JAPAN INTERNATIONAL COOPERATION AGENCY

No.

MINISTRY OF TRANSPORTS, POSTS AND TELECOMMUNICATIONS
MINISTRY OF PUBLIC WORKS AND EQUIPMENT
REPUBLIC OF BURUNDI

THE EMERGENCY STUDY ON URBAN TRANSPORT IN BUJUMBURA REPUBLIC OF BURUNDI

FINAL REPORT
EXECUTIVE SUMMARY

FEBRUARY 2008

JAPAN INTERNATIONAL COOPERATION AGENCY

JAPAN ENGINEERING CONSULTANTS CO., LTD.
IN ASSOCIATION WITH
YACHIYO ENGINEERING CO., LTD.

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Prepared by

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EXCHANGE RATE

August 2007

1 US$ = 1,100 Burundi Franc

1 US$ = 110.0 Yen

1 Yen = 10 Burundi Franc

PREFACE

In response to a request from the Government of the Republic of Burundi, the Government of Japan decided to conduct “The Emergency Study on Urban Transport in Bujumbura” and entrusted the Study to Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Yasushi OHWAKI of Japan Engineering Consultants Co., Ltd. in association with YACHIYO Engineering Co., Ltd., between January 2007 and March 2008.

The team held discussions with the engineers of Ministry of Transport, Posts and Telecommunications, Ministry of Public Works and Equipments and Burundi Public Transport Corporation (OTRACO) as well as other officials concerned of the Government of Burundi and conducted field surveys, data analysis, Master Plan formulation. Upon returning to Japan, the team prepared this final report to summarize the result of the study.

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

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Burundi for their close cooperation extended to the Study.

February 2008

Eiji HASHIMOTO
Vice President
Japan International Cooperation Agency

February 2008

Mr. Eiji HASHIMOTO
Vice President
Japan International Cooperation Agency

Dear Sir,

LETTER OF TRANSMITTAL

We are pleased to submit herewith the Final Report of "The Emergency Study on Urban Transport in Bujumbura in the Republic of Burundi". The report includes the advices and suggestions of the authorities concerned of the Government of Japan and your Agency as well as the comments made by the Ministry of Transport, Posts and Telecommunications, Ministry of Public Works and Equipments and Burundi Public Transport Corporation (OTRACO) and other authorities concerned of the Government of Burundi.

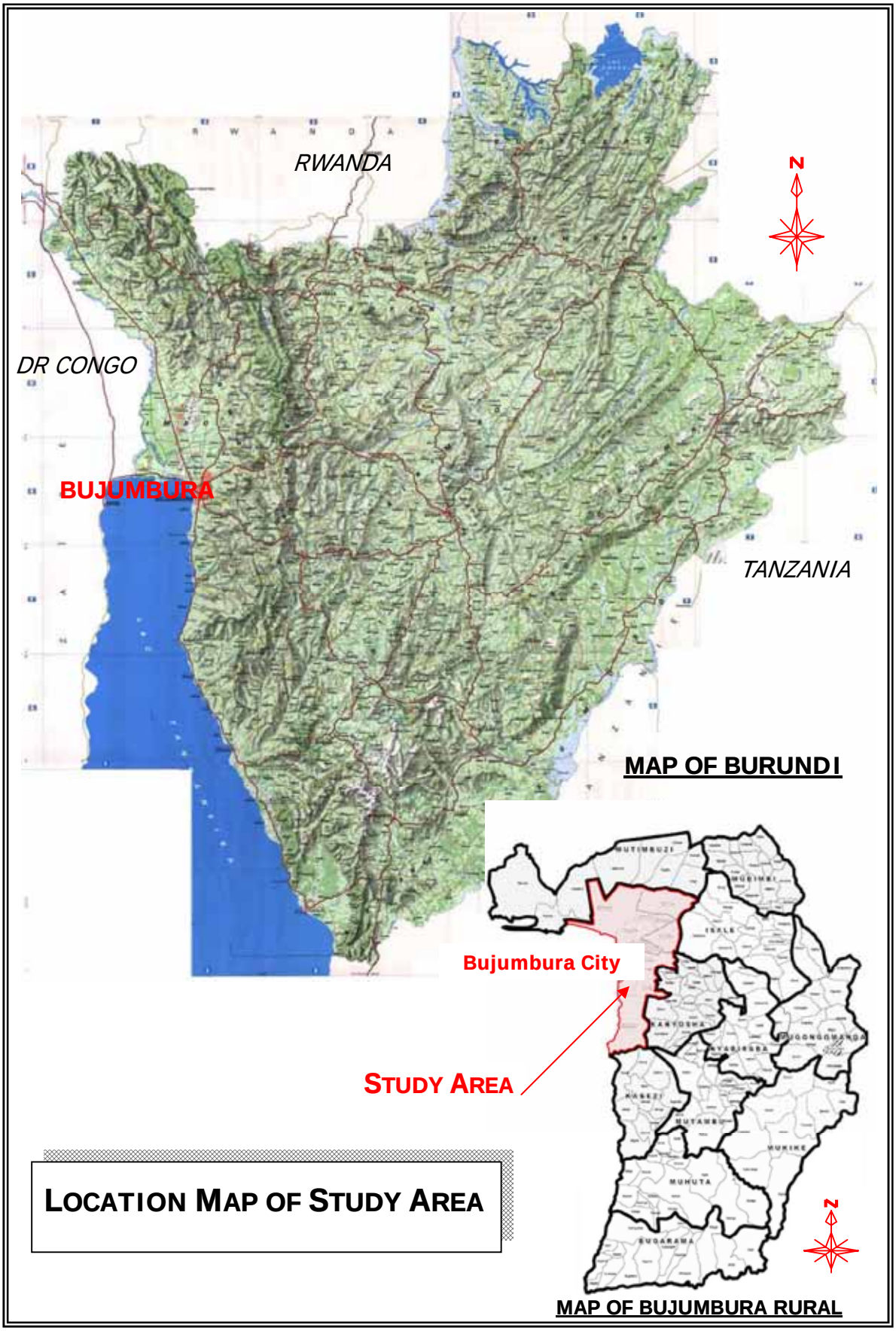
This report analyses the present and future conditions and demand of urban transport in Bujumbura. It comprehensively covers the issues of urban transport including road, public transport, traffic management, institution, legislation, financing and urban environment. The report established an urban transport Master Plan to the year 2017. The outcome of the Study concludes that the established plans are technically, economically, environmentally and socially feasible and will contribute to the development of Bujumbura.

In view of the urgency of development of transport facilities in Bujumbura and socioeconomic development of the Republic of Burundi, we recommend that the Government of Burundi implement the Projects with high priority.

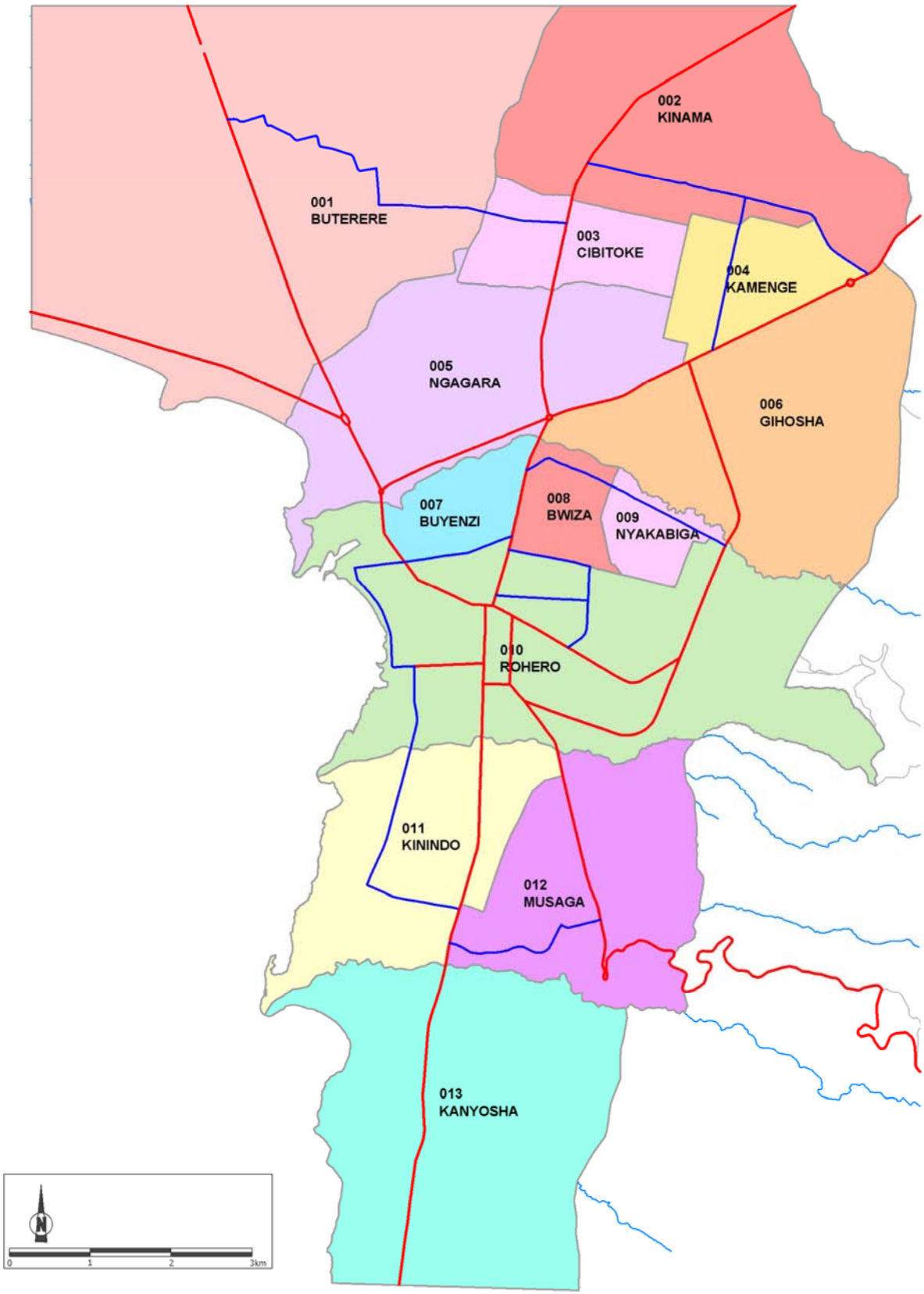
We wish to take this opportunity to express our sincere gratitude to your Agency, the Ministry of Foreign Affairs and Cooperation. We also wish to express our deep gratitude to the Ministry of Transport, Posts and Telecommunications, Ministry of Public Works and Equipments and Burundi Public Transport Corporation (OTRACO) and other authorities concerned of the Government of Burundi for the close cooperation and assistance extended to us during the course of the Study.

Very Truly Yours,

Yasushi OHWAKI
Team Leader
The Emergency Study on Urban Transport in Bujumbura



LOCATION MAP OF STUDY AREA



DETAILED LOCATION MAP OF STUDY AREA

(BUJUMBURA CITY ADMINISTRATION MAP)

PROJECT PROFILE

1. Country	Republic of Burundi
2. Name of Study	The Emergency Study on Urban Transport in Bujumbura City
3. Counterpart Agency	Ministry of Transport, Post and Telecommunication
4. Objective of Study	1. To improve the overall situation of the urban transport system in the City of Bujumbura by formulating an urban transport plan. 2. To provide technical support to OTRACO *(Office des Transports en Commun).* 3. To perform urgent rehabilitation work as a pilot project.

1. THE STUDY AREA

- **THE STUDY AREA** covers the entire city of Bujumbura, capital of Burundi with population of .about 548,000 as of February, 2007.

2. **SCOPE OF THE STUDY**

1) Review and analysis of present situation,
2) Producing of community profiles,
3) Formulation of the framework (socio-economic, traffic demand) up to the target year of 2017,
4) Formulation of the urban transport plan,
5) Implementation of technical support in Bus Operation & Maintenance, and Management of the OTRACO,
6) Formulation and Implementation of Urgent Rehabilitation Works as a Pilot Project,
7) Overall Evaluation and Recommendations for Urban Transportation

3. **NARRATIVE DESCRIPTION**

THE STUDY started from identification of existing problems from various engineering view points. There were findings that, on land use: high population density at the city centre and concentration of urban function at CBD area, on road network: huge dependant on existing radial roads for traffic flow and insufficient road facilities as well as road maintenance, on public transport: inconsistency with passengers' need and insufficient control on bus operation including institutional system, on NMT: no proper facilities (i.e. walkway, bicycle lane) and mixed traffic of NMT and vehicle.

The Study formulates, at first, frameworks of socio-economic including population at year of 2017. As the results, GRDP per capita and the population are estimated to be of 693,931 (FBu) and 736, 000, respectively. The land use plan at 2017 is established that, northern and eastern parts of the city shall not be expanded in consideration of environmental and disaster prevention awareness; and southern part is expected to be of important area (i.e. sub city centre) which would receive population and economic activities to be increased.

With those frameworks the future traffic demand is estimated to be of 454,000 in 2017 which become about 1.64 times to that of 2007. The future road network is formulated which includes ideas of new introduction of costal road and strengthening north-south axis and ring roads development in CBD. The public transport plan is also formulated which includes revised bus route networks on both OTRACO and private mini bus. The network clarifies rolls of the OTRACO and the private mini bus, and an estimation of required nos. of buses to OTRACO to be of 73 is made at same time.

Consequently the Study proposes 9 plans of road development and 2 plans of public transport improvement. Accordingly, an investment plan is made which consisted of Short Term (2008-2010) with 7.3 bil FBu, Medium Term (2011-2013) with 55.6 bil FBu and Long Term (2014-2017) to be 85.1 bil FBu and it results 148.0 bil FBu in total. The plan is justified as viable by the economic evaluation and initial environmental evaluations which are NPV of47.7 FBu, BCR of1.60 and EIRR of16.7%, eventually.

The technical support to OTRACO was conducted in order to improve its capacity on O&M, and it was successfully completed.

In terms of the Pilot Project, the project sites of RN7 at Musaga (1.7km) and some city roads at Rohero were selected as the results of the Steering Committee of the Project. The civil work contract was signed on 12th September 2007 and its completion is planed to be at middle of March 2008.

4. CONCLUSION AND RECOMMENDATION

- The proposed 11 plans as output of the study are justified to be viable by the economic and environmental evaluation.
- In addition to that, the Study recommends to take following actions to Burundian side:

- Authorization of the plans as one of national development plan of Burundi
- Clarification of executive organization for the plans
- Establishment of management plans
  - Establishment of organization and institution for the execution
  - Securing the budget for implementation
  - Adjusting urban development projects by coordinating with urban transport condition
  - Investigating, approving and rejection other plans related to urban development.
- Building a consensus among citizens on plan's implementation
- Conducting EIA, and minimizing involuntary resettlement and affect on existing business rights
- Utilizing of Community Profile which was produced by the Study for establishment of other development plans
- Securing Maintenance budget

1. INTORDCUTION

(1) Background

REPUBLIC OF BURUNDI attained its independence from Belgium in 1962. However, due to continuous civil conflict, the economic sanctions by the neighboring nations since 1996 could not contribute well enough towards the national economy of Burundi and therefore the improvement and maintenance of its domestic infrastructures and transportation network were made nearly impossible. The basic infrastructures, particularly the road conditions of Bujumbura, the capital city of Burundi, are extremely poor, and the reconstruction of these roads is very much essential. As the demand for road transportation in Bujumbura is expected to increase in near future, traffic congestion in the city center is becoming a major concern.

Though the privately-owned minibuses are the primary means of public transportation in Bujumbura, the Office des Transports en Commun (OTRACO) also provides public bus services between Bujumbura and the rural communities. However, the services of OTRACO buses are very poor and inadequate due to no proper O&M system. Consequently, revitalization of the OTRACO public transportation service is very much essential to reconstruct the regional economy.

The aim of this Study is to strengthen the economy and improve the living conditions in Bujumbura by implementing this important project primarily through formulation of an urban transport plan, technical cooperation in revitalizing the OTRACO public transportation service, and improvement of the urban traffic conditions.

(2) Objectives of the Study

The objectives of the Study are:

1. To improve the overall situation of the urban transport system in the City of Bujumbura by formulating an urban transport plan.
2. To provide technical support to OTRACO.
3. To perform urgent rehabilitation work as a pilot project.

(3) Study Area

The Study Area covers the entire city of Bujumbura

2. PRESENT CONDITIONS

(1) General Condition

Bujumbura, the capital city of Burundi, lies at the north-eastern corner of Lake Tanganyika. Being the largest city of Burundi, Bujumbura is the administrative, communications, and economic center of the country. Industries located here include textile and soap industries. Bujumbura, the Burundi's main port, ships most of the country's main export item such as coffee as well as cotton, hide, and tin ore.

(2) Population

Population in Bujumbura is estimated to be of 547,760 as of February, 2007.

(3) Land Use

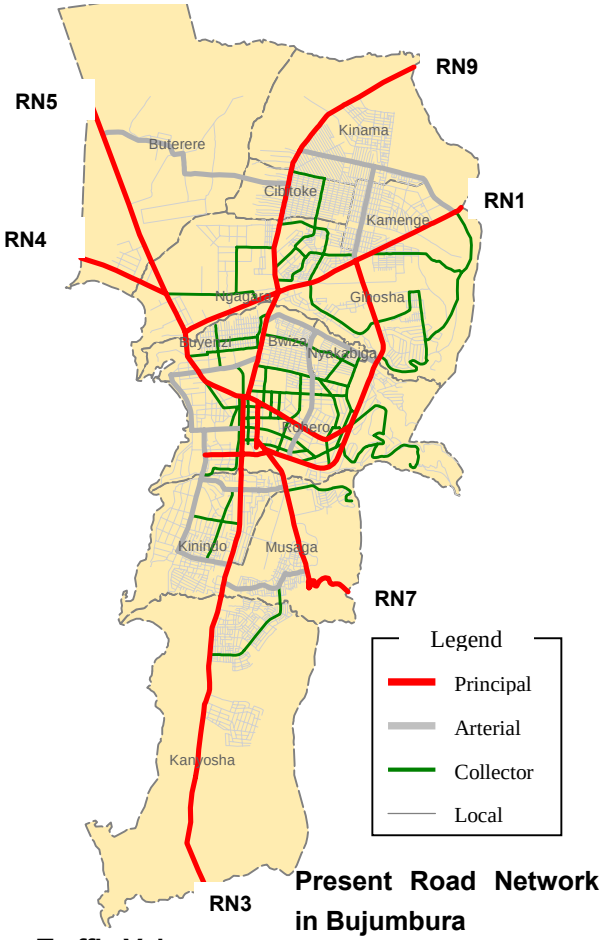
Bujumbura city is located between mountain land on the eastern side and Lake Tanganyika on the west, and the city area spreads out about 4km wide in the direction of north-south. Rohero Commune is the administrative and business, commercial center of the city.

An industrial area is situated around the harbor in the northern area and most of the Burundi’s large-scale factories are located there. Residential areas surround these two areas, and they thus form the entire city of Bujumbura.

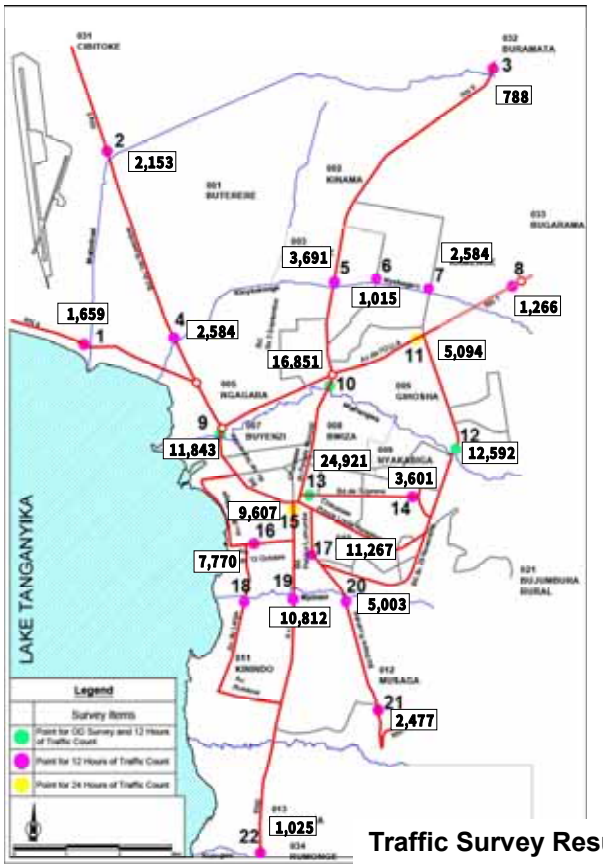
(4) Road Network

Network

Skeletal structure of road network in Bujumbura is formed by 6 national roads and a ring road, which composes principal arterial roads. The national roads, i.e. Rn-1, Rn-3, Rn-4, Rn-5, Rn-7 and Rn-9, are connecting Bujumbura to other provinces in Burundi. The ring road starts from RN-1 at north, passes towards east and connects with RN-7 and RN-3 at the south. Other city road network is classified in three categories namely arterial, collector and local road. The arterial roads form the frame of the network together with principal arterial road, and those frame roads are occasionally connected to the collector and local roads directly



Present Road Network in Bujumbura



Traffic Survey Results

Traffic Volume

By the characteristics of land use, traffic movement into city center excels, consequently traffic volume increases gradually as it near the center. Traffic volume shows its maximum at Av. l'Uprona where 25,000 vehicles per 12 hours are counted. On the other hand, traffic at outskirts of the city is relatively low, scarcely reaching 2000 vehicles. As for the composition of vehicle types, private vehicles are distinguished as majority, but minibuses, which amount more than 5000 vehicles at maximum, also occupy great portion at some point.

A road side OD Survey was conducted at 5 locations on major roads. Traffic concentration to central area is observed from the result

(5) Public Transport

Two types of public transport organizations are currently operating in Bujumbura, one is OTRACO for public sector, and the other is private-sector Bus Company.

OTRACO provides urban, suburban and inter urban bus services with large body buses. Private-sector bus companies are operating inside Bujumbura, using wagon-type minibuses with an average of 14-seat to 30-seat capacity.

Private bus route covers almost all the city area, but some areas which are not serviced exist. Number of daily bus passengers by the passenger interview survey is 118,000 in May, 2007.

(6) Traffic Management

At present all the intersections are non-signalized. Instead, roundabout system is common at the major crossings.

In Bujumbura, there is no system of parking charge or no regulation for parking restriction on the road. Vehicles are parked along the roadside or at the center median strip

3. EXISTING ISSUES

There are some issues/problems on infrastructure in Bujumbura and the Study summarizes issues/problems sectors as follows;

(1) Land Use

- Overcrowded State of Residential Area
- Concentration of Urban Function into CBD

(2) Road Network

- Huge dependant on existing radial roads for traffic flow
- Deficiency of road in residential area
- Insufficient road facilities and improper operation
- Insufficient road maintenance

(3) Public Transport

- Inconsistency with passengers' needs
- Insufficient control to bus operation
- Unprofitable operation in OTRACO

(4) Motorcycle, Bicycle and Pedestrian

- Insufficient sidewalk
- Mixed traffic of bicycles and vehicles

(5) Traffic Management

- Behaviors of roadside parking accelerate traffic congestion

4. SOCIO ECONOMIC FRAMEWORK

(1) Population

The future population in Bujumbura is estimated as shown in following table, which is based on the analysis of several indicators and existing estimation by various donors.

Population Framework in Bujumbura

Item/Year	2007	2012	2017
Population in Bujumbura	547,760	635,000	736,000

(2) Economic Indicators

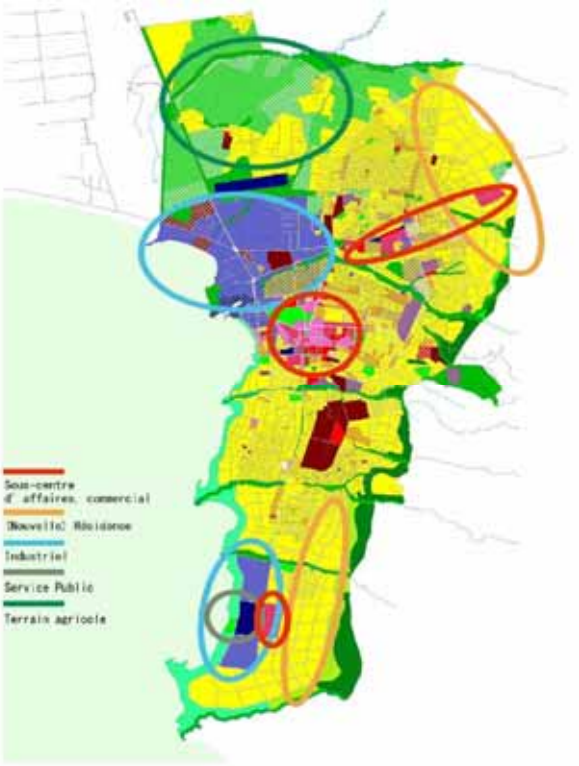
Referring to presumption by IMF and WB, GDP growth rate up to year 2017 in Burundi was set up to be 6.0%. Growth rate of GRDP (Gross Regional Domestic Product) in Bujumbura was also estimated to be between 7.9% and 8.1%based on the growth rate in primary, secondary and tertiary industry.

Economic Indicators in Bujumbura

Indicator	2007	2012	2017
GRDP at 2007 prices (Billion FBu)	237.6	347.34	510.8
Share of GRDP	23.0%	25.2%	27.5%
GRDP Growth Rate	7.9%	8.0%	8.1%
GRDP per capita(FBu)	433,842	546,871	693,931

(3) Future Urbanized Area

The land use plan at 2017 is established that, northern and eastern parts of the city shall not be expanded in consideration of environmental and disaster prevention awareness; and the southern part was expected to be of important area (i.e. sub city centre) where would receive population and economic activity to be increased.



Future Land Use and Distribution of Urban Function

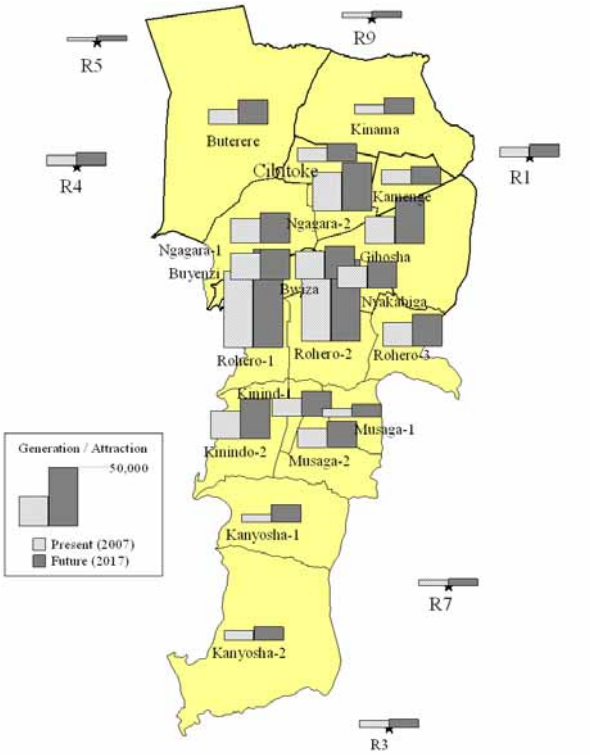
5. FUTURE TRAFFIC DEMAND

(1) Vehicle Trip Generation and Attraction

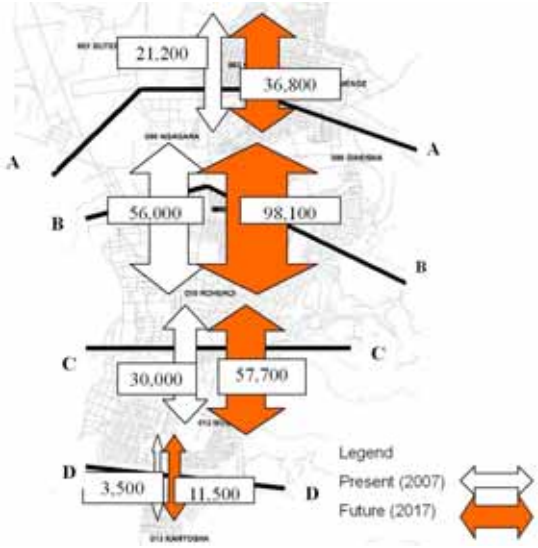
Based on the trip generation model in which number of trips are function of zonal population, total vehicle trips generating/attracting in the study area are estimated 278,000 in 2007 and 454,000 in 2017. Due to the difference in population increase, rate of increase in traffic generation by each zone differs greatly. In the southern area where population increase is expected most, trip generation is 3.8-3.9 times from 2017, in contrast with 1.3-1.6 times in the central area

(2) Traffic Assignment

Traffic assignment in the future is examined by the Multi-pass Assignment Method, searching minimum travel time routes based on the link flow speed. As the result of examination, it is recognized that the traffic demand of north-south direction will increase conspicuously due to the expansion of city area.



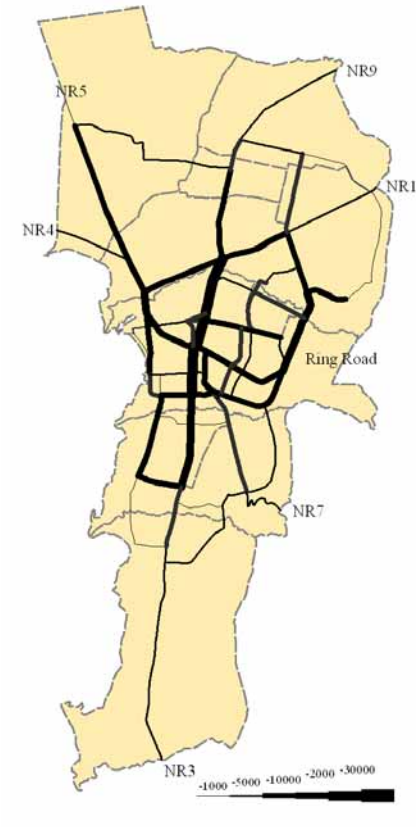
Vehicle Trip by Zone in 2007 to 2017



Comparison of Traffic Volume at Screen Line

Increase Rate at Screen Lines

Screen Line	Traffic Demand		Rate of increase
	2007	2017	(times)
A-A'	21,200	36,800	1.7
B-B'	56,000	98,100	1.8
C-C'	30,000	57,700	1.9
D-D'	3,500	11,500	3.3



Traffic Assignment in 2017

6. TRANSPORT IMPROVEMENT POLICY

(1) Basic Policies

- Coordination with existing policies

The policy of urban transport improvement plan shall consistent with relevant development policies and plans.

- Urban Transport Improvement Plan with consideration of long-term design

The urban Transport Improvement Plan shall be drawn in perspective of the future beyond the target year. To this end, the study will draw a rough picture on urban transport system in the long-term future.

- Shifting to public transport from private vehicles

As the result of the improvement of living standards, private vehicles which carry few passengers increase and are causing traffic congestion. Shifting the traffic modes from private to public is the key issue to solve the urban transport congestion.

- Increase of efficiency of public transport

In order to take an essential role in urban transport, public transport should be more efficient and sophisticated, so as to attract more passengers.

- TDM

Due to a few remaining free space in Bujumbura, road widening and development would be difficult. Considering the awareness of environmental reverse impact, concepts for Traffic Demand Management (TDM) shall be introduced in the Master Plan.

7. ROAD DEVELOPMENT PLAN

(1) Development Concept and Policy

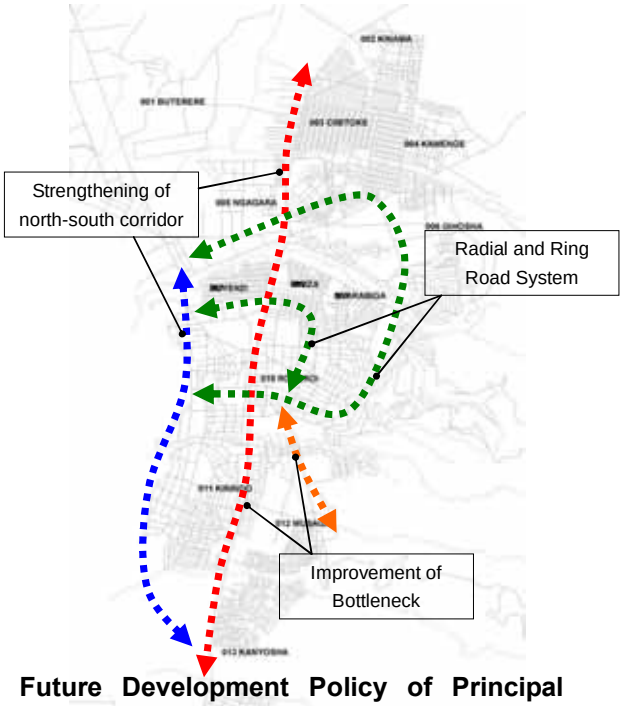
The Road Development Policies are established as follows;

- Reinforcement of ring road system
- Reinforcement of north-south axis
- Improvement of collector road
- Improvement of intersections
- Establishment of road maintenance system

(2) Road Network Development

The Programs for Road Network Development is introduced as follows:

- Development of Coastal Alternative Route
- Improvement of North-South Axis around CBD Area
- Development of Ring Road
- Improvement of Bottlenecks



Future Development Policy of Principal Arterial Roads

(3) Intersection Improvement

Generally, this program aims to re-forming offset intersections, 4 locations in the city are selected.

(4) Traffic Flow Control

In this program, signalization is introduced on major intersections the city. The program is divided into 3 packages as rank of urgency.

Number of Traffic Signal Construction

Package	Places	Priority
Package I	11	Urgent
Package II	18	Short-term
Package III	7	Midterm

(5) Traffic Restriction

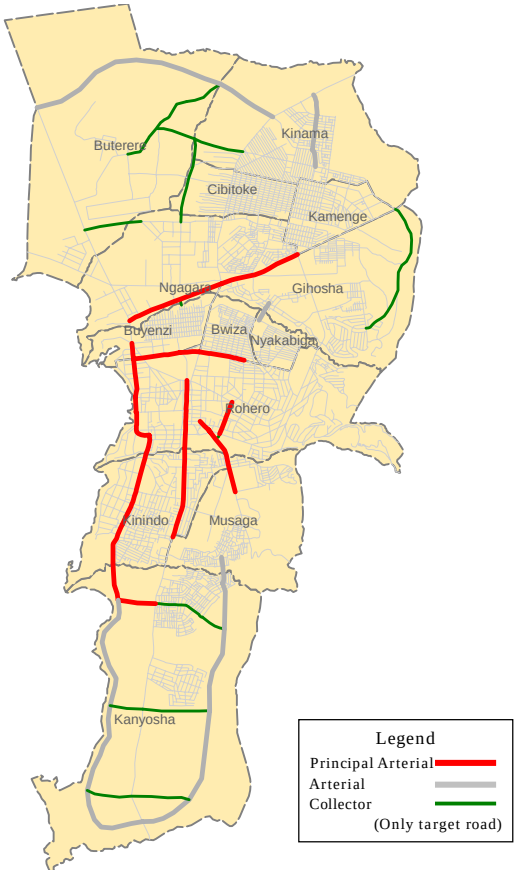
As a part of adopting rational traffic operation, regulation of one-way traffic in the CBD shall be introduced.

(6) Preliminary Cost Estimate

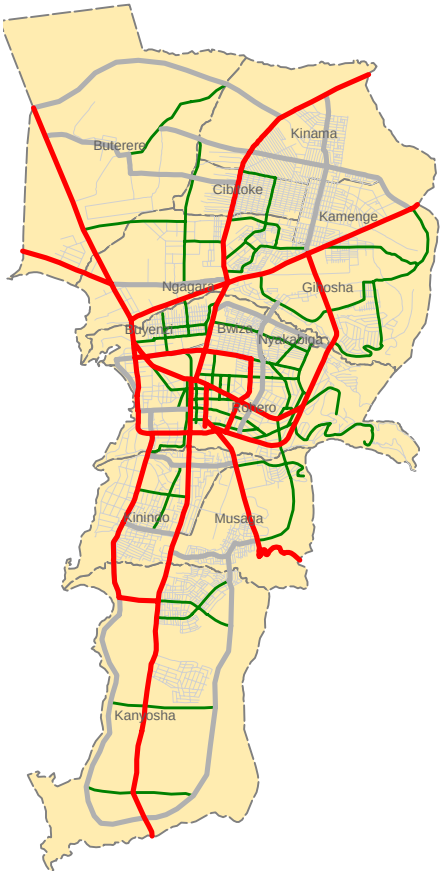
Primary cast estimate is made for above-mentioned programs; the result of it is as shown in following table:

Summaries of Total Road Construction Costs

Name of Project (Section)	Road Length (km)	Total ×1,000FBu
1. Coastal Alternative Route Projects	7.4	19,064,878
2. Widening of NR-3 Projects	4.6	10,573,511
3. Ring Road Development Projects	6.9	17,229,651
4. Widening of NR-7 Projects	2.0	5,544,176
5. Missing Link Development Projects	1.4	4,919,119
6. City Plan Development Projects (Northern Areas)	19.9	39,007,615
7. City Plan Development Projects (Southern Areas)	22.7	48,273,201
8. Stone Pavement Projects	110.5	94,620,485
Total	175.4	239,232,636



Road Development until 2,017



Road Development after 2,017

(7) Design Criteria and Cross Section

The Sturdy proposes the following design dimension for cross section.

Summary of Design Dimension

	Road Classification			
	Principal Arterial	Principal	Collector	Local
Design Speed (km/h)	80	60	50 or 40	30 or 20
Design Traffic (pcu/day)	- 10,000	10,000 - 4,000	4,000 - 500	500 -
Road Reserve (minimum)	38.0 (4 lane) 27.0 (2 lane)	23.5	20.0	12.5
Lane Width (m)	33.0 (4 lane) 22.0 (2 lane)	19.5	16.0	10.5
Lane	3.5	3.25	3.0	2.75
Shoulder	1.5	1.5	1.0	1.0
Median	3.0	1.0	-	-
Walkway	3.5	3.0	2.0	-

8. PUBLIC TRANSPORT PLAN

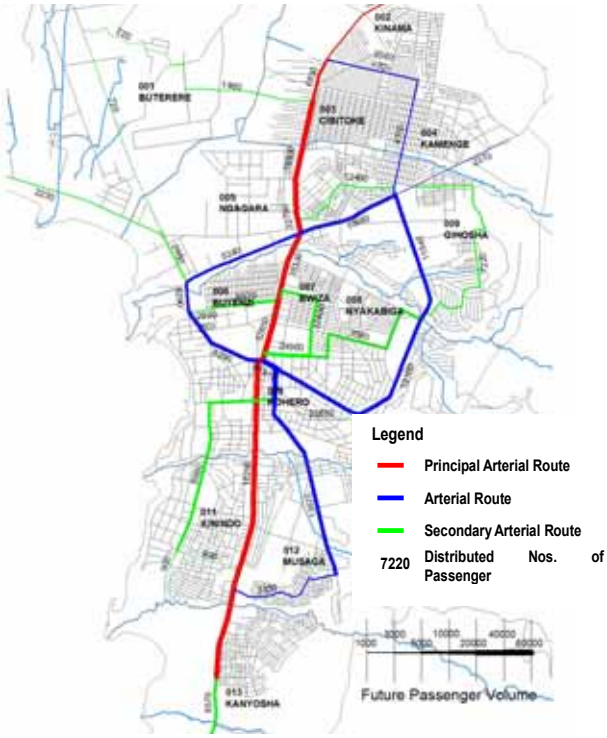
(1) Basic Policies

- Utilization of public transport should be promoted to avoid the congestion in near future.
- The stable operation system with re-structuring of the bus network shall be introduced complying with passengers' needs.
- The OTRACO is expected to play main role in providing the punctual and convenient service and raise the status of public transport.
- To that end, the services by the OTRACO shall be carried out by large sized bus.
- Through these, public transport will serve as a familiar leg for the citizens of all classes.
- The improvement program shall prepare the mitigation measures of minimizing the impacts to the private transporters.
- Controls and regulations shall be introduced to achieve safe and stable operation for the other public transporters, i.e. taxi, bike taxi, and bicycle taxi.

(2) Bus Network Plan

With consideration of the followings, Bus Network Plan is established.

- The North-South Axis shall be formed as a part of main truck bus routes.
- The circulation route on ring roads shall also be introduced.
- The bus route network shall consist of Principal Arterial Route, Arterial Route and Secondary Arterial route.



Proposed Bus Network in 2,017

The Study estimates required nos. of large bus of OTRACO to be of 73 in order to fulfill the basic policies.

(3) Bus Terminal Improvement Plan

The Study proposes the following bus terminal plan with consideration of proposed road and bus network as well as existing plan.

- Bus terminal for long distance bus

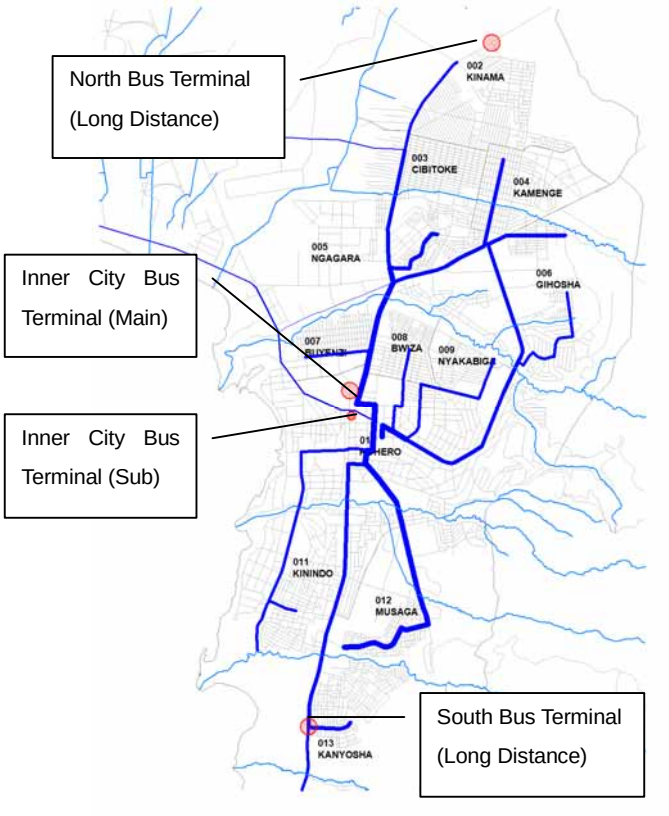
North Terminal: Carama in Kinama commune along RN9

South Terminal: Nyabaranda in Kanyosha commune along RN 3

- Bus terminal for inner city and suburban bus

Main Terminal: Old stadium in Rohero commune along RN9

Sub Terminal: A southern part of Independent Square



Location of Bus Terminals

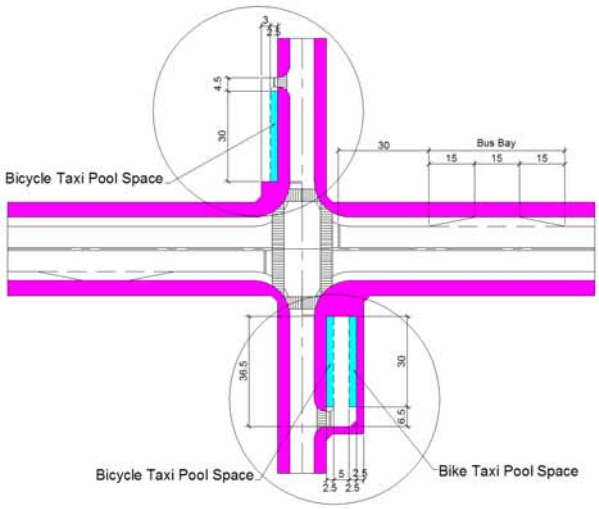
(4) Other Public Transport

(Taxi, Bike Taxi Bicycle Taxi)

Taxi, Bike Taxi Bicycle and Taxi, which are complementing bus, serves as citizen's means for movement. In urban transport, they should be utilized as civic means of transport, supplementing restriction to their movement.

The Study proposes following rules and facility in order to clearly roles of each transport mode...

- Arrangement for Service limitation to the Modes
  - Taxi: No Limitation
  - Bike Taxi: All area with exception of North-South Axis
  - Bicycle Taxi: Arterial and feeder roads only
- Arrangement of Pools for Transit Between Modes



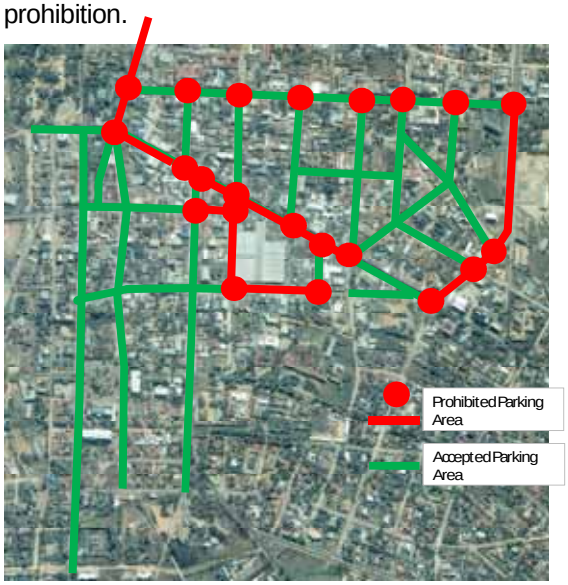
- Arrangements of Regulation and Domestic Rule

Legal prohibition of stopping and parking in specific areas (Especially in central area)

9. TRAFFIC MANAGEMENT PLAN

(1) Parking Facilities and Control

The following figure shows the parking policy in the city which indicates area with parking prohibition.



Parking Control Policy in CBD

Other than above, following regulations/rules shall be introduced;

- Parking prohibition at intersections

Prohibition of roadside parking at least in the range of 30m from intersection should be regulated.

- Parking prohibition on main collector road

Roadside parking should be prohibited on the main collector road.

■ Provision of Parking Facilities

- Widening of car park space and Introduction of parking charge system

Roadside parking strip should be widened around the commercial facilities. Besides, introduction of parking charge system by private enterprises should be introduced.

- Establishment of new building code

In order to impose a duty of the arrangement of a parking lot upon the institution for which cars gather, it is required to add regulation required for the building regulation.

10. IMPLEMENTATION PLAN

(1) Implementation Concepts

In drawing up the implementation plan of the projects proposed by the master plan, the following phaseing is intorduced and the projects shall be devided into the terms depending on improtance and urgency of the project.

- Short term: 2008-2010
- Medium term: 2011-2013
- Long term: 2014-2017

(2) Implementation Schedule

Upon conducting all assessment of each project based on the above items, the conclusions of priority were obtained.

The following table for the project schedule shows the start, execution period and service period for each project. Moreover, the planned required budget in each year according to this schedule is also indicated

Road Development and Public Transport Improvement Implementation Schedule

	Project	Length (km)	Cost (mil.Fbu)	Year 8	9	10	11	12	13	14	15	16	17
Road Development	Coastal Alternative Route	7.4	19,064			3,813	3,813	3,813	3,813	3,813			
	North-South Axis	4.6	10,573						2,115	2,115	2,115	2,115	2,115
	Ring Road	6.9	17,229							4,307	4,307	4,307	4,307
	Widening of NR-7	2.0	5,544							1,386	1,386	1,386	1,386
	Forming the Network system	1.4	4,919		984	984	984	984	984				
	City Plan Roads	42.6	87,280				12,469	12,469	12,469	12,469	12,469	12,469	12,469
	Community Road	110.5	94,620										
	Signalization		874	141	141			214	214			82	82
	One-way Traffic Control												
	Off-set intersection improvement		147	49	49	49							
	Roundabout improvement		33	11	11	11							
	Road Maintenance		83,917	7,071	7,601	7,615	7,645	8,043	8,424	8,810	9,150	9,581	9,977
	Sub Total		230,098	7,272	8,787	12,471	24,910	25,523	28,018	32,900	29,940	29,940	30,337
Public Transport	Bus Terminal and City Bus Centre Improvement		2,406			1,203	1,203						
	Introduction of New Bus Operation Systems in		8,707			2,177	2,177				4,353		
	New installation of taxi pool for motor-bike and Bicycle taxi		150			25	25	25	25	25	25		
	Sub Total		11,263			3,405	3,405	25	25	25	4,378		
Total			241,361	31,935			81,906			127,520			
Definition of Term				Short Term			Medium Term			Long Term			

11. INITIAL ENVIRONMENTAL EXAMINATIONS (IEE)

(1) Check Items for IEE

The IEE for the Master Plan was carried out based on JICA' Guidelines for Environmental and Social Consideration (April 2004).

The checked items were as follows:

1. Air pollution
2. Water pollution
3. Soil pollution
4. Waste
5. Noise and vibration
6. Ground subsidence and soil erosion
7. Offensive odors
8. Geographical features
9. Bottom sediment
10. Biota and ecosystem
11. Water usage
12. Accident
13. Global warming
14. Involuntary resettlement
15. Local economy such as employment and livelihood etc.
16. Land use and utilization of local resources
17. Social institutions such as social infrastructure and local decision-making institutions
18. Existing social infrastructures and services
19. The poor, indigenous of ethnic people
20. Misdistribution of benefit and damage
21. Local conflict of interests
22. Gender
23. Children's rights
24. Cultural heritage
25. Infectious diseases such as HIV/AIDS etc.
26. Others

(2) Conclusion and Recommendation

The following plans that have potentially negative impacts should be evaluated by the EIA in the advanced planning stage such as the Feasibility Study.

- Road Improvement Plan:
  - Development of North-South Axis
  - Development of Ring Road
  - Development of City Plan Roads in Northern Area
  - Development of City Plan Roads in - Southern Area
  - Traffic Flow Control
- Public Transport Plan:
  - - Bus Network Improvement Plan
  - - Bus Terminal Development Plan

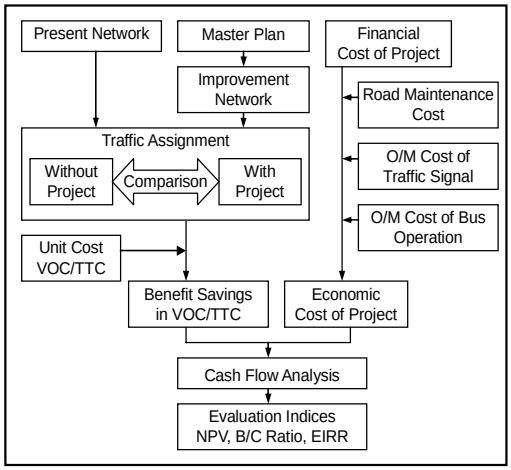
The concept of Strategic Impact Assessment should be included in these plans

12. EVALUATION OF IMPROVEMENT PLAN

(1) Evaluation Method

Economic analysis is carried out by the following workflow

Workflow of Economic Analysis



(2) Evaluation of Improvement Plan

- Cash Flow Analysis

A 25-year analysis period was selected because it would be appropriate for reflecting long-term cost effect, as one or more rehabilitation strategies should be taken.

- Economic Indices

The benefit cost ratio (B/C) of the project is estimated to be 1.60 and the net present value (NPV) to be FBu 47,685 million under the discount rate of 12%. The economic internal rate of return (EIRR) shows 16.7%, which is higher than the discount rate.

A sensitivity analysis is carried out, taking into account the general considerable range of uncertainty as follows;

Case1: Variation of benefit: -25% against the base case

Case2: Variation of cost: +25% to +50% against the base case.

The summary of cash flow analysis and economic sensitivity analysis is shown below.

Economic Evaluation of Master Plan

	Base case	Case-1	Case-2
Variation of benefit	0%	- 25%	0%
Variation of cost	0%	+ 25%	+ 50%
NPV (FBu billion)	47.7	4.9	10.9
B/C Ratio	1.60	1.04	1.09
EIRR (%)	16.7%	12.5%	12.9%

13. TECHNICAL SUPPORT TO OTRACO

(1) Outlines of the Support

Data collection and analysis of O&M at OTRACO was carried out. At same time, some OJT was also carried out responding daily problems on the OTRACO.

As the result of findings, some seminars were conducted as a sort of technical transfer exercise.

The summary of the seminars are as follows:

	Date	Subject	Attendance
1	Apr. 19, 2007	Improvement of environment and safety of the garage	11 mechanics, 1 Engineer
2	May 2, 2007	Brake overhauling	12 mechanics, 2 engineers
3	May 10, 2007	Periodic inspection	9 mechanics, 5 mechanics, 3 Engineers
4	Jul. 12, 2007	Bus maintenance and management (1)	3 section chiefs, 1 section sub chief
5	Jul. 26, 2007	Bus maintenance and management (2)	4 section chiefs, 1 section sub chief
6	Aug. 7, 2007	Pperiodic service	1 section sub chief, 8 inspectors
7	Aug. 11, 2007	Brake overhauling	1 section chief, 1 section sub chief, 10 mechanics, 8 inspectors

14. CONCLUSION AND RECOMMENDATION

(1) Plan Justification

The investment plan to be executed in three terms requires the following amounts;

- Short Term (2008-2010): 7.3 Bil FBu
- Medium Term (2011-2013):55,6 Bil FBu
- Long Term (2014-2017): 85.1 Bil FBu
- Total: 148.0 Bil FBu

The plan is justified as viable by the economic evaluation. Outline of economic evaluation are as follows:

NPV: 47.7 FBu
BCR: 1.60
EIRR: 16.7%

(2) Recommendation

The Study recommends taking following actions to Burundian side:

- Authorization of the plans as one of national development plan of Burundi
- Clarification of executive organization for the plans
- Establishment of management plans
  - Establishment of organization and institution for the execution
  - Securing the budget for implementation
  - Adjusting urban development projects by coordinating with urban transport condition
  - Investigating, approving and rejection other plans related to urban development.
- Building a consensus among citizens on plan's implementation
- Conducting EIA, and minimizing involuntary resettlement and affect on existing business rights
- Utilizing of Community Profile which was produced by the Study for establishment of other development plans
- Securing Maintenance budget

List of Abbreviations

AADT	Annual Average Daily Traffic
ADT	Average Daily Traffic
AfDB	African Development Bank
AMOTABU	Association des Taxi Motos du Burundi
AASHTO	American Association of State Highway and Transportation Officials
B/C	Benefit-Cost Ratio
BHN	Basic Human Needs
BOT	Built, Operate and Transfer
BRT	Bus Rapid Transit
BVOC	Basic Vehicle Operating Cost
CBD	Central Business District
CIDA	Canadian International Development Agency
DOR	Department of Roads (Office de Routes)
DRC	Democratic Republic Congo
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EU	Europe Union
FBu	Burundi Franc
F/S	Feasibility Study
GDP	Gross Domestic Product
GIS	Geographic Information System
GNP	Gross National Product
GOB	Government of Burundi
GOJ	Government of Japan
HCM	Highway Capacity Manual
HDM-4	Highway Development Method-4
HIPC	Heavily Indebted Poor Countries
IEE	Initial Environmental Examination
ILO	International Labor Organization
IMF	International Monetary Fund
IRI	International Roughness Index
IT	Information Technology
ITC	Information Technology and Communication
LOS	Level of Service
LRT	Light Rail Transit

JICA	Japan International Cooperation Agency
MP	Master Plan
MTPE	Ministry of Public Works and Equipment
MTPT	Ministry of Transport, Post and Telecommunications
NGO	Non Government Organization
NMT	Non-Motorized Transport
NOx	Oxides of Nitrogen
NPV	Net Present Value
OAU	Organization of African Unity
OD	Origin-Destination
ODA	Official Development Assistant
O/M	Operation and Maintenance
ONATRACOM	Office des National Transports en Commun
OTRACO	Office des Transports en Commun
OPEC	Organization of the Petroleum Exporting Countries
PAP	Project Affected Persons
PCU	Passenger Car Unit
PIP	Public Investment Plan
PPP	Public-Private Partnership
PRSP	Poverty Reduction Strategy Paper
RMI	Road Maintenance Initiative
RN	National Road（Route Nationale）
ROW	Right of Way
TDM	Traffic Demand Management
TOR	Terms of Reference
TTC	Travel Time Cost
UNDP	United Nation Development Program
USD	United States Dollar
VAT	Value Added Tax
V/C	Volume Capacity Ratio
VOC	Vehicle Operating Cost
VRC	Vehicle Running Cost
WB	World Bank
WHO	World Health Organization

EXECUTIVE SUMMARY

TABLE OF CONTENTS

INTRODUCTION

INTRODUCTION

BACKGROUND

The Republic of Burundi attained its independence from Belgium in 1962. However, due to the civil conflict which continued for 13 years since 1993, the economic sanctions by the neighbouring nations since 1996 could not contribute well enough towards the national economy of Burundi and therefore the improvement and maintenance of its domestic infrastructures and transportation network were made nearly impossible. In these circumstances, in August 2000 the Government of Burundi (hereinafter referred to as "GOB") and the other political parties signed the 'Arusha Peace and Reconciliation Agreement for Burundi' (Arusha Agreement) and as a result, an interim government came into power in 2001. In June and July 2005, communal elections were held (local assembly and members of the diet), and in August President Nkurunziza Peter was officially elected; thus setting the stage for a full-scale move towards reconstruction of the country.

With an estimated population of 400,000, Bujumbura, the capital city, is the political and economic center of Burundi. However, the basic infrastructures, particularly the road conditions of Bujumbura are extremely poor, and the reconstruction of these roads is very much essential before the living conditions of its people can be improved. Although the demand for road transportation in Bujumbura is expected to increase in near future due to the increasing economic activity during the country's upcoming rehabilitation period, the road volumes as well as the road network are inadequate, and the existing structures and traffic controlling system are so poor that traffic congestion in the city center is becoming a major concern.

Though the privately-owned minibuses are the primary means of public transportation in Bujumbura, the *Office des Transports en Commun* (OTRACO) also provides public bus services between Bujumbura and the rural communities. However, the services of OTRACO buses are very poor and inadequate due to the deteriorated conditions and maintenance problems with their buses. Consequently, revitalization of the OTRACO public transportation service is very much essential to reconstruct the regional economy.

The aim of this Study is to strengthen the economy and improve the living conditions in Bujumbura by implementing this important project primarily through formulation of an urban transport plan, technical cooperation in revitalizing the OTRACO public transportation service, and improvement of the urban traffic conditions.

OBJECTIVES OF THE STUDY

The objectives of the Study are:

1. To improve the overall situation of the urban transport system in the City of Bujumbura by formulating an urban transport plan.
2. To provide technical support to OTRACO.
3. To perform urgent rehabilitation work as a pilot project.

STUDY AREA

The Study Area covers the entire city of Bujumbura.

STUDY SCHEDULE

The study was conducted in 3 stages.

1st Stage (Jan.-Apr. 2007)
Investigation by the existing references
Field survey

2nd Stage (Apr.-Jun. 2007)
Establishment of policy and strategy
Environment consideration

3rd Stage (Jul.-Oct. 2007)
Establishment and evaluation of plans
Conclusion and recommendation

STAKE HOLDER MEETING

Stakeholder meetings were held four times to discuss issues and plans for urban transport. The dates and subject were as follows:

- 1st: 5th April, 2007
  Selection of Urgent Rehabilitation Work as Pilot Project
  Population of the city and future development
- 2nd: 25th June, 2007
  Present condition and existing problem of urban transport in the city
  Urban Planning
  Future traffic demand and analysis
- 3rd: 5th September, 2007
  Problem of public transport
  Bus network improvement plan
  Bus terminal development plan
- 4th: 31st October, 2007
  Explanation of Draft Final Report

3rd Stakeholder Meeting

TECHNOLOGY TRANSFER

Technology transfer was made through four phases, such as;

- Steering Committee
- Cooperation in the planning process
- Inspection and meeting in the Pilot Project
- Seminar and training at OTRACO garage

Steering Committee

Meetings by Steering Committee were held simultaneously with the stakeholder meetings. Through the explanation and discussion of the plan, planning procedure and methodology for policy making were transferred.

Cooperation in the Planning Process

Each plan which constitutes the master plan was built through discussions with the relevant counterpart. In this way, methodology for analyzing data and planning procedure were transferred.

Inspection and Meeting in the Pilot Project

At the Pilot Project stage, monthly and weekly meetings were held with counterparts. Methods for process control, quality control and safety control were transferred.

Monthly Meeting for the Pilot Project

Seminar and Training at OTRACO

Seminars and training were conducted as the technical transfer to OTRACO. Details are described in “Technical Transfer to OTRACO”.

Accomplishment

The remarkable achievement was obtained about technology transfer. The capacity of the counterpart was improved in each field. Especially engineers in the OTRACO and engineers in charge of the pilot project, the considerable improvement is obtained in a capacity of engineers.

These results are obtained by the cooperation and assistance of the Burundi government, and this should be emphasized by the study team.

PART 1

PRESENT CONDITION AND ISSUES

1. PRESENT CONDITION

(1) General Condition

Bujumbura, the capital city of Burundi, lies at the north-eastern corner of Lake Tanganyika. Being the largest city of Burundi, Bujumbura is the administrative, communications, and economic center of the country. Industries located here include textile and soap industries. Bujumbura, the Burundi's main port, ships most of the country's main export item such as coffee as well as cotton, hide, and tin ore.

(2) Population

According to the investigation conducted by the study team, Bujumbura is judged to have 547,760 populations at the end of February, 2007.

(3) Land Use

Land Use Structure

Bujumbura city is located between mountain land on the eastern side and Lake Tanganyika on the west, and the city area spreads out about 4km wide in the direction of north-south. Rohero Commune is the administrative and business, commercial center of the city.

An industrial area is situated around the harbour in the northern area and most of the Burundi's large-scale factories are located there. Residential areas surround these two areas and thus form the entire city of Bujumbura.

Business, Commercial Area

Many offices and commercial establishments are located in Rohero. Besides, some governmental agencies are also located at Cartier Gihosha of Gihosha and Musaga communes.

The middle-scale markets are scattered in almost all communes. In addition, small shops stand in a row along the main trunk roads and district connecting roads. Most of these are of mixed use of commercial activity and residential.

Industrial Area

The eastern side of Bujumbura port is developed as the industrial area with land of about 380 ha. Although the development in this zone has been completed, about half of the land is still remaining unused or underutilized. Alongside with that, installations of industrial factories are also observed in areas around the port on the west side of Buyenzi commune, and along the route between the city and the airport.

Residential Area

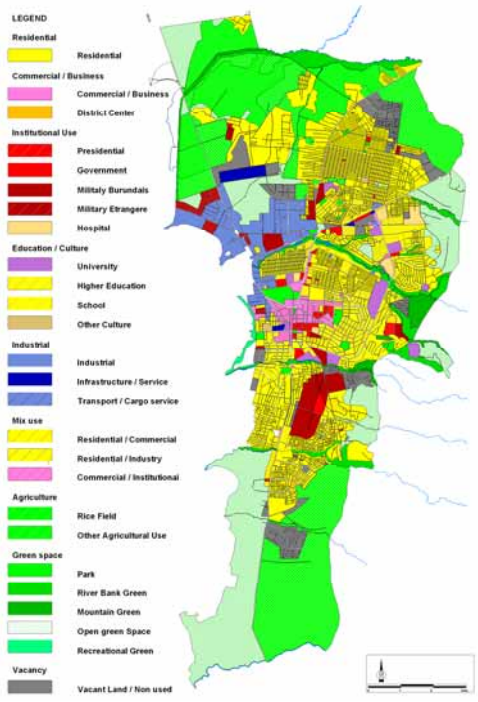
The characteristics of the residential area can be classified into the following two categories:

- Communes with high density population

  The residence houses are mostly one-storied. Streets are narrow and their pavement is not in good condition, From the viewpoint of disaster prevention, problem exists in these areas.

- - Other communes

  The residential density in other communes is very low. Each division has sufficient size of approximately 20m x 30m, and one-story or 2-storied houses are built. A limited numbers of apartment houses of 3 to 4 stories have been built in recent years.

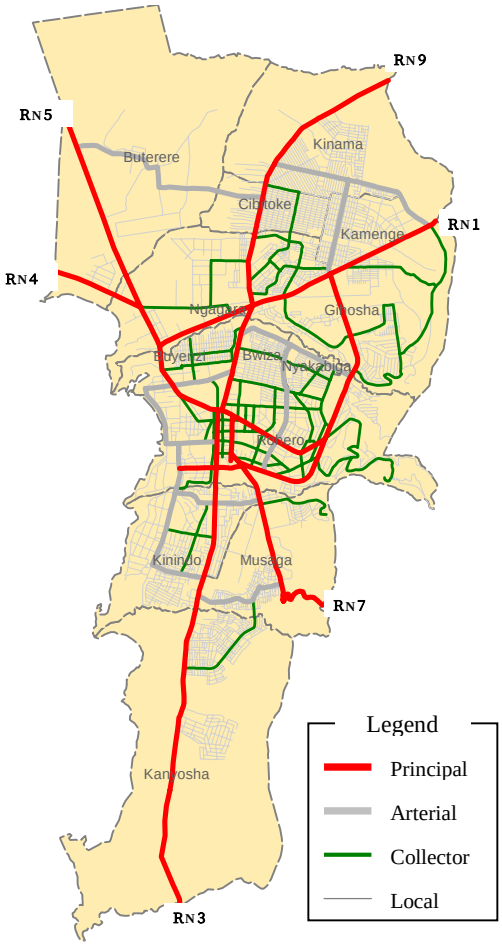


Present Land Use In Bujumbura

(4) Road Network

Network

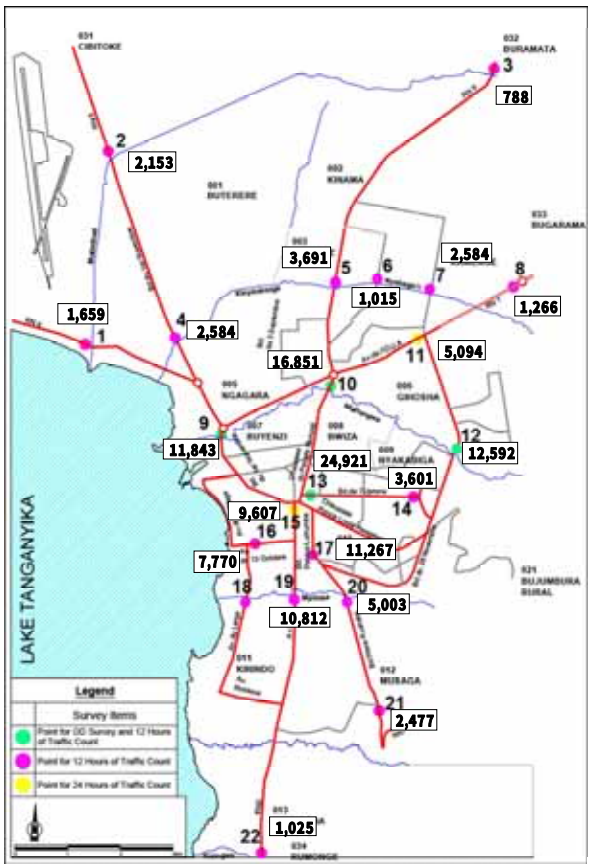
Skeletal structure of road network in Bujumbra is formed by 6 national roads and a ring road, which composes principal arterial roads. The national roads, i.e. Rn-1, Rn-3, Rn-4, Rn-5, Rn-7 and Rn-9, are connecting Bujumbura to other provinces in Burundi and adjacent countries. Among six national roads, four roads start from the center of the city and other two diverge at the outskirts. The ring road starts from RN-1 at north, passes towards east and connects with RN-7 and RN-3 at the south. Other city road network is classified in three categories namely arterial, collector and local road. The arterial roads form the frame of the network together with principal arterial road, and those frame roads are occasionally connected to the collector and local roads directly.



Present Road network in Bujumbura

Traffic Volume

Due to the characteristics of land use, traffic movement into city center excels, consequently traffic volume increases gradually as it near the center. Traffic volume shows its maximum at Av. l'Uprona where 25,000 vehicles per 12 hours are counted. On the other hand, traffic at outskirts of the city is relatively low, scarcely reaching 2000 vehicles. As for the composition of vehicle types, private vehicles are distinguished as majority, but minibuses, which amount more than 5000 vehicles at maximum, also occupy great portion at some point.



12 Hour Traffic Volume by Traffic Count

A road side OD Survey was conducted at 5 locations on major roads. Traffic concentration to central area is also observed in the result of OD survey, which shows the biggest OD is the movements towards Rohero. Long distance trips are very small on Bujumbura road network, and the majority of the movements is the one within the Bujumbura city.

(5) Public Transport

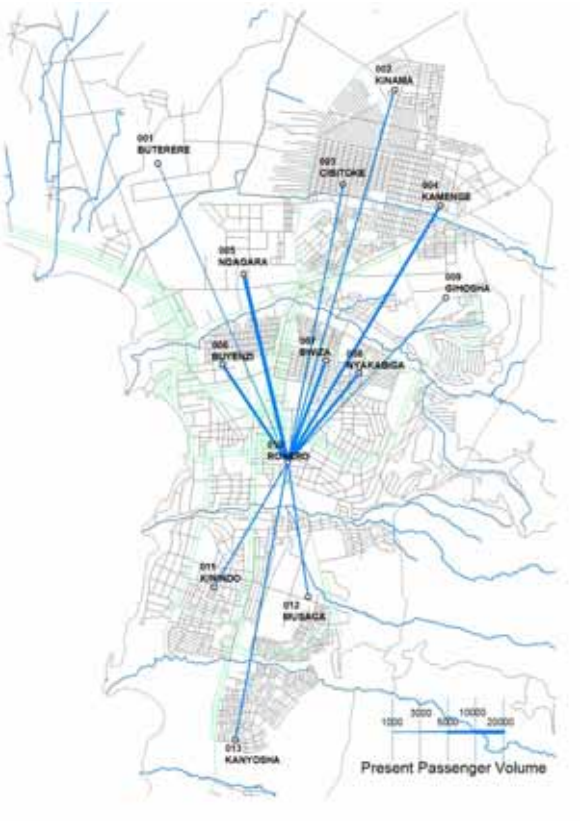
Two types of public transportation organizations are currently operating in Bujumbura one is OTRACO, in the public sector, and the other is private-sector bus company.

OTRACO provides urban, suburban and inter urban bus services with big body buses. Private-sector bus companies are operating inside Bujumbura, using wagon-type minibuses with an average of 14-seat to 30-seat capacity.

In accordance with passenger's movement which concentrates to city center, all the private bus routes have its destination in city center. Private bus route covers almost all the city area, but some areas which are not serviced exist. Number of daily bus passengers by the passenger interview survey is 118,000 in May, 2007.

Bus Route and Passenger' Volume

At present, the OTRACO, which has only approx 40 buses in operation, has 19 service route including school bus in Bujumbura City. Under this condition, the OTRACO is unable to obtain profit from the city bus services.



Passenger's Movement in 2007

Bus Terminal at City Center

(6) Traffic Management

At present all the intersections are non-signalized. Instead, roundabout system is common at the major crossings.

In Bujumbura, there is no system of parking charge or no regulation for parking restriction on the road. Vehicles are parked along the roadside or at the center median strip.

2. EXISTING ISSUES

(1) Land Use

- Overcrowded State of Residential Area

There is a quarter of the high population density of more than 500 persons/ha. There are also areas with narrow streets or insufficient drainage system. These areas have problems on disaster prevention and sanitation.

- Concentration of Urban Function into CBD

Urban functions such as governmental agencies and commercial establishments are concentrated at CBD area in Rohero. Accordingly CBD attracts major traffic movement and this inflow causes congestion along the radial roads.

(2) Road Network

- Network Depending on Radial Roads

Most of the arterial roads is radial roads which connect between city center and suburban areas. Since majority of traffic volume concentrates to the city center, congestions are observed along the arterial road near the city center. Roads which disperse concentration to radial roads are missing.

- Deficiency of Road in Residential Area

Road is basic infrastructure to create safe and comfortable living environment in residential areas. Although road network for living environment is needed more in densely inhabited areas, many of the regional roads in the developed area are narrow and unpaved without adequate drainage facilities.

- Insufficient Road Facilities and Improper Operation

- No proper traffic control system at intersections
- No sufficient traffic facilities to separate the pedestrians and cyclists from vehicle traffic carriageway such as footpath, crosswalk and bus bay

- Insufficient Road Maintenance

- Deterioration of road condition resulting from poor road maintenance disturbs smooth traffic flow.
- Not clear classification and responsibility of each road together with shortage of budget make it difficult to improve road continuously.

Deteriorated Road Surface

(3) Public Transport

- Inconsistency with Passengers' Needs

Bus service does not meet the passenger's requirement. 75% of passengers are not satisfied with current services, consequently bus services cannot be fully utilized by citizens. Reasons of un-satisfaction are;

- Bus routes don't meet the passenger's need
- Irregular bus operation because of too long waiting time

- Insufficient control to bus operation

Since the regulation and management system on bus operations are limited, provision of services concentrates on profitable areas and routes.

- Unprofitable operation in OTRACO

Every year a little less than 30% of total expenditure of OTRACO is supplied by the government subsidy.

(4) Motorcycle, Bicycle, Pedestrian

- Insufficient Sidewalk

As existing width of footpath is not wide enough for walking, pedestrians tend to overflow on carriageway and create friction with vehicle traffic flow.

- Mixed Traffic of bicycles and vehicles

Movement of bicycles is mixed with vehicle's traffic. Bicycles as well as pedestrians are forced to face danger of traffic accidents.

(5) Traffic Management

- Roadside parking system accelerates traffic congestion

PART 2

FRAMEWORKS

3. SOCIO ECONOMIC FRAMEWORK

(1) Population

The following point was taken into consideration in population estimation.

- Other donors such as UNFPA, EU and WB estimate the population growth of the whole country of Burundi to be 2.3% a year based on the population dynamics in recent years.
- The GOB intends to lead the increasing urban population to the local cities other than Bujumbura and has established a policy to promote urban development in other cities.
- The annual average population growth rate of Bujumbura city from 1991 to 2007 is approximately 4.9% a year. It is assumed that the same scale development for housing sites will not be possible, and if the housing site is not provided sufficiently, residential areas will face the overcrowding condition. Therefore an actual population growth rate is expected to be less than this value.

Based on the above three points, Bujumbura city population growth rate were set up as 3.0% a year from 2007 to 2017, and the population of the Bujumbura city in 2017 is estimated about 736,000 persons.

Population Framework in Bujumbura

Indicator	2007	2012	2017
Population in Bujumbura	547,760	635,000	736,000

(2) Economic Indicators

Referring to presumption by IMF and WB, GDP growth rate up to year 2017 in Burundi was set up to be 6.0%. Growth rate of GRDP (Gross Regional Domestic Product) in Bujumbura was also estimated to be between 7.9% and 8.1%based on the growth rate in primary, secondary and tertiary industry.

Economic Indicators in Bujumbura

Indicator	2007	2012	2017
GRDP at 2007 prices (Billion FBu)	237.6	347.34	510.8
Share of GRDP	23.0%	25.2%	27.5%
GRDP Growth Rate	7.9%	8.0%	8.1%
GRDP per capita(FBu)	433,842	546,871	693,931

(3) Future Urbanized Area

- From the viewpoint of preservation of environment, the northern part area should be controlled for development as this area is recognized as the precious green tract of land and farmland.
- On the eastern part, a sloping ground lesser than the degrees of 1/3 slant, stabilized in natural condition, can be developed for the prevention of disaster like landslide.
- The southern part area of the city is expected as an important area for advanced future urbanization. This area is compatible to replace most kind of businesses and employment from central Bujumbura city area by arranging and establishing new industry, business and commercial functions.
- The urbanizing areas' limits is set up as the present administration boundary.

Boundary of Future Urbanized Area

(4) Strategy for Spatial Structure

- Environmental improvement in urban district

Overcrowded condition in some residential areas existing in the city should be alleviated for the sake of its safety and sanitation. In the short term, a new population influx into these congested areas should be controlled.

- Promotion of development in new city area

In order to correspond with the increase in future urban population, development of new city areas should also be promoted. To improve the urban environment in the city area, it is necessary to set up the adequate size and building for the low and middle income earners.

- Formation of safe living environment

In order to prevent the disaster to be caused by heavy rain, a new town is required to be planned in the safe area and development of housing in those dangerous areas should be limited. Also it is required to preserve the mountains slope area and land along the rivers as protected green zones areas.

- Innovation of ring cluster roads network

A ring cluster roads network is to be imposed into the future city development plan so that the traffic congestion in the trunk roads would be moderated. Ring roads enclosing the northern city area, the southern city area and the proposed new southern area are also introduced to form the transportation network of the whole city.

- Formation of subcenters

In order to control the functional concentration in a central district and to urge for equilibrium development of the whole city, a part of business and commercial function will be distributed into the newly planned subcenters. which are located in the northern and southern parts in connection with the above policy.

A subcenter on the south is required to secure new residents' working opportunity and to increase the attraction in the newly developed areas as well as to improve the environment in the old areas.

- Improvement and setting up infrastructure facilities

Corresponding to the city area expansion in southern part, required infrastructure facilities should be prepared and required land lots be reserved beforehand. In the existing city area, the improvement of the service level by expansion of the facilities is necessary.

- Development of agriculture in suburban areas

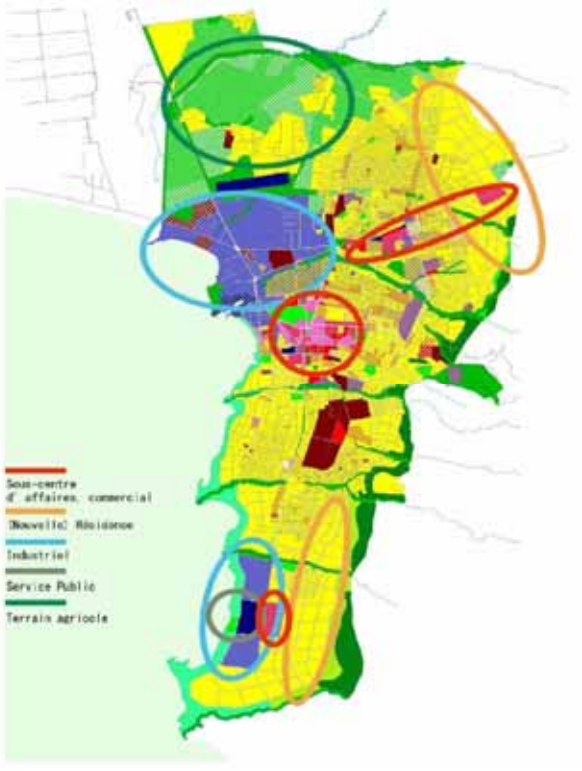
The paddy fields with the provision of the irrigation equipments are located in Buterere area in the northern part. These agricultural land and the existing colonies here should be preserved as much as possible.

- Preservation of natural environment

The following areas have been identified as lots which should be controlled for residential use; and should be reserved for tree planting.

- Sloping lands with 1/3 or more slope
- River slope and a dry riverbed (50~100m in width)

Land strip less than or equal to 200m from coasts of Lac du Tanganika is to be selected as the recreational green land, and recommended to be the place for public-use in principal.

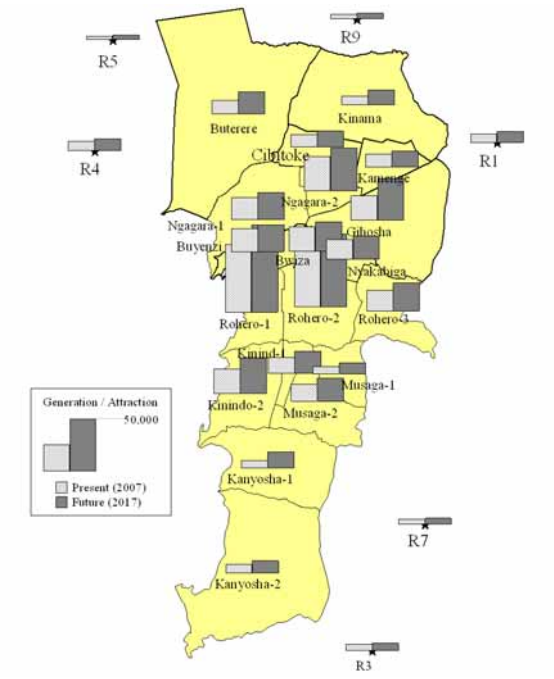


Distribution of Urban Function

4. Future Traffic Demand

(1) Vehicle Trip Generation and Attraction

Based on the trip generation model in which number of trips are function of zonal population, total vehicle trips generating/attracting in the study area are estimated 278,000 in 2007 and 454,000 in 2017. Vehicle trips are assumed to increase by 1.64 times in this period. Due to the difference in population increase, rate of increase in traffic generation by each zone differs greatly. In the southern area where population increase is expected most, trip generation is 3.8-3.9 times from 2017, in contrast with 1.3-1.6 times in the central area.

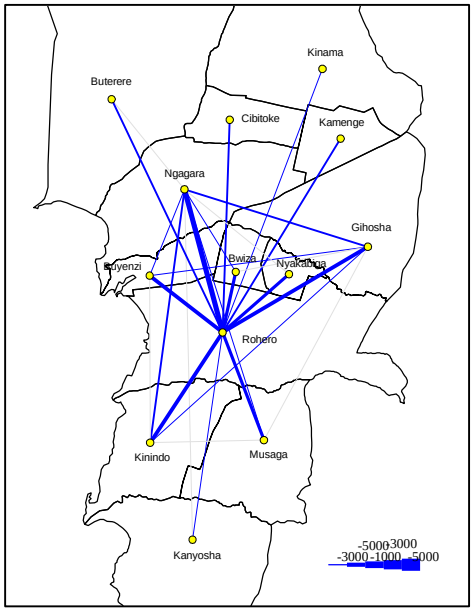


Vehicle trip by Zones in 2007 to 2017

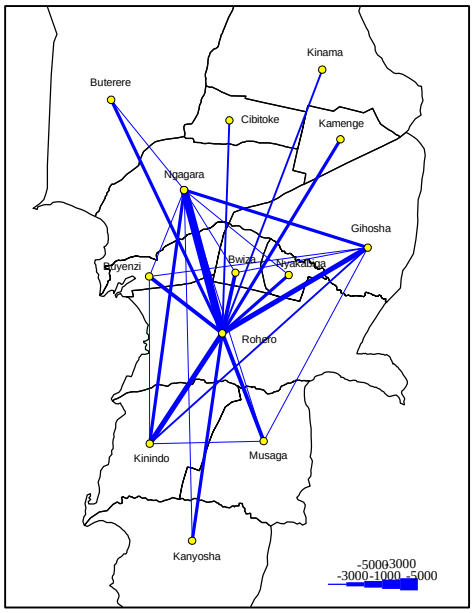
(2) Trip Distribution

Future vehicle trip distribution is applied by the present pattern method. Comparing the distribution in 2007 and 2017, characteristics in future trip distribution are described as follows;

- The tendency which traffic concentrates on the center of the city will be continued.
- As a new current, increase to a southern area is created.
- It is also pointed out that the trip between the zones of the outside area increases.



Trip distribution in 2007



Trip Distribution in 2017

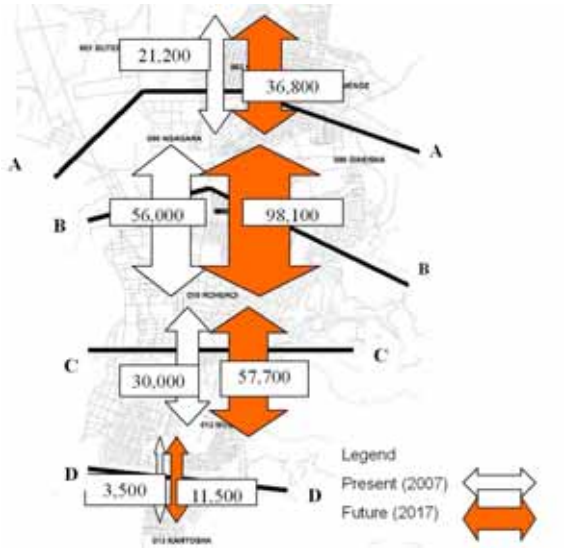
(3) Network

The road network for the traffic assignment was developed based on the road inventory survey. The roads, classified as Principal Arterial road, Arterial road and Collector road, were divided in links and subdivided into sub-links and sections. The total number of the sections in the present network is 340.

(4) Traffic Assignment

As the traffic flow is far less than the capacity and usually comparable routes exist in the urban areas, link flow was calculated by Multi-pass Assignment method, searching the minimum travel time routes based on the link flow speed.

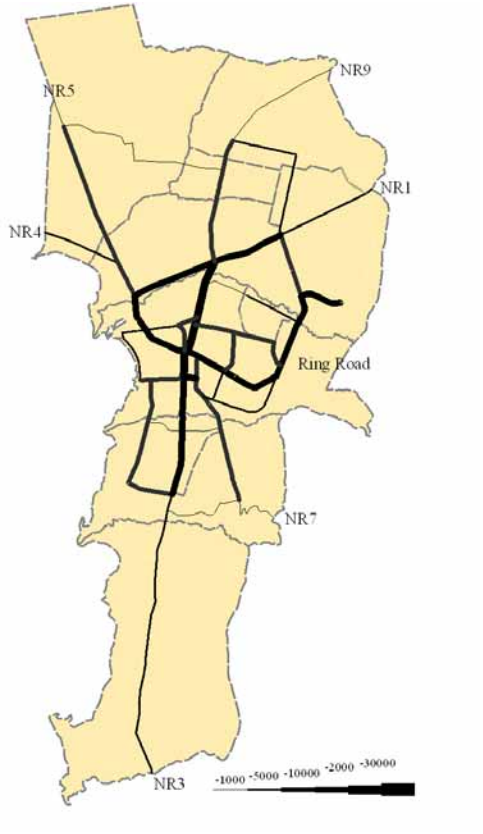
By the future traffic assignment it is noticed that the traffic demand of north-south direction will increase conspicuously due to the expansion of city area. At screen lines shown in below figure, traffic demand will increase 1.7-3.3 times from 2007.At screen line B-B', increasing volume will be 420,000 vehicles. In order to cope with the future traffic demand as well as to accelerate city development, the trunk roads of north-south direction shall be developed.



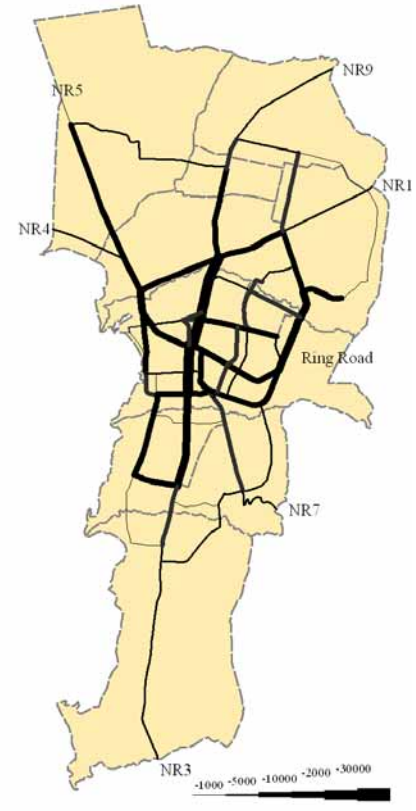
Comparison of Traffic Volume at Screen Lines

Increase Rate at Screen Lines

Screen Line	Traffic Demand		Rate of increase
	2007	2017	(times)
A-A'	21,200	36,800	1.7
B-B'	56,000	98,100	1.8
C-C'	30,000	57,700	1.9
D-D'	3,500	11,500	3.3



Traffic Assignment in 2007



Traffic Assignment in 2017

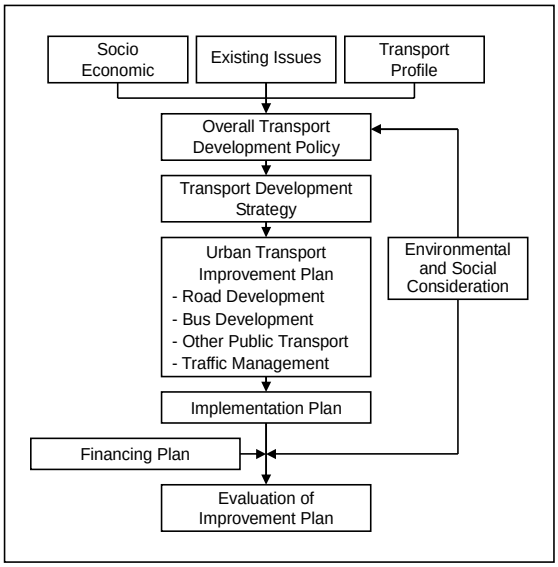
PART 3

TRASPORT IMPROVEMENT PLAN

5. Transport Improvement Policy

(1) Planning Approach

To improve the situation of urban transport in Bujumbura, urban transport plan is formulated through systematic procedure attached below.



Planning Procedure

(2) Basic Policy

- Coordination with existing policies

Bujumbura, the capital of Burundi, is expected to have nationwide functions as the hub of every sort of activities. Accordingly the policy of urban transport improvement plan shall consistent with relevant development policies and plans.

- Urban Transport Improvement Plan with consideration of long-term design

The urban Transport Improvement Plan shall be drawn in perspective of the future beyond the target year. To this end, the study will draw a rough picture on urban transport system in the long-term future.

- Shifting to public transport from private vehicles

As a result of the improvement of living standards, private vehicles which carry few passengers increase and are causing traffic congestion in every country in Africa. Shifting the traffic modes from private to public is the key concept to solve the urban transport congestion.

- Increase of efficiency of public transport

In order to take an essential role in urban transport as a common means of transportation for citizens, public transport should be more efficient and sophisticated, so as to attract more passengers.

- TDM

As Bujumbura has already been urbanized and is located in between hilly area and Lake Tanganika, the space for road widening and development is limited. Considering the awareness of environmental reverse impact, concepts for Traffic Demand Management (TDM) shall be included in the Master Plan.

(3) Development strategy

To fulfil the basic concept, a target to be aimed in year 2017 was set up in consideration with what should be achieved in the phase after the target year.

- Objectives

  Short Term (～2017)
  - Solving urgent problems
  - Composing fundamental traffic frame for the future

  Long Term (2017～)
  - Completion of future structure
  - Achievement of balance between demand and supply of traffic

- Road Network

  Short Term (～2017)
  - Establishment of radial and ring road pattern
  - Strengthening north-south axis

  Long Term (2017～)
  - Widening of radial roads
  - Extension and widening of north-south axis

- Public Transport

  Short Term (～2017)
  - Coexistence of minibus and large bus
  - Hourly exclusive lanes in CBD
  - Expansion of OTRACO operation in urban transport

  Long term (2017～)
  - Shifting to large bus
  - Introduction of BRT along north-south axis
  - Operation by integrated enterprise.

6. ROAD DEVELOPMENT PLAN

(1) Development Concepts and Policy

The following Road development policies are established from the viewpoint to solve the existing problems and contribute to the orderly city development.

- Reinforcement of ring road system
- Reinforcement of north-south axis
- Improvement of collector road
- Improvement of intersections
- Establishment of road maintenance system

(2) Road Classification

The future road network system in Bujumbura shall consist of roads classification in four categories. Basic function of each category is;

- Principal Arterial Road
  - National Road connecting major cities or district to Bujumbura
  - Ring road forming city central boundary in Bujumbura
  - Road connecting the major urban function
- Arterial Road
  - Local distributor connecting or supporting mutual principal arterial road
  - Road forming the basic structure of urban area in Bujumbura
- Collector Road
  - Access road connecting Principal arterial road or Arterial road to community
- Local Road
  - Small road in community except the classification in above

(3) Road Network Development

■ Development of Coastal Alternative Route

To cope with the increasing traffic on roads with North-South direction, development of coastal alternative route is expected to extend the road capacity. The coastal alternative route has following functions besides the road capacity.

- To divert traffic not relating to CBD area
- To form a ladder network pattern that enables dispersion of traffic and increases redundancy.
- To enhance development in southern areas specifically for industrial functions

■ Improvement of North-south Axis around the CBD area

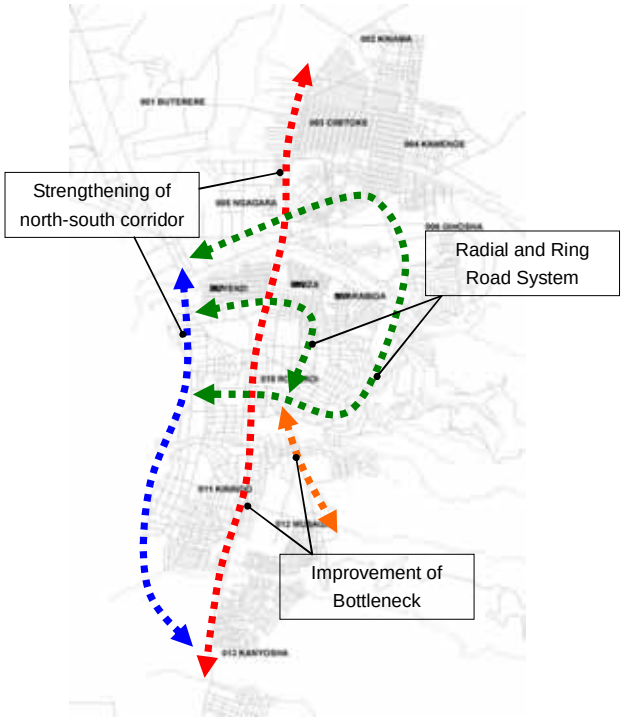
In long term, RN-3 is expected to be widened into 4 lanes up to the southern border of Bujumbura as the prime frame road, but in the period until 2017, urgent improvement of RN-3 into 4 lanes should be commenced from independence square to the intersection of Av. Nzero and Av. Gasibe.

■ Development of the Ring Road

Existing road network system in Bujumbura is composed of the radial roads. In order to alleviate concentration and to mitigate the traffic load in the city centre, improvement of the ring road is inevitable. Development of inner ring road around the city center together with enforcement of outer ring road will alter the network to the radial and ring road network system.

■ Improvement of bottlenecks

In order to expand the residential areas in east of Kanyosha community, which is expected to deal with the future population growth, it is necessary to expand road width of RN-7.



Future Development Policy of Principal Arterial Roads

- Forming the Road Network to Traffic Function

  Existing regional roads shaping cluster network lead to traffic concentration at the junction of the upper trunk roads. Therefore, formation of grid network by supplementing road which enables pass through is needed

- Development of the Road Projects Lead to City Plan

  It is necessary to construct new roads which enclose the residential area to attract and accelerate the residential development in northern and southern areas in the city.

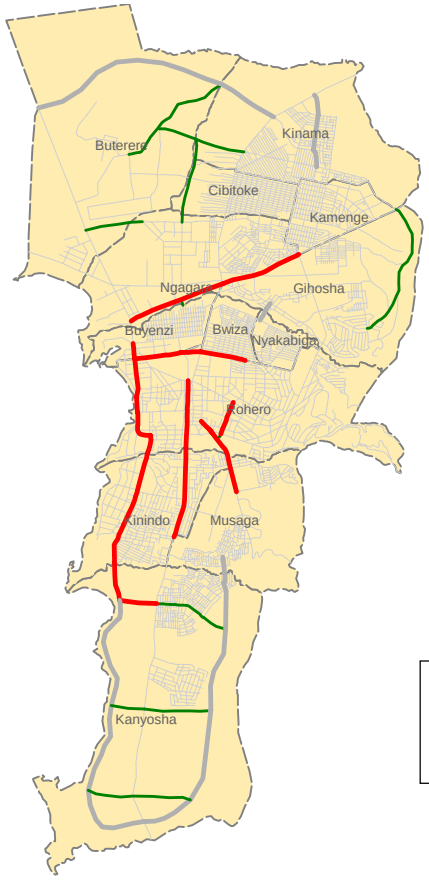
- Road Project to Improve the Living Environment

  Many of the regional roads in residential area are not in proper condition for the living environment as for the width, drainage and pavement. In that regard, improvement of pavements and drainage of the local streets shall be included in the Master Plan.

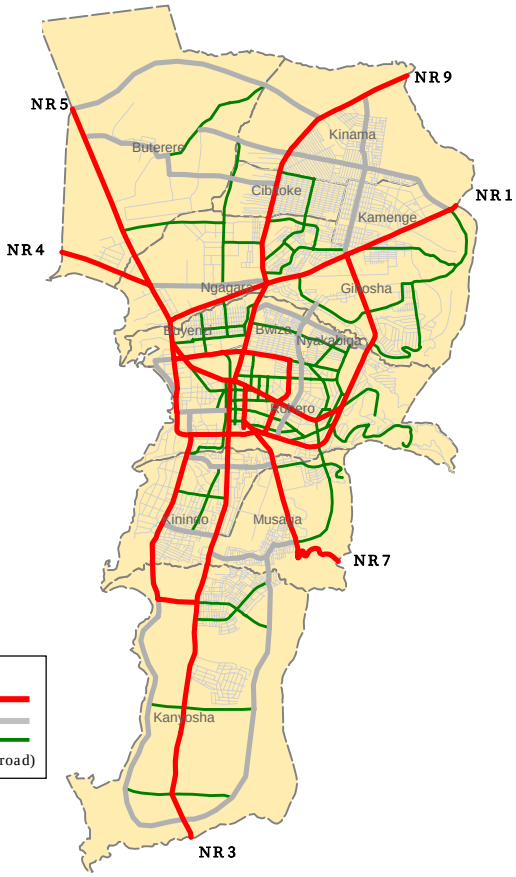
(4) Intersection Improvement Plan

Off-set intersections existing in the city have to be improved to mitigate the traffic congestion and maintain the level of safety for increased future traffic, along with other countermeasures of traffic control such as signalization of the intersections and road traffic flow restriction.

Location of Off-set Intersections



Road development Until 2017



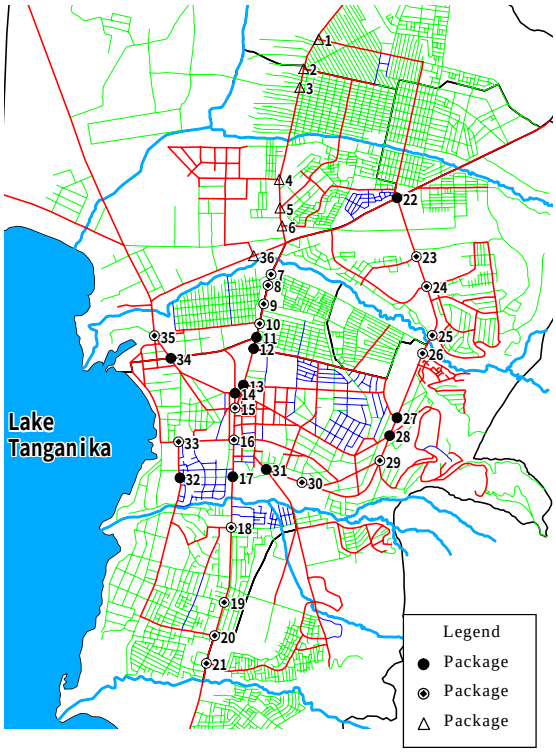
Future road Network in 2017

(5) Traffic Flow Control

At present, no traffic signal is in operation; and that is a cause of traffic congestion and increasing traffic accidents. Priority for improvement of signalized intersection is evaluated by the conditions of intersections referring number of intersecting legs, number of lanes, intersecting road hierarchy and intersecting traffic volumes.

Number of Traffic Signal Construction

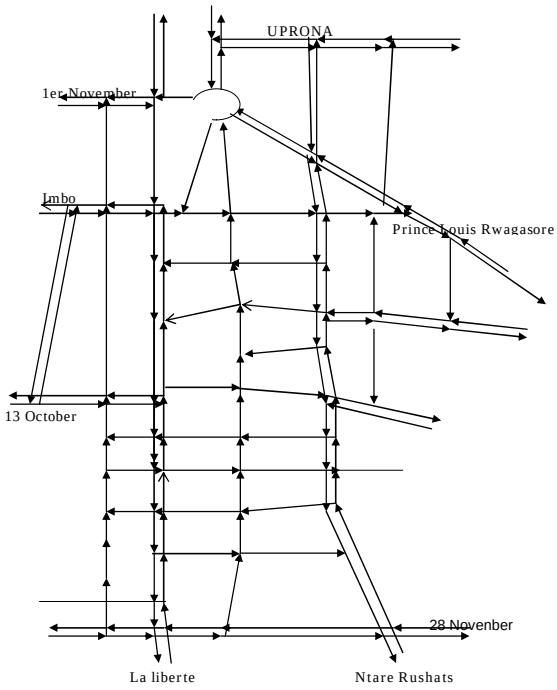
Package	Places	Priority
Package I	11	Urgent
Package II	18	Short-term
Package III	7	Midterm



Location of intersection signalizing Plan

(6) Traffic Restriction

As a part of adopting rational traffic operation, regulation of one-way traffic in the CBD shall be introduced so that traffic congestion can be mitigated in the urban area. By the introduction of one-way control, crossing of traffic flow at bottleneck intersections can be reduced and it contributes to alleviation of traffic.



One-way Traffic Restriction Plan in CBD

(7) Preliminary Cost Estimate

Preliminary cost estimation of future road network was performed by accumulating the construction cost, engineering service cost and indirect cost. Summaries of estimation are shown below.

Summaries of Total Road Construction Costs

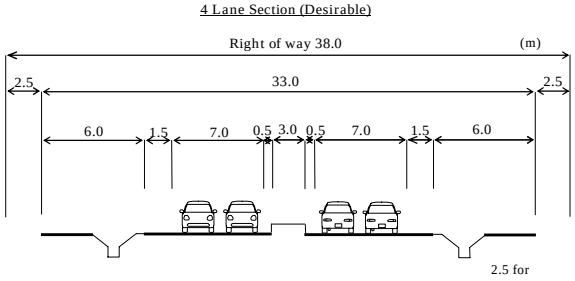
Name of Project (Section)	Road Length (km)	Total ×1,000FBu
1. Coastal Alternative Route Projects	7.4	19,064,878
2. Widening of NR-3 Projects	4.6	10,573,511
3. Ring Road Development Projects	6.9	17,229,651
4. Widening of NR-7 Projects	2.0	5,544,176
5. Missing Link Development Projects	1.4	4,919,119
6. City Plan Development Projects (Northern Areas)	19.9	39,007,615
7. City Plan Development Projects (Southern Areas)	22.7	48,273,201
8. Stone Pavement Projects	110.5	94,620,485
Total	175.4	239,232,636

(8) Design Criteria and Cross Section

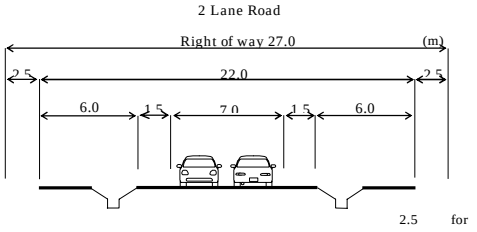
Design standard of cross-section component, design speed and so on was decided by using the Japan road guidelines from Japanese standard.

■ Typical cross section

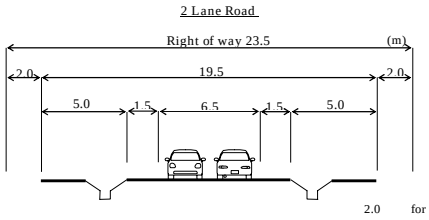
- Principal Arterial road (4-lanes)



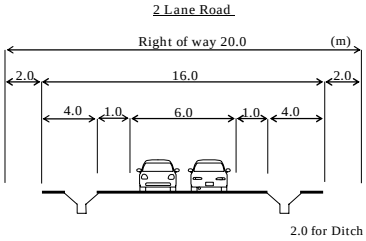
- Principal Arterial Road (2-lanes)



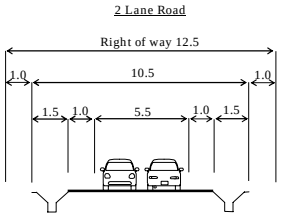
- Arterial Road (2-lanes)



- Collector Road



- Local Road



■ Policy of walkway and Bicycle way

Since bicycle trips are rather mall in Bujumbura, it is appropriate to adopt bicycle and walkways that can be shared by bicycles and pedestrians. Minimum width was set upon by taking existing figures and road structure criteria in Japan.

Policy of Walkway Development

Road Classification	Number of Cars	Number of Pedestrian	Walkway Style	Minimum Width
Principal Arterial	Many	Many	Bicycle and Pedestrian	3.5m (2.0+1.5)
Arterial	Many	Many	Bicycle and Pedestrian	3.0m
Collector	Little	Little	Pedestrian	2.0m
Local	Few	Little	-	-

Summary of Design Criteria

	Road Classification			
	Principal Arterial	Principal	Collector	Local
Design Speed (km/h)	80	60	50 or 40	30 or 20
Design Traffic (pcu/day)	- 10,000	10,000 - 4,000	4,000 - 500	500 -
Road Reserve (minimum)	38.0 (4 lane) 27.0 (2 lane)	23.5	20.0	12.5
Lane Width (m)	33.0 (4 lane) 22.0 (2 lane)	19.5	16.0	10.5
Lane	3.5	3.25	3.0	2.75
Shoulder	1.5	1.5	1.0	1.0
Median	3.0	1.0	-	-
Walkway	3.5	3.0	2.0	-

7. PUBLIC TRANSPORT PLAN

(1) Improvement Policy

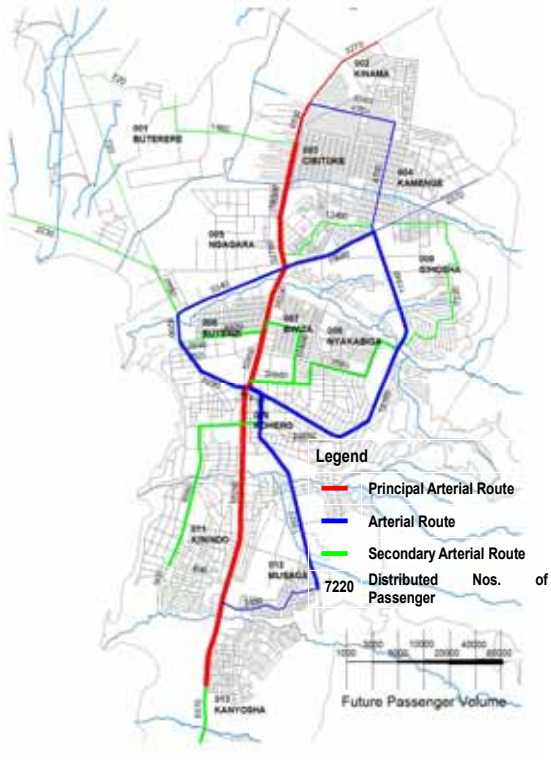
- Utilization of public transport should be promoted to avoid the congestion to be aggravated in near future.
- To achieve this objective, the stable operation system with re-structuring of the bus network shall be introduced complying with passengers' needs.
- The OTRACO is expected to play main role in providing the punctual and convenient service and raise the status of public transport.
- To that end, the services by the OTRACO shall be carried out by large sized bus to obtain efficiency.
- Through these, public transport will serve as a familiar leg for the citizens of all classes, and will be daily used for all citizens.
- The improvement programme shall prepare the mitigation measures to minimize the impacts to the private transporters which will be competing with OTRACO in urban transportation.
- Controls and regulations shall be introduced to achieve safe and stable operation for the other public transporters, i.e. taxi, bike taxi, and bicycle taxi.

(2) Bus Network Plan

The road network in the city will be improved by developing of north – south axis and inner and outer ring roads. This development will help the traffic flow to be smoothly, especially at CBD.

The future bus network shall be proposed in consideration of this road network improvement and future passenger's movement.

- As the movement of passengers in north-south direction will multiply in future, bus route on north-south axis shall be enforced to form the trunk bus route.
- The circulation route on ring roads shall also be introduced which enables bus operation to increase the efficiency.
- Principal arterial routes, the arterial routes and the secondary arterial routes that complement these constitute bus network plan.



Proposed Bus Network in 2017

(3) Bus Operation Plan

■ Bus operation comparison

In order to examine the amount of supply of the large-sized bus by OTRACO to urban transport, comparison by three scenarios was performed. Concepts of scenarios are as follows:

Scenario A

The OTRACO maintains current proportion of transportation in public transport

Scenario B

The OTRACO transports passengers increasing from present and the private transporters transport the same amount of current passengers. The operation by the OTRACO is concentrated on main routes and the routes on areas without public transport service at present.

Scenario C

The OTRACO transports passengers on congested route such as North-South Axis and other arterial route. Private transporters take other routes where the traffic congestion is not expected to occur.

■ Evaluation of Scenarios

The evaluation of scenarios were carried out from several aspects such as nos. of new installation of large sized bus, its cost, positive effect on traffic congestion and social impact. The table below shows the result of evaluation.

Evaluations of Scenario

Scenario	Nos. of New Installation of Large size Bus	New Installation Cost (USD)	Deduction of PCU	Social Impacts
A	0		Nil	Nil
B	36		46,846	Small
C	73		103,187	Large

Total deduction of pcu on whole road network becomes 46,846 and 103,189, respectively, comparing to the Scenario A. The Scenario C is judged to be most effective and feasible so that the Scenario C is selected. In case scenario C is selected, it is necessary that mitigation for the social impact be considered.

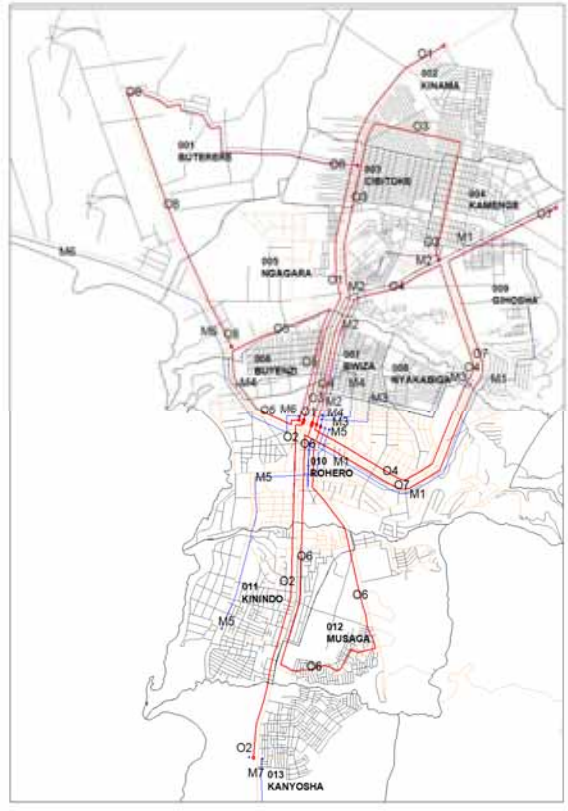
(4) Bus Terminal Improvement Plan

Since the existing bus terminal is the biggest generating and attracting traffic point in the CBD, relocation of the existing bus terminal is inevitably taken into consideration.

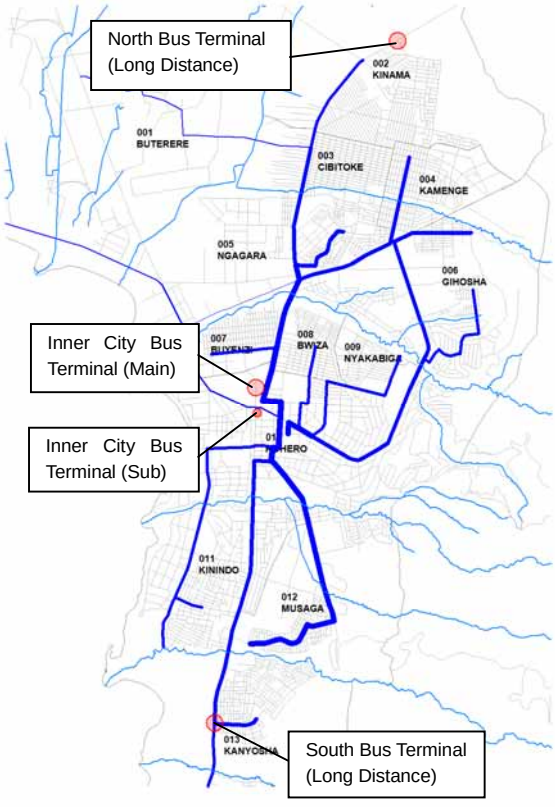
Bus terminal for long distance and inner city transport shall be provided, separately, complying with sort of journeys.

Proposed locations of candidate bus terminal are;

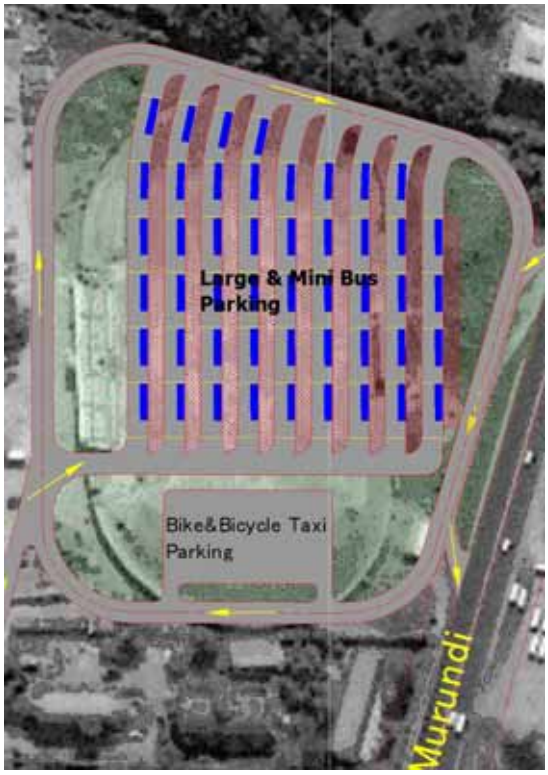
- Bus terminal for long distance bus
  - North Terminal: Carama in Kinama commune along RN9
  - South Terminal: Nyabaranda in Kanyosha commune along RN 3
- Bus terminal for inner city and suburban bus
  - Main Terminal: Old stadium in Rohero commune along RN9
    A required area is estimated to be 3,000 square meters.
  - Sub Terminal: A southern part of Independent Square



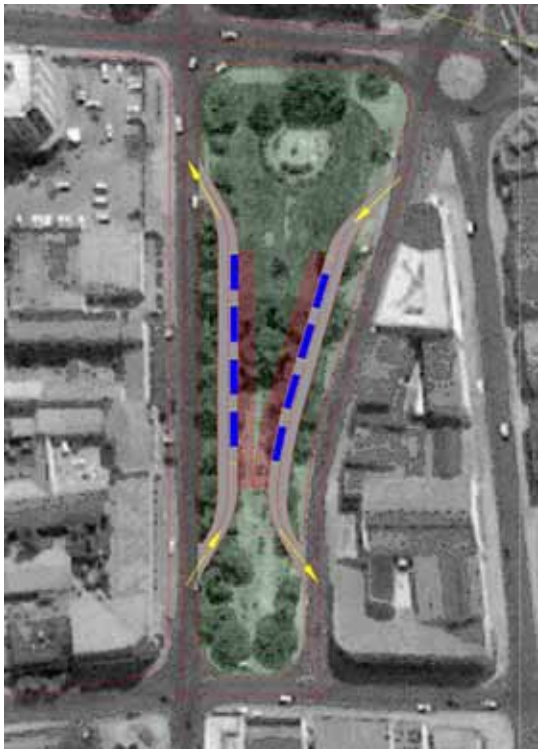
Route Operation Plan by Scenario C



Location of Bus Terminals



Proposed Main Bus Terminal Layout



Proposed Sub Bus Terminal Layout

(5) Other Public Transport

(Taxi, Bike Taxi Bicycle Taxi)

Taxi, Bike Taxi Bicycle and Taxi, which are complementing bus, serves as citizen's means for movement. In urban transport, they should be utilized as civic means of transport, supplementing restriction to their movement.

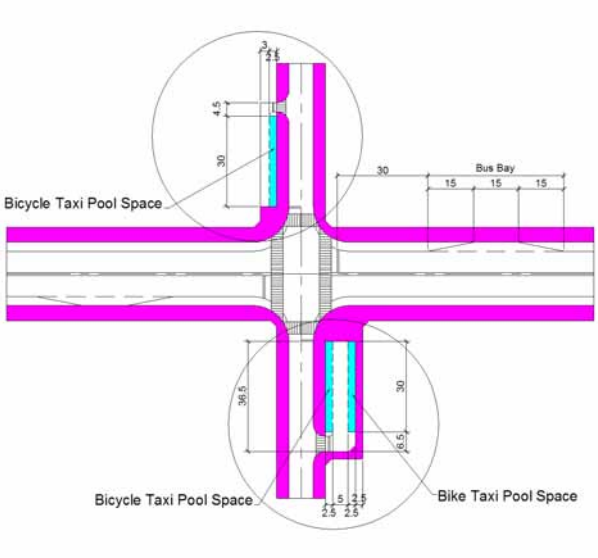
- Arrangement for Service limitation to the Modes

To improve and avoid the traffic congestion accidents caused by those modes, the following limitation to the Public Transport Modes (Specification) shall be proposed.

- Taxi: No Limitation
- Bike Taxi: All area with exception of North-South Axis
- Bicycle Taxi: Arterial and feeder roads only

- Arrangement of Pools for Transit Between Modes

The pool space to change the modes, which is assigned to feeder side, shall be provided. The next figure shows the proposed layout of the facility.



Standard Layout of Bike and Bicycle Taxi Pool

- Arrangements of Regulation and Domestic Rule

Legal prohibition of stopping and parking in specific areas shall be introduced together with the arrangement of facilities. Especially in central area, where carriageway and sidewalk are remarkably congested, restriction should be strictly implemented.

8. TRAFFIC MANAGEMENT PLAN

(1) Parking Facilities and Control

■ Existing Parking Conditions

• No available parking space in CBD

Most of the on-road car parking space in CBD is occupied by the private buses and taxies due to the lack of sufficient parking spaces.

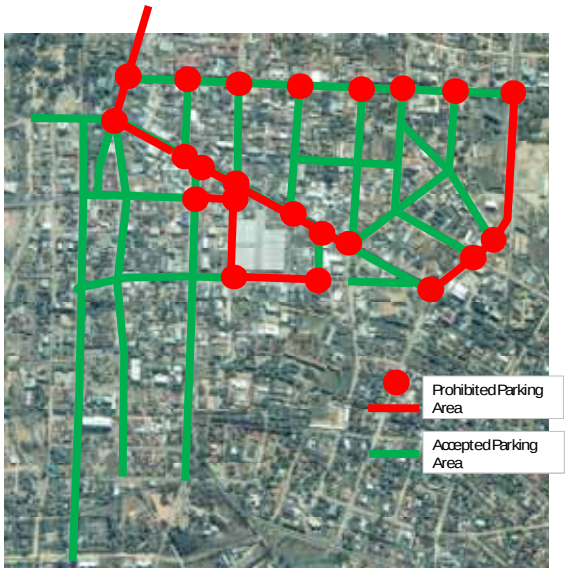
• No regulation for car parking

Passenger cars are found parking on the CBD area streets for long time, causing traffic jam by the reduction of the road capacity.

■ Parking Control

• Parking restriction in CBD

Roadside parking at restricted area should be prohibited and/or charged Parking at the central median should be also prohibited.



Parking Control Policy in the CBD

• Parking prohibition at intersections

Prohibition of roadside parking at least in the range of 30m from intersection should be enforced.

• Parking prohibition on main collector road

Roadside parking should be prohibited on the main collector road.

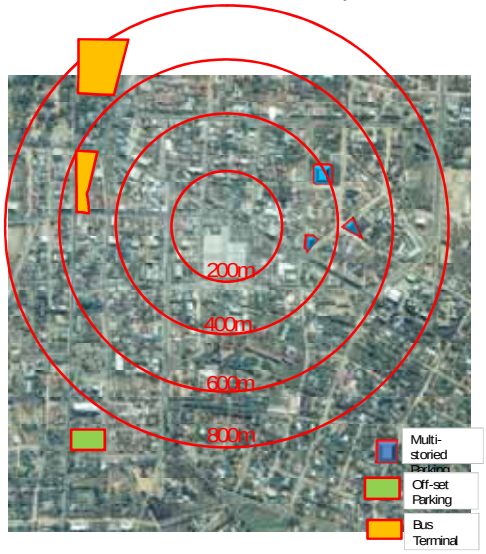
■ Provision of Parking Facilities

• Widening of Car Parks and Introduction of parking charge system

Roadside parking strip should be widened around the commercial facilities. Besides, introduction of parking charge system by private enterprises should be introduced.

• Introduction of Multi-storied Car Parking Building

The multi-storied car parking is recommended from the view point of the construction cost and land acquisition.



Recommendable Location of the Off-street Car Parking Facilities in CBD

• Establishment of new building code

In order to impose a duty of the arrangement of a parking lot upon the institution for which cars gather, it is required to add regulation required for the building regulation.

(2) Traffic Demand Management

■ Restriction of the vehicles entering CBD

Heavy vehicles should be restricted to enter CBD to prevent traffic overcrowding. Also, passenger cars having passengers less than two can also be restricted to enter CBD.

■ Introduction of Park and Bus Ride System

Introduction of park and bus ride system with the provision of secure and convenient parking spaces close to public transport stations/terminals/stops is proposed.

■ Introduction of Staggered Working Hours

The peak hour occurs three times a day in Bujumbra, i.e. morning time, lunch time and evening time. It is recommended that the staggered working hour be introduced after obtaining comprehension by citizens prior to the implementation.

9. IMPLEMENTATION PLAN

(1) Implementation Concepts

In drawing up the implementation plan of the projects proposed by the master plan, the schedule of a plan is set up in the following three periods.

- Short term: 2008-2010
- Medium term: 2011-2013
- Long term: 2014-2017

The priority was set on comparing the following items.

- Contribution for Urgent Problems

  Priority is given to the project set up as the measures for solving the traffic problem in short term.
- Adjustment for Related Project (specially,

  If the synergy by related project is expected, implementation schedule should be adjusted.
- Setup for implementation projects (Land acquisition, agreement in project site, etc)

  When the project includes land acquisition or obtaining agreement, etc, the preparation period to project implementation is required.
- Available Cost for Investment

  Projects that can be executed primarily within available budget are considered to have high priority.
- Efficiency (Cost per unit traffic volume)

  If more beneficiaries can be obtained with fewer budgets, the efficiency of the project is high.

(2) Implementation Schedule

Upon conducting all assessment of each project based on the above items, the conclusions of priority were obtained.

The following table for the project schedule shows the start, execution period and service period for each project. Moreover, the planned required budget in each year according to this schedule is also indicated.

Road Development and Public Transport Improvement Implementation Schedule

	Project	Length (km)	Cost (mil.Fbu)	Year 8	9	10	11	12	13	14	15	16	17
Road Development	Coastal Alternative Route	7.4	19,064			3,813	3,813	3,813	3,813	3,813			
	North-South Axis	4.6	10,573						2,115	2,115	2,115	2,115	2,115
	Ring Road	6.9	17,229							4,307	4,307	4,307	4,307
	Widening of NR-7	2.0	5,544							1,386	1,386	1,386	1,386
	Forming the Network system	1.4	4,919		984	984	984	984	984				
	City Plan Roads	42.6	87,280				12,469	12,469	12,469	12,469	12,469	12,469	12,469
	Community Road	110.5	94,620										
	Signalization		874	141	141			214	214			82	82
	One-way Traffic Control												
	Off-set intersection improvement		147	49	49	49							
	Roundabout improvement		33	11	11	11							
	Road Maintenance		83,917	7,071	7,601	7,615	7,645	8,043	8,424	8,810	9,150	9,581	9,977
	Sub Total		230,098	7,272	8,787	12,471	24,910	25,523	28,018	32,900	29,940	29,940	30,337
Public Transport	Bus Terminal and City Bus Centre Improvement		2,406			1,203	1,203						
	Introduction of New Bus Operation Systems in		8,707			2,177	2,177				4,353		
	New installation of taxi pool for motor-bike and Bicycle taxi		150			25	25	25	25	25	25		
	Sub Total		11,263			3,405	3,405	25	25	25	4,378		
Total			241,361	31,935			81,906			127,520			
Definition of Term				Short Term			Medium Term			Long Term			

PART 4

EVALUATION OF MASTER PLAN

10. INITIAL ENVIRONMENTAL EXAMINATIONS

(1) Environmental Management System in Burundi

- The Ministry of Land Management, Environment and Tourism (MINATTE) established in 1989 is the main administrative body concerning the environmental management in Burundi. According to "The Environment Code of Burundi (Law No.1/010)", the basic environmental law of Burundi, responsibility of the ministry includes the execution of national environmental policy concerning regional development and elaboration of the regulation concerning protection and management of the environment.
- The Environment Code of Burundi (Law No.1/010) was promulgated in 1999 and has been enforced in June, 2000. The environment code consists of 7 titles each comprises of 2 to 6 chapters and about 163 articles.
- Environmental Impact Assessment (EIA) system is mentioned in "TITLE II, CHAPTER 3 THE PROCEDURE OF IMPACT SURVEY ON THE ENVIRONMENT" of the environmental code. This chapter consists of 7 articles (Article 21~27) and explains the fundamental principles and procedure on EIA. Any other regulations and guidelines on EIA are not prepared yet. The articles request to include the following categories in the impact survey.
  - Analysis of initial environmental status
  - Assessment of impact on natural and human environment caused by development project
  - Description of environmental mitigation measures
  - Presentation of the other possible alternative solution to protect environment

Environmental standards for air, water, noise, emission of gas and effluent standards are not yet prepared in Burundi.

(2) Check Items for IEE

The Initial Environmental Examination (IEE) is carried out as a part of the Master Plan. The Environmental scope in the IEE is the first step to identify the environmental impacts and social considerations of the plans in the Master Plan. As the check items for IEE is not prepared in Burundi environmental code, in this master plan, IEE is performed based on the JICA Guidelines for Environmental and Social Considerations (April 2004) "Appendix 3. Screening Format, Check Items"

Check Items by JICA Guidelines

1. Air pollution
2. Water pollution
3. Soil pollution
4. Waste
5. Noise and vibration
6. Ground subsidence and soil erosion
7. Offensive odors
8. Geographical features
9. Bottom sediment
10. Biota and ecosystem
11. Water usage
12. Accident
13. Global warming
14. Involuntary resettlement
15. Local economy such as employment and livelihood etc.
16. Land use and utilization of local resources
17. Social institutions such as social infrastructure and local decision-making institutions
18. Existing social infrastructures and services
19. The poor, indigenous of ethnic people
20. Misdistribution of benefit and damage
21. Local conflict of interests
22. Gender
23. Children's rights
24. Cultural heritage
25. Infectious diseases such as HIV/AIDS etc.
26. Others

(3) Expected Environmental Impacts and Mitigation

■ Road Improvement Plan

- In some plan, the land acquisition of the right of way will be required prior to the construction works. The people living in or owning the land in/along the roads will lose the residential or agricultural land, houses and facilities.
- In the advanced planning stage, to minimize the resettlement and land acquisition, the alternative plans, the flexible cross-section and proper alignment should be studied.
  A land acquisition plan and/or resettlement action plan should be prepared for the implementation with proper compensation and without troubles.
- There are well-grown roadside trees along the several parts of principal arterial road. The widening works of the roads may affect the trees. The construction of City Plan Roads in southern area has potential impacts on the groves and lakeside ecosystem.
- To mitigate the impact on the roadside trees and groves, the Consultant during road design should consider the flexible cross-section and proper alignment. The ecological survey on the side of the City Plan Roads should be conducted prior to the basic design.

■ Public Transport Plan

- The Bus Network Improvement Plan mentions that the services on same route by OTRACO and the private transporters shall be united in the future. Operation of the taxis, motorbike taxis and bicycle taxis shall be also controlled and restricted.
  These managements of the private transporters may decrease the future opportunity on employment.
- The Bus Network Improvement Plan has potentially a matter on uneven distribution of benefit and damage between OTRACO and private bus transporters. The Other Public Transport Plan also has potentially a matter on uneven distribution of benefit and damage.
- In the advanced planning stage, the proponents of the plans should conduct baseline surveys on the private transporters and reflect the results. The proponents should essentially obtain the agreements of the interested parties and individuals. To mitigate the loss of the employment as private drivers, OTRACO should employ the affected divers as necessary.

(4) Conclusion and Recommendation

The following plans that have potentially negative impacts should be conducted by the EIA in the advanced planning stage such as the Feasibility Study.

- Road Improvement Plan:
  - Development of North-South Axis
  - Development of Ring Road
  - Development of City Plan Roads in Northern Area
  - Development of City Plan Roads in Southern Area
  - Traffic Flow Control
- Public Transport Plan:
  - Bus Network Improvement Plan
  - Bus Terminal Development Plan

The concept of Strategic Impact Assessment should be included in these plans.

Roadside trees of North-South Axis in Ngagara

11. FINANCING PLAN

(1) Road Sector

■ The Budget Scale in Burundi

The budget of central ministries consists of the ordinary budget (BO) and the special investment budget (BEI). Out of the whole budget of FBu 473.8 billion, the Ministry of Public Works and Equipment is accounted for 4.5% and Ministry of Transport, Post Telecommunication accounted for 0.2%.

Summary of State Budget FY 2006

	Ordinary Budget (BO)	Special Investment Budget (BEI)	Total BO and BEI
Ministry of Transport, Post and Telecommunication	533 (0.2%)	411 (0.3%)	943 (0.2%)
Ministry of Public Works and Equipment	1,888 (0.6%)	19,313 (12.8%)	21,201 (4.5%)
Total	322,966 (100.0%)	150,825 (100.0%)	473,791 (100.0%)

Million BFu

■ Macroeconomic Context

Burundi's infrastructure spending as percentage of GDP ranges far below that of neighbouring countries, such as Rwanda 5.2%, Uganda 6.2%, Tanzania 6.1% and Kenya 6.0%. The World Bank recommends that Burundi's infrastructure expenditures should be at least in the 5%-8% range of GDP in the next 10-15 years to be commensurate with the government's economic development objectives.

Public Expenditure by Infrastructure Sector

GDP Share (%)	2002	2006
Total Infrastructure Spending	2.37	3.30
Electricity (total)	1.64	1.91
Road (total)	0.03	0.67
(Investment)	(0.01)	(0.64)
(O & M)	(0.02)	(0.03)
Water & Sanitation (Total)	0.71	0.72

■ Investment Scale for the Project

According to the recommendation of the World Bank, when the infrastructure investment scale occupied 8%, of GDP, the trial calculation was performed to clarify the rate that the proposed project cost occupies to the investment in infrastructure.

When the maximum ratio of Infrastructure investment scale of about 8% of GDP is assumed, the total project cost (2008-2017) ratio become about 40%. During the period of execution of this project, the largest amount of project cost will be realized in 2014 whereby the ratio of investment for the road sector will occupy 55%.

Trial Calculation of Road Sector Investment

			Target Year 2017	Accumulated Amount (2008-2017)
A	GDP at 2007prices	billion FBu	1,846.4	
B	Infrastructure Investment (8% of GDP)	billion FBu	147.7	1,234.9
C	Investment in Road Sector (50% of D)	billion Fbu	73.9	617.4
D	Proposed Project Cost	billion FBu	30.5	245.8
E	Ratio of Proposed Project Cost (K/I)	%	41%	39%

- Price: fix-price in the 2007 fiscal year
- The rate of increase of GDP is taken as 6% of an annual rate till 2017
- The investment scale to road Sector is based on 50% of the investment in Infrastructure.

■ Budget for Road Development

The total sum of the project budget proposed is FBu 250 billion, FBu 20-35 billion a year. This budget is appropriated for Budget EI in MTPE. This investment increment scale is equivalent to 75-90% of the BEI budgets in 2007. In that regard, it is therefore necessary to find this new source of funds.

■ Road Maintenance Cost

The estimated annual operation and maintenance (O/M) cost for the projects is shown in the following table.

Estimated O/M Cost for Proposed Project

Estimated O/M cost		2007	2010	2013	2017	2018
Road	Million FBu	0	150	1,141	2,391	2,393
Traffic Signal	Million FBu	0	21.6	43.2	50.4	50.4
Bus Terminal	Million FBu	0	0	0	0	0
Total	Million Fbu	0	171	1,184	2,442	2,443

When this project will be completed by 2017, O/M cost should be considered right away after the completion The O/M cost will gradually increase and the required cost will reach FBu 2,440 million which include O/M for traffic light from year 2018 onward. The newly increment of O/M cost is assumed to range between 16% and 25% of the required O/M cost in the road sector in 2018 as shown below

Required O/M Budget for Road

		2006	2018
A. Revenues Estimated	Million FBu	3,597	
B. Required Budget	Million FBu	3,850	10,050 – 15,770
D. Newly Required Budget	Million FBu	-	2,443
D. Ratio (C/B)		-	16% - 25%

Required budget in 2006 and 2018 is estimated based on the World Bank Report

Newly required budget is O/M cost for the projects proposed in this study

(2) Public Transport Sector

■ Present Financial Balance of OTRACO

Although many of incomes of OTRACO are the fees from passengers, currently subsidy from the central government (MTPT) is accounted for about 30% of annual income, and it has not become self-dependent in management.

OTRACO Annual Income and Expenditure

	2005	2006	2007(*2)
Annual Income (*1)	909.3	1,005.6	1,577.4
Annual Expenditure	1,026.6	1,263.9	
Balance	- 117.3	- 258.3	
Subsidy	(201.8)	(270.2)	(289.7)

(FBu million)

1) Annual income includes subsidy from the central government and others.

2) Annual income in 2007 is budget, not actual.

■ Investment Plan

According to the public transport implementation schedule, OTRACO investment plan is as follows.

OTRACO Investment Plan

Fleet type	Unit price (US$)	Nos.	Fbu million
Bus (60 seats)	81,000	93	8,286
Bus (40 seats)	67,000	55	4,053
Bus (30 seats)	39,000	20	858
Total		168	13,197

■ Financial Forecast

Based on the above OTRACO investment plan (Bus fleet purchasing plan) and the budget planning in 2007, Income and Expense are presumed according to the budget document item of OTRACO.

This financial forecast does not include bus fleet purchasing cost as per investment plan because equipment purchasing cost is fully covered by BEI of the Ministry of Transport. Finance balance of OTRACO shows surplus of FBu 80 million in 2013 even including depreciation cost. In 2016 surplus shows FBu 230 million and becomes almost equivalent to government subsidy.

More precise business analysis is expected to make the assumption in this forecast certain, and efforts should be made to reform OTRACO into profitable enterprise.

Financial Forecast of OTRACO

	2,007	2013	2016
Income	1,577	5,949	7,303
Operating Receipts	720	4,829	5,978
Other Operating Receipts	273	830	1036
Subsidy (Operation)	290	290	290
Subsidy (Equipment)	295	0	0
Expenses	1,557	5,066	5,910
Variable costs	643	3,176	3,550
Fixed costs	285	867	1082
Administration expenses	248	755	943
Investment costs	82	248	309
Contingency	5	20	25
Equipment purchasing costs	295	0	0
Balance	20	883	1393
Depreciation	0	803	1,166
Net Balance	20	80	228

FBu million

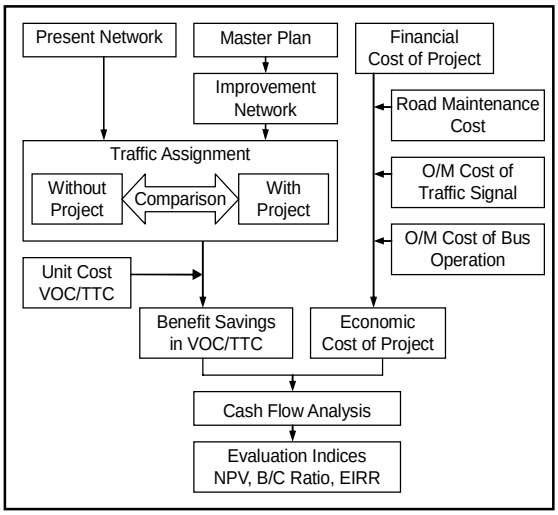
Note: Figures in 2007 are given by the Department if financial service of OTRACO

12. EVALUATION OF IMPROVEMENT PLAN

■ Evaluation Method

Economic analysis is carried out by the following workflow

Workflow of Economic Analysis



■ Estimated Traffic Improved Value between "Without" and "With"

The summary results of assigned traffic volume for economic evaluation, "Without" and "With project" networks both in 2007 and 2017 are summarized in following table.

Comparison of Estimated Traffic Value

	a) With	b) Without	c) Improved Unit (b-a)
	Vehicle-hour (unit:1,000)		
North-South	7,990	8,270	280
Ring Road	7,990	8,235	245
Missing Link	7,990	9,193	203
City Plan Roads	7,990	8,081	91
All Projects	7,990	9,188	1,198
	Vehicle-km (unit:1,000)		
North-South	330,637	333,918	3,425
Ring Road	330,637	332,137	1,500
Missing Link	330,637	334,775	4,102
City Plan Roads	330,673	333,135	2,462
All Projects	330,673	349,386	18,713

■ Investment Plan

According to the proposed implementation plan for various projects, investment plan is summarized in following table.

Economic cost is adjusted with social discount rate of 12% per annum.

Investment Cost and Schedule

Name of Project	Construction Cost (FBu million)	Investment Schedule (year)	Period
North-South	28,437	2011- 2014	4 years
Ring Road	18,297	2014- 2017	4 years
Missing Link	6,268	2009 - 2013	5 years
City Plan Roads	80,350	2011 – 2017	7 years
Traffic Signal	883	2008 - 2017	7 years
Bus Terminal	2,407	2010 - 2011	2 years
Motorbike, Bicycle and Taxi Pool	150	2010 - 2015	6 years
Total Cost (Market price in 2007)	136,792		

■ Cash Flow Analysis

Generally, the life of concrete pavement is more than 20 years, while the life of asphalt pavement is around 10 years. Despite of the fact said above, a 25-year analysis period was selected because it would be appropriate for reflecting long-term cost effect, as one or more rehabilitation strategies should be taken.

■ Economic Indices

The benefit cost ratio (B/C) of the project is estimated to be 1.60 and the net present value (NPV) to be FBu 47,685 million under the discount rate of 12%. The economic internal rate of return (EIRR) shows 16.7%, which is higher than the discount rate.

A sensitivity analysis is carried out, taking into account the general considerable range of uncertainty as follows;

Case1: Variation of benefit: -25% against the base case

Case2: Variation of cost: +25% to +50% against the base case.

The summary of cash flow analysis and economic sensitivity analysis is shown below.

Economic Evaluation of Master Plan

	Base case	Case-1	Case-2
Variation of benefit	0%	- 25%	0%
Variation of cost	0%	+ 25%	+ 50%
NPV (FBu billion)	47.7	4.9	10.9
B/C Ratio	1.60	1.04	1.09
EIRR (%)	16.7%	12.5%	12.9%

PART 5

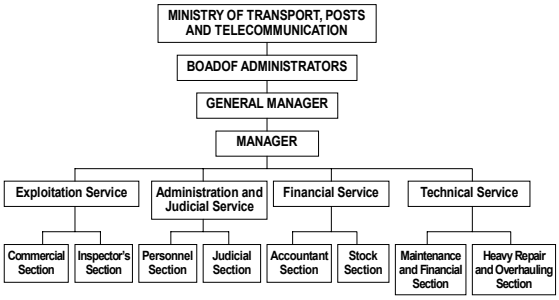
TECHNICAL SUPPORT TO OTRACO

TECHNICAL SUPPORT TO OTRACO

(1) Present Condition

■ Condition of Bus Operation

OTRACO is the public transportation agency under Ministry of Transport, Posts and Telecommunications. MTPT makes short and long term policies in general, and OTRACO is supposed to implement those policies. The organization of OTRACO is controlled by Board of Administrators. And General Manager, 1 manager, 4 departments and 8 sections are in charge for respective duties.



Organization Chart of OTRACO

OTRACO provides the public transportation services which includes the non-profitable bus routes as the national public transport agency.

68 units of large buses in 1983-1984 and 67 units of large buses in 1989 were procured by the Japanese Grant Aid Project. The number of large buses owned by OTRACO exceeded approximately 100 units before the civil conflict. However, most of those large buses and equipments have been damaged, and skilled workers have also been lost. Only 42 buses are currently in operation.

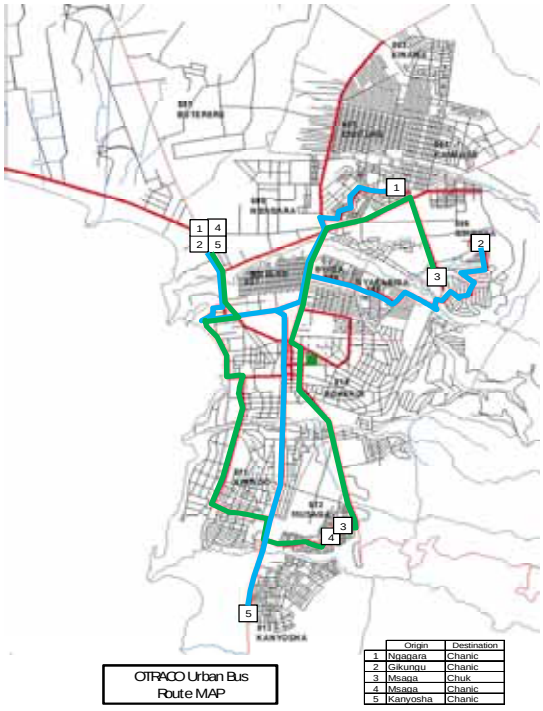
Bus Operation by OTRACO in 1992 and 2006

	1992	2006
Number of operated buses	60	36
Total mileage (km)	2,409,611	813,058
Total passengers	4,992,597	No records
No. of Bus routes	No records	49
Annual Revenue (1000Fbu)	No records	576,585
No of Staffs	248	98

■ Operation Routes

Type of bus operation services consist of 5 categories;

- Urban Bus Service in Bujumbura City (5 routes)
  Almost bus passengers for urban bus services are workers from the industrial area as well as from hospitals.
- Sub-urban Service surrounding Bujumbura City (4 routes)
  Destinations are at Gatumba and Ruziba located approximately 20km away from Bujumbura City.
- School bus service for the students in Bujumbura (11 routes)
  11 school bus routes are connecting commune to Schools.
- Inter-urban service from Bujumbura City (18 routes)
  18 inter-urban bus routes are connecting Bujumbura to major rural towns.
- International bus service between Bujumbura and Kigali/Rwanda (1 route)
  There is one international bus routes which connect Bujumbura to Kigali, the capital city of Rwanda.



Current Bus Operation Route (Bujumbura City)

■ Condition of Buses

At present, OTRACO owns only 68 vehicles of which about 60 % is in operation and among the operational vehicles the majority are 40 passenger buses (70% of running buses).

Current Bus Condition

Capacity (passenger)	Running	Good	Grounded	Total
100	8	3	3	14
60	4	2	9	15
40	30	6	2	38
26	0	0	1	1
Total	42	11	15	68

The ratio of running buses manufactured before 1990 is about 20 %. The operation of these vehicles will decrease extremely in near future as the maintenance will become uneconomical and inefficient.

Number of Buses by Manufacture Year

	Running	Grounded	Total
～1989	9	17	26
1990～1999	1	1	2
2000～	33	7	40
Total	43	25	68

■ Future Operation Plan by OTRACO

OTRACO has future plan for reinforcement of transport capacity. The contents of the future plan are as shown below;

- Reopening of Gitega branch office
- Opening of new branch offices at Ngozi and Bururi
- Increasing number of bus routes to cover the whole of Burundi

The main objective of the future plans is to recover the condition of the bus operation network and system before civil conflict.

Future Bus Operation Plan

	Routes	Bus Quantity	Operation Frequency
BUJUMBURA			
Urban	8	8	106
Suburban	10	10	36
Interurban	27	27	27
Sub Total	45	45	169
GITEGA			
Suburban	7	7	21
School	4	4	16
Interurban	16	16	16
Sub Total	27	27	53
NGOZI			
Suburban	6	6	22
Interurban	9	9	12
Sub Total	15	15	34
BURURI			
Suburban	3	3	8
Interurban	10	10	15
Sub Total	13	13	23
Total	100	100	279

(2) Recommendation

■ Bus Operation

- Improvement of Bus operation by changing starting point

  Buses should be distributed and parked at 3 bus stations at Kamenge, Nyagabiga and Musaga, and the starting point should be changed from current OTRACO garage. By changing starting point, buses can reduce the distance running without passengers and as a result stable bus operation can be secured.
- Improvement of data processing systems in OTRACO

  Currently management of bus operation is recorded manually on paper-base. Improvement of processing bus operation data more efficiently should be made by accumulating into the computer.

■ Organization

- To set up the data management section

  Recording of detailed data of maintenance such as mileage of each bus, parts and components replaced or whereabouts of repair works are needed for the further maintenances, so the setting up of a data section is necessary.
- Establishment of branch organization

  The reopening of the local office will be needed in near future in order to correspond to the increase in the operation frequency

and to perform efficient management.

- Reinforcement of Staff

  No. of OTRACO buses will be increased from 52 units in 2007 to 199 units in 2017 for the future bus operation plan. OTRACO staffs also must be increased in consideration of the no. of buses and newly opened branch office and ticket sales at the newly opened bus terminal in Bujumbura.

  299 staffs are required in Bujumbura head quarter in future from existing 98 staffs. 80 staffs are required for newly opened of 3 branch offices.

  OTRACO should make the recruitment plan based on this future staff arrangement plan.

Required no. of OTRACO staffs in future

	No. of Staff
Bujumbra Head Office	292
Gitega Branch Office	38
Ngozi Branch Office	22
Bururi Branch Office	20
Total	372

■ Finance

- To continue the government subsidy

  Since maintenance cost will exceed year by year due to the bus conditions, and OTRACO's financial balance depends on subsidy more and more, the government subsidy must continue for the maximum maintenance work.

■ Bus Maintenance System

- Establishment of maintenance management System
  - Vehicle ledger

    The equipment ledger which indicates detailed maintenance data for each vehicle should be introduced and managed by drivers.

  -Vehicle maintenance check sheet

    Vehicle maintenance check sheet which indicates periodical maintenance details will help to preserve the maintenance data for each vehicle.
- Preventive maintenance

  Many breakdowns can be prevented by performing a preventive maintenance, and preparing precautionary measures before breakdown occurs.
- Participation of Transport Section

  The department of transport should submit an instruction sheet made by drivers to the maintenance section to clarify the current condition of bus.
- Preparation of proper equipment and facilities
  - Supplementation of basic tools

    Supplementation of the basic maintenance equipments such as air compressor, vehicle washing machine, parts cleaning machine and grease gun are urgent.
  - Appropriate management of tool and material

    The tool ledger will be prepared and the present condition of the tools and materials are to be confirmed.
  - Appropriate time procurement

    Orders are placed at a stage when the remaining number of parts reaches at a certain constant level.
  - Securing of parts quality

    The procurement of appropriate parts is also very important, since some breakdowns are caused by the use of inferior quality parts
- Public vehicle inspection

  The expansion and renovation of the vehicle inspection services will help not only OTRACO sustainable management but also help to public safety awareness.

■ Capacity of Staff

- Increase in Training Opportunity by various means

  The maintenance staffs need field training. It would be very effective if seminars can be arranged by the vehicle dealer or Engineer/Technician using some teaching materials to train up the staffs. Moreover, some training on the body repairing by the producing company will be more effective.

(3) Technical Transfer

As the technical Support to OTRACO, seminars on improvement of surroundings and safety of the garage were held at OTRACO premises.

Seminar for Technical Transfer to OTRACO

	Date	Subject	Attendance
1	Apr. 19, 2007	Improvement of environment and safety of the garage	11 mechanics, 1 Engineer
2	May 2, 2007	Brake overhauling	12 mechanics, 2 engineers
3	May 10, 2007	Periodic inspection	9 mechanics, 5 mechanics, 3 Engineers
4	Jul. 12, 2007	Bus maintenance and management (1)	3 section chiefs, 1 section sub chief
5	Jul. 26, 2007	Bus maintenance and management (2)	4 section chiefs, 1 section sub chief
6	Aug. 7, 2007	Pperiodic service	1 section sub chief, 8 inspectors
7	Aug. 11, 2007	Brake overhauling	1 section chief, 1 section sub chief, 10 mechanics, 8 inspectors

PART 6

CONCLUSION AND RECOMMENDATION

CONCLUSION

(1) Plan Justification

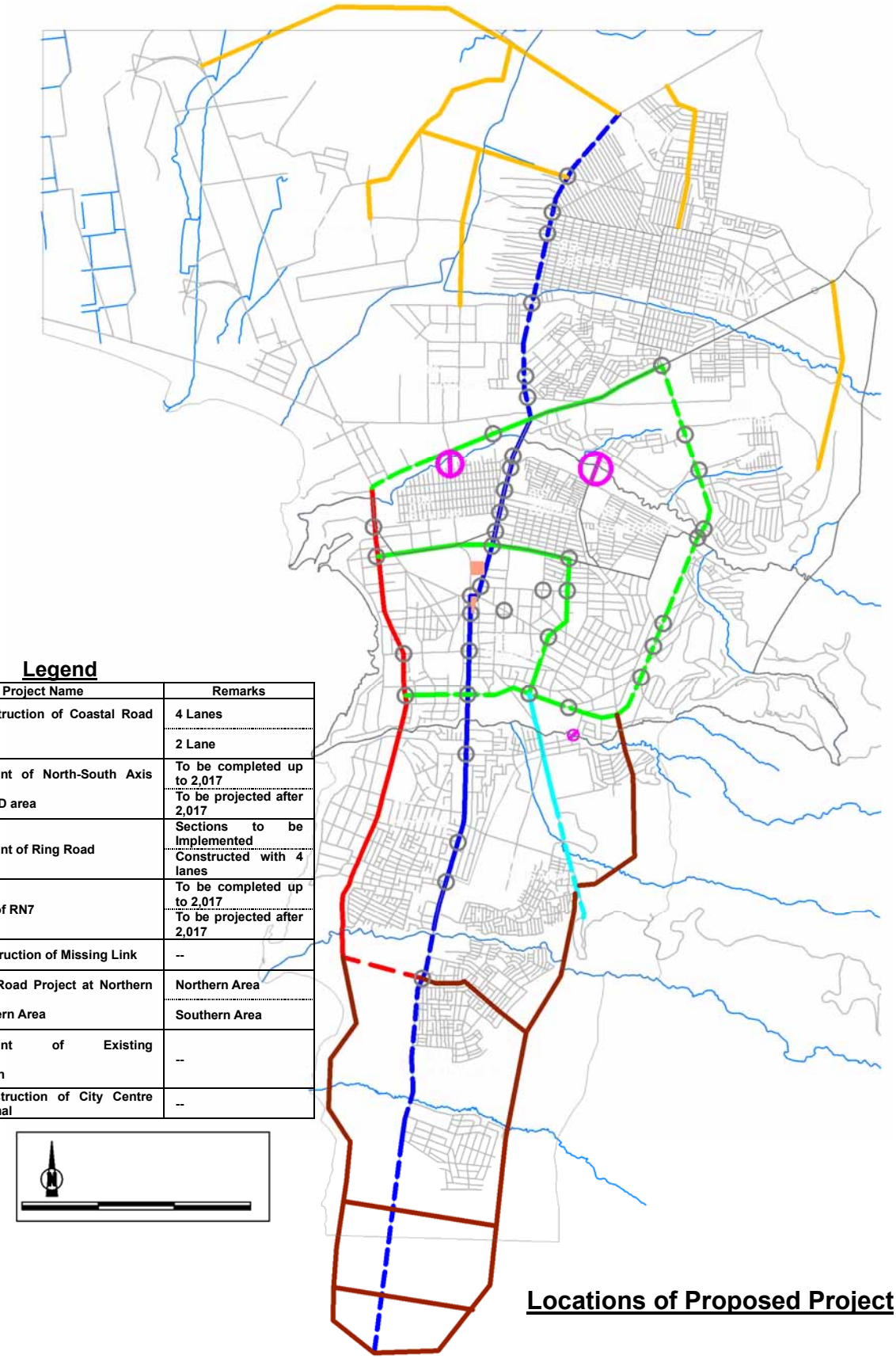
- The Emergency Study on Urban Transport in Bujumbura is conducted to improve the situation of urban transport through analysing present conditions and forecasting future traffic conditions comprehensively.
- The investment plan to be executed in three terms requires the following amounts;
  - Short Term (2008-2010): 7.3 Bil FBu
  - Medium Term (2011-2013): 55,6 Bil FBu
  - Long Term (2014-2017): 85.1 Bil FBu
  - Total: 148.0 Bil FBu
- The plan is justified as viable by the economic evaluation and acceptable by the initial environmental evaluation. Outline of economic evaluation are as follows:
  - NPV: 47.7 FBu
  - BCR: 1.60
  - EIRR: 16.7%

(2) Plan Components

Project components proposed in this study are shown in following table.

Plan Components List

Project Name	Location	Project Scale	Total Cost (Billion Fbu)	Project Term
Road Development				
New Construction of Coastal Alternative Route	Kinindo-Kanyosha	7.4km (length)	19.1	2010-2014
Improvement of North –South Axis around CBD area	Rohero-Kinindo	4.6km (length)	10.6	2013-2017
Improvement of Ring Road	Nagagara-Rohero	6.9km (length)	17.2	2014-2017
Widening of RN-7	Rohero-Musaga	2.0km (length)	5.5	2014-2017
New Construction of Missing Link	Buyenzi-nagagara Bwiza-Gihosha Rohero-Musaga	1.4km (length)	4.9	2009-2013
City Plan Roads (Northern Area)	Buterere, Kinama, Ngagara, Gihosha	19.9km (length)	39.0	2011-2017
City Plan Roads (Southern Area)	Kanyosha, Musaga	22.7km (length)	48.3	2011-2017
Improvement of existing Intersections	Whole City Area	35 Intersections	0.8	2008-2017
Introduction of One-way Traffic control system in CBD area	Rohero			2008-2010
Public Transportation Improvement				
New Construction of City Center Bus Terminal	Rohero	30,600 (sq.m)	2.4	2010-2011
Introduction of New Bus Operation System	Whole City Area		8.7	2010-2015



Legend

	Project No..	Project Name	Remarks
	1	New Construction of Coastal Road	4 Lanes
	1	Alternative	2 Lane
	2	Improvement of North-South Axis around CBD area	To be completed up to 2,017
	2		To be projected after 2,017
	3	Improvement of Ring Road	Sections to be Implemented
	3		Constructed with 4 lanes
	4	Widening of RN7	To be completed up to 2,017
	4		To be projected after 2,017
	5	New Construction of Missing Link	--
	6-1	City Plan Road Project at Northern and Southern Area	Northern Area
	6-2		Southern Area
O	7	Improvement of Existing Intersection	--
	9	New Construction of City Centre Bus Terminal	--

Locations of Proposed Project

RECOMMENDATION

(1) Authorization of the plan

Based on the objective of the study to establish urgent improvement plan of urban transport in ten years as the emergency study, immediate implementation of the plan and substantiation of benefit are required. For that purpose, the plan should be authorised by relevant ministries and agencies, by which every effort should be integrated to execute the plan and achieve the target.

Plans established in the study should be included in superordinate plans of relevant organizations and be highly regarded by donors to prompt the implementation of the plan.

(2) Clarification of Authority Organization

The plan proposed in this study shall be the fundamental guideline for the development of urban transport in Bujumbura and therefore all the development of infrastructure for urban transportation should be performed under the intention of the plan. In order to vitalise the plan and to attain the target of the plan, organization which has authority and is responsible for the implementation of the plan should be defined and clarified. This organization should administer the progress of the plan through promoting and monitoring constantly the execution of the plan as scheduled.

Ministry of Transport, Post and Telecommunication and Ministry of Public Works, the counterpart organizations on this study, shall be given authority and responsibility and take a role as the executor of the plan.

(3) Management of the Plan

These two organizations, under close cooperation and clear role to each other, shall manage the implementation of plan in the fields of public transport and road development respectively. They conduct managements through the following aspects;

- Establishment of organizations and institutions required for the execution of the plan which are proposed in this study.
- To secure budget for the implementation of the plan and, for this sake, to make the plan well-understood among the donors, to promote investments by donors.
- To adjust the urban development projects by coordinating with urban transport condition. New town should be developed in accordance with the road development
- To investigate and to approve or reject the projects not referred in the plan.

Furthermore, if the progress of the plan is not achieved properly as compared with the schedule, the responsible organizations should inspect the reason, review and re-establish the plan if necessary. This review and re-establishment includes reformation of organizations and institutions concerning the execution of the plan.

(4) Building a consensus among citizens on the improvement plan

To make the progress of the plan go smoothly, it is essential to obtain the consensus among the citizen on the plan, so responsible organizations should disclose sufficient information and obtain comprehensive understanding before the commencement of each project. The government organization should offer information including the progress of the plan and ask for opinions of the interested parties and individuals through discussion.

It is also of overriding importance to obtain consensus on the promotion of public transport which is the most basic premise in this study. To arouse the citizen's concern for utilization of public transport, the participants of education and mass media comprehension should be constituted. To this end, personnel of government circles are recommended to promote car pools and go aboard buses to represent the concept of vehicle reduction.

(5) Social consideration

Environmental impact assessment (EIA) for the projects proposed in the study is supposed to be conducted at the design stage in advance. Major impacts to be considered in EIA are as indicated bellow.

- Involuntary resettlement and land acquisition by the road development project
  As described in IEE, road planning Engineer and road design Engineer should analyze the

alternative plan and consider the flexible cross-section and proper alignment.

- Future decrease in employment opportunities by the introduction of large buses
  Introduction of large buses into trunk routes contributes to environmental improvement greatly. On the other hand, employment opportunities of minibus enterprises drivers will be decreased, which will result into social impact. To mitigate the impact, the study proposes the enlargement of employment of OTRACO and the related companies. The organization concerned should strongly take this role into consideration.
- Green environment along the developed road
  Well-grown roadside trees are one of the good scenery of Bujumbura city. To avoid the demolition of this excellent green environment, the road design consultant should take the road sides scenery into consideration.

(6) Utilization of Community Profile

In this study, practical survey in the communities was conducted to clarify the features and profile of the communities. Many items clarified formed the basic information profile for analyzing the urban transportation on the study, including many aspects of community lives. Therefore, community profile can be utilized in various field of technical cooperation as the tool for analyzing the basic need of fundamental lives.

(7) Securing maintenance budget

It is essential to maintain improved road in proper condition as well as to execute plan as scheduled. Periodic preventive maintenance enables to reduce facilities maintenance costs over the long period. In this principle, the study proposes the scheme for road maintenance which deliberates on the efficiency and stability of maintenance. The World Bank also recommends that internal funds for maintenance program shall cover at least 50% of routine maintenance need, and meanwhile, if needs be, periodic maintenance shall be submitted to partners.

PART 7

PILOT PROJECT

PILOT PROJECT

(1) Objective

The objective of the Emergency Work as Pilot Project (EWPP) is to monitor improving living condition through the EWPP and to find out difficulties and problems in its execution. This experience is expected to be used for the implementation of the programmes which is proposed in the Study.

(2) Selection of EWPP

Condition of the EWPP

The condition given to EWPP is as follows;

- Location: Within Bujumbura city
- Duration of work: approx. 4-5 month
- Type of work:: Pavement rehabilitation

Selection of the section to be projected

The RN7 at Musaga commune with stretch of 1.6km and Av. De Government at Rohero commune with stretch of 0.13km were selected as the result of discussion with C/P and stake holders.

Expected Benefits by the EWPP

Direct Benefits

- Smoothing of traffic by the improvement of road conditions and resulting in contribution to the economic and civil activities.
- Improvement of traffic safety by the separation of pathway for vehicle and pedestrian at RN7
- Improvement of traffic confusion by the provision of bus bay at RN7

Indirect Benefits

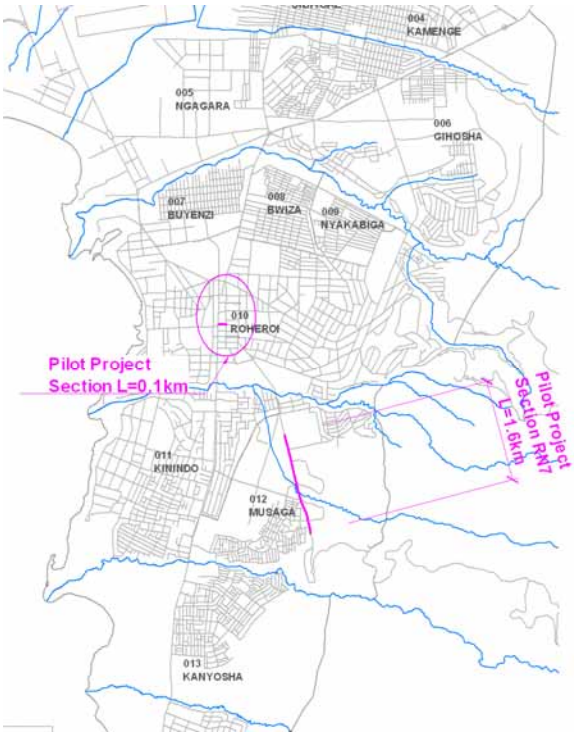
- Activation of area economy by improvement of accessibility and transport condition
- Technical transfer of project management
- Creation of job opportunities for people at vicinity of the project road.

(3) Present Condition

General

The Project sites are located in two communes, Rohero and Musaga, which are adjoining each other. The Rohero commune is located in the central part of Bujumbura, and also includes CBD. Av. De Government is in the government office quarter of CBD and functioning as a major thoroughfare of the area.

Musaga commune is perimeter area of the central district with approx. 78,500 populations. RN-7 is the trunk road for the transportation of the people in the Musaga commune and is also the national trunk road, which connects second largest city, Gitega.



Location of Pilot Project Road

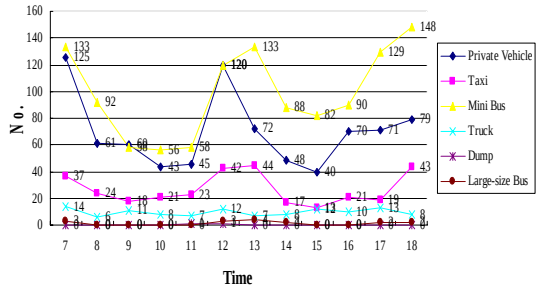
Deteriorated Shoulder

Many Potholes

Traffic Condition

RN-7

The ADT of RN-7 is calculated to be 2,873 and the majorities of the traffic are mini bus and private vehicle which occupies 47.9% and 33.7%. The specific character of this road is many pedestrians amounted as 2,351 per 12 hrs.

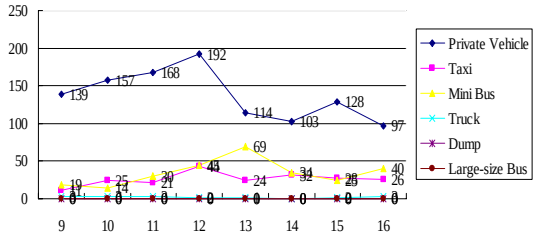


Hourly Traffic Variation of RN7

Av. de Government

The ADT of the road is calculated to be 3,785 and the majority of the traffic is private vehicle which occupies 68.5%

There are many traffic accidents at junction with Bd. Mwezi Gisabo as the junction has the deformed shape.



Hourly Traffic Variation of Av. de Government

Pavement Condition

RN-7

There are innumerable potholes on entire project section; their causes are considered to be poor drainage and unevenness of surface. Some potholes are filled by unsuitable articles such as concrete mass and clay soil. Those articles should be removed one by one carefully by the EWPP's work. Shoulders at the ending point are also heavily damaged and their road beds have already been washed away by storm water.

Av. de Government

This road is located on in front of the Ministry of Interior and there is a parking space for the Ministry adjacent to the road. The entire stretch is heavily damaged due to poor drainage and lack of maintenance. There is no rehabilitation method other than re-construction from sub-base course.

Plan View of Roads at CBD

Plan View of RN7 at Musaga Commune

(4) Design

Design Policy

The design policy of the EWPP is generally to restore road functions so that no upgrade and no future demand are considered in the design, the design work aims to attain appropriate traffic flow and safety for road users.

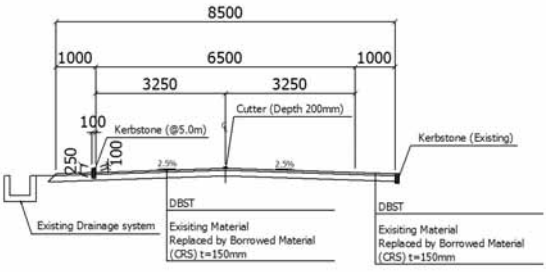
Design Criteria

The SATCC and Tanzanian Standard are referred mainly in consideration of recent trend in eastern African countries and similar natural condition as well as .geographical features.

Engineering Design

- Cross Sectional Design

  Among the total width constraint of 8.5m, the design provides 6.5m (3.25m x 2) for carriageway and 1.0m of walkway assuming ideas of minimum dimension from both the SATCC and Douro Kouzourei.



Typical Cross Section of RN-7

- Pavement Design

  Considering constraint for the construction time and cost, the DBST is selected as surface pavement martial with 15cm of base course re-construction. The design pavement composition is checked by AASHTO design methodology and the result is that life span of the pavement is equivalent to 5 years of design period.

- Safety Measure

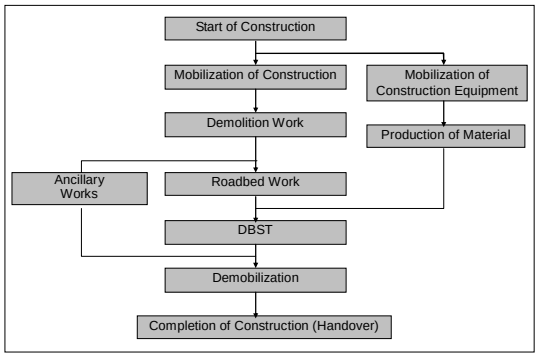
  The following facilities are designed with respective purposes;

  Bus bay : To regulate bus stopping point
  Kerbstone: To demarcate corridor for vehicle and pedestrian
  Hump : To reduce vehicle's running speed
  Markings : To regulate traffic
  U-Cover : To secure the space for waiting bus passenger

Construction Cost

The construction cost for EWPP is estimated as 1,271,000USD by the study team.

(5) Construction Plan



Construction Execution Flow

Working Schedule

Description	2007 Sep	Oct	Nov	Dec	2008 Jan	Feb	Mar
Tender	▼						
Preparation of Agreement	▼						
Mobilization		▬	▬				
Demolition			▬				
Pavement Work				▬	▬	▬	
Drainage					▬		
Ancillary Work				▬			
Demobilization						▬	▬

(6) Environmental Management Plan

From the aspect of environmental and social consideration, the followings are recommended for the implementation of the EWPP.

- Construction Materials:

  No illegal procurement is permitted. The Consultants' supervising team should monitor the procurement.

- Construction Waste:

  To prevent illegal dumping of construction wastes, the construction specification should declare that the construction wastes must be disposed properly.

- Environmental Observation:

  To identify the environmental and social issues immediately, the supervision team should observe the following items.

  - Noise, vibration, dust, odor and exhaust gas caused by operation of heavy equipments
  - Traffic congestion and accident
  - Opinions and complaints from the drivers, residents, pedestrians and passengers.

(7) Major Findings in Execution

- **Public Reaction to EWPP**

The public generally welcome the EWPP and their opinions and behaviours were concluded by local authority. No interfere by public was experienced.

- **Traffic Control during the EWPP**

Existing traffic by vehicle could be controlled when the alternation traffic was introduced and no conflict is raised; however there was a difficulty on controlling pedestrian and traffic modes other than vehicle.

- **Capability of Government Authorities**

The government authorities understood the procedure of road works and pavement maintenance methodology was transferred to them. The issue is the budget arrangement to both maintaining human resource and civil work materials.

- **Capability of Private Sector**

The private organizations both contractor and supplier are limited, available sort of works and goods are also insufficient for road work.

- **Construction Material**

Raw materials such as soil, sand and aggregate are available at Burundi. However there is a problem of production of aggregate on quality and quantity due that the quality and capacity of the crushing plant is not sufficient.

Other constriction material including cement shall be purchased from outside of Burundi. The necessary time for transportation shall generally be estimated as 2 weeks from the origins.

- **Construction Equipment**

Earthwork equipments are available at Bujumbura and however those are relatively in bad condition.

Pavement equipments shall be brought from outside of Burundi, either.

(8) Conclusion and Recommendation

Conclusion

The EWPP was completed on 15th March 2008; actual construction time was approx. 6 month which was in accordance with planned construction time. No serous incidents were experienced during the construction period. From those, it can be evaluated that the EWPP is completed successfully. The rehabilitated roads are expected to contribute to improvement of living standards of Bujumbura people in near feature.

Recommendation

By experiences from the EWPP implementation, the following recommendations are made;

- **Strengthening Private Sector by Government Initiative**

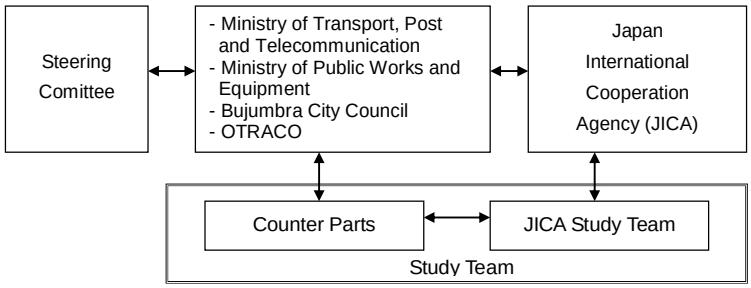
The EWPP clarified that the constriction industry in Burundi is not yet developed. To attain sustainable development in the country, the strengthening capability of private sector (contractor) is essential. The Government, by its initiative, shall consider and introduce strengthening program on private sector by whichever with or without foreign support.

Actual maintenance work, which is currently carried out by the officials. shall also be handed over to private sector; the officials shall concentrate management work in order to reduce recurrent expense.

- **Involving Local Commune Authorities from Early Stage of the Project**

The EWPP discussed with the local commune authorities in addition to the C/P from early stage of the Project. And through the implementation, it was recognized that the authorities has strong power for public so that public opinions were concluded easily by them and it resulted to attain good cooperation with the EWPP.

In case of large scale project, it is recommended to establish working group and/or project implementation unit (PIU) with participation in the local authorities from the early stage.



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Mr. Nicodeme RUKUKI	Duputy Head of Garage, OTRACO	Mr. Tetsuro IZAWA	Bus Operation Plan (1)/Traffic Survey/Natural Conditions Survey
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