabitants? Are adequate measures considered to reduce the impacts, if necessary? ③ Is there a possibility that diseases, including communicable diseases, such as HIV will be introduced due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary? ④ Is there a possibility that the project will adversely affect road traffic in the surrounding areas (e.g., by causing increases in traffic congestion and traffic accidents)? ⑤ Is there a possibility that roads and railways will cause impede the movement of inhabitants? ⑥ Is there a possibility that structures associated with roads (such as bridges) will cause a sun shading and radio interference?	① ② As the Project aims at improving an existing road, there will be no adverse impacts on the living conditions or road traffic in the subject area. ③ Activities to educate workers on the danger and prevention of malaria and HIV will be required. ④ As the main objective of the Project is to alleviate traffic congestion, appropriate consideration should be given to avoiding any unnecessary traffic congestion and accidents during the construction period. It is necessary to introduce safety facilities at appropriate sites along the route of the target road. ⑤⑥ No impediment to the movement of inhabitants or sun shading or radio interference will result from the Project.
	(3) Heritage	① Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage sites? Are adequate measures considered to protect these sites in accordance with the country's laws?	① No cultural nor other sites requiring protection exist at the project sites or in nearby areas.
	(4) Landscape	① Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	① No important landscape requiring special consideration exists at the project sites or in nearby areas.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
4 Social Environment	(5) Ethnic Minorities and Indigenous Peoples	① Where ethnic minorities and indigenous peoples are living in the rights-of-way, are considerations given to reduce the impacts on culture and lifestyle of ethnic minorities and indigenous peoples? ② Does the project comply with the country's laws for rights of ethnic minorities and indigenous peoples?	①,②No ethnic minorities nor indigenous people with a unique culture or lifestyle live in areas where the project sites are located.
5 Others	(1) Impacts during Construction	① Are adequate measures considered to reduce impacts during construction (e.g. noise, vibrations, turbid water, dust, exhaust gases, and wastes)? ② If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? ③ If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts? ④ If necessary, is health and safety education (e.g., traffic safety, public health) provided for project personnel, including workers?	①Noise and vibration due to the work are to be reduced by avoiding unnecessary idle away of accelerator and nighttime work as much as possible. Waste will be transported and disposed at dumping-ground in slump. Dust will be reduced by spraying water periodically. ②As the Project aims at improving an existing road, there will be no adverse impacts on the natural environment (ecosystem). ③Inbound and outbound carriageways will be separately constructed, and safety facilities and watchmen are to be allocated as required in order not to affect the current traffic as much as possible, ④ Education on traffic safety and health will be provided periodically to the workers engaged with the Project. Regarding the matters above, contractor will implement mitigation measures under supervision of TANROADS.
	(2) Monitoring	① Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? ② Are the items, methods and frequencies included in the monitoring program judged to be appropriate? ③ Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? ④ Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	①-④ Monitoring Plan is stated in the ESIA Report After commencement of the work, TANROADS and a contractor will continuously review by holding talks together and implement the monitoring.
6 Note	Reference to Checklist of Other Sectors	① Where necessary, pertinent items described in the Forestry Projects checklist should also be checked (e.g., projects including large areas of deforestation). ② Where necessary, pertinent items described in the Power Transmission and Distribution Lines checklist should also be checked (e.g., projects including installation of power transmission lines and/or electric distribution facilities).	Not applicable
	Note on Using Environmental Checklist	① If necessary, the impacts to trans-boundary or global issues should be confirmed, if necessary (e.g., the project includes factors that may cause problems, such as trans-boundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	Not applicable

Table 1-9 Contents of Environmental Monitoring

Monitoring Item	Description
Involuntary Resettlement	To confirm that the agreed terms of resettlement (payment of the resettlement cost, if necessary) are properly implemented To confirm the secured site for resettlement To confirm that the resettled people live in the new places without any problems
Air Pollution	To confirm a proper response to complaints made by local residents regarding dust
Noise and Vibration	To confirm a proper response to complaints made by local residents regarding noise To confirm a proper response to complaints made by local residents regarding vibration

Counteractions to results of the monitoring need be clarified in project development. Below are details of an implementation plan for the monitoring which are given as continuously checked items in the ESIA Report (Draft).

Execution Parties: Execution Agency and contracting parties to the subject project

Steps for confirmation of complaints:

①. Complainants → Contracting parties
②. Contracting parties → Execution Agency
③. Hearing from complainants (clarification and confirmation of main causes of complaints
④. Counteractions to the causes by Execution Agency and contracting parties

CHAPTER 2

CONTENTS OF THE PROJECT

CHAPTER 2
CONTENTS OF THE PROJECT

2.1 Basic Concept of the Project

2.1.1 Higher Goals and Project Goal

(1) Higher Goals

In 2003, the Government of the United Republic of Tanzania (hereinafter referred to as "Tanzania") formulated the National Transport Policy and the 10 Year Transport Sector Investment Programme (TSIP) Phase I as a medium-term investment programme aimed at concretely implementing the National Transport Policy. The TSIP identified the following issues as key components of a concrete transport sector development strategy.

① Achievement of smooth transport by means of developing seamless transport infrastructure

② Elimination of areas with poor transport facilities through the improvement of transport infrastructure

③ Facilitation of economic growth in such sectors as agriculture, manufacturing, mining, tourism and external trade through the improvement of transport infrastructure

(2) Project Goal

Dar es Salaam which is the target area of the Project plays a central role in the economy and physical distribution in Tanzania. As the city is the starting point for all transport systems, including the road, rail, air and maritime transport systems, it is truly a strategic point for transport in Tanzania.

Urban development in Dar es Salaam has been taking place along four trunk roads, i.e. Morogoro Road, Nyerere Road, Kilwa Road and New Bagamoyo Road albeit in a disorderly manner. In the last 10 years, the number of registered vehicles in the city has grown at an annual rate of 7% which is higher than the population growth rate. As a result, the traffic congestion along trunk roads has been worsening every year, hampering economic activities in the city.

To alleviate the situation, projects of various donors to expand the trunk roads to dual two lane roads (four lanes in total) have commenced or have been completed. Meanwhile, the Bus Rapid Transit (BRT) Programme has been formulated and the related work is underway to facilitate the switching over from reliance on private vehicles to the use of public transport. Under such circumstances, the primary goal of the Project is the improvement and widening of New

Bagamoyo Road to a four lane road as targeted by the BRT Programme for urban trunk roads in Dar es Salaam.

2.1.2 Outline of the Project

The Project aims at upgrading a some 12.9 km section of New Bagamoyo Road between the Mwenge Intersection and Tegeta Intersection to achieve the goal described in 2.1.1, at alleviating the traffic congestion along the route and improving the road network involving secondary roads connected to New Bagamoyo Road. At the same time, necessary recommendations will be made to ensure the effective management of the Project and good maintenance of the new facilities. Through such work, the Project can be expected to contribute to the achievement of such higher goals as "smooth transport by means of developing seamless transport infrastructure" and "facilitation of economic growth in such sectors as agriculture, manufacturing, mining, tourism and external trade through the improvement of transport infrastructure".

2.2 Outline Design of the Japanese Assistance

2.2.1 Design Policies

(1) Basic Policies

The field survey found the necessity for a follow-up survey and monitoring as described below for the some 4.3 km long section from the Morocco Junction to the Mwenge Junction of the subject road.

① Such underground structures as large diameter water mains are buried along existing houses within the ROW at the some 1.6 km point from the Morocco Junction. It is necessary to clearly establish their exact location and depth to determine the optimal road alignment (horizontal and longitudinal).

② Because of the need to conduct a survey to determine the location and depth of large diameter water mains, etc., the procedure to acquire the land and to remove the existing fencing in this particular section will take some time to complete. If this survey and subsequent analysis find it necessary to relocate the water mains, etc. in question, the entire process is likely to take more than one year to complete.

③ Although there are plans to expand Old Bagamoyo Road and Rose Garden Road connected to the subject road of the Project at the Morocco Junction and Kijitonyama Junction respectively to four lanes, the details of these plans are currently unclear.

Partial widening of the section between the Morocco Junction and Mwenge Junction to four lanes without proper finalisation of the overall road alignment will lead to further congestion because of the continuation of some non-widened sections. Such an approach would, therefore, leave doubt concerning the achievement of the positive effects of the widening of the section concerned and also concerning the overall relevance of the Project. Accordingly, it is judged that planning of the work to expand the section between the Morocco Junction and Mwenge Junction should take place based on the findings of an additional survey at a suitable time while monitoring the progress of the necessary procedures, including that for land acquisition, and plans/projects to expand the neighbouring sections.

In view of the above judgement, the design policies for this preparatory survey deal with only the some 12.9 km long section between Mwenge Junction and Tegeta Junction. The following design policies are adopted for this target section of some 12.9 km in view of the status of the subject road for the purpose of alleviating the current traffic congestion and securing safe and smooth traffic flow.

① In principle, the existing horizontal road alignment will be inherited to avoid both any major adverse impacts on houses and fencing along the route and any large-scale alteration of the topography along the route.

② Because of the level crossing at the existing junctions, smooth connection with other roads at these junctions will be planned.

③ Service roads are effective from the viewpoint of alleviating traffic congestion. Because of their simpler specifications compared to the facilities planned under the Project, it is judged that these roads can be constructed with the funding of the Tanzanian side after the completion of all of the planned road facilities by the Japanese side and their handing over to the Tanzanian side. As such, while the land for the planned service roads is considered in the planning of the road alignment, the actual construction of service roads is excluded from the scope of the Project.

④ The subject section has three bridges: Mlalakuwa Bridge, Lugalo Bridge and Tegeta Bridge. Apart from their deterioration, all of these bridges lack the required width and experienced a dangerous situation in 1996 when, for example, they were either flooded or nearly flooded (the water level rose up right to the bottom of the girders) due to heavy rain caused by El Nino. Because of this, all three bridges will be replaced under the Project.

⑤ The planning for bridge replacement will give proper consideration to the establishment of an appropriate load bearing capacity as well as the safety and convenience of vehicles and

pedestrians. Moreover, any adverse impacts on the social environment will be kept to a minimum.

(2) Design Policies Regarding the Natural Conditions

New Bagamoyo Road, part of which is the subject section of the Project, is located on a coastal terrace which runs parallel to and some 2 km inland of the coast along the Indian Ocean. The elevation of this terrace varies from 20 m to 60 m. Dar es Salaam receives rainfall in every month of the year and the rainy season, accounting for half of the annual rainfall, lasts for three months from March to May. At those parts of the subject section where the longitudinal slope is gentle, the road surface often has many puddles because of insufficient side drains and drainage facilities, hampering the traffic.

The subject section is located at the end of coastal land which gently slopes towards the Indian Ocean and the ground primarily consists of sand mixed with clayey soil and coral limestone.

The design policies regarding the natural conditions are described below.

① The ground in the section with a gentle longitudinal slope primarily consists of sand mixed with clayey soil. The groundwater table is high and the bearing capacity of this ground is low. Because of this situation, highly permeable underground drainage facilities which are capable of constantly keeping the groundwater table at a low level will be planned along with other appropriate above ground drainage facilities.

② At sites with sandy soil of which the bearing capacity is low due to a high groundwater table, the road surface will be raised above the roadside area along with the introduction of various drainage facilities. However, at sites with a low bearing capacity but where the prospect of raising the longitudinal height is restricted because of the necessary arrangements with the roadside area, the replacement of the existing soil with good quality soil will be planned.

③ Road drainage facilities will be planned based on the results of a survey on existing drainage systems and the local rainfall conditions.

④ The road pavement structure will be planned based on the results of a traffic volume survey, ground survey and material property test.

⑤ The project implementation plan will be formulated taking the timing and level of rainfall into consideration.

(3) Design Policies Regarding the Socioeconomic Conditions

The work to expand the radial trunk roads has been completed in Dar es Salaam for three (Kilwa, Nyerere and Morogoro Roads) out of the city's four principal roads, leaving New Bagamoyo Road (i.e. the subject road of the Project) as the only two lane trunk road. Those sections of New Bagamoyo Road where the daily traffic volume exceeds 20,000 vehicles are currently experiencing severe congestion and it takes 2 - 3 hours to travel only a few kilometres from/to the city centre during the morning and evening peak times. The areas along the subject section are residential, commercial and/or industrial areas and the route is lined by a military barracks and other public facilities, private houses, stores, offices, factories, warehouses, hospitals and others. Improvement of New Bagamoyo Road by 2015 is strongly hoped for to ensure safe and speedy travel on the road, incorporating the BRT Programme which is designed to facilitate the increased use of public transport to alleviate the crisis situation posed by an ever increasing number of private vehicles.

The design policies regarding the socioeconomic conditions are described below.

① The planning of the widening of the subject section to four lanes will take the BRT Programme which is in contemplation into consideration. To be more precise, careful consideration will be given to not only the main BRT route but also to the planned modules (In the BRT Programme, BRT bus stops are called modules).

② The planning of the junctions will take the likely congestion length in addition to the findings of a survey on the current traffic volume into consideration. The junctions will be capable of dealing with large vehicles as such vehicles heading to or returning from inland will use the subject section via Morogoro Road and the Ring Road.

③ As the Project primarily aims at alleviating the current traffic congestion on New Bagamoyo Road, the provision of an access road for every building along its route is undesirable. The introduction of service roads will be effective in this context and the acquisition of additional land between the Mwenge Junction and Tegeta Junction will be unnecessary as the new configuration of the road, including that of the service roads, can be accommodated within the ROW. Given the fact that the existing service roads are earth roads, the Tanzanian side should be able to construct new service roads along the route. For this reason, the Project will consider the road alignment and service roads on the basis that service roads will be constructed by the Tanzanian side in due course.

④ In consideration of the traffic volume on the main lanes and the future introduction of service roads, safety facilities for pedestrians (footpaths and pedestrian crossings) and road signs will be planned.

⑤ As detours for general vehicles and pedestrians will be unavoidable during the construction period, the implementation plan must consider traffic safety to be one of the most important requirements.

(4) Policies Regarding the Local Conditions for Construction and Procurement

1) Policies Regarding the Local Conditions for Construction

In Tanzania, it is unnecessary to apply to the municipal authority, the Police and/or any other authority other than the competent agency for a permit or authorisation as in the case of Japan as part of the project implementation process. The TANROADS, the organization responsible for the Project, has complete authority for the granting or refusal of temporary permission for the exclusive use of roads and others which must be obtained for road work. As far as the municipal authority and the police which have their own jurisdiction over the project area are concerned, notification in writing is believed to be sufficient. However, the Japanese contractor and consultant will provide the municipal authority and the police with an appropriate explanation of the planned routes and hours of the material transportation work at appropriate times as part of the project implementation procedure in order to further ensure safety during the construction period.

For the implementation of the Project, it will be necessary to employ workers in line with Tanzania's Employment and Labour Relations Act of 2004. This revised Act of 2004 stipulates such matters as working hours, conditions of work, social insurance and conditions for additional pay. This Act will be fully complied with throughout the project implementation period.

2) Policies Regarding Procurement

Construction materials which can be locally procured include crushed stone, concrete aggregate, cement, reinforcing bars, timber, plywood and square logs, covering all of the basic materials for the construction work. Imported fuel and asphalt can also be procured locally. In the case of hard crushed stone and aggregate used for the subgrade, asphalt concrete or concrete, the production sites in Tanzania are quite limited, increasing the production cost as well as transportation cost. Cement is produced in Tanzania and both the quality and quantity are stable, making local procurement possible. While the raw materials for cement are available in Tanzania, the expensive cost of electricity which is required to produce cements means a high cement price. Reinforcing bars are manufactured by two or three local companies on a part-time basis. These companies import raw coils from South Africa and process them into AASHTO or BS reinforcing bars. However, their quality management system is questionable as their products are unable to return uniform results in

tensile strength, bending and dimension tests. The price of these reinforcing bars is fairly high because of the state of an oligopoly. It is, therefore, essential to compare local products with imported products in terms of their cost and quality.

In general, the main construction materials for the Project will be procured in Tanzania while not rejecting the possibility of procuring Japanese products because of quality and economic considerations.

(5) Policies Regarding the Use of Local Construction Companies

All private construction companies which are capable of receiving orders for public sector construction work are registered with the Contractors Registration Board (CRB) and are classified in seven classes (Class 1 through Class 7) using the annual turnover and asset value of the construction machinery in possession as indices. For road construction work, 42 Class 1 companies and 12 Class 2 companies are registered and each company has a range of its own construction machinery.

Because of the absence of leasing companies or leasing system for construction machinery in Tanzania, local construction companies mutually lease their machinery, making it possible to lease construction machinery in Tanzania except for special kinds of equipment. Accordingly, the policy regarding construction machinery for the Project is the effective use of that machinery owned by local subcontractors except for special kinds of equipment.

(6) Policies Regarding Operation and Maintenance

The responsible ministry for the Project in Tanzania is the MoID. The MoID supervises the Tanzania National Road Agency (TANROADS) which is the implementing agency. Since the early 1990's, the Government of Tanzania has been implementing the modernisation of the road sector with the assistance of the World Bank and the TANROADS was established in July, 2000 with responsibility for the development and maintenance of the road network. It currently also plays a coordinating role for aid projects of the World Bank, African Development Bank, EU and other donors.

The TANROADS has 21 regional offices which are controlled by four zone offices. The Dar es Salaam Regional Office has jurisdiction over New Bagamoyo Road, the subject road of the Project. The Dar es Salaam Regional Office has been implementing the necessary measures to deal with problems encountered in connection with project management through close contact with the head office and coordination with all stakeholders. As the Dar es Salaam Regional Office has been generally acting as the implementing agency for the purpose of PQ, tender and

contract management for various loan projects, it is judged to have sufficient capability to act as the proxy owner.

The TANROADS is also responsible for road maintenance. In recent years, the intensity of both routine and periodic maintenance work vis-a-vis the total length has been quite high and the work has been funded by the Road Fund, the MoID and donors in the form of basket aid. The Road Fund in particular provides a fixed amount of funding to the TANROADS and as such is an importance funding source for road maintenance. The main revenue sources of the Road Fund are petrol tax and fees for roadside advertisement boards and the Fund allocates 70% of its revenue to the MoID and the TANROADS and 30% to local public bodies.

Given the situation of road maintenance in Tanzania as described above, the TANROADS will be designated the project operating body as well as the maintenance body for the new road facilities after their handing over to the Tanzanian side.

(7) Policies Regarding the Facility Grades

A suitable geometric structure and design conditions for the class of each subject road will be adopted. While the Tanzanian standards are taken into consideration, US standards (AASHTO) are primarily referred to for the design of road facilities as they are commonly referred to in Japan and other countries throughout the world.

(8) Policies Regarding the Construction Method and Period

The following policies are adopted in connection with the construction work under the Project.

① The planned work to expand the subject road of the Project must be conducted despite the difficulty of diverting the entire daily traffic volume of more than 20,000 vehicles to nearby roads. An appropriate and economical construction schedule will, therefore, be prepared by arranging a suitable detour using existing roads and newly expanded section so that the work can be conducted without a severe detrimental effect on the existing traffic flow.

② At present, the traffic volume along the route gradually increases from Tegeta (end point) towards the Mwenge Junction (start point). To prevent the occurrence of stagnant traffic during the construction period, widening of the road to four lanes will commence from the Mwenge Junction towards Tegeta.

③ Through close consultation and coordination with the project implementing agency, a project implementation schedule which allows the smooth commencement of each work will be prepared so that the work by the Tanzanian side to relocate obstacles can be completed prior to the work by the Japanese side.

④ As the prompt completion of the bridge work is critical for the steady progress and completion of the Project, the bridge specifications will be standardised to shorten the overall construction period. The bridge construction schedule will be determined to ensure safe and economical bridge construction work while compiling an appropriate overall work schedule.

⑤ In consideration of the maintenance capability of the Tanzanian side, the structures of the planned road facilities will not require special construction machinery or skills.

⑥ The social environment and traffic safety will be taken into full consideration for the formulation of the implementation plan.

⑦ A close communication network involving the Government of Tanzania, the JICA Office in Tanzania, the Consultant and the Contractor will be established for the smooth implementation of the Project.

As part of this survey, a field investigation was conducted in April, 2009 to check the present conditions of the target section. This field investigation did not find any need for substantial changes of the design policies adopted at the Basic Design stage as the target section was not subject to major changes of the topography or the implementation of a large-scale local development project. Accordingly, the design policies adopted at the Basic Design stage were inherited.

2.2.2 Basic Plan

2.2.2.1 Overall Plan

The scope of the Project is the upgrading of a 12.9 km section of New Bagamoyo Road between the Mwenge Junction and the Tegeta Junction to four lanes (with consideration of the BRT Plan) together with the replacement of bridges and the construction of drainage facilities and other auxiliary road structures.

The planned road improvement work envisages the upgrading of the existing road to a four lane road to alleviate the present and future traffic congestion due to an anticipated increase of the traffic volume. As such, the alignment of the existing road will be basically maintained without any major alteration. The basic design for the Project is outlined in Table 2-1.

Table 2-1 Outline of the Project

Planned Item		Description/Specifications
Target Section		12.9 km (Sta. 4.3 km ~ Sta. 17.2 km)
Road Paving Work	Surface Course	Asphalt concrete 5 cm (carriageway) or 3 cm (footpath)
	Binder Course	Asphalt concrete 5 cm
	Base Course	Base course 10 cm (asphalt stabilised: DBM)
		Sub-base course: 12.5 cm ~ 33 cm (cement stabilised)
	Protective Shoulder	Cement stabilisation + bitumen sealing
Underground Drainage Work		Sta. 8.2 km ~ Sta. 9.5 km subsoil drain
Width		Carriageways 7.5 m x 2; BRT central reservation 9.0 m; footpaths 1.5 m
Bridge Work	Mlalakuwa Bridge	PC-T girder bridge (post tension); 30 m long with pile foundations
	Lugalo Bridge	PC-T girder bridge (post tension); 30 m long with spread foundations
	Tegeta Bridge	PC-T girder bridge (post tension); 30 m long with pile foundations and spread foundations
Drainage Work		▪ Concrete block open drains: newly constructed along the entire route ▪ Road crossing culvert : 28 locations (box culvert of 900 mm x 900 mm or other specifications) ▪ U-shaped side drain : 400 mm x 300 mm at cut sections, etc. ▪ Inlet/outlet : 52 locations ▪ Catch basin : 43 locations
Auxiliary Road Structures		▪ Kerbstone work ▪ Road markings ▪ Guard rails ▪ Road signs ▪ Bus bays

2.2.2.2 Establishment of the Design Conditions

(1) Road Design Standards

The Standard Specifications for Road Works 2000, which were published by the former Ministry of Infrastructure Development and which are commonly used for road projects in Tanzania, are considered to be the basic design standards for the Project. However, the Explanations and Applications of the Road Construction Ordinance in Japan and others are referred to as the said Standard Specifications lack a detailed description of certain design standards.

① Tanzanian Standard Specifications for Road Works 2000

② Japan's Road Construction Ordinance: "Its Explanations and Applications" published by the Japan Road Association

The road design conditions adopted for the Project are shown in Table 2-2.

Table 2-2 Road Design Conditions

Item	Unit	Design Constant
Type of Road	-	Urban trunk road
Design Speed	km/hr	60
Number of Lanes	Lane	4
Width of BRT Central Reservation	m	9.0
Width of Lane	m	3.5
Width of Shoulder	m	0.5
Width of Footpath	m	1.5
Maximum Longitudinal Gradient	%	5 (6% within 500 m)
Minimum Radius of Curvature	m	150

(2) Design Standards for Paving

The Pavement and Materials Design Manual 1999, which were published by the former Ministry of Infrastructure Development and which are commonly used for road projects in Tanzania, is considered to be the basic design standard for paving work under the Project. The AASHTO paving design is also referred to for verification of the configuration of the planned paving work for the Project.

1) Configuration of the Planned Paving

The recommended configuration of the road paving is shown in Table 2-3 based on the Pavement and Materials Design Manual 1999 published by the former Ministry of Infrastructure Development.

Table 2-3 Configuration of Planned Paving

(Unit: mm)

Design Traffic Volume	Configuration	Roadbed Class S15
TLC 20	Surface Course	AC : 50
	Base Course	DBM 40 : 175
	Sub-Base	CM : 200
TLC 50	Surface Course	AC : 50
	Base Course	DBM 40 : 200
	Sub-Base	CM : 250

TLC 20 : ESAL 10×10^6 < TLC 20 < 20×10^6;
S15 : CBR = 15;
AC : asphalt concrete surface course;
DBM 40 : dense bitumen macadam 40;
CM : cemented material;
TLC 50 : ESAL 20×10^6 < TLC 50 < 50×10^6

2) AASHTO's Paving Design Guidelines

The design conditions for the AASHTO's paving design method are shown in Table 2-4.

Table 2-4 Paving Design Conditions Recommended by the AASHTO

Design Life		15 years
Traffic Loading		ESAL 30.95 x 10^6
Reliability		80%
	ZR	-0.841
	SO	0.4
Serviceability	PO	4.2
	Pt	2.0
Design Subgrade Resilient Modulus	MR = 1,500 x CBR	CBR 15
Structural Layer Coefficient	Asphalt concrete	0.44
	Base course	0.34 (DBM)
	Sub-base	0.15 (cement stabilised)
Drainage Coefficient	Base course	1.0
	Sub-base	1.0

(3) Design Standards for Drainage Facilities

The design of the road drainage facilities will take the state of drainage from the existing facilities and the local rainfall conditions into full consideration and the existing facilities will be used as much as possible. The present situation of standing water on the road surface and the state of drainage from the subject road will be established to conduct a drainage calculation in order to determine the required scale of the facilities. In the case of the rain intensity (Rn), observation data on the maximum annual 60 minute rainfall for a period of 40 years from 1965 to 2004 has been studied and the maximum hourly rainfall for each category of rainfall return period is used as the Rn value. The rainfall return periods used are those of the East Africa flood model which is applied to Sam Nujoma Road and those of the South African road design manual. The design conditions for drainage facilities are shown in Table 2-5.

Table 2-5 Design Conditions for Drainage Facilities

Type of Drainage Facility	Rainfall Return Period	Hourly Rainfall (mm/hr)
Open Ditch	2 years	64.6
Pipe Culvert, Open Ditch	10 years	64.6
Box Culvert	25 years	71.2
Bridge	50 years	111.8

(4) Design Standards for Junctions

It has been decided to plan the improvement of the junction design taking the future traffic volume into consideration. The issues for examination include the need for additional lanes, including right-turn only lanes, in correspondence with the traffic flow inside each junction and their desirable length. The structure of these additional lanes will be planned with reference to the Explanations and Applications of the Road Construction Ordinance in Japan and other relevant materials. The design conditions for additional lanes at junctions are shown in Table 2-6.

Table 2-6 Design Conditions for Additional Lanes

Item	(m)	Reference Equation
Waiting Length	minimum 30	The results of the examination of the existing arrangements will be taken into consideration.
Taper Length	35 (minimum 30)	V x Δw x 1/6
Shifting Main Lane Length	70	V x Δw x 1/3

V: design speed; Δw: width of additional lane

2.2.2.3 Facility Plan

(1) Road Plan

1) Geometric Structure of the Road

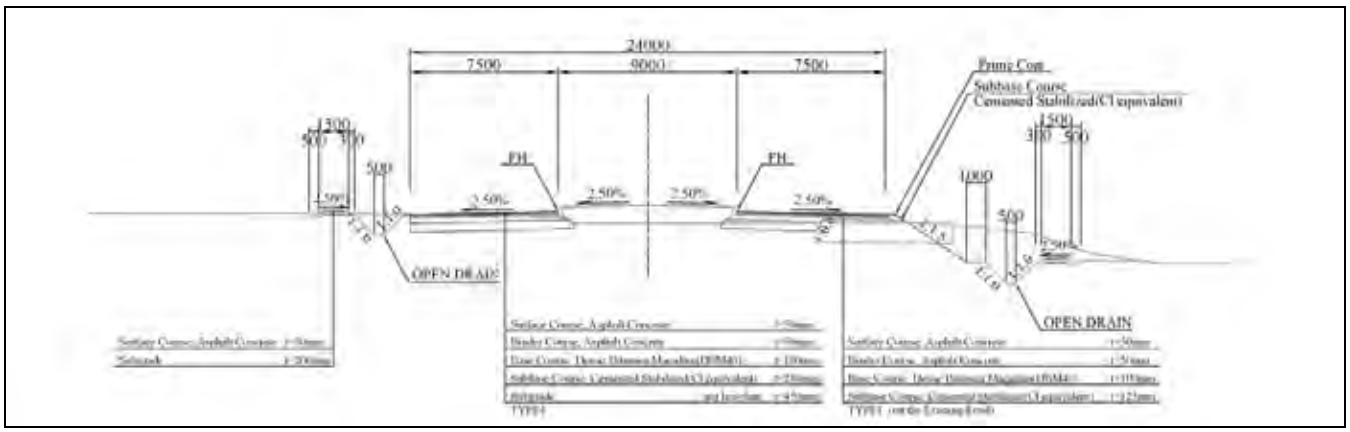
Based on the planning and design standards for roads, the geometric structure numerical design values of the road are decided as shown in Table 2-7 to comply with the standard road design in Tanzania and Japan's Road Construction Ordinance.

Table 2-7 Road Design Values for the Project

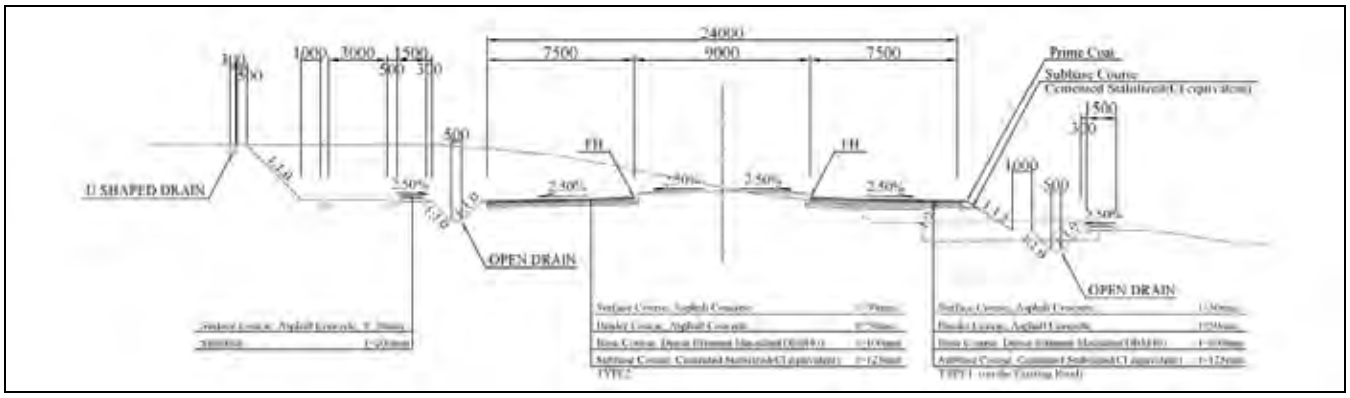
Item		Unit	Value/Remarks
Design Speed		km/hr	60
Number of Lanes		No.	4
Width of Right of Way		m	▪ Morocco Junction to Mwenge Junction: based on the ownership map for leased land ▪ Mwenge Junction to Tegeta Bridge: 60 except for the Lugalo Military Barracks section ▪ Tegeta Bridge to Tegeta Junction: 45
Lane Width		m	3.5/lane; 1.5/footpath
Shoulder Width		m	0.5
Width of Central Reservation		m	9.0
Drainage Slope for Road Surface		%	2.5
Drainage Slope for Shoulder		%	2.5
Minimum Curve Radius		m	150
Maximum Longitudinal Gradient		%	5 (6%, within 500 m)
One-Way Grade		%	6
Banked Slope	Ordinary Soil	Angle	1: 1.5 ~ 1: 4.0 (depending on the soil type)
Cut Slope	Hard Rock	Angle	1: 0.5
	Soft Rock	Angle	1:10
	Other than Rock	Angle	1: 1.0 ~ 1: 2.0

2) Cross-Section

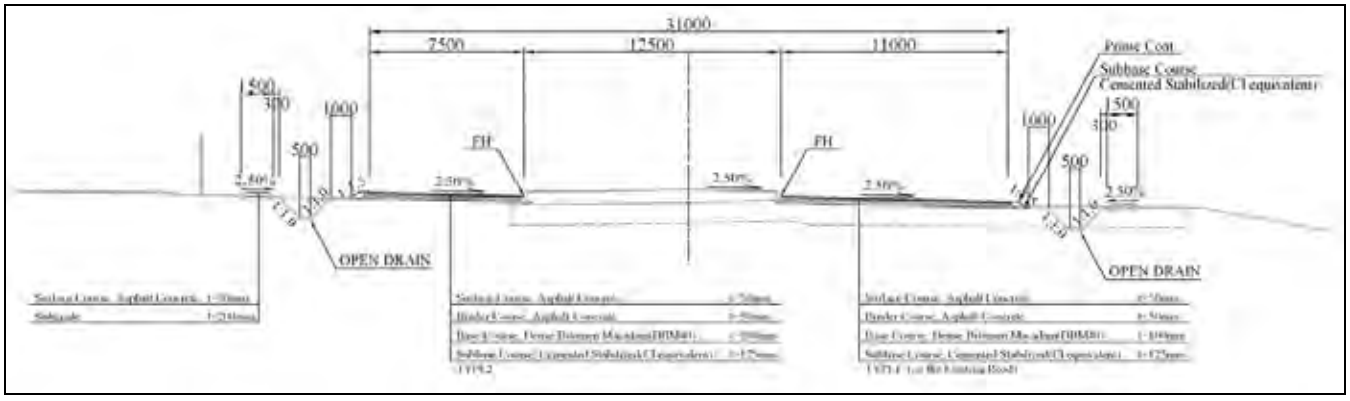
The typical cross-section of the road which is planned based on the design policy and intended geometric structure of the road is shown in Fig. 2-1.



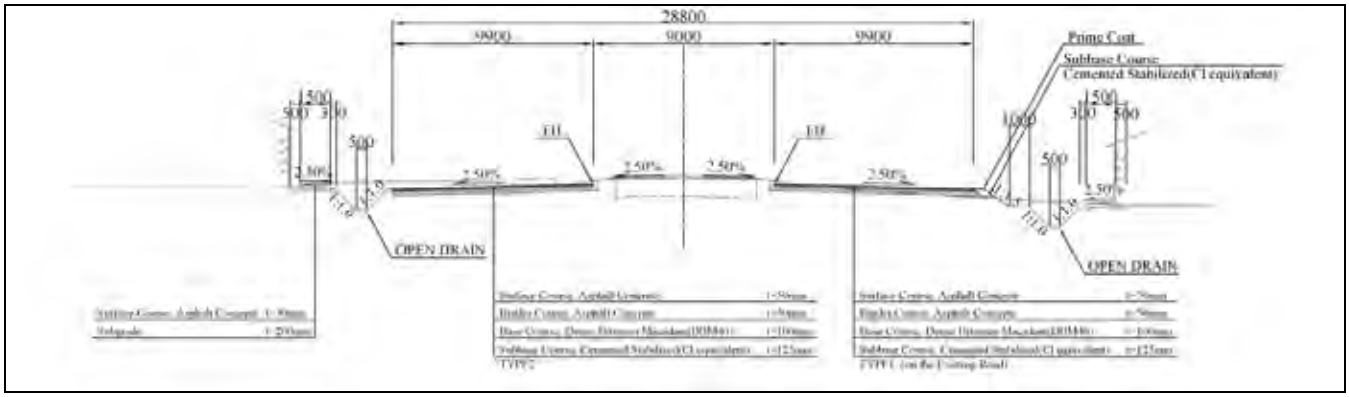
General Section



Cut Section



Junction



Bus Station Location

Fig. 2-1 Typical Cross-Section of the Road

3) Horizontal Alignment

The horizontal alignment of the widened road will principally inherit the horizontal alignment of the existing road. The final design incorporates some alignment elements based on the standards for the geometric structure of roads while ensuring the minimum impacts on fencing and housing as well as minimum topographical changes along the route. The starting point is set at the Mwenge Junction and the end point is where the existing two lane road meets the Tegeta Junction. At the Mwenge Junction, the available land will be effectively used and the design takes the future horizontal alignment of the road on the Morocco side into consideration. Accordingly, auxiliary road structures at this junction are based on the provisional configuration of the junction until the work to improve the road on the Morocco side is implemented. The road alignment on both sides of bridges is based on the concept of the lane shift length from the main lane adopted by the AASHTO. This is one method to determine the horizontal alignment of a road and has been employed for expressway design in Japan.

4) Longitudinal Alignment

For the design of the longitudinal alignment of the subject road, the elevation is carefully planned to ensure smooth level crossing with other roads at the existing junctions (Mwenge Junction at the 4.30 km point, Kawe Junction at the 7.33 km point, Africana Junction at the 11.85 km point, Kunduchi Junction at the 13.17 km point and Tegeta Junction at the 17.05 km point). The steepest longitudinal alignment is currently observed at the approach sections to the Lugalo Bridge and Tegeta Bridge from the starting point side. Any planning of major banking or cutting work to improve the current longitudinal road alignment at these sections will not only have a major impact on the neighbourhood but will also increase the overall project cost. Because of this, special design values (a longitudinal gradient of up to 6% with a slope length of up to 500 m at a design speed of 60 km/hr) are adopted as they

can contain the design longitudinal gradient to a level similar to the allowable longitudinal gradient for large vehicles.

5) Pavement Design

The pavement is designed based on the road specifications, relevant design standards and ground survey results. The SN value calculation results using the basic formula for the design of flexible asphalt pavement of the AASHTO are shown in Table 2-8.

Table 2-8 Required Pavement Structure Index (SN)

Item	Design Value			
Cumulative 18 kip equivalent single axle load application (W18)	ESAL 30.95 x 10^6			
Standard deviation (ZR)	-0.841			
Standard error (SO)	0.4			
Difference between serviceability coefficients ΔPSI = PO - Pt	4.2 - 2.0 = 2.2			
Subgrade resilient modulus (MR)	18,000	10,500	9,000	7,500
G15 banking thickness (cm)	0	15	30	45
G7 banking thickness (cm)	0	0	15	0
CBR of the ground	≧ 15	≧ 7	≧ 3	< 3
Required pavement structure index (SN)	3.809	4.547	4.724	5.020

a. Design of Pavement Structure

The pavement design work has followed the flow of the AASHTO's asphalt pavement design method shown in Fig. 2-2.

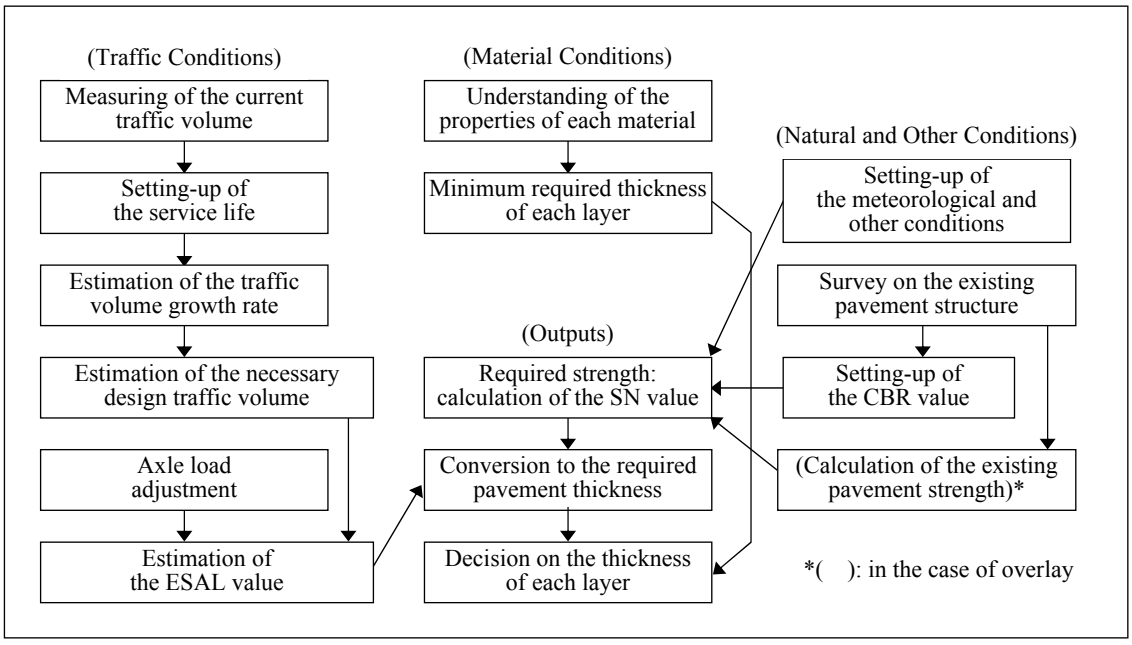


Fig. 2-2 Asphalt Pavement Design Method of the AASHTO

The required strength is expressed in terms of the structure index (SN) and has been calculated using the following equation.

$$\log_{10} W_{18} = Z_R * S_0 + 9.36*\log_{10}(SN+1) - 0.20 + \frac{\log_{10}\frac{\Delta PSI}{(4.2-1.5)}}{0.4 + \frac{1094}{(SN+1)^{5.19}}} + 2.32*\log_{10} M_R - 8.07$$

Where,

W18 : Number of passing axles converted to 18 kip (= 8.16 tons) during the service life

ZR : Reliability coefficient (ZR)

SO : Overall standard deviation

MR : Subgrade resilient modulus = CBR x 1,500

ΔPSI : Decreased value of the serviceability index (example: assuming that the initial value of Po and Pt is 4.2 and 2.5 respectively, the value of ΔPSI (Po - Pt) is 1.7)

b. Calculation of the Required Pavement Thickness

The pavement structure of each road section is shown in Table 2-9 while the cross-section of the pavement is shown in Fig. 2-3.

Table 2-9 Pavement Structure of Each Road Section

Sta.	Sta.	Distance (m)	Control minimum depth b/w *FH1 and GL		Remarks
			LHS	RHS (On existing road)	
4 + 300	4 + 500	200	325	275	
4 + 500	4 + 750	250	325	275	
4 + 750	5 + 0	250	780	275	
5 + 0	5 + 250	250	780	275	Br-1 km4+875~km4+905
5 + 250	5 + 500	250	780	275	
5 + 500	5 + 750	250	730	275	
5 + 750	6 + 0	250	780	275	
6 + 0	6 + 250	250	780	275	
6 + 250	6 + 500	250	780	275	
6 + 500	6 + 750	250	475	475	Embankment
6 + 750	7 + 0	250	475	475	Embankment
7 + 0	7 + 250	250	475	275	Excavation
7 + 250	7 + 500	250	325	275	Moderate longitudinal slope
7 + 500	7 + 750	250	780	275	Moderate longitudinal slope
7 + 750	8 + 0	250	780	275	Br-2 km7+777.5~km7+807.5 (Inbound) km7+754.5~km7+784.5 (Outbound)
8 + 0	8 + 250	250	780	275	Moderate longitudinal slope
8 + 250	8 + 500	250	980	275	
8 + 500	8 + 750	250	980	275	
8 + 750	9 + 0	250	980	275	
9 + 0	9 + 250	250	980	275	
9 + 250	9 + 500	250	980	275	
9 + 500	9 + 750	250	780	275	Possible further 20cm thickness removal
9 + 750	10 + 0	250	400	275	
10 + 0	10 + 250	250	780	275	Possible further 20cm thickness removal
10 + 250	10 + 500	250	780	275	Possible further 20cm thickness removal
10 + 500	10 + 750	250	780	275	Possible further 20cm thickness removal
10 + 750	11 + 0	250	780	275	Possible further 20cm thickness removal
11 + 0	11 + 250	250	780	275	Possible further 20cm thickness removal
11 + 250	11 + 500	250	780	275	Possible further 20cm thickness removal
11 + 500	11 + 750	250	325	275	
11 + 750	12 + 0	250	400	275	
12 + 0	12 + 250	250	780	275	Possible further 20cm thickness removal
12 + 250	12 + 500	250	780	275	Moderate longitudinal slope
12 + 500	12 + 750	250	730	275	Moderate longitudinal slope
12 + 750	13 + 0	250	400	275	Moderate longitudinal slope
13 + 0	13 + 250	250	400	275	
13 + 250	13 + 500	250	325	275	
13 + 500	13 + 750	250	325	275	
13 + 750	14 + 0	250	325	275	
14 + 0	14 + 250	250	400	275	
14 + 250	14 + 500	250	400	275	
14 + 500	14 + 750	250	325	275	
14 + 750	15 + 0	250	400	275	
15 + 0	15 + 250	250	400	275	
15 + 250	15 + 500	250	325	275	
15 + 500	15 + 750	250	325	275	Br-3 km15+585~km15+615
15 + 750	16 + 0	250	325	275	
16 + 0	16 + 250	250	325	275	
16 + 250	16 + 500	250	325	275	
16 + 500	16 + 750	250	325	275	
16 + 750	17 + 0	250	400	400	Both planned carriage way are not on the existing road.
17 + 0	17 + 200	200	400	400	Both planned carriage way are not on the existing road.
		12,900 m			

* FH1 is formation height of the center of the planning lane.
* GL is ground level.

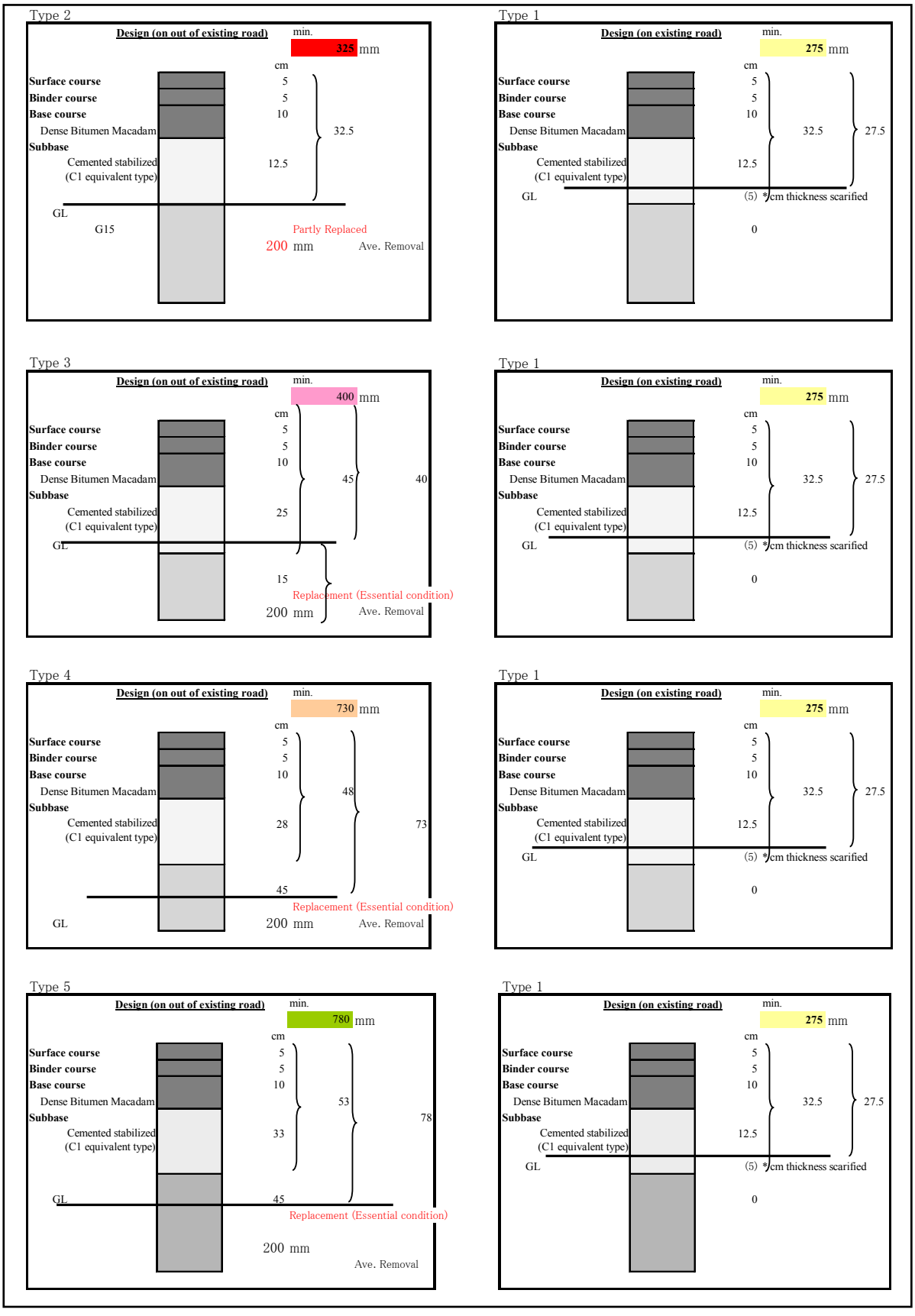


Fig. 2-3 (1) Cross-Section of the Pavement

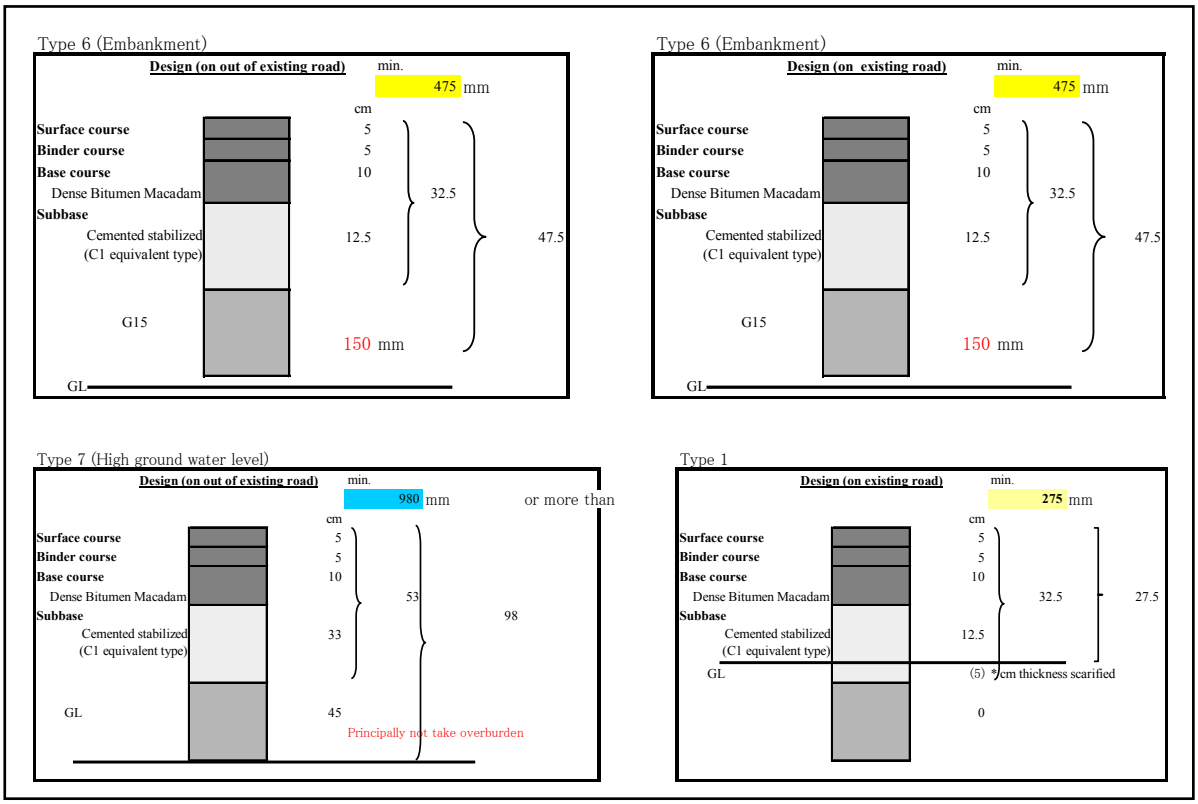


Fig. 2-3 (2) Cross-Section of the Pavement

c. Pavement Improvement Methods

For the rehabilitation of the pavement, the method described below will be used based on (i) the standard pavement structure in Tanzania and (ii) the pavement structure for the Project which takes into consideration the pavement structure adopted by similar road projects recently implemented by other donors.

① Type A (mainly applied to the paving of existing outbound lanes)

The ground consisting of sandy soil will be covered by an asphalt concrete surface course (5 cm), asphalt concrete binder course (5 cm), DBM base course (10 cm) and cement stabilised sub-base (12.5, 25, 28 or 33 cm) depending on the level of the bearing capacity of the ground. At some sections where the bearing capacity of the ground is low, inferior soil will be replaced by good quality subgrade soil. The required pavement thickness ranging from 15 cm to 45 cm depending on the level of the bearing capacity of the ground will be met.

② Type B (applied to the replacement of the existing pavement by newly laid pavement)

In the case of Type B, the existing asphalt mixed surface course will be replaced by a new pavement structure consisting of an asphalt concrete surface course (5

cm), asphalt concrete binder course (5 cm), DBM base course (10 cm) and cement stabilised subgrade (12.5 cm). While the pavement structure and thickness of each layer beneath the existing surface course vary from one section to another, the bearing strength of good quality subgrade soil or higher is secured.

(2) Underground Drainage Plan

1) Selection Criteria for Underground Drainage Work

The type of underground drainage work will be selected based on the following criteria.

① The ground at the section (8.2 km to 9.5 km) where underground drainage work is planned consists of sandy soil mixed with clay. The poor drainage results from a high groundwater table at this section, causing a lowering of the bearing capacity due to the saturated state of the ground. The introduction of a structure capable of facilitating drainage will restore the expected bearing capacity of the ground. The construction work selected for this section will offer minimum adverse impacts on the general traffic and adjoining land and the drainage structure to be introduced should be able to function almost permanently without becoming clogged.

② The maintenance capability of the Tanzanian side must be taken into consideration.

2) Underground Drainage Work Plan

The prompt collection and discharge of water from the filled up ground is necessary. The application of the subsoil drain pipe method is planned for underground drainage. The permeable layer surrounding the drainage pipe consists of crushed stones of 20 - 40 mm in diameter. Suitable materials will be laid to prevent clogging of the pipe by fine grains. These pipes are connected to a catch basin or road crossing culvert for efficient discharge.

The design quantity of underground drainage is calculated based on the "Design Guidelines Volume I: Drainage" published by the former Japan Highway Public Corporation.

(3) Road Drainage Facility Plan

The road drainage facilities are decided in the manner described below based on the relevant road specifications and design standards. While maximum effort is made to utilise the existing road drainage facilities, the sizes of side drains and crossing culverts (pipes) newly introduced are designed on the basis of the flow calculation results.

1) Design Rainfall Intensity

The design rainfall intensity is determined based on the rainfall intensity which is part of the design conditions for drainage shown in Table 2-5 while also taking the following probability characterisation factors into consideration.

① Pipe culvert, open ditch : 64.6 mm/hr (probability characterisation factor: βn10 = 2.0)
② Box culvert : 71.2 mm/hr (probability characterisation factor: βn10 = 2.0)

2) Calculation of Rainwater Runoff Volume

The rainwater runoff volume is calculated using the catchment basin map prepared based on the relevant topographical map and field reconnaissance findings. The runoff volume at each check point (terminal and confluence points) is calculated using the following rational formula.

$Q = (1/3.6 \times 10^6) \times C \times I \times a$

Where,

Q : runoff volume (m^3/s)
C : runoff coefficient (road surface: 0.9; mountain river area: 0.8; flat farmland: 0.6)
I : rainfall intensity (mm/hr)
A : catchment area (m^2)

3) Calculation of Required Scale of Road Drainage Facilities

The required scale of the side drains and drainage pipes is examined using the following Manning's equation.

$V = 1/n \times R^{(2/3)} \times i^{(1/2)}$

Where,

V : mean flow velocity (m/s)
N : roughness coefficient (concrete side drain: 0.013; box culvert: 0.015)
R : hydraulic radius (mm/hr) (area ÷ wetted perimeter)
I : drainage inclination

The drainage volume at each check point is calculated using the following equation.

$Q = A \times V$

Where,

Q : drainage volume (m^3/s)
A : area (m^2)
V : mean flow velocity (m/sec)

(4) Road Crossing Culvert Plan

Box culverts (internal dimensions: 900 mm x 900 mm) will be used as the standard type of culvert crossing the main road. The reasons for this choice are (i) economy as the required quantity of concrete for a box culvert is less than the required quantity of concrete for a wrapped around pipe culvert and (ii) ease of maintenance. Among the existing pipe culverts, that near the Mwenge Junction, where the planned road height is similar to the present height and poor drainage is not experienced due to the excellent water conveyance capacity and good terminal treatment, will receive new concrete pipes for its extension. For other existing and new road crossing culverts, the individual shapes will be determined based on the check results of the required drainage volumes as indicated in (1) - Road Drainage Facility Plan.

Table 2-10 lists the road crossing culverts to be improved or newly constructed under the Project.

Table 2-10 List of Road Crossing Culverts

Type of Inlet / Outlet		Box 900 X 900				Pipe Φ	Box 2000 X 3000	Box 2500 X 4000	Remarks
Out of pit	Pit	1 Cell (Nos.)	2 Cell (Nos.)	3 Cell (Nos.)	4 Cell (Nos.)	1 Cell (m)	(Nos.)	(Nos.)	
	○	-	1	-	-	1	-	-	
○		8	8	6	2	-	1	1	
Total (Nos.)		8	9	6	2	1	1	1	
Total (m)		241	281	190	65	18			

(5) Side Drain Plan

Many of the side drains have only a small flow area and do no exist at all in many sections. The fact that most of the existing side drains are simple dug ditches means a permanently insufficient water conveyance area, constituting one factor for poor drainage. New side drains lined with concrete blocks along the entire route are planned under the Project based on the road drainage facility plan. Table 2-11 lists the planned side drains.

Table 2-11 List of Planned Side Drains

Dimension		Side Drain					
Right	Left	W500 X H495 (Nos.)	W500 X H672 (Nos.)	W500 X H834 (Nos.)	W500 X H1000 (Nos.)	W500 X H1500 (Nos.)	W4500 X H1500 (Nos.)
	○	34	5	13	10	2	1
○		50	0	1	3	0	0
Total (Nos.)		84	5	14	13	2	1
Total (m)		17,958	588	2,702	1,990	365	200

Dimension		Box 600 X 600		Box 900 X 900		
Right	Left	1 Cell (Nos.)	2 Cell (Nos.)	1 Cell (Nos.)	2 Cell (Nos.)	3 Cell (Nos.)
	○	25	1	5	4	1
○		33	-	-	1	-
Total (Nos.)		58	11	5	5	1
Total (m)		961	13	117	75	10

(6) Auxiliary Road Facility Plan

1) Junction Plan

Examination of the junctions along the route concludes that smooth traffic flow can be secured at four junctions, i.e. Kawe Junction, Africana Junction, Kunduchi Junction and Tegeta Junction between Mwenge and Tegeta, by means of introducing a right-turn only lane with an appropriate waiting length without signalised traffic control even though such signalised traffic control is essential at four junctions between Morocco and Mwenge. Accordingly, the right-turn lane waiting length, tapered slowing down lane length and shifting main lane length shown in the following diagrammes are planned for the four former junctions.

It has been decided to use the existing signalised traffic control system at the Mwenge Junction on a provisional basis.

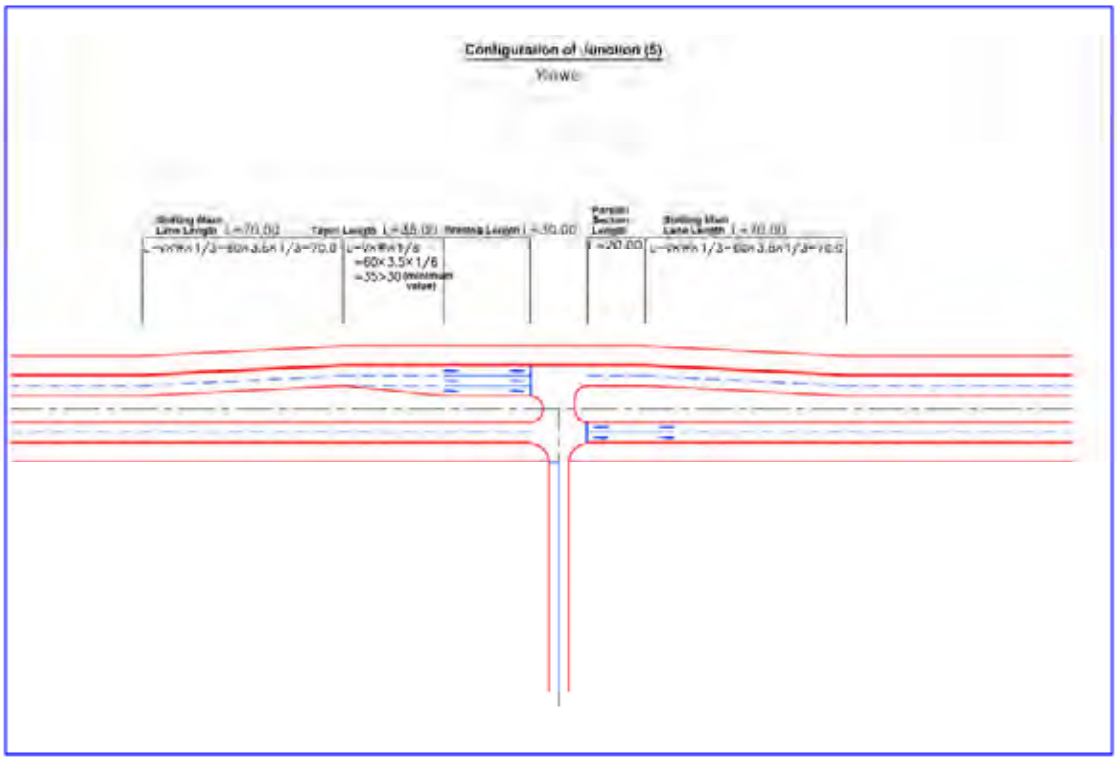


Fig. 2-4 Configuration of the Planned Kawe Junction

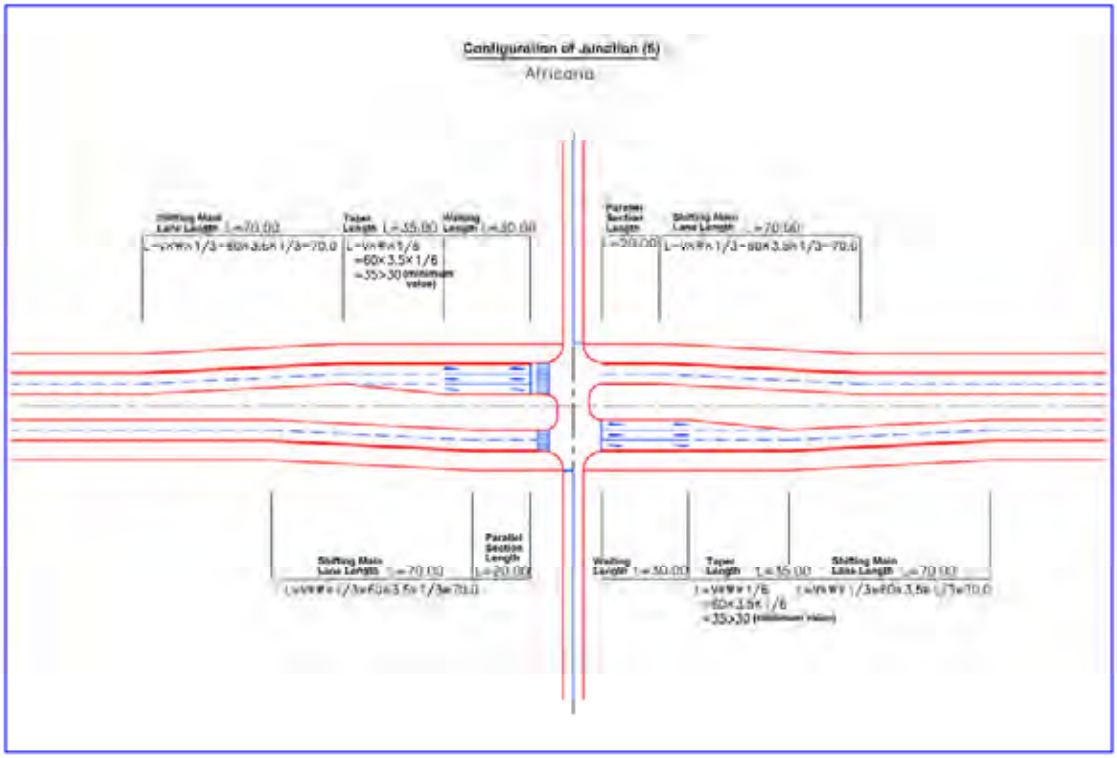


Fig. 2-5 Configuration of the Planned Africana Junction

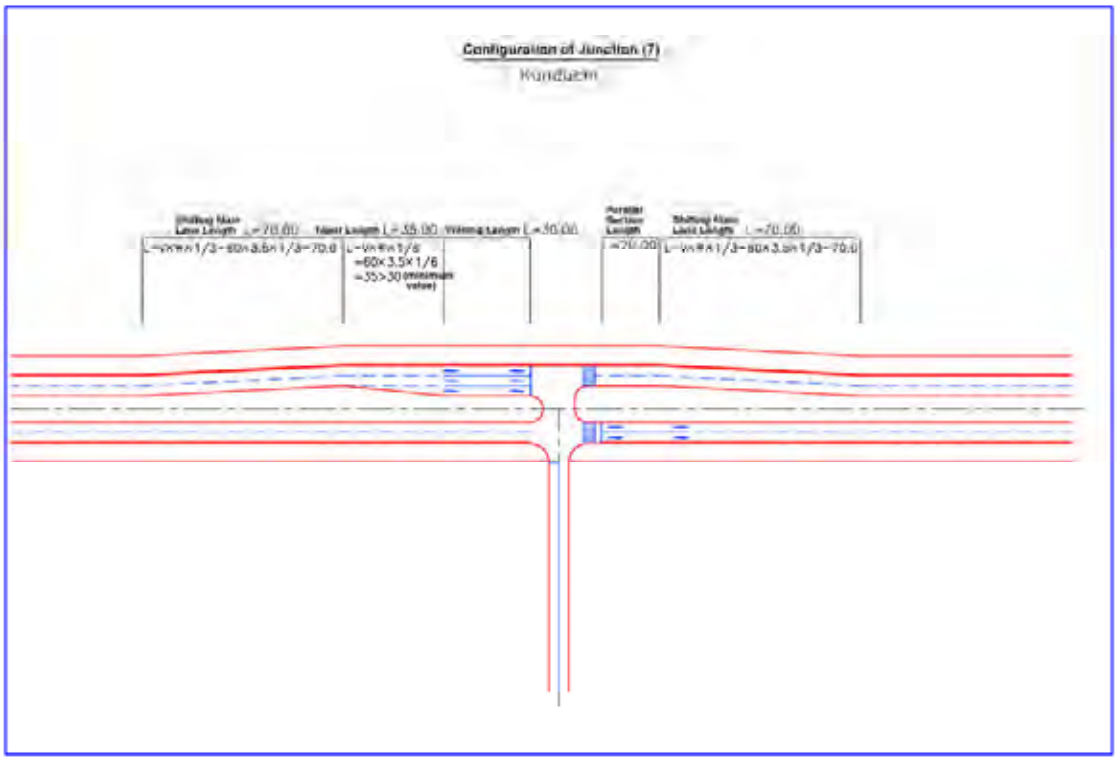


Fig. 2-6 Configuration of the Planned Kunduchi Junction

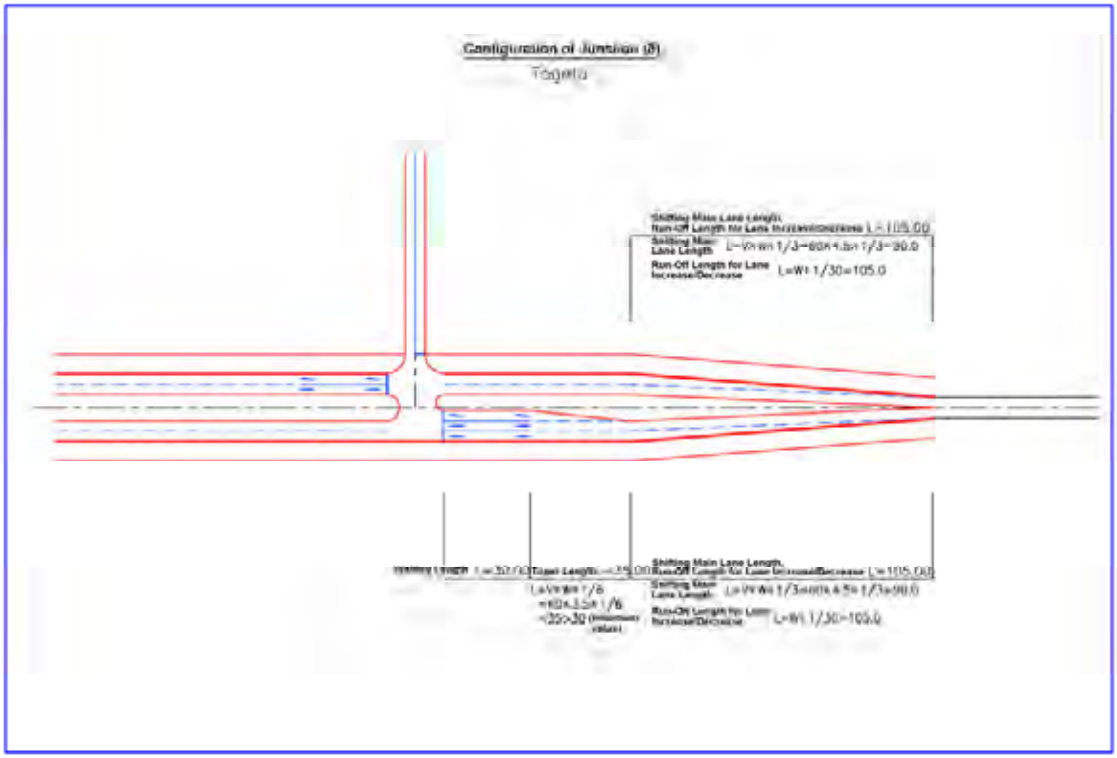


Fig. 2-7 Configuration of the Planned Tegeta Junction

2) Bus Bays

At present, the section between Mwenge and Tegeta has exclusive roadside spaces (bus bays) for getting on and off buses. When modules are introduced in the central reservation in the future under the BRT (Bus Rapid Transit) Programme (bus stations are called modules in this programme), the functions of the existing bus bays will inevitably be transferred to the modules. The existing basic plan for the introduction of modules envisages the introduction of single modules at intervals of a minimum of 500 m to a maximum of 700 m between Mwenge and Tegeta. It is desirable for the Project to incorporate bus bays (modules) at the same or near locations suggested by the basic plan in view of ensuring present and future convenience for planners as well as bus users. Because of such consideration, new bus bays of which the width is equal to the planned widening width of the central reservation under the BRT Programme to accommodate the modules are planned at the locations of the modules as part of the Project. The inclusion of these bus bays in the Project will allow the re-arrangement of the lanes without the need to acquire additional land when the modules are constructed under the BRT Programme. As the planned bus bays under the Project will be introduced along the route at the level height as the main lanes, the areas adjacent to these bus bays will be affected by the banking height of the main lanes. In view of this, two types of bus bay configuration are planned. One type is level with the adjacent land while the other is the elimination of the some 90 cm on the average difference using steps. The planned bus bay locations are shown in Table 2-12.

Table 2-12 List of Planned Bus bay Locations

Dimension		SINGLE BUS STOP (LEVEL)	SINGLE BUS STOP (FILL)
Left	Right	(Nos.)	(Nos.)
○		10	11
	○	11	10
Total		21	21

3) Service Roads

Service roads are excluded from the scope of the facilities to be borne for the Japanese side. This is based on the judgement that service roads can be constructed by the Tanzanian side with its own funding after the completion of the Project because of the much simpler specifications compared to the facilities included in the Project. In the case of the cut section along the Lugalo Military Barracks, however, the planning of a service road in an integral manner with the drainage facilities for the cut section is necessary from the viewpoint of the proper maintenance of the main lanes. Therefore, cutting work in this section is planned taking the required width of the service road into consideration.

4) Access Roads

The target road faces various secondary roads, houses, factories, warehouses and other structures along its route. The provision of access for all of these roads and structures to the improved road will reduce the effectiveness of the Project of which the main purpose of upgrading the present road to a four lane road is to alleviate the current heavy traffic congestion. The introduction of service roads should prove useful to accommodate local traffic. The construction of service roads will be left to the Tanzanian side as mentioned earlier. The access roads or points planned under the Project are, therefore, existing access points from major facilities (such as petrol stations and public facilities), access roads from principal feeder roads which are paved with asphalt concrete and of which the confirmed traffic volume is fairly high and connection points with service roads which link the main lanes to adjacent built-up areas. The design specifications for these access roads are an asphalt concrete surface course of 5 cm in thickness and sub-grade of 33 cm in thickness so that they are easily compatible with the pavement configuration for the main lanes.

5) Safety Facilities

a. Guard Rails

The installation of guard rails is planned for the bridge approach roads for the purpose of preventing the fall of vehicles. At the Mwenge Junction, the introduction of temporary guard rails with precast concrete footings is planned to align with the guard rails of the existing junction. These precast concrete footing-type guard rails can be used for detours during the construction period under the Project.

b. Guard Posts

The installation of guard posts is planned to prevent the entry of vehicles and to protect people at bus bays and also to protect the road crossing culverts.

c. Roadside Signs

Roadside signs are essential to protect the road structure and also to ensure safe and smooth road traffic. The installation of roadside signs is planned to convey any necessary warnings and information on traffic control or instructions to road users.

d. Road Markings

The planned road markings include lane lines (broken white line), lane edge lines (solid yellow line), stop lines and pedestrian crossings. Both the lane lines and lane edge lines will be painted along the entire route while the stop lines with directional

arrow markings will be introduced at the improved junction lines. Meanwhile, the pedestrian crossing marking will be provided at the improved junction sites as well as bus bays. The application of a broken warning line is also planned at the bus bays and openings of the central reservation where the introduction of such a line is judged to be appropriate.

e. Kerbstones

Kerbstones will be installed along the boundaries of the BRT central reservation with the main lanes to constitute the boundary for the pavement work during the BRT construction period to prevent any adverse impacts on the pavement of the main lanes constructed under the Project. Such kerbstones are used for the BRT central reservation of other trunk roads. Moreover, mount-up style footpaths lined by kerbstones are planned for the purpose of protecting pedestrians from passing traffic on the main lanes as well as service roads of which the construction is scheduled by the Tanzanian side.

f. Project Commemoration Boards and Information Boards

The installation of a project commemoration board is planned at two locations near the starting and ending points of the subject section to ensure long-lasting memories of the project among those involved in both countries and road users as a sign of the friendship between the two countries. The installation of project information boards is also planned to widely publicise the outline of the Project to local residents along the route and road users.

(7) Bridge Plan

1) Selection of Bridge Locations

The bridge locations were selected upon taking into account conformity with road alignment considering the social environment including nearby houses, etc., diversion of traffic during the works, and the future planned location of BRT bridges. Bridges to be replaced in the inbound direction will be located in the same position as existing bridges, while bridges going in the outbound direction have been planned on the upstream side. As is shown in the following figures, it is planned to leave clearance of 2 m each adjoining the inbound direction bridge and outbound direction bridge and to construct a BRT bridge in the middle.

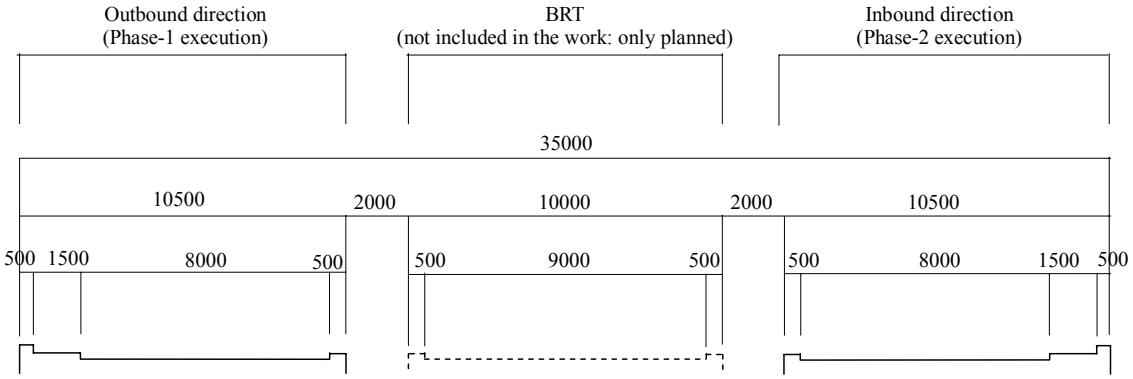


Fig. 2-8 Bridge Rebuilding Position

2) Design Standards

The British standard BS5400-2:1978 is used as the design standard for bridges in Tanzania; accordingly, this standard shall basically be applied to steel, concrete and composite bridges, while the Specifications for Highway Bridges in Japan will be referred to whenever necessary.

Concerning live load, out of the HA load and the combination of HA load + HB load, the load that puts more strain on the members in question will be used. As a result of discussions with the Tanzanian side, the HB live load is set at 37.5 units.

As for the design horizontal seismic coefficient, the figure of 0.05 that is adopted in Tanzania is applied.

3) Other Loads that Need to be Considered

Water pipes are attached to existing bridges, and since it is planned to attach water pipes to the replaced bridges after they are finished, the same load as at present, i.e. 3 kN/m, will be taken into account.

4) Design Conditions for Bridge Replacement

a. Determination of bridge length

Although it is desirable to make bridges as short as possible, with a view to reducing costs, the length of each bridge has been unified at 30 m so that the same superstructure can be adopted. Doing this will make it possible to reduce the implementation design cost and the superstructure fabrication and construction cost.

b. Determination of the design road elevation

The three existing bridges targeted in the Project experienced high water levels during the heavy rains caused by El Nino in 1996. The design bridge elevation was set so that the clearance from the soffit of the replaced bridge girders to the HWL is more than the figures indicated in the table below in accordance with "Handbook for Bridge Design, Bridge Management System for Tanzania".

Table 2-13 Relationship Between Discharge and Vertical Clearance

Discharge (m3/sec)	Vertical clearance (m)
＜0.3	0.15
0.3 to ＜3.0	0.45
3.0 to 30.0	0.6
30.0 to 300.0	0.9
＞300.0	1.2

5) Selection of Bridge Type

a. Superstructure

Bridge length and span length

In the case of 30 m bridges, establishing piers inside the river course is undesirable because it reduces the river flow cross section. Moreover, doing so increases a number of structures to be constructed and also extends the works period. Therefore, the superstructure will be constructed over a single span covering the 30 m bridge length. Accordingly, the ideal structure has been selected from superstructures that can be applied to a span length of approximately 30 m.

Superstructure type and applicable span

The types of superstructure that can be applied to a span length of approximately 30 m are three steel bridge types and three concrete bridge types listed below.

- Steel bridge : simple non-composite I-girder bridge; simple composite I-girder bridge; simple non-composite box girder bridge
- Concrete bridge : T-girder bridge (post-tension); hollow slab bridge (cast-in-place); box girder bridge (cast-in-place)

Comparison and evaluation of superstructure types

The following table compares the features of steel bridge and concrete bridge types that can be applied to a span of 30 m. Each type to be adopted in the Project is evaluated and prioritized.

Table 2-14 Comparison and Evaluation of Steel Bridge and Concrete Bridge Types

	Bridge Type	Features	Contents	Evaluation
Steel bridge	Simple non-composite I-girder bridge	Merit	Can be applied to bridges with a sharp angle of skew	2
		Demerit	Less economical than composite girders	
	Simple composite I-girder bridge	Merit	More rational and economical than non-composite	1
		Demerit	Inappropriate for skew bridges	
	Simple non-composite box girder bridge	Merit	Ideal for large span and curved girders	3
		Demerit	Uneconomical on small and straight bridges	
Concrete bridge	T-girder bridge (post-tension)	Merit	Economical on bridge spans of 20-30m	1
		Demerit	Temporary assembly yard is required on site	
	Hollow slab bridge (cast-in-place)	Merit	Economical on bridge spans of 20-30m	2
		Demerit	Fixed support works are required over the whole bridge length when building	
	Box girder bridge (cast-in-place)	Merit	Ideal for large spans of 30 m or more and curved girders	3
		Demerit	Fixed support works are required over the whole bridge length when building	

As a result, as the superstructure types most suited to the Project, the simple composite I-girder bridge is selected in the case steel bridges, and the T-girder bridge (post-tension) is adopted in the concrete bridges.

Comparison of steel bridges and concrete bridges

As is shown in the following table, comparison of applicability to the Project was carried out between steel bridges and concrete bridges in order to select the most suitable superstructure type out of simple composite I-girder bridges (steel bridges) and PC-T girder bridges (concrete bridges).

Table 2-15 Comparison of Steel Bridges and Concrete Bridges

	Steel Bridge (simple composite I-girder)	Concrete Bridge (PC-T girder)
Acquiring materials	Steel girders, etc. almost all need to be imported from overseas.	Materials except for PC steel and steel forms can be procured locally.
Construction period	Execution period can be shortened through adopting pre-fabricated parts.	Girders can be fabricated in the yard at the same time as the substructure works
Need for yard	A small yard is sufficient.	A relatively large yard is needed.
Required skill level	Expert workers such as scaffolders and painters are needed	Workers apart from PC workers can be procured locally.
Superstructure cost (comparison)	Expensive	Inexpensive
Maintenance	Periodic painting is required	General maintenance is extremely simple.

Based on the results of the above comparison, the post tension PC-T girder bridge is more suitable than the steel bridge in terms of the ease of execution, ease of maintenance and economy. Moreover, in the case of a bridge with a span of around 30 m, PC girders are more economical than steel bridges.

Considering all these factors, post tension PC-T girders are adopted for bridge superstructure.

b. Abutment type

General types of abutment are the gravity type abutment, inverted T-type abutment and rigid frame abutment. Of these types, the inverted T-type abutment is most commonly employed for the abutment height of 6-14 m.

c. Foundation type

Generally speaking, spread foundations are the most advantageous in terms of ease of execution and economy if the geological conditions are good.

Concerning the abutments on both sides of Lugalo Bridge and on the right side of Tegeta Bridge, since a good supporting layer exists at a relatively shallow depth from the ground surface, spread foundations utilizing the ground have been adopted; however, comparatively deep pile foundations are required for the remaining abutments.

Pile foundation types that can be applied in the Project are PHC piles, steel pipe piles, Chicago method foundations and reverse circulation, etc., however, all-casing piles (Benoto piles) have been adopted for the following reasons:

- PHC piles will not be adopted because of the risk of damage during transportation and the inability to procure in Tanzania.
- Steel pipe piles will not be adopted because they cannot be procured locally and it is difficult to extend the length of piles.
- Chicago method foundations are a type of cast-in-place pile used in mountainous areas and so on where it is difficult to carry in works machinery. This method mainly involves manual excavation. In the Project, this method will not be adopted because of concern over spring water and oxygen deficiency, etc. during construction.
- Reverse circulation is adopted for foundations deeper than 30 m, however, it will not be applied in the Project since foundations will only go to around 25 m.

d. Abutment protection

In order to prevent abutments from leaning and collapsing due to scouring by running water, mat gabions will be installed around the abutment bases in order to provide protection.

6) Outline of Plan

a. Bridge standard section

Fig. 2-9 shows the standard section of the bridge (single side).

b. Sides

The side view of the bridge is also shown in Fig. 2-9.

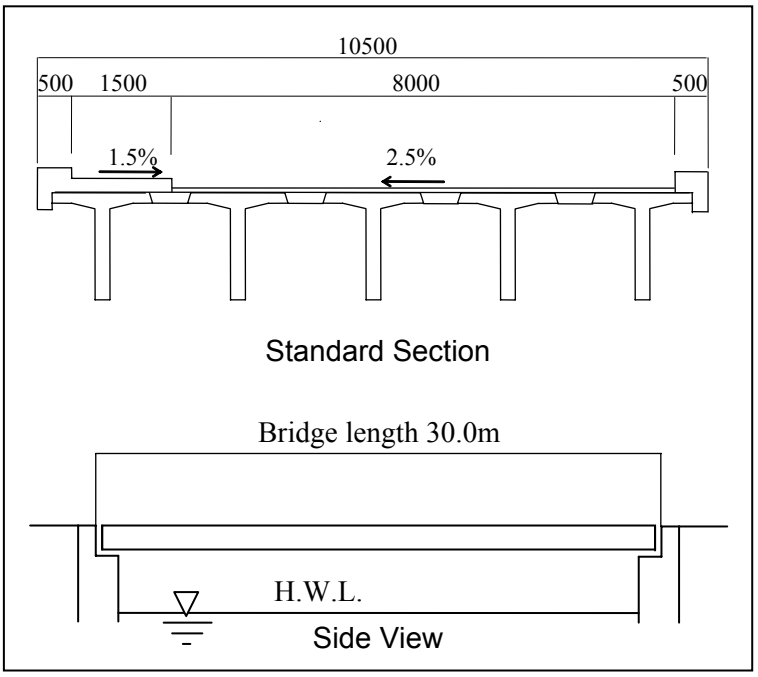


Fig. 2-9 Typical Cross Section and Side View of Bridge

2.2.3 Outline Design Drawings

The outline design drawings prepared based on the basic plan are as indicated below. The actual drawings are attached to the appendices.

Table 2-16 List of Outline Design Drawings

No.	Drawing Contents	Number of Drawings
1	Road plan (Morocco-Tegeta)	2
2	Road profile (Morocco-Tegeta)	11
3	Road typical cross section	2
4	Paving structure drawing	2
5	Drainage facilities structure drawing	8
6	General bridge drawing	3
7	Bus bay structure drawing	6
8	Safety facilities drawing	5
9	Road signs drawing	1
10	Kerbstone structure drawing	3
11	General box culvert drawing	3
12	Road plan (Mwenge-Tegeta)	17
Total		63

2.2.4 Implementation Plan

2.2.4.1 Implementation Policy

In deciding the implementation policy, the following items were taken into consideration because the Project will be implemented within the framework of the Government of Japan's grant aid scheme.

① In order to mitigate traffic congestion, works will be conducted in the direction going from Mwenge Junction to Tegeta Junction.

② Local engineers and laborers will be fully utilized in the Project with a view to contributing to the creation of job opportunities, promotion of technology transfer and vitalization of the local economy, etc.

③ A plan for temporary installations for the road work will be compiled based on the efficient procurement and delivery of materials and operation. This plan will fully reflect the local weather, topography, geology and other factors affecting the road construction work.

④ An economical implementation plan will be compiled upon considering local weather conditions, the necessary lead time for equipment and materials procurement, appropriate works methods and so on.

⑤ As the planned road construction work takes place in suburban areas, the implementation plan will incorporate a safety plan with due considerations to the existing traffic, workers and pedestrians.

⑥ To ensure the smooth implementation of works, a close communications setup will be established between the Government of Tanzania, the Consultant and the contractors.

⑦ Locally procurable construction materials and machines will be utilized as much as possible.

2.2.4.2 Implementation Conditions

Important points to consider when implementing the road rehabilitation works are described below.

(1) Adherence to Labor Standards

The contractor shall comply with appropriate labor conditions and customs in line with employment based on the existing construction legislation in Tanzania, and it shall strive to prevent disputes with workers and secure safety during the works period.

(2) Environmental Conservation during the Works

In consideration of impacts on the surrounding environment, waste materials and waste earth generated in line with the removal of existing structures (asphalt-concrete paving, concrete paving, traversal drainage structures) will be carried to and disposed at designated disposal sites. Also, consideration will be given to measures for dealing with dust and muddy water generated during the works.

(3) Need for Means of Communication on Sites

The target road experiences traffic congestion in the morning and evening, while it is used by buses and roadside residents during the day. Under these circumstances, a communications setup will be established in order to secure safety of general traffic and roadside residents at times of emergencies as well as the safety of works personnel during the works.

(4) Traffic Safety

Since the target road has a lot of traffic and is used by many pedestrians during the day and it includes numerous intersections of varying sizes, a pair of traffic controllers will be assigned before and after the works section which means total four traffic controllers will be assigned

regularly during the construction for the project. Also, safety measures such as barricades, etc. will be adopted wherever necessary at points where the works cross over the road.

(5) Security Measure

In order to ensure security in the base camp, guardsmen (two per team) will be assigned 24 hours a day (in two shifts).

(6) Process Coordination

The progress of works undertaken by the Tanzanian side will be carefully ascertained and coordinated.

2.2.4.3 Scope of Works

The works to be undertaken by the Japanese and Tanzanian sides during the Project are outlined below.

Table 2-17 Undertakings of the Japanese Side and Tanzanian Side

Item	Contents	Scope of Works		Remarks
		Japan	Tanzania	
Equipment and materials procurement	Procurement of equipment and materials	○		
	Transportation of equipment and materials	○		
Preparatory works	Securing of site for base camp		○	Site office, dormitory, equipment & materials store, asphalt plant, workshop
	Securing of borrow pits and earth disposal site		○	
	Securing of a waste materials disposal site		○	
	Other preparatory works	○		
Relocation of utilities	Relocation of buried water pipes		○	
	Transfer of buried power lines		○	
	Transfer of buried telephone lines		○	
	Cutting and transplanting of roadside trees		○	
	Stalls for which relocation space cannot be obtained nearby		○	
Main construction works	Road rehabilitation works	○		
	Bridge works	○		

2.2.4.4 Consultant Supervision

Based on the framework of the Government of Japan's grant aid scheme and the contents of the consultant agreement, the Consultant will organize a consistent project team to conduct the implementation design, tender work and construction supervision work according to the principles of the basic design, and it will execute the Project through to completion without delay. The main contents of the work are described below.

(1) Implementation Design Work

After concluding the consultant agreement with the Government of Tanzania, the Consultant will conduct site surveys, confirm the contents of the cooperation in discussion with the counterpart agency on the Tanzanian side, and conduct the implementation design upon returning to Japan. The implementation design will mainly comprise the following contents:

① Detailed design and preparation of design drawings
② Procurement plan and review of project cost
③ Preparation of works specifications, etc.

Following completion of the above work, the Consultant will obtain the approval of TANROADS (the ordering party) for the tender documents. The length of time required for completing these tasks described above is 5.33 months.

(2) Tender Stage

TANROADS will be responsible for staging the tender opening and making all final decisions. Upon conducting full preliminary discussions with TANROADS, the Consultant will chair the tender opening and conduct review of documents, etc. A person representing the Government of Tanzania to take part in the tender needs to be someone who holds the authority to award the contract and who is qualified to make technical decisions. The contents of the tender work are as follows:

① PQ announcement and review
② Announcement of tender
③ Distribution of tender documents
④ Tender and tender evaluation
⑤ Binding of contracts with contractor

The length of time required for completing these tasks is 0.83 months.

(3) Works Supervision Stage

Site supervision and works supervision staff will be dispatched to make sure that the works are being correctly implemented with the designated quality in accordance with the specifications

and design drawings, etc. prescribed in the contract. The works supervision will mainly comprise the following contents:

① Approval of the implementation plan
② Quality control
③ Schedule control
④ Progress control
⑤ Safety control
⑥ Preparation and presentation of monthly reports

The length of time required for completing these tasks is 30.00 months.

2.2.4.5 Quality Control Plan

The contractor will present an implementation plan detailing the target values for strength and dimensions, test and inspection methods and execution methods based on the design documents (specifications, drawings, etc.) to the Consultant before starting the works. The Consultant will check the contents of the presented implementation plan. In particular, conscious efforts will be made to secure good quality by means of specifying test methods, implementation timing, frequency and numerical targets for tests and inspections. Moreover, the Consultant will determine the quality control values, etc. (in regard to material properties, design strength, structure, shape and dimensions) and fully examine the contents of the test and inspection method (draft) contained in the implementation plan presented by the contractor. Based on the examination results, the Consultant will compile the quality control plan. The subject items for quality control are listed in the following table.

Table 2-18 List of Quality Control Items

Control Item			Test Method	Test Frequency
Roadbed materials	Mixing materials		Liquid limit, plastic index	Each mix
			Particle distribution (mixture)	
			Aggregate strength test	
			Aggregate density test	
			Maximum dry density (compaction testing)	
	Laying		Density test (compaction rate)	Every designated interval
Prime coat, tuck coat	Materials	Bitumen	Quality certificate	Each material
			Quality certificate, temperature during storage and scattering	Each delivery
Asphalt	Materials	Bitumen	Quality certificate, componential analysis sheet	Each material
		Aggregate	Particle size distribution (mix)	Each mix, once a month
			Water absorption	Each material
			Aggregate strength test	
	Mix test		Stability	Each mix
			Flow value	
			Void ratio	
			Aggregate void ratio	
			Tensile strength (indirect)	
			Residual stability	
			Design asphalt quantity	
	Paving		Set temperature during mixing	As appropriate
			Temperature during leveling	Each delivery
			Sampling Marshal test	Roughly once a day
Concrete	Materials	Cement	Quality certificate, chemical and physical test results	Each material
		Water	Componential test results	Each material
		Additive	Quality certificate, componential analysis sheet	Each material
		Fine aggregate	Dry specific gravity	Each time the material changes
			Particle size distribution, coarse particle ratio	
			Clay lump and soft mote ratio	
		Coarse aggregate	Dry specific gravity	Each time the material changes
			Particle size distribution (mixed)	
	During mixing test		Compression strength test (test specimen cube)	Each mix
	During placement		Slump (concrete)	Each placement
			Air flow	Each placement
			Temperature	Each placement
	Strength		Compression strength test (7 days, 28 days)	Each designated interval
Reinforcing bars	Materials		Quality certificate, tensile strength test results	Each lot

2.2.4.6 Equipment and Materials, etc. Procurement Plan

(1) Road Construction Materials

The field survey found that the general materials (cement, aggregate, timber, etc.) for use in the main construction works are produced in Tanzania. Imported bitumen and reinforcing bars are available on the local market and can be procured in Tanzania. However, it is difficult to locally procure construction materials for bridge superstructure such as PC cables, expansion joints and rubber supports, etc.

Considering the above points, procurement sources have been planned as shown in Table 2-19 based on the following principles.

① Procure locally produced items as much as possible.

② Procure imported products in cases where they are constantly available on the local market.

③ Concerning materials that cannot be procured locally, procure from Japan or third countries. Concerning procurement sources, make final decisions upon considering price, quality, delivery time and other relevant issues.

Table 2-19 Procurement Sources of Main Materials

Material	Procurement Source		Remarks
	Tanzania	Japan	
[General materials]			
Bitumen	●		
Cement	●		
Paving aggregate	●		
Reinforcing bars		●	Procurement in Japan is cheaper
Concrete aggregate	●		
Miscellaneous cut stone	●		
Timber (plywood, square timber, boards)	●		
Fuel	●		
Oil	●		
Paint	●		
Shaped steel, steel pipes	●		
[Bridge construction materials]			
Framework, main girder fabrication formwork		●	Due to difficulty of local procurement
PC cables		●	ditto
Fixtures		●	ditto
Guard rails		●	ditto
Expansion joints		●	ditto
Rubber supports, non-shrink material		●	ditto
Waterproof sheet		●	ditto

(2) Road and Bridge Construction Machinery

Road construction machines not including special machinery used in bridge works, etc. can be rented from local construction companies in Tanzania. However, some of the machines that are leased by local construction companies are not maintained in suitable condition for use in the Project.

Considering the above information, the procurement sources of main works equipment have been planned as shown in the following table based on the following principles:

① Rent construction machinery that is owned by local construction companies.

② In cases where local procurement is unfeasible, procure from Japan or third countries. Decide procurement sources upon considering the ease of procurement, transportation cost and rental charge.

Table 2-20 Main Works Machinery Procurement Sources

Machine	Standards, Specifications, etc.	Procurement Source			Remaks
		Tanzania	Japan	Third	
Crawler crane	Hydraulic drive winch lattice jib, 50-55t suspension		●		
Large breaker (single unit)	Hydraulic 600～800kg		●		
Concrete plant	Fully automatic forced kneading, capacity 30m^3/h		●		
Asphalt plant	60 ton/hr		●		
Asphalt finisher	Wheel type, paving width 2.4-6.0m		●		
Asphalt distributor	Self-running, tank capacity 2,000～3,000ℓ		●		
Tension jack			●		
Gate crane			●		
Girder installation equipment			●		
Girder suspension equipment			●		
Set-off equipment			●		
Drawing equipment			●		
Track equipment			●		
Tension jack	Horizontal setting, hydraulic jack 30t		●		
Hydraulic pump	Horizontal setting, hydraulic pump powered type		●		
Oscillating all-casing excavator	Crawler type, maximum excavation diameter 1500mm		●		
Asphalt engine sprayer	Hand push type, sprinkling capacity 25ℓ/min		●		
Motor generator	Diesel engine drive, rated capacity 300kVA		●		
Asphalt kettle	Stationary type, tank capacity 6,000ℓ		●		
Melting tank	200-350kg x 2 layers		●		
Bulldozer	Ordinary 15t class	●			
Bulldozer	Ordinary 21t class	●			
Backhoe	Crawler type, 0.28m^3 pile	●			
Backhoe	Crawler type, 0.45m^3 pile	●			
Backhoe	Crawler type, 0.80m^3 pile	●			
Wheel loader	Ordinary type, 2.1m^3 pile	●			
Truck crane	Hydraulic expansion jib 16 suspension	●			
Rough terrain crane	Hydraulic expansion jib 20t suspension	●			
Rough terrain crane	Hydraulic expansion jib 25t suspension	●			
Motor grader	Blade width 3.1m	●			
Stabilizer	For roadbed improvement, treatment width 2.0m, treatment depth 0.6m	●			
Road roller	Macadam 10～12t	●			
Tire roller	8～20t	●			
Vibrating roller	Hand guide type 0.8～1.1t	●			
Vibrating roller	Mounted combined type 3～4t	●			
Tamper	60～80kg	●			
Dump truck	Ordinary, diesel, 4t loading	●			
Dump truck	Ordinary, diesel, 10t loading	●			
Truck fitted with crane	6t loading, 2.9t suspension	●			
Micro bus	Capacity: 26 persons	●			
Road sprinkler (water supply truck)	Tank capacity 11,000ℓ	●			
Fuel carrier	Road sprinkler, tank capacity 11,000ℓ	●			
Semi-trailer	20t loading	●			
Line marker	melting, self-running, line width 15-20cm, hopper capacity 80-130kg	●			
Concrete agitator truck	Mix capacity 4.4-4.5m3	●			
Concrete pump vehicle	Boom type, pressure conveyance capacity 55-60 m3/hr	●			
Concrete pump vehicle	Boom type, pressure conveyance capacity 90-110 m3/hr	●			
Motor generator	Diesel engine drive, rated capacity 200kVA	●			
Fork lift	Engine drive, 1.5t	●			

2.2.4.7 Soft Component Plan

This is not applicable in the Project.

2.2.4.8 Implementation Schedule

In the event where the Project is implemented under the grant aid scheme of the Government of Japan, it will proceed through the following stages. The implementation schedule is as indicated in 2.2.4.4 Consultant Supervision.

(1) Implementation Design (detailed design)

This is as indicated in 2.2.4.4 Consultant Supervision.

(2) Tender Work

This is as indicated in 2.2.4.4 Consultant Supervision.

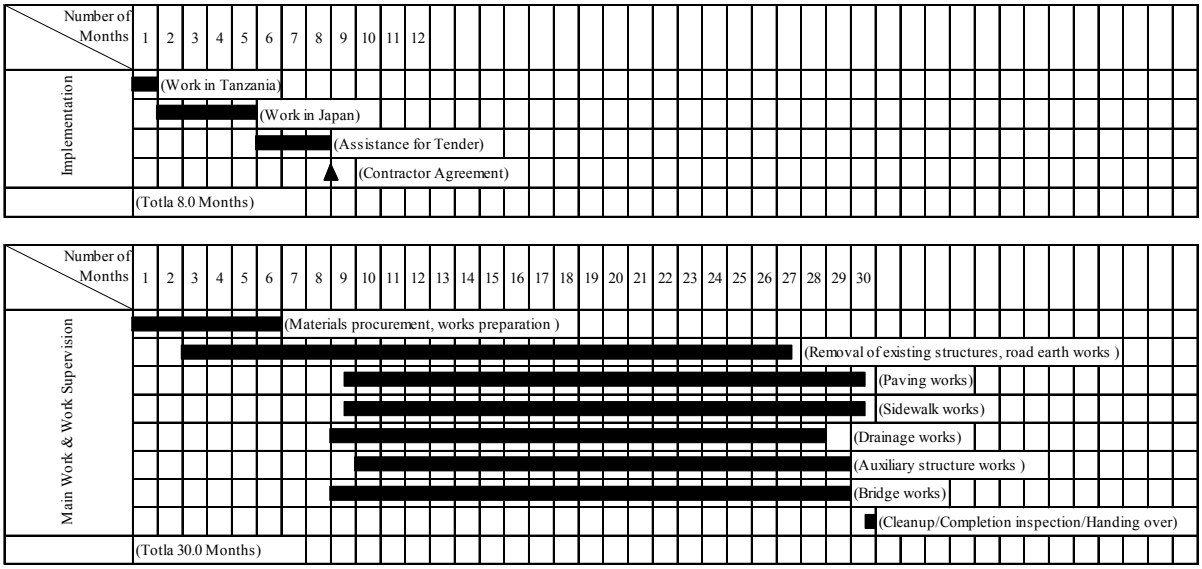
(3) Road Construction Works

The contract signed between TANROADS and the Japanese corporation will come into effect upon being certified by JICA, and the contractor will commence the construction works. The works will require a period of 30 months.

(4) Completion of Works

The work implementation schedule prepared based on the procedure of the Government of Japan's grant aid scheme is indicated below.

Table 2-21 Work Implementation Schedule (Draft)



2.3 Obligations of the Recipient Country

(1) General Items in the Government of Japan's Grant Aid Scheme

The following lists the general scope of works of the Tanzanian side confirmed in the minutes of meeting agreed upon by both governments.

① Relocate buildings and their exteriors at the project sites and trees along the planned route.
② Remove and relocate existing public utilities (power lines, water lines, etc.) including underground structures from the Project sites.
③ Secure traffic control at necessary points.
④ Arrange tariff exemptions for equipment, materials and vehicles procured for the Project.
⑤ Secure and clear the site(s) required to set up temporary yard(s).
⑥ Secure a waste disposal site(s).
⑦ Provide conveniences for securing borrow pits and a rock quarry.

(2) Specific Requirements for the Project

The items undertaken by the Tanzanian side that are specific to this project and are not included in the general requirements are as follows.

Table 2-22 Contents and Quantities, etc. of Works Undertaken by the Tanzanian Side

Work	Contents	Quantity/Type, etc.
*1. Existing building	① Existing buildings in the ROW ② Some existing buildings outside of the ROW	① 2 buildings: around 8.3km from Mwenge Junction ② 6 buildings Mwenge Junction
*2. Public utility structures	③ Water supply pipes	▪ Φ0.10m : 2,825m ▪ Φ0.15m : 4,810m ▪ Φ0.20m : 6,995m ▪ Φ0.25m : 4,630m ▪ Φ0.30m : 1,450m ▪ Φ0.40m : 2,400m
	④ Optical cables	④ 8,350m: From Mwenge Junction to Africana Junction
	⑤ Telephone lines and telephone poles	⑤ 8,138m and 209 poles
	⑥ Power lines and poles	⑥ 32,947m and 476 poles
*3. Trees	⑦ Trunk diameter of less than 0.5m ⑧ Trunk diameter of 0.5m~0.99m ⑨ Trunk diameter of 1.0m~1.49m ⑩ Trunk diameter of 1.5m or more	⑦ 108 trees, ⑧ 50 trees, ⑨ 11 trees, ⑩ 6 trees
4. Registration costs for construction operators (CRB, ERB)	Registration of construction and consultant firms with related organizations in Tanzania: In cases where registration is necessary, registration costs will be borne by the Government of Tanzania.	
5. Refund of duties	① VAT ② Commodity tax ③ Fuel tax	① Materials procured in Tanzanian side ②, ③ Fuel (diesel, petrol) etc.

* Note : Detailed positions can be confirmed in the survey documents and drawings shown in the appendices.

Regarding the size of the financial burden for the Tanzanian side, the TANROADS estimated the cost of the removal/relocation of the existing buildings and trees in the 17.2 km section between the Morocco Intersection and Tegeta Intersection. The cost of relocating underground structures belonging to various public services in the same section was also estimated. The Government of Tanzania has already agreed to secure a budget of some T.shs. 7,192,000,000 which will be required to perform its undertakings for the 12.9 km section of the Project between the Mwenge Intersection and Tegeta Intersection. Of this amount, funding of some T.shs. 1,690,000,000 has already been secured in the FY 2008/09 budget. It has been confirmed with the TANROADS and MoID that the remaining funds will be secured in the 2009/10 budget.

Table 2-23 Costs to be Borne by the Tanzanian Side

Cost Item	Cost Burden (Tshs/Usd)			
	Mwenge-Tegeta 12.9km			Funding for FY 2008/09 already secured
1. Existing buildings	① Existing buildings in the ROW	100		
	② Some existing buildings outside of the ROW			
2. Public utility structures	③ Water supply pipes: T.shs. 3,479,406,250	6,874		
	④, ⑤ Optical cables, telephone lines and telephone poles: T.shs. 721,924,137			
	⑥ Power lines and poles: T.shs. 2,672,816,245			
3. Trees	⑦ Trunk diameter of less than 0.5m	100		
	⑧ Trunk diameter of 0.5m~0.99m			1,690
	⑨ Trunk diameter of 1.0m~1.49m			
	⑩ Trunk diameter of 1.5m or more			
4. Firm registration fees and annual membership fees	Registration fee: US$ 7,000	49		
	Annual membership fee: US$ 30,000 (Assuming US$ 10,000 per year)			
5. Cost of Authorisation to Pay (A/P)		69		

Approximately ¥7,192 million

[Calculation conditions]

① Estimation point: May 2009

② Exchange rate: T.shs.1 = ¥ 0.0725 (mean for the 6-month period up to May, 2009)

Table 2-24 shows the assumed amount of the refund by the Government of Tanzania from taxes paid by the contractor based on the estimation conditions for the project cost.

Table 2-24 Assumed Refunds from the Government of Tanzania

Refund Item		Assumed Amount of Refund
Refund of duties	① VAT	US$ 6,000,000
	② Commodity tax	US$ 1,450,000
	③ Fuel tax	US$ 950,000

These refunds will be made by the Government of Tanzania in accordance with the rules of Japan's grant aid scheme from the commodity and other taxes paid by the contractor for locally procured materials, etc. for the purpose of implementing the Project. The actual amounts may vary depending on how the said materials, etc. are procured by the contractor.

(3) Requests from the Start of Works to Completion

The following requests are made to the Government of Tanzania in order to ensure the smooth implementation of the construction work for the Project.

1) Relocation of buildings, exteriors and trees at the Project sites along the planned route

In order to minimize traffic congestion arising from diversions and partial handing over during the work period, the work is scheduled to move from the Mwenge Junction towards the Tegeta Junction. Accordingly, it is requested that, immediately after the signing of the Exchange of Notes, the TANROADS will invite roadside residents or their representatives to explain the contents of the Project to them and that it starts and completes the relocation of obstructive structures starting from the Mwenge Junction side.

2) Removal or relocation of public utility structures, including underground structures from the Project sites

Similar to the above request, it is requested that TANROADS will invite representatives of concerned ministries and agencies immediately after the signing of the Exchange of Notes to explain the contents of the Project and that it starts and completes the removal and relocation of public utility structures starting from the Mwenge Junction side.

3) Traffic safety and thorough notification to road users

It is requested that pedestrians and drivers will be thoroughly informed about temporary traffic arrangements so that they comply with instructions given by traffic controllers during the construction period. Moreover, as the construction work is expected to cause inconvenience to the passing traffic, it is requested that such inconveniences be thoroughly informed to road users via radio and other public media.

4) Procedures for import and exemption of tariffs for imported equipment, materials and vehicles

Import procedures at Dar es Salaam Port are beset by frequent delays of around one month on average and sometimes as long as two months. In the Project, it is planned to procure and import some equipment and materials from Japan, and any delays in the delivery of these equipment and materials the construction sites could have a major adverse impact on the Project schedule. Accordingly, it is requested that the Tanzanian side promptly completes the necessary procedures to import such equipment and materials and to exempt them from customs duties.

5) Securing and preparation of a temporary yard

In the Project, it is planned to secure a temporary yard measuring at least 50 m x 250 m as the base camp to set up asphalt and concrete plants over the assumed implementation period of thirty months. The proposed site is located close to the Mlalakuwa Bridge, and it is requested that the Tanzanian side communicate and coordinate with related authorities with a view to securing this site or an alternative site nearby.

6) Securing of a waste disposal site

Since the planned construction work will generate 44,000m^3 of surplus soil, some 5,200m^3 of rubble from the existing road pavements and some 2,500m^3 of concrete rubble from such structures as bridges, etc., it is planned to secure a waste disposal site in Kunduchi district. Accordingly, it is requested that the Tanzanian side communicate and coordinate with related authorities with a view to securing this site or an alternative site nearby.

7) Close information sharing and prompt response

The subject road of the Project is a truck urban road with the daily traffic volume of more than 20,000 vehicles. In order to safely finish the work within a limited implementation period, it will be necessary to smoothly advance the Project while securing the full cooperation of related agencies, roadside residents and road users in regard to the matters described in paragraphs 1) through 6) above. For this reason, it is strongly hoped that the Tanzanian side will establish the system for closer information sharing with the Japanese side so that the Project can enjoy the fastest possible responses and support from all the stakeholders.

2.4 Project Operation and Maintenance Plan

(1) Operation and Maintenance Setup

Regarding the operation and maintenance setup for new facilities after the completion of the Project, the maintenance department at the head office of the TANROADS will compile the maintenance plan, while the Dar es Salaam Regional Office of the TANROADS, which has the jurisdiction over the subject road section of the Project, will execute the actual road maintenance work. Since the planned work doesn't have any construction processes that require special technology, the planned work should not face any technically difficult problems. Accordingly, it is judged that the operation and maintenance of new facilities under the existing setup will be possible.

(2) Contents of Maintenance Work

The maintenance work generally needed to keep the road in good conditions consists of the following components.

① Periodic inspection : Inspection of road surface, drainage facilities and auxiliary facilities

② Routine maintenance : Cleaning and simple repairs of road surface, drainage facilities and auxiliary facilities

③ Repairs : Sealing of pavement cracks, patching of pot holes, repainting of road markings (pedestrian crossings, partition lines, etc.), repair of broken drainage facilities

(3) Important Points to Consider in Maintenance

As it is important to carry out adequate maintenance to keep the road in good conditions at all times and also to enhance the durability of facilities in order to sustain the Project effects, it is imperative to pay attention to the following matters.

① Carry out periodic inspections and always gauge the state of facilities.

② Carry out thorough cleaning of drainage facilities, particularly before the rainy season.

③ Secure the maintenance budget based on the maintenance plan.

As the prompt repair of damaged parts will be particularly important to sustain the positive effects of the Project, it is requested that sufficient inspections and patrols are carried out as a matter of routine.

2.5 Project Cost Estimation

2.5.1 Initial Cost Estimation

(1) Cost Burden on the Tanzanian side: T.shs. 7,192,000,000 (approximately ¥518 million)

Necessary costs include① cost of relocating existing buildings, ②cost of relocating buried water pipes, ③ cost of relocating telephone lines and poles, ④ cost of relocating power lines and poles, ⑤ cost of transplanting roadside trees, ⑥ cost of registering construction companies, ⑦ bank commissions, ⑧ Refund of duties. The Tanzanian side has already secured a budget of approximately T.shs.1,690 million (approximately ¥122 million) for the Project in its FY 2008/09 budget.

(2) Estimation Conditions

The estimation conditions at the point of estimation in May, 2009 were as follows.

1) Exchange rate

US$1 = ¥95.77

2) Implementation period

The Project is planned to use the government bond (A) scheme for funding with approximately 38.0 months being set aside for the detailed design and construction work as shown in the implementation schedule.

3) Other

- The Project will be implemented in accordance with the grant aid scheme of the Government of Japan.
- The above exchange rate is subject to revision.

2.5.2 Operation and Maintenance Cost

The following table shows the results of calculating operation and maintenance costs according to the aforementioned plan.

Table 2-25 Main Maintenance Items and Costs

(Unit: Tshs.)

Type	Cycle	Maintenance Contents	Specifications	Unit	Unit Rate	Work Quanti ty	Frequency	Cost (Tshs.)
Routine	Every year	Patching	1.0% of road area	m^2	35,000	1,806	9	568,890,000
		Roadbed repair	1.0% of road area	m^2	26,400	1,792	9	425,779,200
		Shoulder repair	1.0% of shoulder area	m^2	26,000	128	9	29,952,000
		Cleaning of structures	-	m	2,860	260	9	6,692,400
		Subtotal-I		m		10-year aggregate=		1,031,313,600
Periodic	Every 10 years	Roadbed repair	2% of total paved area	m^2	26,400	3,584	1	94,617,600
		Overlay	2% of total paved area	m^2	35,000	3,612	1	126,420,000
		Shoulder repair	2% of shoulder area	m^2	26,000	256	1	6,656,000
		Repair of structures	-	m	230,230	2,600	1	598,598,000
		Subtotal-II		m				826,291,600
			Total routine and periodic maintenance III (=I + II)					3,708,518,000
Operation and maintenance cost			10% of III	Set	-	-		185,760,520
Total								2,043,365,720
Cost per year								204,336,572

Yen conversion = Approx. ¥14.8 million/year

Based on the above calculations, the average annual operation and maintenance cost for routine and periodic maintenance is estimated to be approximately ¥14.8 million during the Project life. Since this is equivalent to 0.44% of the routine and periodic road maintenance budget (¥3.36 billion) of the TANROADS in 2008/09, this cost is considered to be easily affordable for the Tanzanian side.

2.6 Other Relevant Issues

The following points require careful consideration for the implementation of the Project.

① As the target section for the construction work involves urban areas, special attention should be paid to ensuring the safety of local residents.

② Careful coordination will be required because of the fact that the responsible body for the Project differs from the implementing body. The involvement of many other organizations, including public utilities, also makes such coordination vital.

③ The work to relocate/remove obstacles, which is one of the undertakings of the Tanzanian side, must commence immediately after the signing of the E/N.

④ The TANROADS should play a leading role in thoroughly informing road users and local residents in advance of the forthcoming road work for the purpose of lessening any traffic congestion and preventing unnecessary problems with local residents during the work period.

CHAPTER 3

PROJECT EVALUATION AND RECOMMENDATIONS

CHAPTER 3
PROJECT EVALUATION AND RECOMMENDATIONS

3.1 Project Effects

The implementation of the Project will improve the severe traffic congestion between the Mwenge Intersection and Tegeta Intersection and will also secure a smooth and safe traffic flow, benefiting some 3 million residents of Dar es Salaam. Table 3-1 describes the expected positive effects of the Project.

Table 3-1 Project Effects

Current Situation and Problems	Remedial Measures Under the Project	Direct Effects and Extent of Improvement	Indirect Effects and Extent of Improvement
The city of Dar es Salaam plays a key role in Tanzania's transport network. The disorderly urban development of the city along four trunk roads has been steadily worsening the traffic congestion to the point of hampering the economic activities of the city. The BRT programme has been formulated to facilitate the increased use of public transport instead of private vehicles along with widening of the trunk roads to four lane roads. Of the four trunk roads, New Bagamoyo Road, the subject road of the Project, has not yet been widened and its insufficient transport capacity has resulted in chronic congestion. During the morning and evening peak hours in particular, severe congestion occurs on a daily basis and the situation is aggravated by the presence of slow moving vehicles and the damaged road surface. Another factor for the severe congestion is flooding of the road at the time of strong rain because of the insufficient drainage system, including the inadequate water conveyance capacity of the drainage pipes as well as side drains.	Rehabilitation and improvement of the road	① The improvement of the target road section will increase the average travelling speed to 42 km/hr during the two peak periods of eight hours in total (from 06:00 to 09:00 in the morning and from 15:00 to 20:00 in the evening) due to commuting to work or school from the current 6.5 km/hr, greatly shortening the travelling time. The traffic capacity will increase from the current some 825 vehicles/hr/lane to 1,740 vehicles/hr/lane. ② The introduction of proper road drainage facilities capable of handling the level of rainfall during the rainy season means that the road will not be flooded, ensuring smooth traffic. ③ With the completion of the planned construction work, vehicles travelling at the design speed will be separated from vehicles travelling at a slower speed, resulting in smooth traffic flow.	① The shortening of the travelling time will reduce the transportation cost. ② The increased traffic capacity and introduction of BRT will greatly improve the convenience of urban transport for the residents of Dar es Salaam.

3.2 Recommendations

3.2.1 Pending Issues for the Tanzanian Side and Recommendations

Although the implementation of the Project is expected to produce a number of positive effects as described in 3.1, the Tanzanian side should address the following issues to ensure the realisation of the expected effects based on the relevant efforts prior to, during and after the implementation of the Project.

① In connection with the relocation of the existing overground as well as underground structures of various public services, which is one of the undertakings of the Government of Tanzania, the TANROADS concluded a series of agreements with the relevant organizations in August, 2009, enabling the procurement of the materials required for the relocation work without the budgetary appropriation of advance money, etc. for these organizations. However, from the viewpoint of the smooth implementation of the Project, it will be important for the TANROADS and MoID to acquire and execute the necessary budget as planned.

② Through discussions with the TANROADS and other stakeholders, it became clear that the work to relocate the existing obstacles could be completed in approximately nine months if the work starts at the beginning of the year from the Mwenge Intersection to the Tegeta Intersection. For the smooth implementation of the Project by the Japanese side, this means that it will be necessary for the Tanzanian side to complete the relocation work in the identified section(s) prior to the commencement of the main construction work. Any delay of the relocation work will adversely affect the implementation schedule for the main construction work.

③ The relocation of the existing underground structures in the target section is the responsibility of the Tanzanian side if such work is deemed to be necessary. The Government of Tanzania must ensure that the relocated structures are buried at the exact locations and depth so that they will not adversely affect the newly improved and widened road.

④ The services of capable engineers should be continually secured along with human resources development efforts to strengthen the road maintenance system and capacity of the TANROADS.

⑤ Maintenance work, especially repair of the pavement and the removal of sediment and other objects from the drainage facilities, is extremely important to ensure the long sound usage of the road. Short-term and long-term maintenance systems should be properly established and should be backed by appropriate budgets.

⑥ The improvement of the target road will lead to an increase of not only the general traffic but also large heavy vehicles. One common cause of road damage (especially damage of the pavement) is

the excessive load of over-loaded vehicles. Strict control (and law enforcement) will be necessary to reduce over-loading to protect the road and to ensure smooth traffic flow.

⑦ Of the originally requested road section for improvement, the some 4.3 km section between the Morrocco Intersection and Mwenge Intersection has now been excluded from the scope of the Project. The primary reason for this exclusion is the fact that it will be impossible to finalise the alignment for the planned road as long as the locations and depth of the water mains, etc. buried on privately owned land remain unclear. The Tanzanian side should be fully aware of this situation in its preparations for the forthcoming proceeding and implementation of the Project.

3.2.2 Technical Cooperation and Collaboration with Other Donors

At present, the BRT Programme is in progress with the assistance of the World Bank. Meanwhile, the traffic volume on trunk roads in Dar es Salaam, including the target section of the Project, is predicted to grow at an annual rate of approximately 7.7%. It is, therefore, recommended that the TANROADS, the implementing agency of the Project, actively engage in discussions with other donors and related government departments so that the work on the target section, which constitutes Phase IV of the BRT Programme, can quickly commence after the completion of Phase 1 of the BRT Programme which is currently at the bidding stage.

In regard to technical cooperation, such cooperation is necessary in the form of training in Japan for staff members of the road management department of the TANROADS with a view to improving their technical capability to conduct the maintenance work in a satisfactory manner.

APPENDICES

Appendix 1 Member List of the Study Team

(1) Preparatory Survey

Name	Work Assignment	Position
Mr. Tomiaki ITO	Project manager	Economic Infrastructure Department, JICA
Mr. Takahiro GOTO	Project Coordinator	Economic Infrastructure Department, JICA
Mr. Jiro KOYAMA	Project Manager/ Maintenance	Ingérosec
Mr. Kazuharu KOISHIKAWA	Road Design I/ Survey on Existing Underground Structures	Ingérosec
Mr. Takeo MOGAMI	Road Design II/ Natural Conditions Survey	Ingérosec
Mr. Masahiro YOSHIZAWA	Transport Planning	Ingérosec
Mr. Masashi HADA	Environmental and Social Impacts Assessment	Ingérosec
Mr. Sueo HIROSE	Procurement & Construction Planning/ Cost Estimation	Ingérosec

(2) Explanation of the Summary of the Preparatory Survey Report

Name	Work Assignment	Position
Mr. Toshihisa HASEGAWA	Project manager	Deputy Manager, JICA Tanzania Office
Mr. Yoshitomo KUBO	ODA scheme	Economic Infrastructure Department, JICA
Mr. Jiro KOYAMA	Project Manager	Ingérosec
Mr. Kazuharu KOISHIKAWA	Road Planning	Ingérosec

Appendix 2 Study Schedule

(1) Preparatory Survey

Day Number	Date	Day of the Week	Project manager	Project Coordinator	Project Manager/ Maintenance	Road Design I / Survey on the Existing Underground Structures	Road Design II/ Natural Conditions Survey	Transport Planning	Environmental and Social Impacts Assessment	Procurement & Construction Planning/ Cost Estimation
			JICA	JICA	Koyama, J.	Koishikawa, K.	Mogami, T.	Yoshizawa, M.	Hada, M.	Hirose, S
1	3/17	Tue				EK6251 Dep. from Haneda Airport 20:40 Arr. at Kansai Airport at 22:00 EK317 Dep. from Kansai Airport at 23:15			EK6251 Dep. from Haneda Airport 20:40 Arr. at Kansai Airport at 22:00 EK317 Dep. from Kansai Airport at 23:15	
2	18	Wed				Arr. at Dubai at 05:55+1 EK725 Dep. from Dubai at 10:50 Arr. at Dar es Salaam at 15:20			Arr. at Dubai at 05:55+1 EK725 Dep. from Dubai at 10:50 Arr. at Dar es Salaam at 15:20	
3	19	Thu				Courtesy visit to the TANROADS/ Filed survey			Courtesy visit to the TANROADS/ Filed survey	
4	20	Fri				Discussion on local subcontracting and contract negotiations			Discussion on local subcontracting and contract negotiations	
5	21	Sat	*Maulid day			Discussion on local subcontracting and contract negotiations			Discussion on local subcontracting and contract negotiations	
6	22	Sun			EK6251 Dep. from Haneda Airport 20:40 Arr. at Kansai Airport at 22:00 EK317 Dep. from Kansai Airport at 23:15	Field survey		EK6251 Dep. from Haneda Airport 20:40 Arr. at Kansai Airport at 22:00 EK317 Dep. from Kansai Airport at 23:15	Field survey	
7	23	Mon			Arr. at Dubai at 05:55+1 EK725 Dep. from Dubai at 10:50 Arr. at Dar es Salaam at 15:20	Field survey		Arr. at Dubai at 05:55+1 EK725 Dep. from Dubai at 10:50 Arr. at Dar es Salaam at 15:20	Field survey	
8	24	Tue			Field survey	Field survey		Field survey	Field survey	
9	25	Wed			Discussion on local subcontracting and contract negotiations	Discussion on local subcontracting and contract negotiations		Discussion on local subcontracting and contract negotiations	Discussion on local subcontracting and contract negotiations	
10	26	Thu			Explanation of the Inception Report(TANROADS)			Explanation of the Inception Report(TANROADS)		
11	27	Fri		Tokyo～	Field survey	Field survey	EK6251 Dep. from Haneda Airport 20:40 Arr. at Kansai Airport at 22:00 EK317 Dep. from Kansai Airport at 23:15	Field survey	Field survey	
12	28	Sat		～Dar es Salaam	Team meeting and gathering/ sorting out of references	Team meeting and gathering/ sorting out of references	Arr. at Dubai at 05:55+1 EK725 Dep. from Dubai at 10:50 Arr. at Dar es Salaam at 15:20	Team meeting and gathering/ sorting out of references	Team meeting and gathering/ sorting out of references	
13	29	Sun		Field survey						
14	30	Mon	Courtesy visits to the Embassy, MoID and TANROADS meeting at the JICA Office							
15	31	Tue	Courtesy visits to and discussions at the NEMC , the Environment Department of the MoID, IRA, MoLHHSD and Dar es Salaam Municipal Office							
16	4/1	Wed	Field survey							

Day Number	Date	Day of the Week	Project manager	Project Coordinator	Project Manager/ Maintenance	Road Design I / Survey on the Existing Underground Structures	Road Design II/ Natural Conditions Survey	Transport Planning	Environmental and Social Impacts Assessment	Procurement & Construction Planning/ Cost Estimation
			JICA	JICA	Koyama, J.	Koishikawa, K.	Mogami, T.	Yoshizawa, M.	Hada, M.	Hirose, S
17	2	Thu	Discussions (TANROADS)				Field survey	Field survey	Coutesy visits to and discussions at the NEMC , the Environment Department of the MoID, IRA, MoLHHSD and Dar es Salaam Municipal Office	
18	3	Fri	Discussions (TANROADS)				Field survey	Field survey	Discussions at/with the Planning Bureau of the TANROADS, EIA Officers and NEMC staff members	
19	4	Sat	Field survey	Field survey	Field survey	Field survey	Field survey	Field survey	Field survey	
20	5	Sun	Team meeting and gathering/sorting out of reference materials			Traffic volume survey	Team meeting and gathering/sorting out of reference materials			
21	6	Mon	Discussion on Minutes (TANROADS)				Field survey	Field survey	Field survey	EK6251 Dep. from Haneda Airport 20:40 Arr. at Kansai Airport at 22:00 EK317 Dep. from Kansai Airport at 23:15
22	7	Tue	Heroes Day (Zanzibal only)	Field survey	Field survey	Field survey	Field survey	Field survey	Field survey	Arr. at Dubai at 05:55+1 EK725 Dep. from Dubai at 10:50 Arr. at Dar es Salaam at 15:20
23	8	Wed	Signing of the Minutes; reporting to the Embassy; meeting at the JICA Office				Field survey	Field survey	Discussions at/with the Planning Bureau of the TANROADS, EIA officers and NEMC staff members	Market price survey; request for quotes
24	9	Thu		Dar es Salaam ~	Field survey	Field survey	Field survey	Field survey	Discussions at/with the Planning Bureau of the TANROADS, EIA officers and NEMC staff members	Market price survey; request for quotes
25	10	Fri	Good Friday	~Tokyo	Field survey	Field survey	Field survey	Field survey	Discussions at/with the Planning bureau of the TANROADS, EIA officers and NEMC staff members	Market price survey; request for quotes
26	11	Sat			Field survey	Field survey	Field survey	Field survey	Field survey	Market price survey; request for quotes
27	12	Sun	Easter Holiday		Team discussions and gathering/sorting of reference materials					
28	13	Mon	Easter Monday		Reporting to the Embassy, MoID, TANROADS and JICA Office	Field survey	Field survey	Field survey	Gathering/sorting of reference materials	Survey on the material procurement situation
29	14	Tue			EK726 Dep. from Dar es Salaam at 17:20 Arr. at Dubai at 23:50	Field survey	Field survey	Field survey	EK726 Dep. from Dar es Salaam at 17:20 Arr. at Dubai at 23:50	Survey on the material procurement situation
30	15	Wed			EK316 Dep. from Dubai at 03:40 Arr. at Kansai Airport at 17:50 EK6252 Dep. from Kansai Airport at 19:15 Arr. at Haneda Airport at 20:25	Field survey	Field survey	Traffic volume survey	EK316 Dep. from Dubai at 03:40 Arr. at Kansai Airport at 17:50 EK6252 Dep. from Kansai Airport at 19:15 Arr. at Haneda Airport at 20:25	Gathering of hydrological and meteorological data
31	16	Thu				Field survey	Field survey	Gathering/sorting of		Sampling from a rock

Day Number	Date	Day of the Week	Project manager	Project Coordinator	Project Manager/ Maintenance	Road Design I / Survey on the Existing Underground Structures	Road Design II/ Natural Conditions Survey	Transport Planning	Environmental and Social Impacts Assessment	Procurement & Construction Planning/ Cost Estimation
			JICA	JICA	Koyama, J.	Koishikawa, K.	Mogami, T.	Yoshizawa, M.	Hada, M.	Hirose, S
								reference materials		quarry and soil pits and transfer of samples for laboratory testing
32	17	Fri				Field survey	Field survey	Gathering/sorting of reference materials		Survey related to cost estimation; survey on the material procurement situation
33	18	Sat				Field survey	Field survey	EK726 Dep. from Dar es Salaam at 17:20 Arr. at Dubai at 23:50		Survey related to cost estimation; survey on the material procurement situation
34	19	Sun				Team meeting and gathering/sorting of reference materials		EK316 Dep. from Dubai at 03:40 Arr. at Kansai Airport at 17:50 EK6252 Dep. from Kansai Airport at 19:15 Arr. at Haneda Airport at 20:25		Team meeting and gathering/sorting of reference materials
35	20	Mon				Gathering/sorting of reference materials	Gathering/sorting of reference materials			Survey related to cost estimation; survey on the material procurement situation
36	21	Tue				Field survey	Field survey			Survey related to cost estimation; survey on the material procurement situation
37	22	Wed				Field survey	Field survey			Survey related to cost estimation; survey on the material procurement situation
38	23	Thu				Field survey	Field survey			Survey related to cost estimation; survey on the material procurement situation; analysis and sorting of the analysis results
39	24	Fri				Field survey	Field survey			Survey related to cost estimation; survey on the material procurement situation; analysis and sorting of the analysis results
40	25	Sat				Field survey	Field survey			Survey related to cost estimation; survey on the material procurement situation; analysis and sorting of the analysis results
41	26	Sun	Union Day			Team meeting and gathering/sorting of reference materials				Team meeting and gathering/sorting of reference materials
42	27	Mon				Gathering/sorting of reference materials	Field survey			Survey related to cost estimation; survey on the material procurement situation; analysis and sorting of the analysis results
43	28	Tue				Gathering/sorting of reference materials	Field survey			Survey related to cost estimation; survey on the material procurement situation; analysis and

Day Number	Date	Day of the Week	Project manager	Project Coordinator	Project Manager/ Maintenance	Road Design I / Survey on the Existing Underground Structures	Road Design II/ Natural Conditions Survey	Transport Planning	Environmental and Social Impacts Assessment	Procurement & Construction Planning/ Cost Estimation
			JICA	JICA	Koyama, J.	Koishikawa, K.	Mogami, T.	Yoshizawa, M.	Hada, M.	Hirose, S
										sorting of the analysis results
44	29	Wed				Field survey	Field survey			Survey related to cost estimation; survey on the material procurement situation; analysis and sorting of the analysis results
45	30	Thu				Reporting to the Embassy, MoID, TANROADS and JICA Office	Field survey			Reporting to the Embassy, MoID, TANROADS and JICA Office
46	5/1	Fri	International Labour Day			EK726 Dep. from Dar es Salaam at 17:20 Arr. at Dubai at 23:50	Field survey			EK726 Dep. from Dar es Salaam at 17:20 Arr. at Dubai at 23:50
47	2	Sat				EK316 Dep. from Dubai at 03:40 Arr. at Kansai Airport at 17:50 EK6252 Dep. from Kansai Airport at 19:15 Arr. at Haneda Airport at 20:25	Field survey			EK316 Dep. from Dubai at 03:40 Arr. at Kansai Airport at 17:50 EK6252 Dep. from Kansai Airport at 19:15 Arr. at Haneda Airport at 20:25
48	3	Sun					Gathering/sorting of reference materials			
49	4	Mon					Field survey			
50	5	Tue					Field survey			
51	6	Wed					Field survey			
52	7	Thu					Field survey			
53	8	Fri					Field survey			
54	9	Sat					Field survey			
55	10	Sun					Gathering/sorting of reference materials			
56	11	Mon					Field survey			
57	12	Tue					Field survey			
58	13	Wed					Sorting of the gathered data			
59	14	Thu					Reporting to the Embassy, MoID, TANROADS and JICA Office			
60	15	Fri					EK726 Dep. from Dar es Salaam at 17:20 Arr. at Dubai at 23:50			
61	16	Sat					EK316 Dep. from Dubai at 03:40 Arr. at Kansai Airport at 17:50 EK6252 Dep. from Kansai Airport at 19:15 Arr. at Haneda Airport at 20:25			

(2) Explanation of the Summary of the Preparatory Survey Report

Date	Day of the Week	Hasegawa, T. (Project manager)	Kubo, Y., (ODA Scheme)	Koyama, J. (Project Manager)	Koishikawa, K., (Road Planning)
10/ 14	Wed			Departure from Japan JL959 from Narita Airport at 18:20 Arrival at Incheon Airport at 20:55 EK726 from Incheon Airport at 23:55	
15	Thu			Arrival at Dubai at 04:25 Departure from Dubai at 10:50 Arrival at Tanzania (Dar es Salaam) at 15:20	
16	Fri			Interviews with representatives of other donors	
				Visit to the TANROADS to explain the report	
17	Sat			Field survey	
18	Sun		Departure from Tokyo	Sorting of the reference materials; interviews with representatives of other donors	
19	Mon		Arrival at Tanzania; visit to the JICA Tanzania Office	Interviews with representatives of other donors	
		Courtesy visit to the TANROADS			
20	Tue		Discussions with representatives of the TANROADS, MoID and DAWASA		
			Preparation of the draft M/D		
21	Wed		Discussions on the M/D with representatives of the TANROADS, MoID, TANESCO and TTCL		
22	Thu	Discussions on the M/D with representatives of the TANROADS and MoID			
		Signing of the M/D together with representatives of the TANROADS and MoID			
23	Fri	Reporting to the JICA Tanzania Office and Embassy of Japan, Tanzania			
			Departure from Tanzania EK726 From Dar es Salaam at 16:50, arrival at Dubai at 23:20		
24	Sat		Departure from Dubai at 03:00 Arrival at Incheon Airport at 16:05 JAL956 Departure from Incheon Airport at 17:35 Arrival at Narita Airport at 20:00		

Appendix 3 List of Parties Concerned in the Recipient Country

(1) Preparatory Survey

Ministry of Infrastructure Development (MoID)

Mr. Omar A. Chambo	Permanent Secretary
Mr. Bartholomew B.Rufunjo	Director, Department of Transport
Mr. Edwin Mujwahuji	Assistant Director, Roads Division

Tanzania National Roads Agency (TANROADS)

Mr. Ephraem C. Mrema	Chief Exective
Mr. Jason M. Rwiza	Director of Planning
Mr. Masawe	Director of Implementation
Mr. Thomas L. Mosso	Director of Maintenance
Mr. Ebenezer R. Mollel	Head of Design & Standards
Ms. Motta Kando	Project Engineer
Mr. Emmanuel Msumba	Structural Engineer
Mr. Arnold Masaki	Traffic Engineer
Mr. Sanjo M. Mgeta	Senior Environmentalist
Mr. Julius K. Luhuro	Environment Officer

Dar es Salaam Regional Office, Tanzania National Roads Agency (TANROADS)

Mr. James R. Nyabakari	Regional Manager
Mr. A. W. Phillip	Ag. Regional Manager, Head of Procurement Manager
Ms. Aisha Salim	Engineer, Head of Engineering Secion
Mr. Juluis Ngusa	Procect Engineer, Bridge
Ms. Evelye Mlay	Engineer, Head of Planning Section
Mr. Martin D. Mwakabende	Ast. Planning Engineer
Mr. Meja Mefira	Site Engineer

Ministry of Defense and National Service

Mr. Shimbo	Lieutenant General
Mr. Mella	Chief of Military Intelligence
Mr. E. E. M. Mrema	Commisioner for Industries
Mr. Sebastian	Surveyor in Charge
Mr. Betoni	Captain
Ms. Jani Kipengeli	Lieutenant

Dar es Salaam Water and Sewerage Agency(DAWASA)

Mr. Romanus Mwangingo	Program Delivery Manager
Mr. Bunyese S. J.	Program Delivery Engineer

Dar es Salaam Water and Sewerage Company(DAWASCO)

Mr. Fumbuka F.J	Engineer
Mr. Tshering Peljor	Project Coordinator
Mr. Mabuli Y.D.	Engineer

Tanzania Telecomunication Company Ltd.(TTCL)
Mr. Pristilla Chilipweldi Engineer
Mr. Martin Chilumba Engineer

Tanzania Electric Supply Company (TANESCO)
Ms. Simbila C. Engineer
Mr. Msindu K. Engineer

Dar es Salaam Rapid Transit Agency
Mr. Cosmas P. M. Takule Chief Executive
Mr. Enoch J. Kitandu System and Operation Director

World Bank, Tanzania
Mr. Dieter E. Schelling Chief Executive
Mr.Yonas E. Mchomvu Trabsport Specialist

Embassy of Japan, Tanzania
Mr. Hiroshi Ito First Secretary
JICA Tanzania Office
Mr.Kiyoshi Masumoto Manager
Mr.Koji Makino Deputy Manager
Ms. Asuka Tsuboike Staff Member

(2) Explanation of the Summary of the Prepatory Servey Report

Ministry of Infrastructure Development (MoID)
Mr. Musa I. Iymbe Director of Roads
Mr. Samuel Jacson Principa engineer, Department of Roads

Tanzania National Roads Agency (TANROADS)
Mr. Ephraem C. Mrema Chief Exective
Mr. Jason M. Rwiza Director of Planning
Mr. Salutari M. Massawe Director of Project
Mr. Victor H. Seff Project Manager
Mr. Ebenezer R. Mollel Head of Design and Standards
Mr. Danford Mariki Head, Department of Research & Materials
Mr. Sanjo M. Mgeta Senior Environmentalist
Ms. Motta Kando Project Engineer
Mr.Hamisi R. Waziri Project Engineer
Mr.L.E. Mwandamso Project Engineer

Dar es Salaam Regional Office, Tanzania National Roads Agency (TANROADS)
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