

JAPAN INTERNATIONAL COOPERATION AGENCY

No.

MINISTRY OF TRANSPORT, POST AND TELECOMMUNICATION

MINISTRY OF PUBLIC WORKS AND EQUIPMENT

REPUBLIC OF BURUNDI

THE EMERGENCY STUDY
ON
URBAN TRANSPORT
IN
BUJUMBURA
REPUBLIC OF BURUNDI

FINAL REPORT

FEBRUARY 2008

JAPAN INTERNATIONAL COOPERATION AGENCY

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

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THE EMERGENCY STUDY ON URBAN TRANSPORT IN BUJUMBURA



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jica Japan International Cooperation Agency

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 Burundi, the Government of Japan decided to conduct a study on “The Emergency Study on Urban Transport in Bujumbura” and entrusted to the study to the 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 officials concerned of the Government of Burundi and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that 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,
Deputy Vice President
Japan International Cooperation Agency

February 2008

Mr. Eiji HASHIMOTO,
Deputy 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 Japan International Cooperation 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.

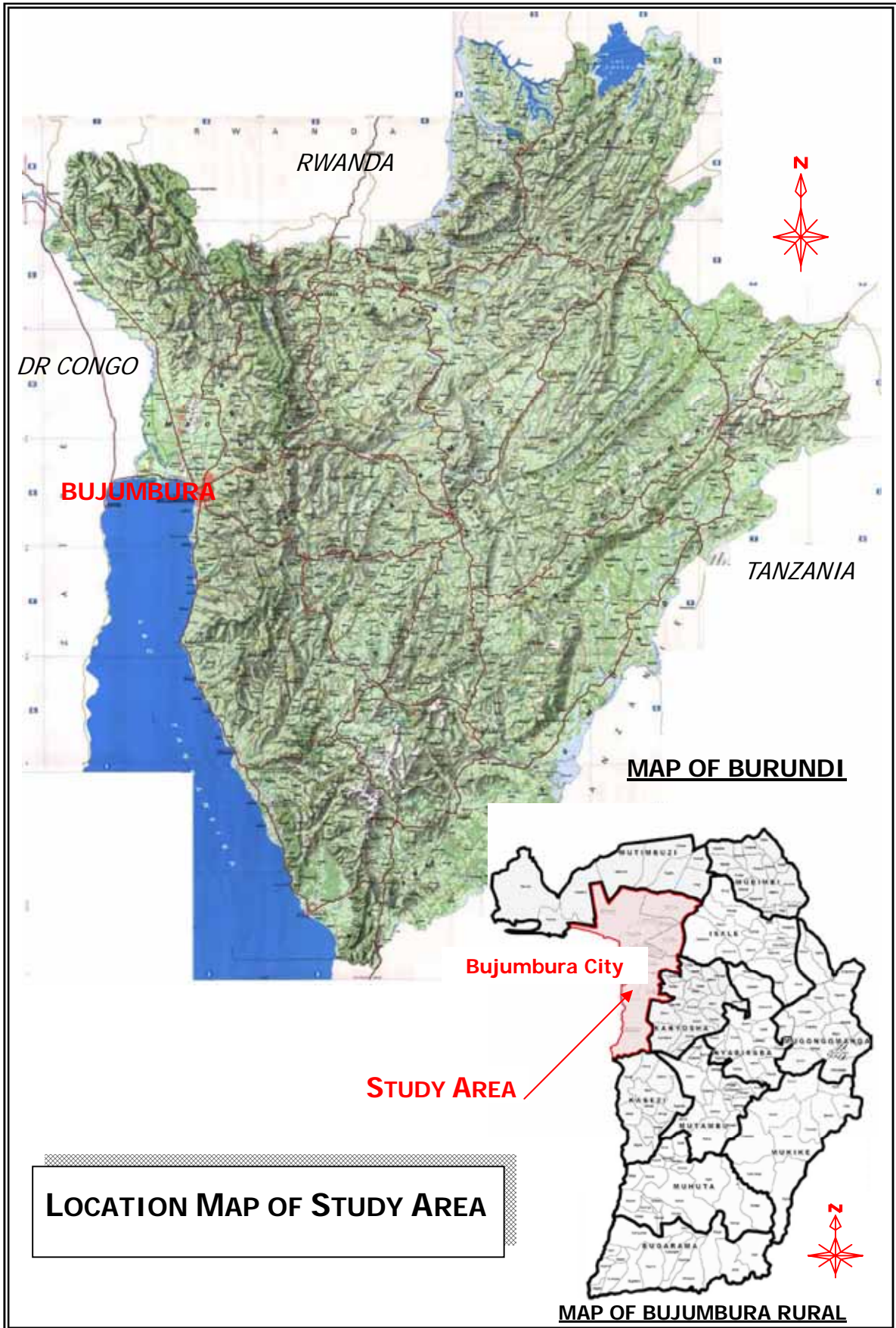
This report analyses the present and future conditions and demand of urban transport in Bujumbura. It comprehensively covers the issues of urban transport including road, public transport, traffic management, institution, legislation, financing and urban environment. The report established an urban transport Master Plan with the target year 2017. The Study concludes that the formulated master plans are feasible from technical, economical, environmental, social view points, and the implementation of the plan will contribute to the development of Bujumbura.

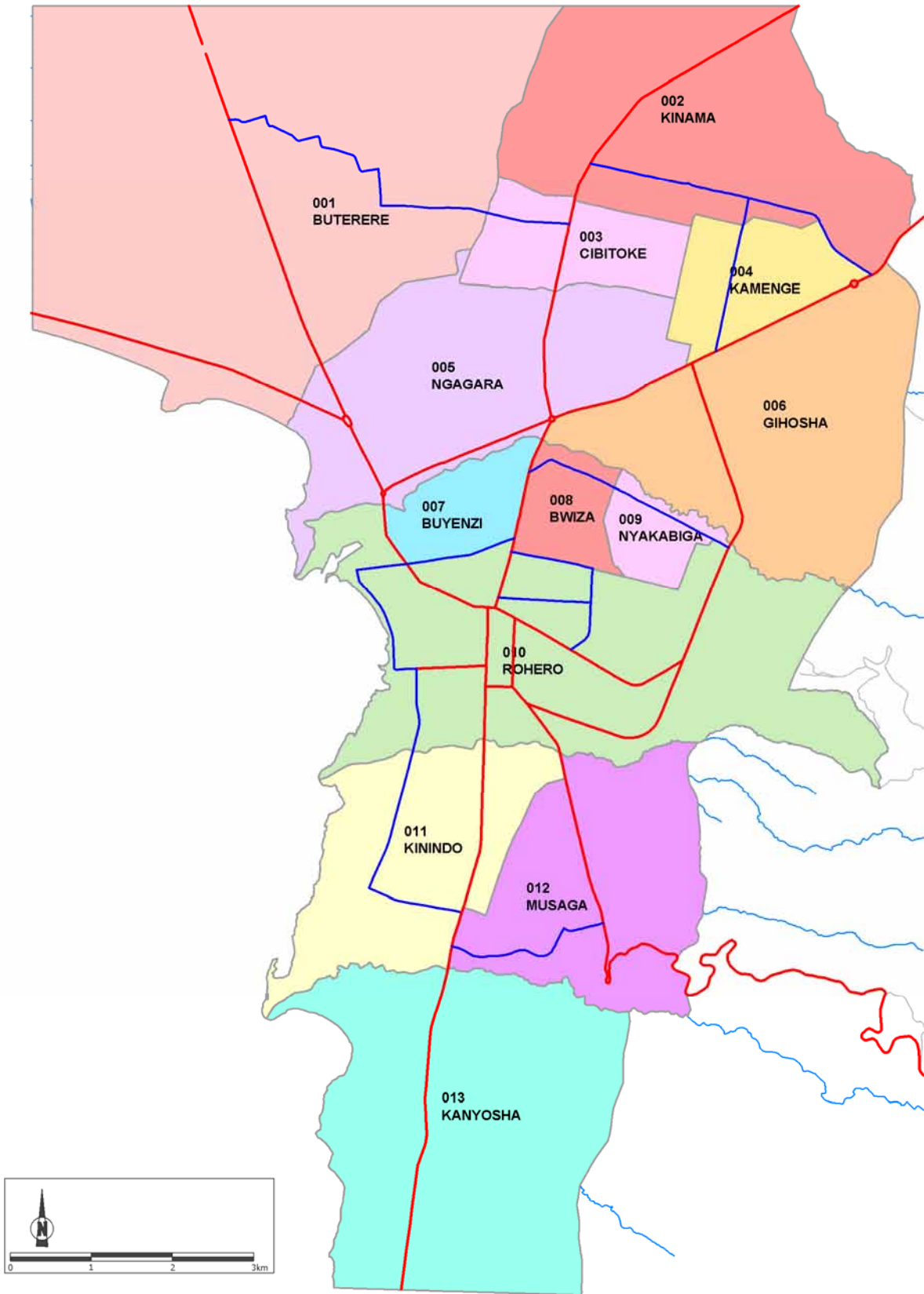
In view of urgency of the development of transport facilities in Bujumbura and socioeconomic development of the Republic of Burundi, we recommend that the Government of Burundi implement the prioritized projects in the Study.

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 Equipment 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





**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	<ol style="list-style-type: none"> 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 (<i>Office des Transports en Commun</i>). 3. To perform urgent rehabilitation work as a pilot project.
1. THE STUDY AREA	<ul style="list-style-type: none"> · 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	<ol style="list-style-type: none"> 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	<p>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.</p> <p>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.</p> <p>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.</p> <p>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 of 47.7 FBu, BCR of 1.60 and EIRR of 16.7%, eventually.</p> <p>The technical support to OTRACO was conducted in order to improve its capacity on O&M, and it was successfully completed.</p> <p>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 planned to be at middle of March 2008.</p>
4. CONCLUSION AND RECOMMENDATION	<ul style="list-style-type: none"> · 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: <ul style="list-style-type: none"> ■ Authorization of the plans as one of national development plan of Burundi ■ Clarification of executive organization for the plans ■ Establishment of management plans <ul style="list-style-type: none"> - 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. INTRODUCTION

(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

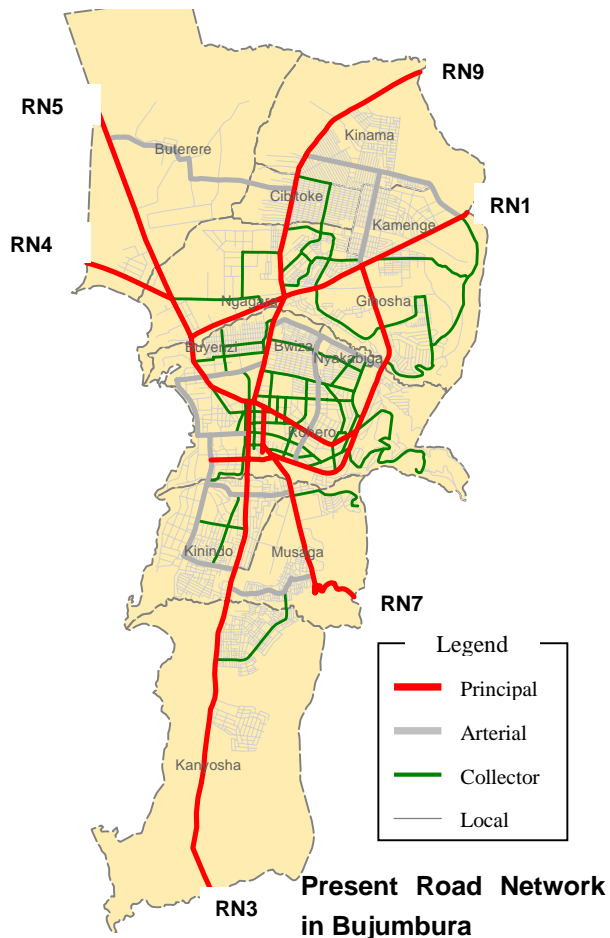
Bujumbura city is located between mountain land on the eastern side and Lake Tanganyika on the west, and the city area spreads out about 4km wide in the direction of north-south. Rohero Commune is the administrative and business, commercial center of the city.

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

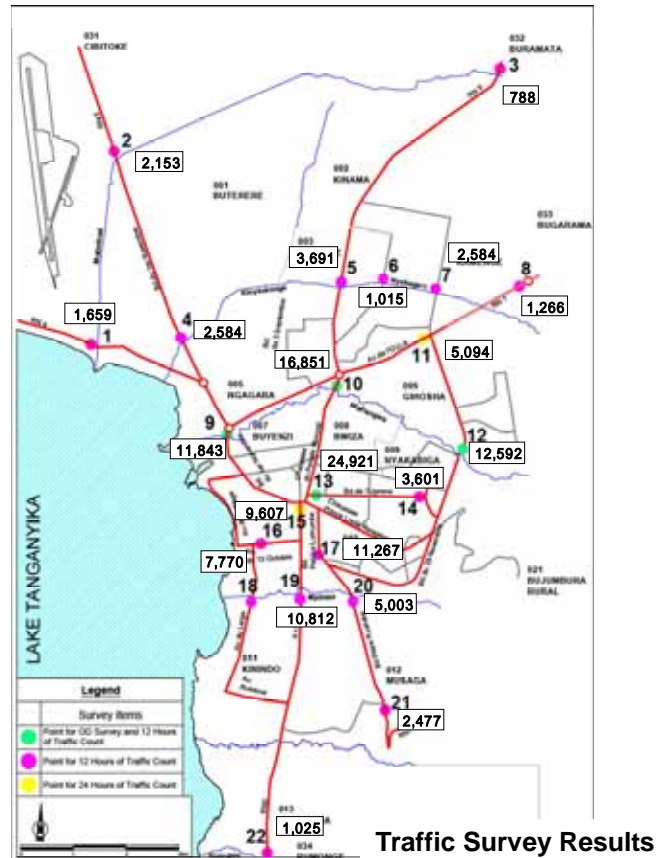
Network

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



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,

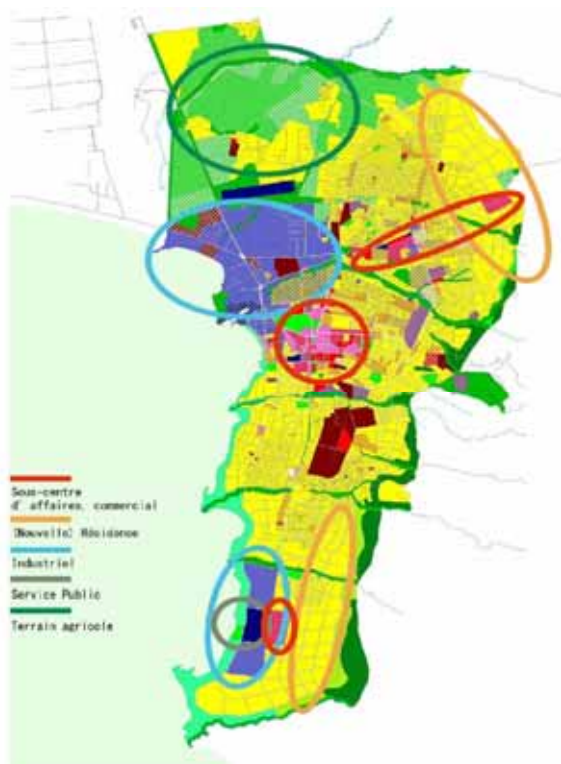
secondary and tertiary industry.

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

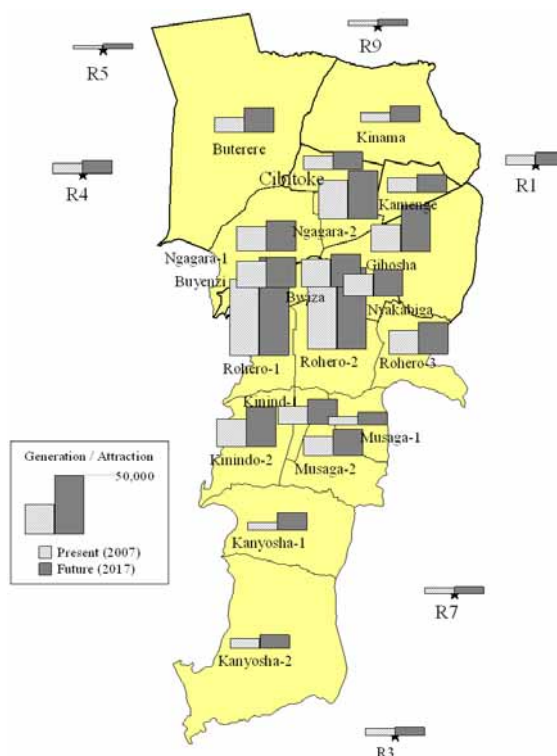
5. FUTURE TRAFFIC DEMAND

(1) Vehicle Trip Generation and Attraction

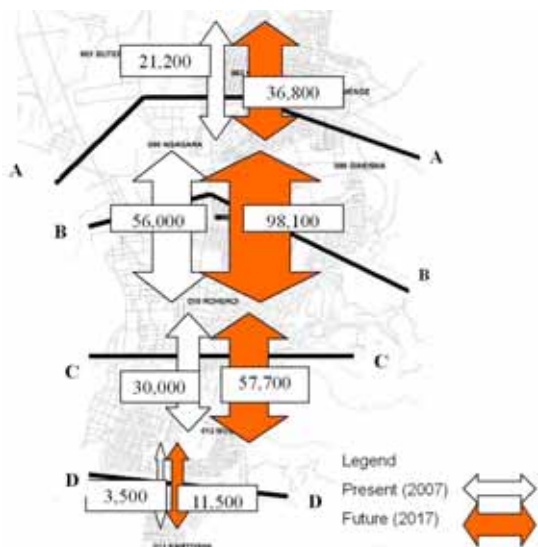
Based on the trip generation model in which number of trips are function of zonal population, total vehicle trips generating/attracting in the study area are estimated 278,000 in 2007 and 454,000 in 2017. Due to the difference in population increase, rate of increase in traffic generation by each zone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

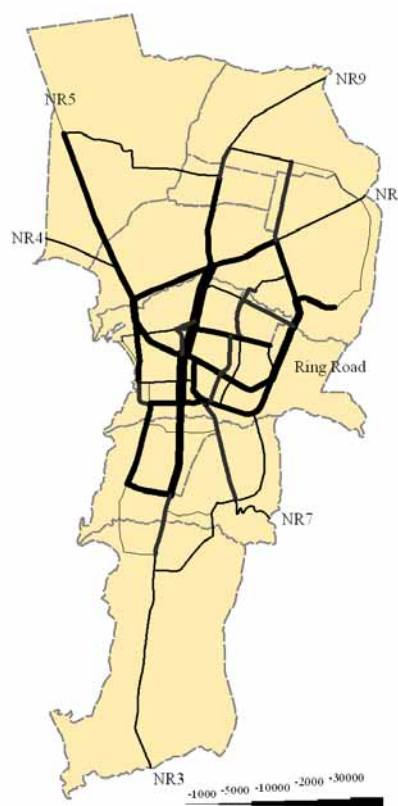


Vehicle Trip by Zone in 2007 to 2017



Comparison of Traffic Volume at Screen Line
Increase Rate at Screen Lines

Screen Line	Traffic Demand		Rate of increase (times)
	2007	2017	
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

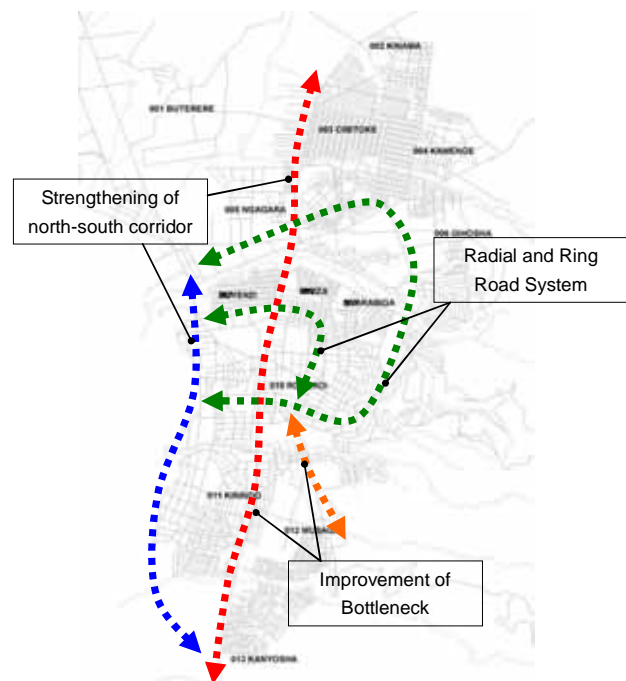
The Road Development Policies are established as follows;

- 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

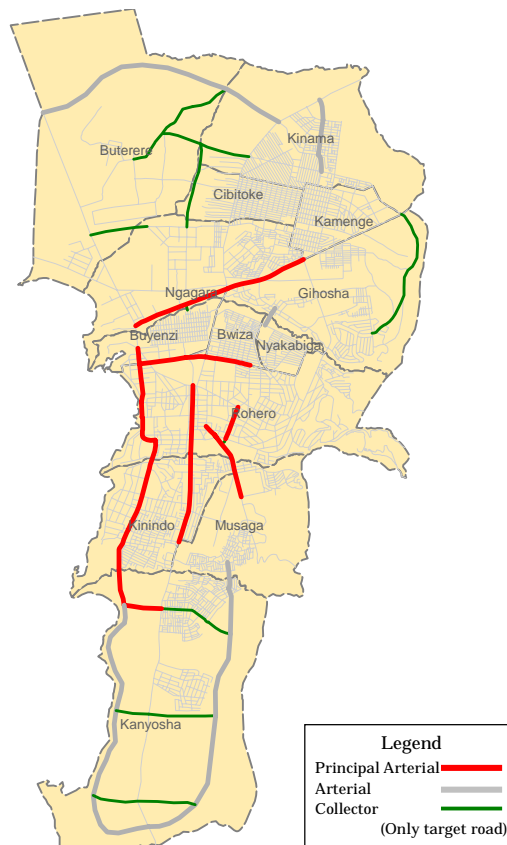
As a part of adopting rational traffic operation, regulation of one-way traffic in the CBD shall be introduced.

(6) Preliminary Cost Estimate

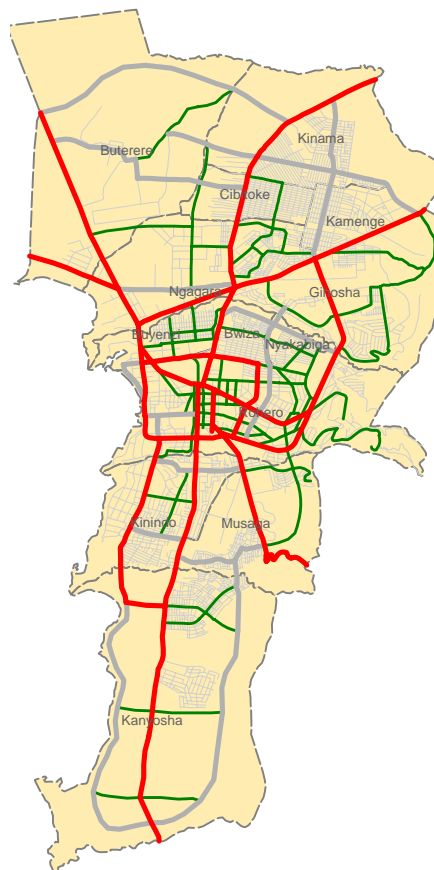
Primary cast estimate is made for above-mentioned programs; the result of it is as shown in following table:

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

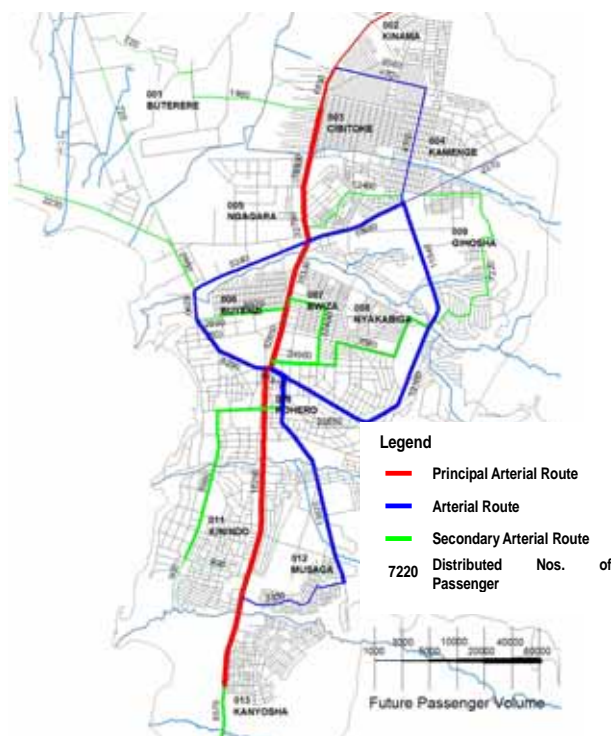
	Road Classification			
	Principal Arterial	Principal	Collector	Local
Design Speed (km/h)	80	60	50 or 40	30 or 20
Design Traffic (pcu/day)	- 10,000	10,000 - 4,000	4,000 - 500	500 -
Road Reserve (minimum)	38.0 (4 lane) 27.0 (2 lane)	23.5	20.0	12.5
Lane Width (m)	33.0 (4 lane) 22.0 (2 lane)	19.5	16.0	10.5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

- 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 2017

(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 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

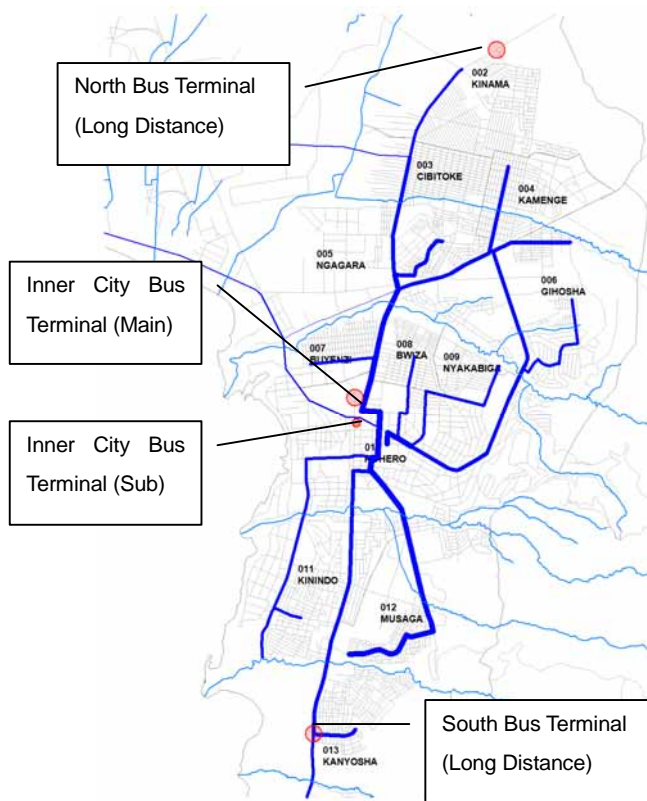
North Terminal: Carama in Kinama commune along RN9

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

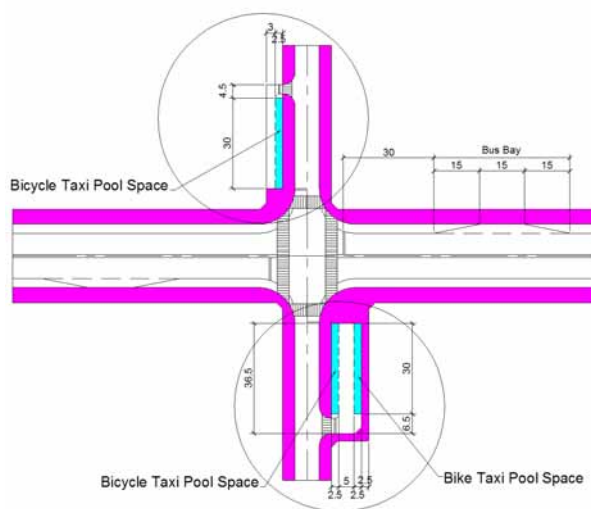
(4) Other Public Transport

(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

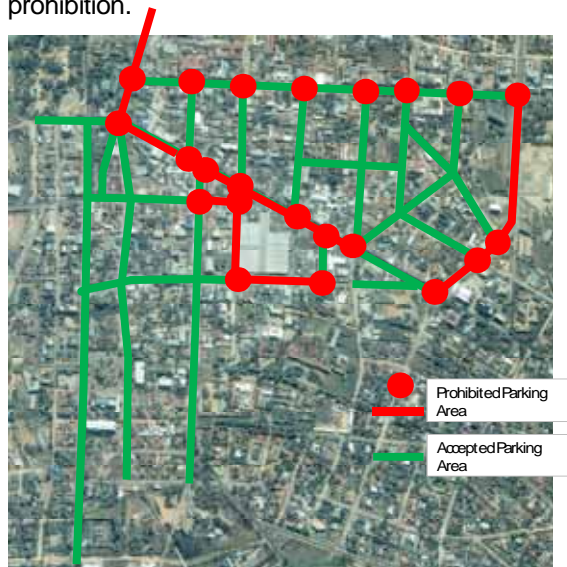


- Arrangements of Regulation and Domestic Rule
- Legal prohibition of stopping and parking in specific areas (Especially in central area)

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 phasing is introduced and the projects shall be divided into the terms depending on importance and urgency of the project.

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

Road Development and Public Transport Improvement Implementation Schedule

(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

Project	Length (km)	Cost (mil.Fbu)	Year													
			8	9	10	11	12	13	14	15	16	17				
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	2,115	2,115	2,115	2,115
Ring Road	6.9	17,229								4,307	4,307	4,307	4,307	4,307	4,307	4,307
Widening of NR-7	2.0	5,544								1,386	1,386	1,386	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	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	9,977	9,977	9,977
Sub Total		230,098		7,272	8,787	12,471	24,910	25,523	28,018	32,900	29,940	29,940	29,940	30,337	30,337	30,337
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	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.

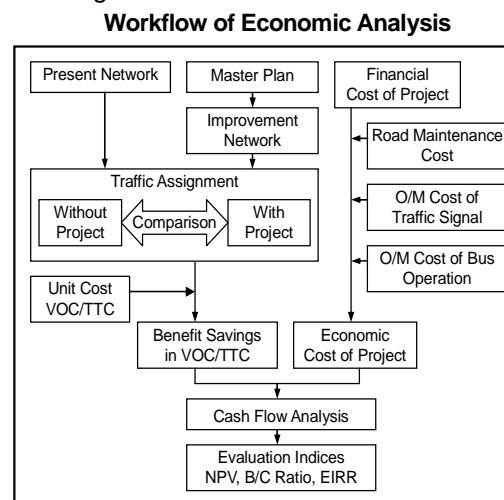
- Road Improvement Plan:
 - Development of North-South Axis
 - Development of Ring Road
 - Development of City Plan Roads in Northern Area
 - Development of City Plan Roads in - Southern Area
 - Traffic Flow Control
- Public Transport Plan:
 - - Bus Network Improvement Plan
 - - Bus Terminal Development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



(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
ASSHTO	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
IRR	Internal Rate of Return
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

THE EMERGENCY STUDY ON URBAN TRANSPORT IN BUJUMBURA

FINAL REPORT

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CHAPTER 1

INTRODUCTION

CHAPTER 1 INTRODUCTION

1-1 BACKGROUND

REPUBLIC OF BURUNDI attained its independence from Belgium in 1962 and since then most of its development works have been centered in the capital, Bujumbura, and in Gitega. Following the Structural Adjustment Loan (SAL) from the World Bank and the International Monetary Fund (IMF) in the 1980s, the national growth has been started primarily in the agricultural and other economic sectors. 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 moreover, 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, 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 548,000, 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.

and improvement of the urban traffic conditions.

1-2 OBJECTIVE OF THE STUDY

The objectives of the Study are:

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

1-3 STUDY AREA

The Study Area covers the entire city of Bujumbura as shown in the Location Map at the beginning of this Final Report.

1-4 SCOPE OF STUDY

In order to achieve the objectives mentioned above, the Study covers the following items:

A. Review and Analysis of Present Situation

- A-1 to review existing laws, regulations, policies and institutional arrangements related to urban transport;
- A-2 to review past studies, development plans, projects and traffic surveys related to road and urban transport;
- A-3 to review other existing data and information related to the Study;
- A-4 to conduct survey on community and formulate community profiles;
- A-5 to conduct additional traffic survey;
- A-6 to conduct inventory survey on roads and other road facilities; and
- A-7 to identify and analyze transport problems in the Study Area

B. Formulation of the Framework

- B-1 to set up future socio-economic framework up to the target year: 2017;
- B-2 to estimate future traffic demands; and
- B-3 to formulate basic policy for urban transport, including measures to improve the access of the poor

C. Formulation of the Urban Transport Plan

- C-1 to formulate basic community development plans;
- C-2 to formulate road development plans;
- C-3 to formulate public transport plans;
- C-4 to carry out environmental and social consideration study (IEE level); and

- C-5 to compare alternatives, estimate costs of the priority projects, conduct cost/benefit and financial analysis, and formulate implementation plan.
- D. Implementation of Technical Support in Bus Operation & Maintenance, and Management of the OTRACO
 - D-1 to formulate a bus operation plan;
 - D-2 to formulate plans for bus maintenance and bus/equipment repairing; and
 - D-3 to provide technical support to OTRACO for its self-management and bus/equipment repairing and maintenance
- E. Formulation and Implementation of Urgent Rehabilitation Works as a Pilot Project
- F. Overall Evaluation and Recommendations for urban transportation

1-5 STUDY FRAMEWORK

The Study is to be carried out in the following phases:

1-5-1 Methodology

(1) Examination of Study Implementation Planning

By organizing materials and information available in Japan, basic policy, methodology, study items and contents, implementing organization and schedule, etc. related with the implementation of the Study are being examined. The following data obtained from existing materials and homepages, etc. are being organized.

- National-level development plans, etc.
- Trend in assistance from each donor (especially the EU, Belgium and the World Bank, etc.)
- Socio-economic conditions (such as population, population composition, GDP, employment, revenue and expenditure, investment, trade, prices, poverty and living standards)

(2) Preparation of Inception Report

Basic policy, methodology and process of the Study were compiled in an inception report.

(3) Explanation of Inception Report and Establishment of Study Implementation System

The following items were coordinated with the GOB in order to ensure appropriate implementation.

- A steering committee was set up for the purpose of sharing and discussing the study contents with the GOB.
- A stakeholders meeting was organized for the purpose of public consultations with the major groups concerned affecting relative social and environmental matters that exceed the GOB position.
- Counterpart personnel (C/P) from the GOB have been arranged.

In addition, some discussions were held with the GOB with respect to the study implementation plan formulated as mentioned in the preceding paragraph and at that time the partial responsibility of the GOB was confirmed. In particular, as the concerning procedures are to be in accordance with the JICA Guidelines for Environmental and Social Considerations, special attention are being given to obtain sufficient understanding of the contents and schedule, and to work simultaneously toward creating a necessary system.

(4) Review of Existing Plans on Urban Development and Urban Transportation in Bujumbura and Survey on Current State in Bujumbura including Social and Living Conditions

Study and Analysis including the following items are being conducted.

- To grasp existing social and economic materials and current land usage, and to review transportation-related legislation and policy
- Review the interim poverty reduction strategy paper (I-PRSP), and existing and on-going planning and projects in the transport sector
- Grasping of socio-economic conditions in the commune units (hereinafter referred to as “community”)
- Road inventory survey
- Transport characteristics and traffic volume survey
- Transportation facilities (including the Port) of Bujumbura
- To collect information on the types of constraints and problems with the urban transport system
- Bus services, operation and maintenance, implementation system and capacity of OTRACO
- Private bus operators and licensing system

- Data on road maintenance
- Data on weather and natural conditions (such as rainfall, river flow conditions, topography and geographical features, earthquakes)
- Information on other donors
- Land ownership (ownership conditions, land market prices)
- Related environmental institutions (such as environmental legislation, organizations, standards and environmental assessment system)
- Confirmation of procurement conditions

(5) Preparation of Community Profiles

Community profiles are being prepared based on the findings of the following studies.

➤ Fact Finding Survey and Analysis

Present condition of public facilities and services in each community in Bujumbura, socio-economic infrastructure, community organizations and profiles (such as population, distribution of the poverty, occupations, incomes, family characteristics and family member), presence of internally displaced persons (IDPs) and needs related to improvement of living conditions

➤ Interview and Household Visiting Survey

General conditions were grasped by interviewing the concerned parties and conducting a survey by visiting of sampled households in the above-mentioned area.

(6) Survey of Traffic Volume

A simple survey of traffic volume was conducted in order to roughly grasp the current volume of traffic in the transport network.

(7) Setup of Socio-economic Framework of Land Usage Plan and Urban Transport Plan (Target Year: 2017)

A framework related to a land usage plan and an urban transport plan (including a road maintenance plan) will be formulated.

- Establishment of a socio-economic framework (such as population, economy, employment, poverty level, income, number of persons attending schools, and living environment)

- Examination of estimated traffic demand
- Establishment of basic policy on a land usage plan and an urban transport plan

(8) Review of existing Land Usage Plan and Formulation of Future Land Usage Plan

- Identify the potentials, constraints and problems lies with the development in Bujumbura based on the fact finding analysis described in above 4) and 5),
- Re-arrangement of potentials, constraints and problems that lies with the development in Bujumbura
- Review of the existing land usage plan
- Formulation of a future land usage plan

Based on above, the course of future development in Bujumbura will be illustrated and a land usage plan will be formulated.

(9) Formulation of Urban Transport Plan and Road Maintenance Plan

An urban transport plan will be formulated through the following procedures. Urban transport facilities contributing to improvement in accessibility for the poor, development of communities and revitalization of regional economy will also be examined.

- Formulation of an urban transport plan
- Formulation of a road maintenance plan
- Formulation of a plan for other related facilities
- Implementation of an economic analysis and financial analysis
- Preparation of a work plan
- Examination of an implementing organization

(10) Environmental and Social Consideration

Special effort will be given to access the appropriate environmental and social considerations in accordance with the JICA Guidelines for Environmental and Social Consideration.

(11) Selection of Urgent Rehabilitation Work

The contents of the urgent rehabilitation work to be implemented in the Study will be

decided through discussions with the GOB.

The rehabilitation work for implementation will be selected from the following items.

- Priority road rehabilitation
- Improvement of intersections
- Improvement of bus terminal

(12) Formulation of Plan Related to Urgent Rehabilitation Work and Tender Preparation

➤ Planning for Urgent Rehabilitation Work

In due consideration of (11) mentioned above, the scale and contents of urgent rehabilitation work will be examined in a flexible manner in accordance with the budget and other related conditions

➤ Design

Based on the planning results, the design of the urgent rehabilitation work will be carried out.

➤ Formulation of the Construction Plan and Estimation of the Project Cost

The construction plan will be established to estimate the cost for the Project. In particular, extra attentions will be given on the transportation cost of materials and equipments.

➤ Preparation of the Tender Documents

Tender documents shall be prepared in accordance with the JICA Guideline.

(13) Supervisory Service for the Urgent Rehabilitation Work

➤ Tender and Selection of Contractors

The Tender for the Project shall be carried out, following the methodology to be established by the JICA Study Team (JST). In the Tender, the JST may call not only the local Contractors but also the international Contractors to participate.

The Selection of the Contractor will be carried out by the JST from various aspects such as amount of quotation, company's experience, qualifications and experiences of the Engineers to be appointed, and proposed construction plan.

➤ Supervisory Service for the Project

The Project will be implemented under the supervision of the Engineer(s) assigned by the JST. The progress and test results shall be reported in time to JICA and relevant authorities of the GOB.

(14) Formulation of Bus Operation Plan and Vehicle & Equipment Maintenance Plan

- Bus operation system and methodology by the OTRACO has been collected.
- Bus maintenance plan has already been checked by the JST expert.
- Assessment of staff's ability and Inventory of maintenance gear are being carried out.
- Goals to be reached for vehicle and equipment maintenance will be established.
- Vehicle and equipment maintenance plan will be established.
- New Bus operation plan will be established.

(15) Technical Support for Bus and Equipment Maintenance

- Technical support plan and its text for Bus and Equipment Maintenance will be prepared and introduced.

(16) Conclusion and Recommendations

Conclusions and recommendations including necessary notes for the proposed project for future, based on the overall results of the Study, will be presented. There will also be some feedbacks from the study process in the conclusion and the recommendation.

(17) Preparation of Draft Final Report

Aforementioned data, analysis, planning, conclusion and recommendation will be presented in the Draft Final Report in both in English and French.

(18) Explanation of the Draft Final Report

The explanation and discussion to the Draft Final Report will be held in Bujumbura.

(19) Preparation of Final Report

With consideration of the explanation and discussion, the Final Report will be prepared as the result of the Study. The Final Report shall be submitted to the JICA and delivered to the C/P in Burundi through the official channel.

(20) Conclusion of the Urgent Rehabilitation Work

1-6 STUDY ORGANIZATION

The Study is being carried out jointly by the JICA Study Team, which comprises the members of Japan Engineering Consultants Co., Ltd. in association with Yachiyo Engineering Co., Ltd., the Japan International Cooperation Agency (JICA) and the counterparts organized by the GOB, namely Ministry of Transport, Posts and Telecommunications (hereinafter referred to as “MTPT”), Ministry of Public Works and Equipment (hereinafter referred to as “MPWE”), OTRACO (*Office des Transports en Commun*) and Bujumbura City Council. Moreover, for the duration of the whole Study-period, a Steering Committee has been set up.

The study organization among these institutions is shown in Fig 1.6.1.

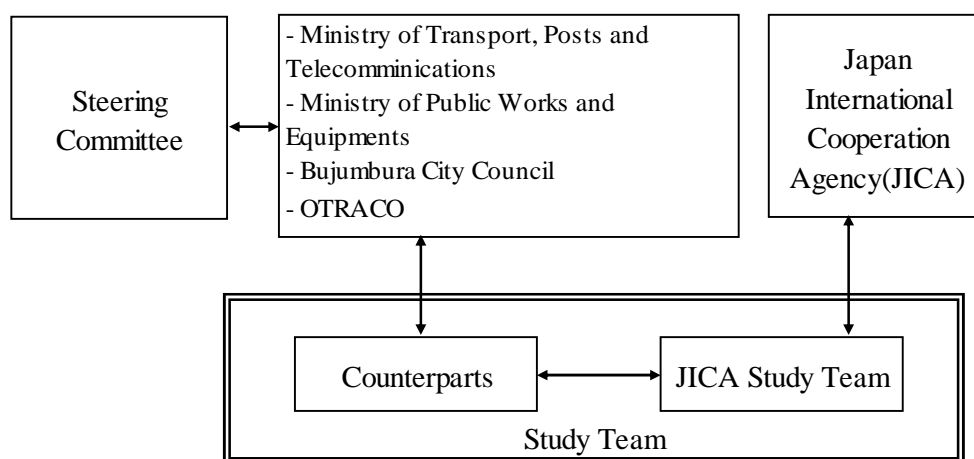


Figure 1.6.1 Study Organization

The members of the GOB(Government of Burundi) counterpart, Steering Committee and JICA Study Team are as shown below.

(1) Members of Steering Committee

Mr. Vital NARAKWIYE	Chairman for Steering Committee, General Director, MTPT
Mr. Didace BIRABISHA	Head of Cabinet, MPWE
Mr. Alphonse BAZONYICA	Director in charge of Asia and Oceania, MOFA
Mr. Jean Pierre MANIRAKIZA	General Director, OTRACO(after August 2007)
Col. Melino HAMENYIMANA	General Director, OTRACO(before August 2007)
Mr. John NDIKUMWAMI	Technical Adviser, Road Department, MTPE
Ms. Jeannette BUDURI	General Secretary, Bujumbura City Council

(2) Members of Counterparts Team

Mr. Vital NARAKWIYE	Chairman of Steering Committee, General Director, MTPT
Mr. Gervais NIYONGABO	Technical Adviser, MPWE

Mr. Edouard NYANDWI	Transport Director, MTPT
Mr. Gregoire KABUNDA	Adviser of General Director, MTPT
Mr. Appolinaire NZEYIRAWA	Technical Adviser, Bujumbura City Council
Mr. Stausles NDAYIBANGUTSE	Head of Operation Service, OTRACO
Mr. Xavier MWANO	Head of Garage, OTRACO
Mr. Nicodeme RUKUKI	Deputy Head of Garage, OTRACO
Mr. John NDIKUMWAMI	Technical Adviser, Road Department, MTPT
Mr. Daniel NDIKUNANA	Head of Environment and Standard Service
Mr. Salvador NDABIRORERE	Environmental Technical Adviser, Ministry of Land Management Environment and Tourism

(3) Member of JICA Study Team

Mr. Yasushi OHWAKI	Team Leader/Urban Development Plan (1)
Mr. Hiroaki TAKAHASHI	Sub Team Leader/Urban Transport Plan/Public Transport Plan
Mr. Kenichi HASHIMOTO	Urban Development Plan (2)
Mr. Takashi KADOTA	Urban Development Plan/Bus Operation Plan (2)
Mr. Masaaki UEDA	Socio-economic Analysis/Community-based Development Plan (1)
Mr. Yasuhiro YAMAUCHI	Socio-economic Analysis/Community-based Development Plan (2)
Mr. Koji UZAWA	Technical Support to OTRACO/Equipment Maintenance Adviser
Mr. Masanori TAKEISHI	Bus Maintenance Plan
Mr. Toshihiro HOTTA	Road Development Plan/Design
Mr. Nobuo YONEDA	Construction Supervision for Emergency Work Project
Mr. Kanji WATANABE	Environmental and Social Consideration (1)
Mr. Hironori KUROKI	Environmental and Social Consideration (2)
Mr. Shin ONODA	Cost Estimate
Mr. Yoshiaki NISHIKATSU	Procurement Plan
Mr. Tetsuro IZAWA	Bus Operation Plan (1)/Traffic Survey/Natural Conditions Survey
Mr. Atsushi ITO	Interpreter

CHAPTER 2

PRESENT CONDITION

OF

THE STUDY AREA

CHAPTER 2 PRESENT CONDITION OF THE STUDY AREA

2-1 NATURAL CONDITION

2-1-1 Location



Figure 2.1.1 Location Map for Bujumbura and Burundi

BUJUMBURA, the capital city of Burundi, lies at the north-eastern corner of Lake Tanganyika with an estimated population of 400,000. 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. Bujumbura is located at 3°22'34" South, 29°21'36" East (-3.3761111, 29.36).

2-1-2 Climate

Burundi has an equatorial climate and high plateau topography with considerable altitude variation (772m to 2,670m above sea level). Average annual temperature varies with altitude from 23 to 17 degrees centigrade but it is generally moderate at the average altitude of about

1,700m. Average annual rain fall is about 1,500mm; wet seasons from February to May and September to November, and dry seasons from June to August and December to January.

Table 2.1.1 Average Temperature Years on Record: 13

	YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul.	Aug	Sep	Oct	Nov	Dec
°C	25	25	25	24	25	25	24	24	25	25	25	24	24

Table 2.1.2 Average High Temperature Years on Record: 13

	YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul.	Aug	Sep	Oct	Nov	Dec
°C	27	26	27	26	27	27	27	27	27	28	27	26	26

Table 2.1.3 Average Low Temperature Years on Record: 13

	YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul.	Aug	Sep	Oct	Nov	Dec
°C	22	22	22	22	22	22	21	21	22	22	22	22	22

Table 2.1.4 Highest Recorded Temperature Years on Record: 13

	YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul.	Aug	Sep	Oct	Nov	Dec
°C	35	33	35	33	35	32	32	32	32	32	32	32	32

Table 2.1.5 Lowest Recorded Temperature Years on Record: 13

	YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul.	Aug	Sep	Oct	Nov	Dec
°C	12	15	16	16	17	17	13	12	12	16	13	16	15

Table 2.1.6 Average Numbers of Days above 29C Years on Record: 13

	YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul.	Aug	Sep	Oct	Nov	Dec
°C	87	4	7	6	7	7	6	5	10	13	12	5	4

Table 2.1.7 Average Numbers of Days below 23C Years on Record: 13

	YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul.	Aug	Sep	Oct	Nov	Dec
°C	274	23	21	25	24	24	22	24	22	22	21	23	23

Table 2.1.8 Average Numbers of Days below 18C Years on Record: 13

	YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul.	Aug	Sep	Oct	Nov	Dec
°C	35	1	1	1	1	2	7	9	5	4	2	1	1

Table 2.1.9 Average Precipitation Years on Record: 39

	YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul.	Aug	Sep	Oct	Nov	Dec
Cm	82	9	9	12	12	6	1	---	1	4	6	9	9

Table 2.1.10 Most Recorded Rainfall Years on Record: 39

	YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul.	Aug	Sep	Oct	Nov	Dec
mm	960	240	220	210	210	140	40	30	90	180	130	200	230

Table 2.1.11 Least Recorded Rainfall Years on Record: 39

	YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul.	Aug	Sep	Oct	Nov	Dec
mm	610	30	20	60	60	10	---	---	---	---	10	40	20

Table 2.1.12 Average Numbers of Days with Thunderstorms Years on Record: 12

	YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul.	Aug	Sep	Oct	Nov	Dec
Days	78	9	10	10	11	6	1	1	1	4	8	8	9

Table 2.1.13 Average Numbers of Days with Fog Years on Record: 12

	YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul.	Aug	Sep	Oct	Nov	Dec
Days	4	1	1	---	---	---	---	---	---	1	---	---	1

Table 2.1.14 Average Morning Relative Humidity Years on Record: 2

	YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul.	Aug	Sep	Oct	Nov	Dec
%	90	93	92	93	93	92	89	84	85	84	88	92	94

Table 2.1.15 Average Evening Relative Humidity Years on Record: 2

	YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul.	Aug	Sep	Oct	Nov	Dec
%	63	69	67	68	69	65	55	53	55	57	65	72	71

Table 2.1.16 Average Dew Point Years on Record: 5

	YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul.	Aug	Sep	Oct	Nov	Dec
°C	18	19	19	19	20	19	17	16	16	17	18	19	19

Table 2.1.17 Average Wind Speed Years on Record: 5

	YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul.	Aug	Sep	Oct	Nov	Dec
Km/h	19	16	17	17	17	19	20	22	22	20	20	19	17

2-1-3 Geology

Geologically, folded and slightly metamorphosed clastic sediments of the Mesopoterozoic Kibaran belt underlie most of Burundi. Rocks of this belt extended from the Democratic Republic of Congo through Burundi and Rwanda into northwest Tanzania and Uganda in an east–northeast direction. The Kibaran rocks are intruded by granites, and along 350km long ‘alignment’ a narrow zone mafic and ultramafic intrusion (Deblond and Tack 1999). The Kibaran is flanked in the eastern part of the country by Neoproterozoic shallow water sediments of the Malagazi Supergroup (Tack 1995) with basal conglomerates, schists, dolomitic limestones and lavas. Tertiary and Quaternary sediments fill parts of Western Rift at northern tip of Lake Tanganyika.

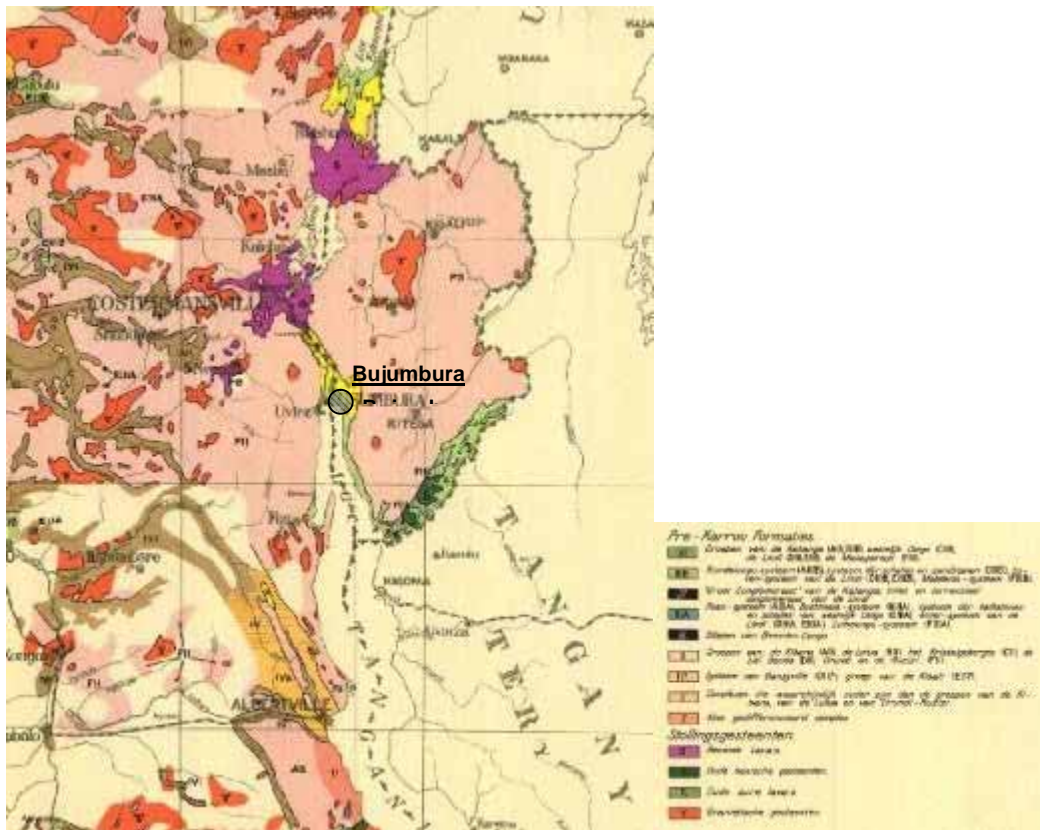


Figure 2.1.2 Geological Map

2-2 SOCIO-ECONOMIC CONDITION

2-2-1 Administrative System

(1) Relationship between Central Government and Bujumbura City

The central government consists of 21 ministries including the Secretary (Prime Minister's Office). Although most of ministries were established many years ago, three ministries such as Ministry of Good Governance, Ministry of National Solidarity, Human Rights and Gender, and Ministry in Charge of Fighting against Aids are comparatively newly established. Among the ministries, the Ministry of Interior and Public Security (MIPS) have the jurisdiction over the city office of Bujumbura.

However, the administration of Bujumbura city is managed by a completely different budget from the central government organization. Although a part of the central government's budget is provided by funds offered by international organizations or through some bilateral aid, the city office budget depends on the tax and duty which were collected from the citizens against various services. The Ministry of Public Works and Equipment is in charge of the infrastructure development and maintenance of the country including those of Bujumbura. The city office is providing the other administrative services for Bujumbura. Since the city office is not mandated in infrastructure development, the central government is having jurisdiction over the budget required for the infrastructure development in Bujumbura.

The budget of the central ministries in the fiscal year 2006 is shown in Table 2.2.1.

The budget consists of the ordinary budget (BO) and the special investment budget (BEI). Out of the whole budget of FBu 473.8 billion, the part for BO is FBu 322.9 billion (68%) and for BEI is FBu 150.8 billion (32%). The Ministry of Finance had the largest share to be 28.4% of the total budget, subsequently, the Ministry of Education and Culture and the Ministry of National Defence and Former Combatants had the second and third largest shares which are 17.1% and 15.4% respectively. These three ministries are accounted for about 60% of the whole budget. Many ministries and government offices are accounted for less than 5% of the total budget. The MIPS is accounted for 7.3% out of which 95% is BO for the policeman's personnel expenses (salary). On the contrary, the Ministry of Public Works and Equipment is accounted for 4.5% out of which 90% is BEI for the infrastructure development.

Table 2.2.1 State Budget FY2006

Ministères	Budget de Fonctionnement 2006 (FBU)	Part de chaque ministère dans le BO	BEI 2006 (FBU)	Part de chaque ministère dans le BEI	Total BO et BEI (FBU)	Part de chaque ministère dans le budget global
résidence de la République	4,152,551,161	1.3%	45,000,000	0.0%	4,197,551,161	0.9%
Secrétariat général du gouvernement	2,383,732,198	0.7%	5,000,000	0.0%	2,388,732,198	0.5%
Première vice présidence	548,776,953	0.2%	44,126,000	0.0%	592,902,953	0.1%
Deuxième vice présidence	671,274,065	0.2%	36,730,000	0.0%	708,004,065	0.1%
Assemblée nationale	3,842,900,305	1.2%	50,000,000	0.0%	3,892,900,305	0.8%
Sénat	1,902,384,690	0.6%	60,000,000	0.0%	1,962,384,690	0.4%
Cour des Comptes	508,505,760	0.2%	11,989,600	0.0%	520,495,360	0.1%
Ministère de la Planification du développement et de la Reconstruction	509,405,361	0.2%	9,598,643,125	6.4%	10,108,048,486	2.1%
Ministère des Relations Extérieures et de la coopération	9,177,091,969	2.8%	205,000,000	0.1%	9,382,091,969	2.0%
Ministère de la Défense Nationale et des anciens combattants	51,943,704,560	16.1%	20,850,003,001	13.8%	72,793,707,561	15.4%
Ministère de l'Intérieur et de la sécurité publique	32,890,812,136	10.2%	1,898,585,205	1.3%	34,789,397,341	7.3%
Ministère des finances	111,980,581,779	34.7%	22,405,085,352	14.9%	134,385,667,131	28.4%
Ministère de la justice et garde des sceaux	6,333,513,122	2.0%	389,188,250	0.3%	6,722,701,372	1.4%
Ministère de l'information, communication, relations avec le parlement et porte parole du Gouvernement	1,908,504,557	0.6%	111,000,000	0.1%	2,019,504,557	0.4%
Ministère Fonction Publique, du travail et de la sécurité sociale	3,783,036,683	1.2%	17,808,000	0.0%	3,800,844,683	0.8%
Ministère de la bonne gouvernance et de l'inspection générale de l'Etat et de la collectivité locale	473,580,310	0.1%		0.0%	473,580,310	0.1%

Ministère de l'Education Nationale	60,738,988,073	18.8%	20,207,714,136	13.4%	80,946,702,209	17.1%
Ministère à la présidence chargé de la lutte contre le SIDA	3,660,265,521	1.1%	15,598,523,407	10.3%	19,258,788,928	4.1%
Ministère de la Santé Publique	16,986,151,294	5.3%	2,666,460,000	1.8%	19,652,611,294	4.1%
Ministère de la solidarité nationale des droits de la persone humaine et du genre	1,710,010,644	0.5%	1,714,788,091	1.1%	3,424,798,735	0.7%
Ministère de la Jeunesse et des Sports	1,007,414,753	0.3%	245,407,297	0.2%	1,252,822,050	0.3%
Ministère de l'Agriculture et de l'Elevage	1,765,999,746	0.5%	23,710,108,671	15.7%	25,476,108,417	5.4%
Ministère du Commerce, de l'Industrie	374,995,948	0.1%	124,825,807	0.1%	499,821,755	0.1%
Ministère de l'Energie et des Mines	612,798,419	0.2%	10,773,000,000	7.1%	11,385,798,419	2.4%
Ministère des Transports, Postes et Télécommunications	533,117,511	0.2%	410,500,000	0.3%	943,617,511	0.2%
Ministère des Travaux Publics et de l'Equipement	1,887,644,294	0.6%	19,313,412,807	12.8%	21,201,057,101	4.5%
Ministère de l'Aménagement du Territoire, l'Environnement et du Tourisme	677,852,453	0.2%	332,576,990	0.2%	1,010,429,443	0.2%
Total	322,965,594,265	100.0%	21,201,475,739	100.0%	473,791,070,004	100.0%

Source: MOF

(2) Organization and Role of Bujumbura City Office

The organization chart of Bujumbura city office is shown in Figure 2.2.1. The total number of the personnel is 733 as of April, 2007. Head (officially called as “Administrator”) of a Commune, which in a city district, is elected through an election for a five-year term. On the other hand, the mayor is appointed by the President and his term of duty is fixed by the President. The city office service is divided into Cabinet, which has jurisdiction over 13 Communes, and General Secretary, which executes the administration services. The role of the Cabinet is coordinating and supervision of the communes related to the matters of politics and economics. The role of the Secretary General is management of 9 departments and taking charge of the technical aspects about administrative services other than politics.

The role of each department is as follows.

1) Administration Department (Staff number: 46 persons)

This department consists of three sections such as i) personnel affairs, ii) resident registration, and iii) issuance of ID cards. This department is performing various issues such as the coordination between the departments, preparation of taxpayers list, issuance of various kinds of certificates for tax and contribution collections (INSS), office registration, birth/death and marriage registration, etc. Financial fund of the city office is derived through collecting money from the citizens charged to issue various certificates. Moreover, the city office also charges the citizens for socio-cultural promotions, HIV campaign, aged persons’ protection, etc.

2) Technical Department (Staff number: 291 persons)

This department is in charge of the approval procedures concerning construction of houses and buildings, and mediation of disputes. In addition to those, it is also works for preparation and management of the memorial events likely a festival, and registration of a residence and sale of land etc. The number of the personnel is large because of involvement of too much work.

3) Imposition Tax Department (Staff number: 48 persons)

This department is in charge of management of a land acquisition and lease tax, etc. These Lease tax calculations are made and tax-payment documents are drawn up every year. It also carries out audit of these changes.

4) Revenue Department (Staff number:117 persons)

This department consists of three sections and is in charge of the collection of taxes about the commercial transactions such as a residence, a store and a market.

5) Budget Department (Staff number: 14 persons)

This department is in charge of accounting and logistics. It also involved in preparation of financial statements, payroll calculation, payment for fuel and vehicle repairing cost, etc., and procurement of stationery and office equipments etc.

6) Socio-Culture Department (Staff number: 24 persons)

This department is in charge of social welfare, sports and educational promotions. In addition to the above, SETEMU is under the city office as an auxiliary organization which is in charge of garbage collection and treatment.

7) Operation Budget of City Office

The city budget for the past 5 years is shown in the following table. The fiscal year is from 1st January to 31st December. The city budget depends upon the amount of money collected from the citizens against the provided city services. Thus, the citizens are charged by a fiscal year. The largest budget so far recorded is more than FBu1,800 million in the year 2006. The maximum expenditure track record is about FBu1,800 million in the year 2002. In addition, there is a plan to allot some budget to the communes according to the decentralization policy, but, it has not yet been started.

Table 2.2.2 Annual Budget and Actual Expenditure of Bujumbura City Office

Year	Budget (million FBu)	Actual Expenditure (million FBu)
2002	1,725	1,797
2003	1,574	1,364
2004	NA	1,256
2005	1,709	1,479
2006	1,858	1,794

Note: Prepared based on the information given by city office.

THE CURRENT CHART OF BUJUMBURA CITY COUNCIL

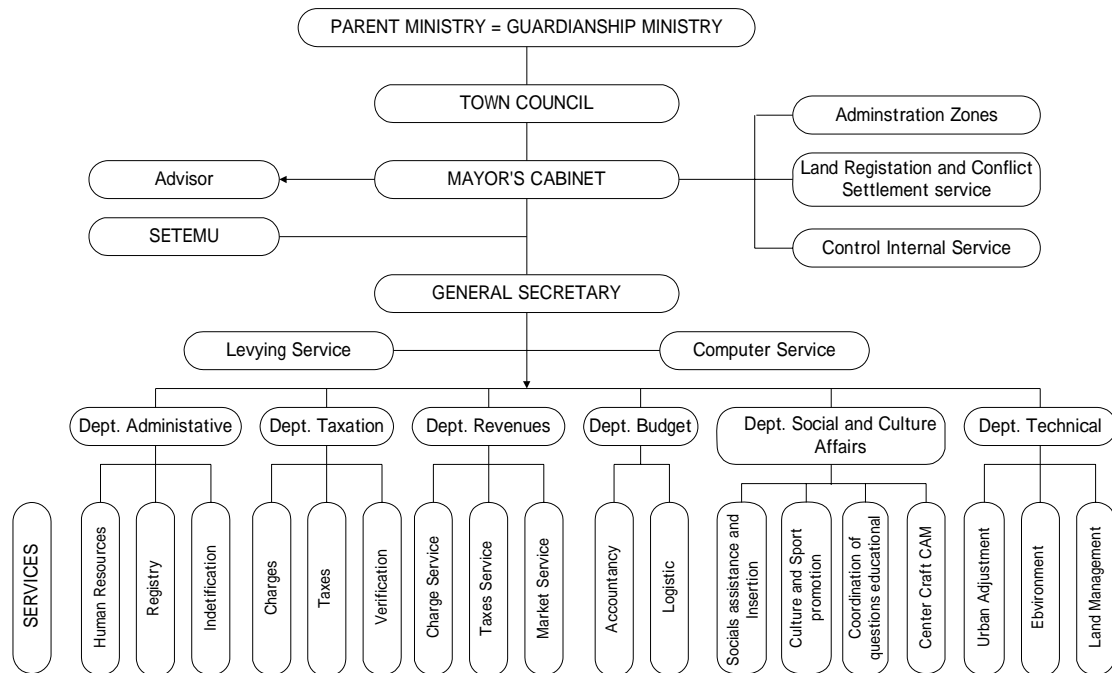


Figure 2.2.1 Organization Chart of Bujumbura City Office

2-2-2 Population

Since the last census of population conducted in 1991, investigation about the latest population of Bujumbura city has not been conducted. The existing statistical materials are also judged to be unreliable data.

The main existing statistical materials and the contents are as follows.

(1) Annuaire Statistique du Burundi 2003

The statistics about the population-by-sex of each year from 1991 to 2003 are indicated. It is a statistics in a classification according to nine communes as of 1991 in Bujumbura. It contains no statistics value statement about the four communes newly established by division or incorporated. Moreover, there is no big difference in the population growth rates between each commune, and so it is judged to be an estimated value.

(2) Donor reports

Although UNFPA, EU, etc. have adopted an estimated value of 2.3% increase in population growth rate of the whole country, but they are not a statistics values based on any investigation. Moreover, statistics of the Bujumbura city are not investigated individually.

Although the population census of Bujumbura city will be carried out by the support from France in 2008, only 7 communes are targeted for investigation among the 13 existing communes.

Based on the present condition of the above existing statistical materials, it was judged that the demographic-statistics data of Bujumbura city based on real number investigation does not exist.

Therefore, through the cooperation obtained from the Bujumbura city office and each commune offices, an investigation on number of residents and number-of-households was conducted in February to March 2007. In that investigation, visit and listening comprehension investigation were conducted to each commune, and the numerical values acquired by hearing from the chiefs of cartier were totalled. Also re-visit investigation was conducted in April, 2007 at each commune office, and the numerical values were reconfirmed.

As a result, Bujumbura city was judged to have a population of about 547,760 by the end of

February, 2007 (Table 2.2.3). Henceforth, the plans in main enumeration and analytical work are based on this investigation result.

Table 2.2.3 Population Data in Bujumbura

	Commune	Manages	Population
1	BUTERERE	8,722	33,500
2	KINAMA	14,115	61,423
3	CIBITOKÉ	7,884	70,263
4	KAMENGE	8,605	42,068
5	NGAGARA	3,522	21,901
6	GIHOSHA	4,621	50,843
7	BUYENZI	12,528	47,413
8	BWIZA	6,931	37,763
9	NYAKABIGA	3,415	24,345
10	ROHERO	2,616	14,711
11	KININDO	3,450	22,097
12	MUSAGA	6,511	78,541
13	KANYOSHA	8,303	42,892
	Total	91,223	547,760

Source: JICA Study TEAM, 2007.02

2-2-3 Economy

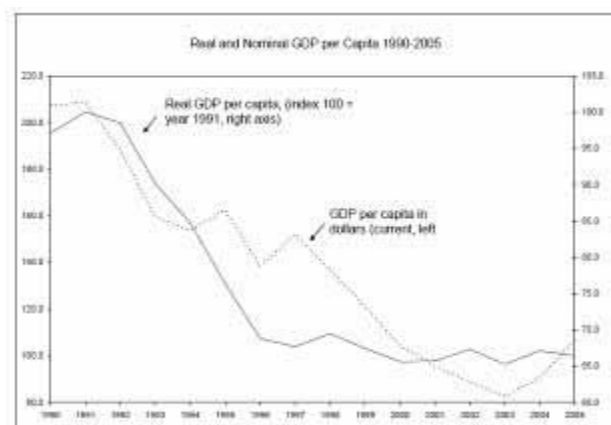
(1) Economic Trend

Burundi is one of the poorest countries in the world with a real GDP per capita about US\$100 as it was in 2003. Economic prospects were significantly affected by the civil conflict which was continued between 1993 and 2000; and during that the national capital stock was depreciated through 44%, the real GDP per capita fell through almost 27% (from US\$137 to US\$100), and by 2002 the number of poor citizen below the national poverty threshold increased from 35% to 68%.

During 1990–2005, the real income per capita fell through 35%; the internal tensions were not the only factors for the declination. The economy was also affected by public interventions, which led to significant inefficiencies, notably in the coffee sector.

The hardships due to the civil conflict, when about 700,000 people fled to the neighbouring countries and more than one million refugees were displaced from their houses within the country, almost doubled the percentage of people living below the poverty line (from 35% to 68%). As the consequence, Burundi has been ranked at a very lower position among the least developed countries (169 of 177 countries according to the 2005 Human Development Index, UNDP).

After signing the Arusha Agreement in 2000, the social security condition began to improve and the growths slowly resumed. GDP grew through a cumulative 11.4% during the years 2000–05, while GDP per capita became stable (+1.2 %) and inflation slowed remarkably (7.7% compared to an average of 30.3% over 1991–2000).



Sources: IMF Country Report No. 06/307, August 2006

Figure 2.2.2 Real and Nominal GDP per Capita

(2) Recent Economic Developments

Real GDP growth rate during 2001-05 was fluctuating between 4.8% and -1.2% (refer to Table 2.2.4). GDP at the current prices in 2005 was about FBU860 billions, and the agriculture sector was the dominating one for the economic growth and was accounted for the large share to absorb the labor force; however, its share declined from 40 % in 2001 to about 35 % in 2005. Agriculture, the primary sector, mostly deals with the food crops and this sector (mainly coffee) accounts for 90 % of the exports earnings of the country.

The Secondary sector is not largely dominated in GDP, but, this sector has been remarkably increased during 5 years from 2001 to 2005. A large share of this sector is contributed by the manufacturing, followed by the construction industry.

The Tertiary sector is accounted for about 30% of GDP, but public service has the majority share in this sector. The others such as transport and communications, commerce, and other services can not contribute to GDP (refer to Table 2.2.4 and 2.2.5).

The account in 2005 was US\$-84 million, but at the present, account excluding official transfers, is US\$-274.3 million. Trade balance in 2005 deficit was US\$-181.8 million against the imports of US\$-239 million (refer to Table 2.2.6).

The official exchange rate of Burundi franc (FBu) remained stabilized at about 3% between 2004 and 2005.

Table 2.2.4 Gross Domestic Product at Current Prices, 2001–05, Burundi

(In billions of Burundi francs)

	2001	2002	2003	2004	2005
	Estimates				
Primary sector	195.9	213.2	232.5	264.0	271.1
Food crops	151.0	152.8	168.3	191.1	220.7
Export crops	20.3	36.4	37.2	42.2	13.0
Livestock	19.3	18.8	21.0	23.8	29.0
Forestry	3.9	3.8	4.4	4.9	6.0
Fishing	1.4	1.3	1.7	1.9	2.3
Secondary sector	94.3	97.8	109.8	124.7	155.7
Manufacturing	43.5	44.2	49.2	55.9	68.7
Agricultural processing	4.5	4.6	5.4	6.1	7.3
Food industries	23.7	24.1	26.0	29.5	36.3
Textiles and leather products	4.7	4.8	5.7	6.4	8.0
Other industry	10.5	10.7	12.2	13.8	17.1
Handicrafts	22.1	23.3	26.0	29.6	36.2
Construction	23.1	24.3	28.0	31.8	41.7
Mining and energy	5.6	6.0	6.6	7.4	9.1
Tertiary sector	205.4	215.0	237.8	270.1	347.6
Public services	131.9	138.0	152.2	172.9	220.1
Transport and communications	27.7	29.0	32.2	36.6	46.9
Commerce	26.3	27.6	30.7	34.8	44.7
Other	19.5	20.4	22.7	25.8	35.9
GDP at factor cost	495.6	526.0	580.1	658.8	774.4
Growth rate (in percent)	8.8	6.1	10.3	13.6	17.6
Indirect taxes, net of subsidies	54.3	58.6	64.1	72.8	86.4
GDP at market prices	550.0	584.6	644.2	731.5	860.8
Growth rate (in percent)	7.6	6.3	10.2	13.6	17.7

Sources: IMF Country Report No. 06/307, August 2006

Table 2.2.5 Gross Domestic Product at Constant 1996 Prices, 2001–05, Burundi

(In billions of Burundi francs, unless otherwise indicated)

	2001	2002	2003	2004	2005
	Estimates				
Primary sector	141.3	152.6	141.2	146.0	136.8
Food crops	112.5	117.0	112.9	113.5	112.4
Export crops	10.6	16.9	9.0	12.3	3.3
Livestock	14.4	14.7	15.3	16.0	16.8
Forestry	2.9	2.9	3.0	3.1	3.3
Fishing	1.0	1.0	1.0	1.1	1.1
Secondary sector	36.2	37.0	39.9	43.2	46.4
Manufacturing	16.7	16.7	17.6	18.2	19.2
Agricultural processing	1.7	1.7	1.8	1.9	1.9
Food industries	9.1	9.1	9.6	10.0	10.6
Textiles and leather products	1.8	1.8	1.9	1.8	2.0
Other industry	4.0	4.1	4.3	4.5	4.8
Handicrafts	8.5	8.8	9.3	9.8	10.2
Construction	8.9	9.2	10.8	12.9	14.5
Mining and energy	2.2	2.3	2.2	2.4	2.5
Tertiary sector	78.9	81.3	85.4	90.4	98.5
Public services	50.7	52.2	55.1	58.2	63.5
Transport and communications	10.6	11.0	11.4	12.1	13.3
Commerce	10.1	10.4	10.9	11.5	12.7
Other services	7.5	7.7	8.0	8.6	9.0
GDP at factor cost	256.5	270.9	266.6	279.6	281.7
Growth rate (in percent)	2.8	5.6	-1.6	4.9	0.7
Indirect taxes	20.7	18.6	19.4	20.1	20.8
GDP at market prices	277.2	289.5	285.9	299.8	302.5
Growth rate (in percent)	2.0	4.4	-1.2	4.8	0.9

Sources: IMF Country Report No. 06/307, August 2006

Table 2.2.6 Balance of Payments, 2001-05, Burundi

	2001	2002	2003	2004	2005
	(In millions of U.S. dollars)				
Current account	-30.8	-22.3	-27.3	-54.0	-84.0
(excluding official transfers)	-98.8	-109.8	-125.6	-169.4	-274.3
Trade balance	-69.9	-76.2	-90.8	-101.1	-181.8
Exports, f.o.b.	38.5	31.0	37.5	47.9	57.2
Of which: coffee	19.7	16.7	22.9	29.4	40.5
Imports, f.o.b.	-108.4	-107.2	-128.3	-148.9	-239.0
Of which: petroleum products	-16.4	-15.9	-22.0	-26.5	-38.3
imports related to reconstruction effort	-45.7	-62.5	-77.5	-71.0	-90.7
Services (net)	-23.1	-25.3	-23.9	-60.6	-89.5
Credits	6.9	7.7	12.5	15.8	34.0
Debits	-30.0	-33.0	-36.4	-76.4	-123.6
Income (net)	-12.3	-13.7	-17.9	-18.1	-20.3
Of which: interest on public debt (including IMF charges)	-9.7	-11.7	-11.1	-9.9	-11.4
Current transfers (net)	74.6	93.0	105.2	125.9	207.6
Private (net)	6.5	5.5	7.0	10.5	17.3
Official (net)	68.1	87.5	98.2	115.4	190.3
Capital account	7.1	14.1	33.0	48.1	26.2
Of which: HIPC relief	0.0	0.0	0.0	0.0	7.4
Financial account	-4.0	-2.4	-12.4	6.7	66.6
Direct investment	0.0	0.0	0.0	10.0	15.0
Medium- and long-term official loans (net)	-13.1	-3.1	2.0	11.5	37.7
Disbursements	15.2	34.6	41.9	42.5	69.3
Project loans	8.8	14.6	21.0	42.5	43.1
Program loans	6.4	20.0	20.9	0.0	26.2
Amortization (excluding IMF)	-28.3	-37.7	-39.9	-31.0	-31.6
Other investment	9.1	0.7	-14.4	-14.7	13.9
Errors and omissions	-13.6	-7.2	-10.4	10.2	13.4
Overall balance	-41.3	-17.7	-17.1	11.1	22.1
Financing (- increase in assets)	41.3	17.7	17.1	-11.1	-22.1
Net change in official foreign reserves (- increase)	13.2	-5.7	-8.1	14.9	-31.0
Gross official reserves	19.5	-36.3	-7.2	0.1	-45.5
Liabilities to IMF, net	-4.6	10.7	15.5	12.4	19.3
Other, net	-1.7	20.0	-16.5	2.4	-4.9
Other reserves, net	8.8	4.3	5.4	25.5	-9.9
Change in arrears (+ increase)	28.2	23.4	-1.9	-106.1	-22.2
Exceptional financing 2/	0.0	0.0	27.1	80.1	31.1
	(In percent of GDP, unless otherwise indicated)				
Memorandum items:					
Trade balance	-10.6	-12.1	-15.3	-15.2	-22.7
Current account	-4.6	-3.5	-4.6	-8.1	-10.5
Of which: excluding current official transfers	-14.9	-17.5	-21.1	-25.5	-34.3
Gross official reserves					
In million of U.S. dollars	23.8	60.1	67.3	67.2	112.7
In months of imports, c.i.f.	2.3	5.8	5.4	4.8	5.2
Total external debt	162.0	181.6	224.6	208.0	189.3
In months of following period's imports of goods and services	2.0	4.4	3.6	2.2	2.9
Imports					
Growth rate	0.5	-1.1	19.7	16.1	60.5
In percent of GDP	16.4	17.1	21.6	22.4	29.9
Exports					
Growth rate	-21.2	-19.5	21.0	27.5	19.5
In percent of GDP	5.8	4.9	6.3	7.2	7.1
Debt-service ratio (in percent of exports of goods and services)					
Scheduled current maturities (including IMF)	93.4	134.1	101.8	109.2	47.1
Actual debt service (including IMF, after HIPC)	—	—	—	—	27.1
Exchange rate (Burundi francs per U.S. dollar, period average)	830.4	930.7	1,082.6	1,100.9	1,075.3
Nominal GDP (in millions of U.S. dollars)	662.3	628.1	595.0	664.5	800.5

Sources: IMF Country Report No. 06/307, August 2006

2-2-4 Land Use

(1) Preparation of land use drawing

1) Preparation of a base map

The base map was prepared using the following existing data shown in table 2.2.7.

Although the map was created by overlay of two or more data, adjustment by survey was omitted. For this reason, the base map contains an error.

Table 2.2.7 Data for base map

Name	Data publisher (provider)	Product year	Remarks
Carte de la Ville de Bujumbura	UN Burundi	2006.01	For preparation of base map, it follows distance, a scale, etc. as reference.
Plan Guide, Thematique et Historique de Bujumbura	Sylvestre Ndayi rukiye	2001	It was used as auxiliary data of land use and institutions' location.
Iconos picture	Geo Eye	2006.3.27	It was used for the check of land use and the site border
Google Earth Picture	Google (Web)	Around 2007	I was used for the land use check of a southern area where it lacks Iconos picture.
SRTM (Shuttle Radar Topography Mission)	NASA	N/A	Altitude data based on a 90m mesh

2) Land use classification

The drawing classifies land use in Bujumbura city in categories as shown in figure 2.2.8 referring the actual condition of sites.

In addition, the marks or names of facilities shown on the referential maps; were surveyed by actual field site visit to check the current situation of the land use. However, because of the difficulties of checking on the map, the small facilities such as school or health centre etc., some differences from the actual land use have been observed which are not reflected in the classification.

Table 2.2.8 Land use classification

1. Residence	4. Education / Culture	7. Agriculture
1.1 Residential	4.1 University	7.1 Rice Field
1.2 Higher Education	5. Industrial	7.2 Other Agricultural Use
1.3 School	5.1 Industrial	8. Green Space
1.4 Culture	5.2 Infrastructure / Service	8.1 Park
1.5 Hospital	5.3 Transport / Cargo service	8.2 River Bank Green
2. Commercial / Business	6. Mix Use	8.3 Mountain Green
2.1 Commercial / Business	6.1 Residential / Commercial	8.4 Open Green Space
2.2 District Center	6.2 Residential / Industry	8.5 Recreational Green
3. Institutional Use	6.3 Commercial / Institutional	9. Others
3.1 Presidential		9.1 Vacant Land
3.2 Government		9.2 Others
3.3 Burundi Military		
3.4 Foreign Military		

(2) Present condition of land use

1) Overall urban structure

The current land use of the entire Bujumbura city is shown in figure 2.2.3 and the ratio of the land use categorically is shown in table 2.2.9. Also details data calculated on each commune is shown in tables 2.2.10 & 2.2.11.

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 center of this historical city. Many Governmental agencies and commercial establishments are located in this area. There is also an industrial area around the harbour in the northern area of the city 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.

Table 2.2.9 Current land use in Bujumbura (whole city, 2007)

Land use Category	Surface (ha)	Ratio (%)	Land use Category	Surface (ha)	Ratio (%)
1. Residence	2,795.1	25.45	6. Mix Use	312.6	2.85
1.1 Residential	2,474.8	22.53	6.1 Residential / Commercial	170.0	1.55
1.2 Higher Education	80.2	0.73	6.2 Residential / Industry	95.5	0.87
1.3 School	167.8	1.53	6.3 Commercial / Institutional	47.1	0.43
1.4 Culture	10.7	0.10	7. Agriculture	2,734.0	24.89
1.5 Hospital	61.7	0.56	7.1 Rice Field	897.9	8.17
2. Commercial/ Business	111.4	1.01	7.2 Other Agricultural Use	1,836.1	16.71
2.1 Commercial / Business	97.5	0.89	8. Green Space	2,486.4	22.63
2.2 District Center	13.9	0.13	8.1 Park	85.7	0.78
3. Institutional Use	415.9	3.79	8.2 River Bank Green	429.4	3.91
3.1 Presidential	15.8	0.14	8.3 Mountain Green	85.4	0.78
3.2 Government	88.0	0.80	8.4 Open Green Space	1,755.4	15.98
3.3 Burundi Military	245.0	2.23	8.5 Recreational Green	130.5	1.19
3.4 Foreign Military	67.1	0.61	9. Others	544.6	4.96
4. Education / Culture	111.3	1.01	9.1 Vacant Land	541.4	4.93
4.1 University	111.3	1.01	9.2 Others	3.2	0.03
5. Industrial	599.2	5.45			
5.1 Industrial	506.2	4.61	River / water surface	60.5	0.55
5.2 Infrastructure / Service	53.8	0.49	Road	874.2	7.96
5.3 Transport / Cargo service	39.3	0.36	Total	10,984.6	100.00

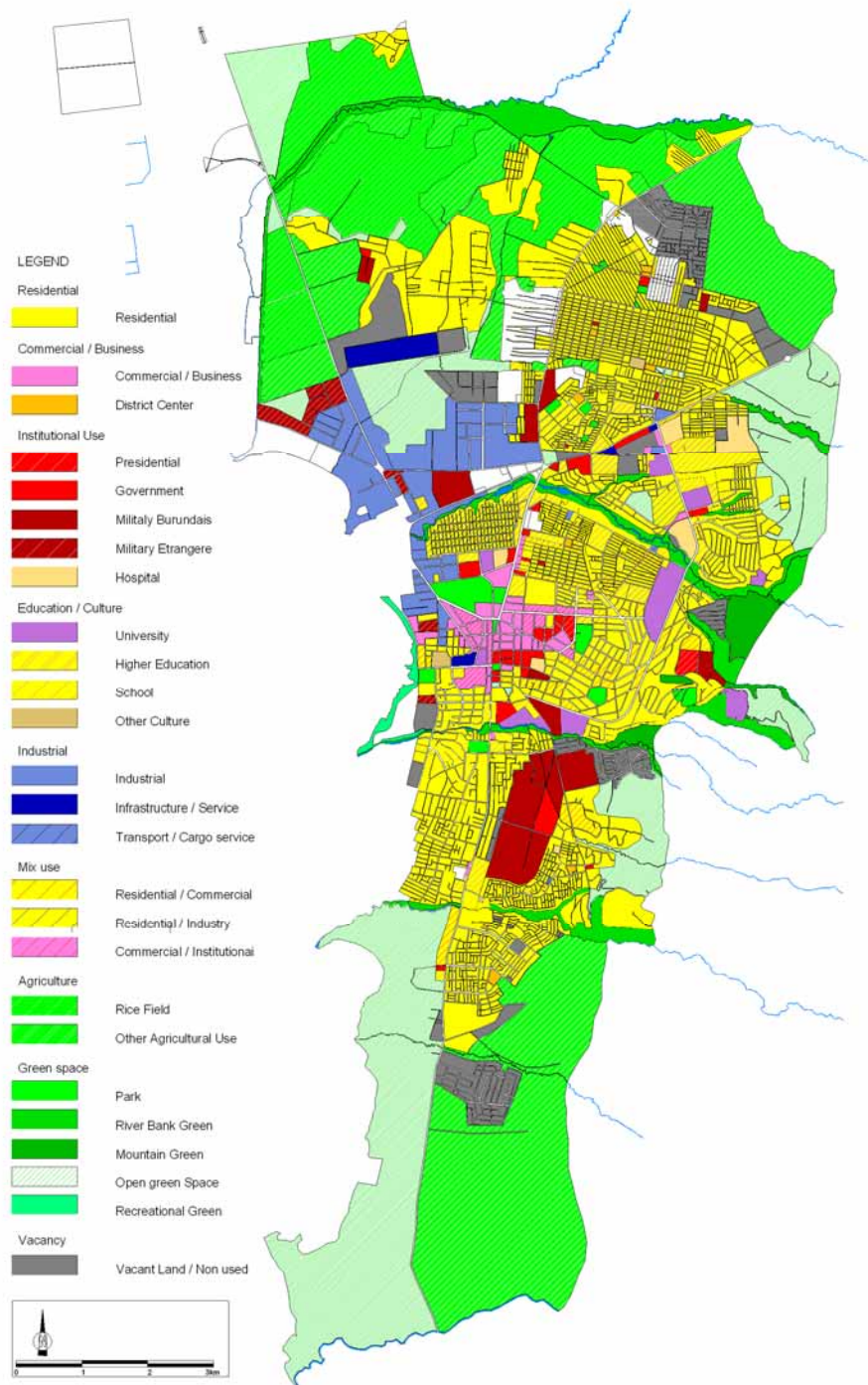


Figure 2.2.3 Current Land Use Pattern in Bujumbura

2) Residential area

The divisions of residential areas in Bujumbura city were systematically done in rectangular shape whereby the residential areas are developed in the direction of north-south in accordance

with the gradual development and extension of the city.

However, the characteristic of the residential area differ greatly for every commune. The difference can be classified roughly into the following two characteristic:

- Communes with high density population (Cibitoke, Kamenge, Buyenzi, Bwiza, Nyakabiga)

This commune has the simple type of residence in which one-storied house is mainly built. Street width in these communes is narrow compared with the other areas, and their pavement is also not in a good condition. Most of the streets have no enough width for a vehicle to pass. However, houses of mixed use such as cottage industry or store with residential use also exist. Moreover, there is also problem on its land use from the viewpoint of disaster prevention.

- Other communes

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

Public facilities like elementary, junior high schools and health centers were seen at both type of communes explained above. However, the establishment of the number of those public facilities does not correspond with the number of existing residents.

3) Business, commercial area

Office Sites and commercial establishment occupy 2.0% of the whole Bujumbura city land.

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 there in almost all communes. In addition, small shops, which play a great role of the commune's commercial service, stand in a row along the main trunk roads and district connecting road. Most of these are of mixed use whereby commercial activities and housing are combined. The mixed type Land use takes about 2.5% or more of the whole city land and 10% or more of the residential area. It is difficult to distinguish and understand such land use and facilities in a field survey. In fact, it is guessed that considerable residential sections are used for other commercial or industrial purpose.

4) Education, research institution

The main institution of higher education is the Bujumbura University; it is established in the east of Rohero commune. There is also a university and a research institution area located along the ring road in Gihosha commune.

On the other hand, elementary, junior high schools and high schools, occupy about 2.3% of the whole Bujumbura city land and about 10% of the whole residential area, and there is no misuse of land in total. However, there are communes which have sites for the educational facilities less than 5% of the residential section. In these communes, there is shortage of institutional lots, the situation which has created gap between communes.

5) Industrial area

The eastern side of Bujumbura port having a land of about 380 ha(s) is developed as the industrial area. Although the development in this zone has been completed, about half of the land is still remaining unused (about 45.0 ha) or underutilized.

Alongside with that, installations of industrial factories are also observed in area around the port on the west side of Buyenzi commune, and along the route between the city and the airport.

6) Others

The existence of the dense illegal residence is not identified. However, the existence of individual residences in partially dangerous state of natural disaster can be observed on the steep incline precipice along the rivers and on the east of mountain land.

The parks occupy about 85 ha(s) of land, which is 0.8% of the whole Bujumbura city land. 1.6 square meters per capita is currently green area, and its development will be a future subject.¹

The road occupies about 8% of the whole land. In some commune, a little less than 20% is a road lot, and it is a very high lot ratio when we think about the inadequacy of transport. Furthermore, in Buyenzi and Bwiza many stores, studios of cottage industry, etc. are using their forefront road as working places.

¹ *Park area in the typical city in advanced countries is about 11.8 square meters (Paris, 1994) per person and 29.3 square meters/person (New York, 1997).*

CHAPTER 2 PRESENT CONDITION OF THE STUDY AREA

Table 2.2.10 Current Land use in Bujumbura (detail, 2007)

	Residential		Commercial/Business				Institutional				Education				Industrial			
	Residential		Commercial/Business	District Center	Presidential	Government	Military Burundais	Military Etrangere	Hospital		University	Higher Education	School	Other Culture	Industrial	Infrastructure / Service	Transport / Cargo service	
01 Butere	329.8	329.8	0.0	0.0	0.0	1.7	7.6	54.2	0.0	63.5	0.0	0.0	0.0	0.0	88.4	44.4	0.0	132.8
	16.0%	16.0%	0.0%	0.0%	0.0%	0.1%	0.4%	2.6%	0.0%	3.1%	0.0%	0.0%	0.0%	0.0%	4.3%	2.2%	0.0%	6.5%
02 Kinama	279.6	279.6	0.0	2.2	0.0	1.9	2.5	0.0	0.0	4.4	0.0	10.1	0.0	0.0	0.0	0.0	0.0	0.0
	25.1%	25.1%	0.0%	0.2%	0.0%	0.2%	0.2%	0.0%	0.0%	0.4%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
03 Kamenge	155.7	155.7	0.0	1.4	0.0	0.6	0.5	0.0	0.0	1.1	0.0	1.7	0.0	0.0	3.2	0.0	0.0	3.2
	59.6%	59.6%	0.0%	0.6%	0.0%	0.2%	0.2%	0.0%	0.0%	0.4%	0.0%	0.6%	0.0%	0.0%	1.2%	0.0%	0.0%	1.2%
04 Cibitoke	173.4	173.4	0.0	1.0	0.0	0.5	0.0	0.0	0.0	0.5	0.0	0.6	3.7	0.0	0.0	0.0	0.0	0.0
	64.6%	64.6%	0.0%	0.4%	0.0%	0.2%	0.0%	0.0%	0.0%	0.2%	0.0%	0.2%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%
05 Ngagara	130.6	130.6	1.4	1.8	3.2	0.0	50.8	5.3	0.0	56.3	0.0	26.8	8.7	0.0	35.5	0.0	0.0	330.9
	14.9%	14.9%	0.2%	0.2%	0.4%	0.0%	5.8%	0.6%	0.0%	6.4%	0.0%	3.0%	1.0%	0.0%	4.0%	0.0%	0.0%	37.6%
06 Buyenzi	0.0	0.0	0.0	0.0	0.0	9.4	0.0	0.0	5.5	14.9	6.3	7.8	8.3	0.0	22.4	0.0	0.0	47.4
	0.0%	0.0%	0.0%	0.0%	0.0%	3.9%	0.0%	0.0%	2.3%	6.1%	2.6%	3.2%	3.4%	0.0%	9.2%	0.0%	0.0%	19.4%
07 Githosha	252.2	252.2	6.5	0.0	6.5	0.0	0.0	0.0	50.1	67.0	25.5	32.7	50.9	0.0	109.1	2.5	3.7	0.0
	25.9%	25.9%	0.7%	0.0%	0.7%	1.7%	0.0%	0.0%	5.1%	6.9%	2.6%	3.4%	5.2%	0.0%	11.2%	0.3%	0.4%	0.0%
08 Bwiza	73.0	73.0	5.2	1.3	6.5	0.0	0.0	0.0	0.0	5.0	0.0	0.0	12.3	0.0	12.3	1.1	0.0	0.0
	49.4%	49.4%	3.5%	0.9%	4.4%	0.0%	0.0%	0.0%	0.0%	3.4%	0.0%	0.0%	8.3%	0.0%	8.3%	0.8%	0.0%	0.8%
09 Nyakabiga	37.2	37.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.9	22.3	0.0	30.2	0.0	0.0	1.0
	31.5%	31.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.7%	18.9%	0.0%	25.6%	0.0%	0.0%	0.9%
10 Rohero	348.6	348.6	80.3	0.0	80.3	32.8	27.7	7.6	4.0	87.9	79.5	3.2	23.1	6.5	112.2	32.7	5.7	0.0
	26.9%	26.9%	6.2%	0.0%	6.2%	2.5%	2.1%	0.6%	0.3%	6.8%	6.1%	0.2%	1.8%	0.5%	8.7%	2.5%	0.4%	0.0%
11 Kinindo	313.7	313.7	4.1	1.8	5.9	0.0	17.0	0.0	0.9	19.2	0.0	1.3	12.4	0.0	13.6	0.0	0.0	0.0
	49.5%	49.5%	0.6%	0.3%	0.9%	0.2%	2.7%	0.0%	0.1%	3.0%	0.0%	0.2%	2.0%	0.0%	2.1%	0.0%	0.0%	0.0%
12 Musaga	204.2	204.2	0.0	1.4	1.4	16.7	138.8	0.0	1.2	156.7	0.0	0.7	15.2	0.5	16.4	0.0	0.0	0.5
	28.9%	28.9%	0.0%	0.2%	0.2%	2.4%	19.6%	0.0%	0.2%	22.1%	0.0%	0.1%	2.1%	0.1%	2.3%	0.0%	0.0%	0.1%
13 Kanyosha	176.9	176.9	0.0	2.9	2.9	1.1	0.0	0.0	0.0	1.1	0.0	0.0	2.2	0.0	2.2	0.0	0.0	0.0
	7.7%	7.7%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%
Total	2,474.8	2,474.8	97.5	13.9	111.4	88.0	245.0	67.1	61.7	477.6	111.3	80.2	167.8	10.7	369.9	506.2	53.8	599.2
	22.5%	22.5%	0.9%	0.1%	1.0%	0.8%	2.2%	0.6%	0.6%	4.3%	1.0%	0.7%	1.5%	0.1%	3.4%	4.6%	0.5%	5.5%

CHAPTER 2 PRESENT CONDITION OF THE STUDY AREA

Table 2.2.11 Current Land use in Bujumbura (detail, 2007)

	Mixed use			Agriculture				Green						Vacant		river	Road	Total	
	Residential/ Commercial	Residential/ Industry	Commercial/ Institutional		Rice Field	Other Agricultural Use		Park	River Bank Green	Mountain Green	Open Space Green	Recreational Green		Vacant / non use	Others				
01 Butere	0.0	0.0	0.0	0.0	664.6	381.3	1,045.9	0.0	112.9	0.0	239.8	0.0	352.7	74.1	0.0	74.1	7.8	59.6	2,058.3
02 Kinama	0.0%	0.0%	0.0%	0.0%	32.3%	18.5%	50.8%	0.0%	5.5%	0.0%	11.7%	0.0%	17.1%	3.6%	0.0%	3.6%	0.4%	2.9%	100.0%
	7.0	0.0	0.0	7.0	233.3	363.1	596.4	3.8	50.9	0.0	0.0	0.0	54.7	94.7	0.0	94.7	4.2	64.0	1,113.1
	0.6%	0.0%	0.0%	0.6%	21.0%	32.6%	53.6%	0.3%	4.6%	0.0%	0.0%	0.0%	4.9%	8.5%	0.0%	8.5%	0.4%	5.8%	100.0%
03 Kamenge	17.8	0.0	0.0	17.8	0.0	0.0	0.0	0.0	0.0	0.0	3.2	0.0	3.2	40.5	0.0	40.5	0.6	36.8	261.3
	6.8%	0.0%	0.0%	6.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	0.0%	1.2%	15.5%	0.0%	15.5%	0.2%	14.1%	100.0%
04 Cibitoke	6.1	0.0	0.0	6.1	0.0	36.8	36.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	46.6	268.5
	2.3%	0.0%	0.0%	2.3%	0.0%	13.7%	13.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	17.3%	100.0%
05 Ngagara	0.2	0.0	0.0	0.2	0.0	26.3	26.3	9.2	5.8	0.0	144.7	0.0	159.8	44.8	0.0	44.8	6.1	91.4	879.0
	0.0%	0.0%	0.0%	0.0%	0.0%	3.0%	3.0%	1.1%	0.7%	0.0%	16.5%	0.0%	18.2%	5.1%	0.0%	5.1%	0.7%	10.4%	100.0%
06 Buyenzi	0.0	72.1	0.0	72.1	0.0	0.0	0.0	0.0	6.8	0.0	0.2	0.0	7.0	6.4	0.0	6.4	4.3	35.9	243.8
	0.0%	29.6%	0.0%	29.6%	0.0%	0.0%	0.0%	0.0%	2.8%	0.0%	0.1%	0.0%	2.9%	2.6%	0.0%	2.6%	1.8%	14.7%	100.0%
07 Gihosha	6.5	23.4	0.0	29.9	0.0	0.0	0.0	0.0	85.6	0.0	306.9	0.0	392.5	22.8	0.0	22.8	7.3	86.0	972.1
	0.7%	2.4%	0.0%	3.1%	0.0%	0.0%	0.0%	0.0%	8.8%	0.0%	31.6%	0.0%	40.4%	2.3%	0.0%	2.3%	0.8%	8.8%	100.0%
08 Bwiza	14.7	0.0	0.0	14.7	0.0	0.0	0.0	0.0	7.0	0.0	0.0	0.0	7.0	0.0	0.0	0.0	2.0	28.2	147.7
	10.0%	0.0%	0.0%	10.0%	0.0%	0.0%	0.0%	0.0%	4.7%	0.0%	0.0%	0.0%	4.7%	0.0%	0.0%	0.0%	1.4%	19.1%	100.0%
09 Nyakabiga	22.9	0.0	0.0	22.9	0.0	0.0	0.0	0.0	11.6	0.0	0.0	0.0	11.6	0.0	0.0	0.0	2.0	15.1	118.1
	19.4%	0.0%	0.0%	19.4%	0.0%	0.0%	0.0%	0.0%	9.8%	0.0%	0.0%	0.0%	9.8%	0.0%	0.0%	0.0%	1.7%	12.8%	100.0%
10 Rohero	63.6	0.0	47.1	110.8	0.0	0.0	0.0	67.5	69.8	68.3	54.1	28.9	288.5	49.8	0.0	49.8	6.6	177.7	1,294.2
	4.9%	0.0%	3.6%	8.6%	0.0%	0.0%	0.0%	5.2%	5.4%	5.3%	4.2%	2.2%	22.3%	3.8%	0.0%	3.8%	0.5%	13.7%	100.0%
11 Kinindo	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1	17.3	0.0	5.2	92.2	119.9	73.1	3.2	76.3	5.2	84.9	633.4
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	2.7%	0.0%	0.8%	14.6%	18.9%	11.5%	0.5%	12.0%	0.8%	13.4%	100.0%
12 Musaga	18.0	0.0	0.0	18.0	0.0	0.0	0.0	0.0	61.7	17.1	141.2	0.0	220.0	39.1	0.0	39.1	3.9	51.3	707.6
	2.5%	0.0%	0.0%	2.5%	0.0%	0.0%	0.0%	0.0%	8.7%	2.4%	20.0%	0.0%	31.1%	5.5%	0.0%	5.5%	0.6%	7.2%	100.0%
13 Kanyosha	13.3	0.0	0.0	13.3	0.0	1,028.7	1,028.7	0.0	0.0	0.0	860.1	9.4	869.5	96.2	0.0	96.2	9.5	96.8	2,287.5
	0.6%	0.0%	0.0%	0.6%	0.0%	45.0%	45.0%	0.0%	0.0%	0.0%	37.6%	0.4%	38.0%	4.2%	0.0%	4.2%	0.4%	4.2%	100.0%
Total	170.0	95.5	47.1	312.6	897.9	1,836.1	2,734.0	85.7	429.4	85.4	1,755.4	130.5	2,486.4	541.4	3.2	541.4	60.5	874.2	10,984.6
	1.5%	0.9%	0.4%	2.8%	8.2%	16.7%	24.9%	0.8%	3.9%	0.8%	16.0%	1.2%	22.6%	4.9%	0.0%	4.9%	0.6%	8.0%	100.0%

(2) Electricity

In the general there are 3 sets of hydro-electric power generation plants working for domestic electric power supply in Burundi. In addition, imported electric power based on contract is also obtained from two sets of power plants in Congo. The maximum dissipation amount of supply is 134MW. However, since the domestic plants are of hydro-electric type, the amount of power generation may be reduced in dry season. On the other hand, imported electric power supply may be hampered by the shortfall in the budget.

The power supply required for Bujumbura city is considered to be about 40MW at present condition. It means that about one third of the total supply of electricity for the whole country is consumed only in Bujumbura city, and thus it is difficult to have a stable supply of power.

Three sub-stations in Bujumbura city mainly supply electric power to the central city area. In some peripheral areas, the electric power supply is limited. Moreover, electric power supply to the newly developed housing areas may also be delayed a lot.

Table 2.2.12 Current Condition of Electric Supply in Burundi

Name of Power Station	Type	Electric power	Voltage for supply
Rwegura	Waterpower	6MW x 3	110 KV
Mugere	Waterpower	2MW x 4	35 KV
Ruvyronza	Waterpower	13.3MW x 3	
Ruzizi I	Thermal, Congo	40MW	70 KV
Ruzizi II	Thermal, Congo	28MW	110 KV

Source: Department of Electricity, Resideso

(2) Water supply

Water supply to Bujumbura city is performed through five pump stations. Currently, the users in Bujumbura city are estimated to be 500,000 persons, and 87,210m³/day of water is supplied.

In the central part of Bujumbura city, direct supply of water through pipe line to each building or site is established. On the other hand, there are also many areas in the peripheral parts of the city where direct supply is not available. The reason is the shortage of funding to constructing water pipes to each house or site. In the areas where water supply to each individual house or site is not available, common water service taps for residents have been

offered in some places. There are certain areas where more than 3,000 persons use only one water service tap, therefore the supply of water to those houses through new pipe lines in the districts is needed.

In future, Resideso has a plan to increase water supply to about 120,000m³/day. Since there is enough precipitation in Bujumbura area, there is little problem of having continuous reserved water sources. Since the electric power supply is unstable at present, trouble may occur on supplying water to the high altitude areas. To cope with this situation pump facilities are planned to be installed near a water source in the high altitude mountain land on the eastern side, and its examination is going on the presumption that water supply will be performed through gravity.

Table 2.2.13 Current Condition of Water Supply in Bujumbura

Name of Pump Station	Sort of Source	Supply Capacity
Lac du Tanganyika	Lake water	81,000 m ³ /day
Gatunguru	Well	1,150 m ³ /day
Ntakangwa	River water	3,500 m ³ /day
Buhonga	Well	860 m ³ /day
Musimba	well	700 m ³ /day

Source: Department of Electricity, Resideso

(3) Sewage

Construction of sewer in Bujumbura city was entranced in 1992. At the present, sewage service is being carried out at Nyakabiga, Bwiza and Rohero commune (centre ville, quartier Asiatique).

There is a sewage treatment plant located in Buterere having the maximum treatment capacity of 59,000m³/day. The present amount of influent to the plant is 10,000m³/day.

Other than the sewage treatment plant, human waste is treated by underground osmosis through a hole dug in each site. Open type drain is constructed along the roads in other areas, where waste water drains into Lake Tanganyika as the termination place.

Since the area to be serviced by the above said sewage treatment plant is limited under the present circumstances, there is no problem of its treatment capacity. To build a new sewage treatment plant and expansion of its service area is necessary to cope with the newly

development of Bujumbura city going on in the southern side. A new treatment plant should be constructed in the area beyond the south of the river Kizingwe, because of its maximum service distance from the existing treatment plant.

2-3 URBAN TRANSPORT FACILITIES AND CONDITION

2-3-1 Existing Urban Transport System

(1) Road Network and Public Transport System in Bujumbura

In Bujumbura city, most of the passenger car and public transport concentrate to the city centre, because of the feature of road network, where radial trunk roads connect at the city centre. And also there is a bus terminal in front of the city centre market. These existing situations cause the traffic congestion at the city centre.

(2) Parking Systems

There is no system of parking charge in Bujumbura city. Vehicles are parked along the roadside or at the centre of the median strip.

The city centre bus terminal is congested by private minibuses waiting for the passengers most of the time, because the private minibuses do not leave the terminal until it is full of passengers. And also many private vehicles, taxis, motorbike-taxis are parked around the city centre market.

New introduction of parking charge system is recommended for the reduction of illegal parking, traffic congestion and traffic accident.

(3) Traffic Management System in Bujumbura City

At present all the intersections are non-signalized. Though there are some traffic signals at some intersections, none of them are working because of frequent power cut and unstable power condition in Burundi.

Roundabout system is well operated by the drivers in Burundi. However, some times, some drivers drive at the ordinary intersections as how they used to drive at the roundabout intersections. This behaviour causes traffic congestion at the ordinary intersection.

Improvement of the intersection and roundabout systems and review of traffic management system are required at the city centre of Bujumbura to reduce traffic congestion and traffic

accident.

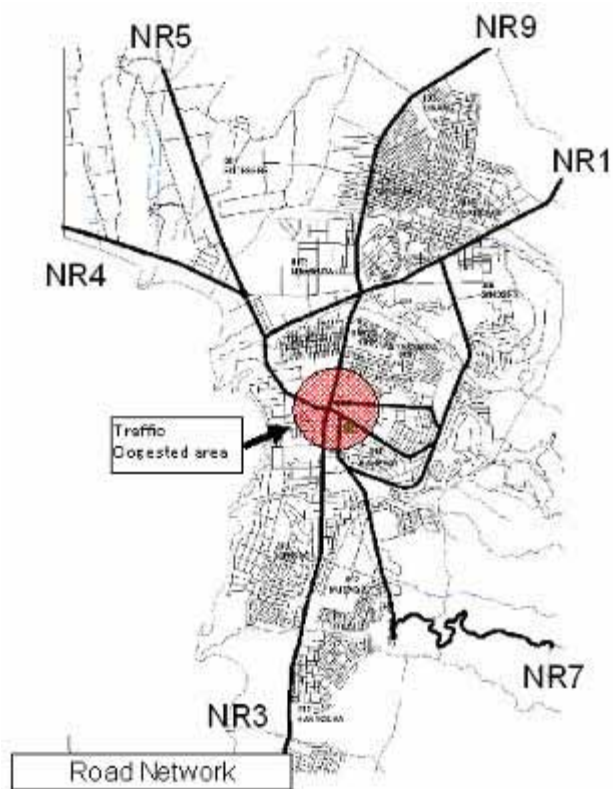


Figure 2.3.1 Road Network System in Bujumbura City

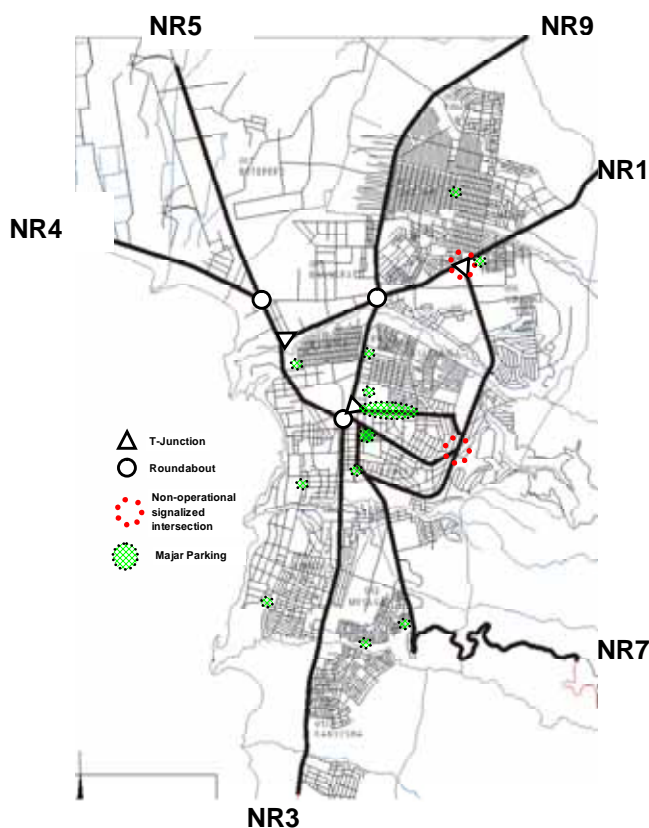


Figure 2.3.2 Major Parking and Type of Major Intersection in Bujumbura City

Table 2.3.1 Traffic Accident in Bujumbura City

Type of accident	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Vehicle-Vehicle	125	113	156	161	127	142	166	142	139	150	142	52	1,615
Vehicle-Bike	45	46	57	41	51	38	49	31	36	31	47	10	482
Vehicle-Bicycle	21	2	22	24	21	24	22	20	25	24	24	9	238
Vehicle-Pedestrian	15	12	15	17	21	24	15	16	24	26	12	8	205
Bike-Pedestrian	2	1	8	5	11	8	4	5	7	3	3	2	59
Bicycle-Pedestrian	0	0	1	1	0	0	0	0	1	0	1	0	4
Bicycle-Bicycle	0	0	0	0	0	0	0	0	0	0	0	1	1
Vehicle-Animal	0	1	1	3	1	0	0	0	0	1	0	1	8
Vehicle-House	6	3	3	9	8	8	4	0	4	4	2	4	55
Bike-Bike	2	1	4	1	2	0	1	1	1	2	2	0	17
Bike-Bicycle	1	0	7	3	4	5	1	5	3	5	4	1	39
Total	217	179	274	265	246	249	262	220	240	246	237	88	2,723
Fatalities	12	8	7	10	11	14	11	11	8	6	4	2	104
Injured.	45	55	55	51	72	91	68	59	105	92	84	38	815

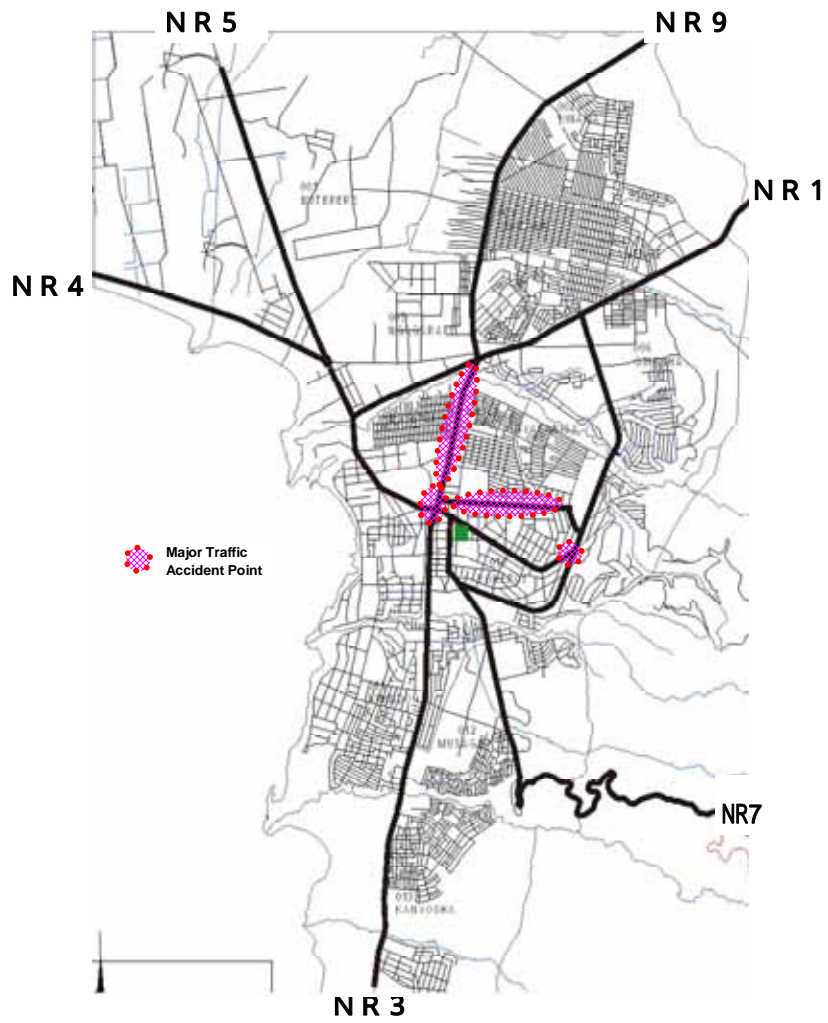


Figure 2.3.3 Location of Major Traffic Accident Points in Bujumbura City

2-3-2 Traffic Regulation/Act

The original traffic regulation was enacted on September 11, 1958. The latest version of the regulation in use was revised on July 17, 1980.

In Bujumbura, vehicles are driven on the right hand side of the road, just like in European countries. However, most of vehicles in Burundi are right hand drive vehicles mainly second hand Japanese vehicles. The drivers in right hand drive vehicle cannot see the condition in front of the vehicles ahead, at the time of overtaking. Most of the private minibus is also right hand drive vehicles, so that passenger's exit is located at the left hand side. When the passengers get on and off the bus, they face too close to the driving vehicles on the carriageway. Those situations are so dangerous from the view point of traffic safety.

On the other hand, Burundi will join the East African Community (hereinafter referred to as "EAC") within this year. In Kenya, Tanzania and Uganda which are members of EAC, cars are driven on the left-hand side of the road just like in Japan. However, the government of Burundi still has not considered changing the existing traffic driving regulation from right hand side to left hand side of the road.

After officially joining the EAC, many right hand drive vehicles will enter Burundi. Most of the drivers in right hand drive vehicles will be confused with the situation of traffic driving regulation which are different from that of Kenya, Tanzania and Uganda.

Concerning the right hand drive vehicles in Bujumbura, the government of Burundi should support the private bus operators in changing vehicles from right hand drive to left hand drive.

On the other hand, concerning the drivers from Kenya, Tanzania and Uganda who are used with the traffic regulation in Burundi, safety facilities such as traffic sign, marking should be installed for the prevention of traffic accidents.

2-4 ROAD NETWORK CONDITION

2-4-1 Road Administration

(1) Road Management Policy of Bujumbura City

City development is implemented by SIP and ECOSTA which are the agencies under the Ministry of Public Works. The arrangement of public land and the roads in the developed area in the city were planned and constructed by those development agencies and sold to the private sectors.

The original different sections of the Ministry of Public Works and Equipment of Burundi have been transferred into public corporations under the same Ministry in accordance with the declaration in October 2001. Ten (10) public corporations such as Road Corporation (OR), Civil Construction Equipment Corporation (ALM), Civil Construction Test Corporation (LNBPT), etc. were established under the Ministry of Public Works and Equipment, and the budget for the road construction is allocated among all these public corporations.

The maintenance of the roads in Bujumbura City is implemented by the public corporation (SETEMU) under the Bujumbura City Office consigned by OR. But it is increasing these days that the work is implemented by the private firms consigned directly by OR.

However, the community roads included in the Commune Road Rehabilitation and Improvement Project are developed under the guidance of SETEMU under the Bujumbura City Office so that it is implemented as SETEMU's project with OR.

(2) Road office (OR) organization

OR consists of three (3) departments i.e. administration and financial department, planning department and construction department under the Director General. Planning department and Construction department have 3 Engineers each.

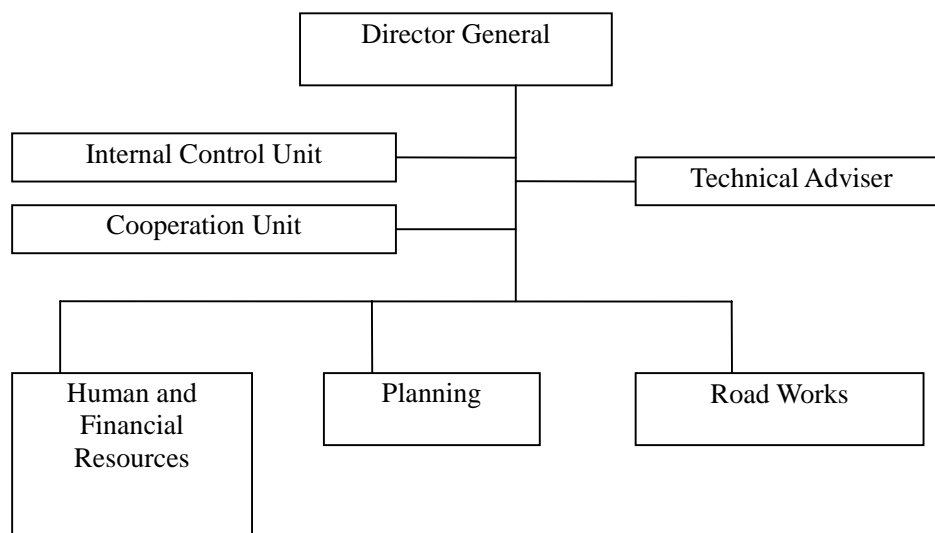


Figure 2.4.1 Organization Chart of OR

(3) Activities of OR

The following twelve (12) activities are the main tasks of OR. These tasks are 1) Study, 2) Road Safety, 3) Food Distribution Programme for work, 4) Cleaning of Paved Road, 5)

Cleaning of Unpaved Road, 6) Disaster Restoration Works, 7) Mechanical Maintenance of Paved Road, 8) Construction Works, 9) Rehabilitation of Unpaved Road, 10) Construction Supervision, 11) Emergency Works and 12) Application to Donors.

Table 2.4.1 Annual Budget of OR

Items	Million FBU			
	Annee			
	2004	2005	2006	2007
Study	31			79
Road sefty				92
Food Distribution Program for Work				21
Claning of Paved Road	203	229	745	461
Cleanining of Unpaved Road		740	280	85
Disaster Restratrion Works	703		872	45
Paved road Maintenamnce with Machiery			921	1,764
New Construction of Road	64	245		
Rehabilitatin of Unpaved Road				
Construction Supervision		687	25	
Emergency Work	259	92	761	500
Apprication to Donors				
Total	1,260	1,993	3,602	3,047

2-4-2 Road Classification

In Bujumbura city, apart from the already classified road network of the principal arterial roads (National Road) and main regional roads controlled by OR, there are unclassified roads which were controlled by the former local governments.

In the city road network, the main roads connecting with the national roads are named “Boulevard” or “Chausses”, the regional arterial roads are named “Avenida”, and the divisional streets are called “Rue”. However, these classifications are based neither on the function nor on the management of the road network.

2-4-3 Existing Road Network

Road network frame in Bujumbura city consists of the frame roads connecting the national roads and the arterial roads in the central business district. Commune (ward) and Quartier (quarter), which are the administrative units in Bujumbura city, have been developed based on the axis of these frame roads as the shape of clusters; and hence the residential areas have been expanded.

In each administrative unit area, collector and local road are provided, and the collector road is connected to frame road directly.

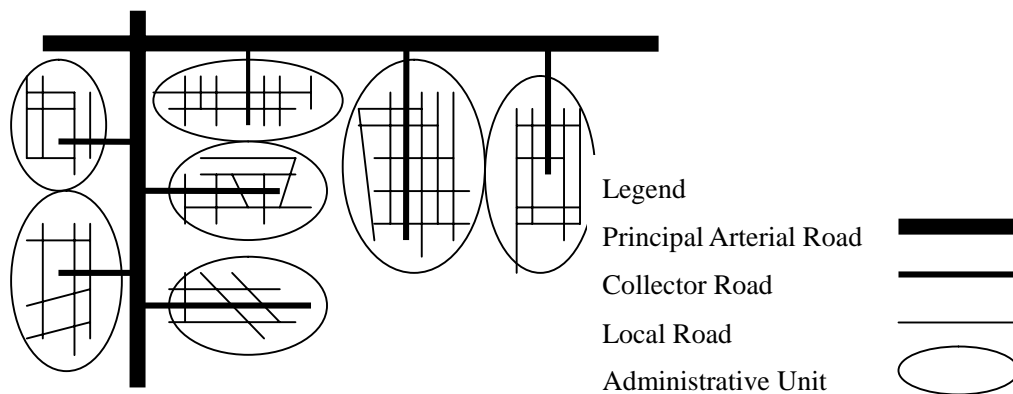


Figure 2.4.2 Present Road Network Pattern

The City road network can be classified in four categories namely principal arterial, arterial, collector and local road. The principal arterial and arterial roads form the frame of the network, and those frame roads are directly connected to the collector and local roads. However, the arterial roads connecting the collector roads are not continuous and their length is short, it is difficult to clearly identify collector roads which are main road in administrative unit area.

(1) Principal Arterial Road and Arterial Road

Selected from the road network of Bujumbura City, the Figure 2.4.3 and Figure 2.4.4 show the principal arterial roads forming the frame and arterial roads connecting the collector and/or the principal arterial roads.

(2) National Roads Accessing to Bujumbura City

Bujumbura City is located at the northern edge of Lake Tanganyika and the following six (6) national roads radiate from the city as its access roads.

1) RN-1:

This road extends from north-east area of Bujumbura city connecting to the north, central and east part of Burundi.

RN-1 and RN-9 join together at the north of the city and connects to the city centre.

2) RN-3

It extends from south of the Bujumbura city towards the south region of Burundi along the Lake Tanganyika.

RN-7 and RN-3 comes into the city centre from the south of the city.

3) RN-4:

It is extending along the western side of the lake and enters to Democratic Republic of Congo; the road is a two-lane carriageway without any footpath.

4) RN-5:

The road runs along the border of Democratic Republic of Congo in the direction towards the north-west of Bujumbura city. The road is a two-lane carriageway and it is also passing along Bujumbura International Airport.

RN-4 and RN-5 join together at the north-west of the city and connects with the city centre.

5) RN-7:

This road stretches from south-east of Bujumbura city connecting the city centre and south-east of Burundi.

6) RN-9

The road stretches from the northern area of Bujumbura city toward north-west of Burundi

(3) Ring Road

The ring road starts from RN-1 at north of the city centre, passes towards east and connects with RN-7 and RN-3 at the south. The northern area of the city is basically connected with the western area by the arterial roads connecting with the national roads, and it passes along the side of Lake Tanganyika. However, due to the undeveloped junctions, it is not frequently used.

2-4-4 Road Condition

(1) Principal Arterial Road

The principal arterial roads of Bujumbura city consist of national roads radiating from the city centre; the roads connecting to the national roads as well as ring road also connect each other. These principal arterial roads are named and form 17 streets of which the total length is 43.9km (Refer to Table 2.4.2). Among these roads, there are five (5) 4-lane roads separated with medians such as Blv. Du 1er Novembre whose total length is 16.1km. The rest are 2-lane roads.

Although there are some pot-holes at the junction parts, the road surface conditions of the arterial roads in many routes are evaluated as reasonably smooth (based on HDM evaluation standard).

Table 2.4.2 Principal Arterial Roads Network in Bujumbura City

Number	Name of Road	Length (m)	Carriageways	IRI	Remarks
1	Route Nationale 1	2,360	2lane	4	
2	Blv Mwambutsa	1,960	2lane	4	
3	Chaussee de l OUA	2,320	4lane	4	
4	Blv Mwezi Gisabo	3,380	2lane	4	
5	Blv de la Liberte	720	2lane	4	
6	Route Nationale 4	2,120	2lane	4	
7	Blv du 1er Novembre	3,400	4lane	4and 10	
8	Route Nationale 5	3,280	2lane	4	
9	Blv de la Nation	1,200	2lane	4	
10	Boulevard Ntare Rushatsi	3,400	2lane	4and8	
11	Boulevard Patrice Lumumba	1,120	2lane	6	
12	Route Nationale 9	3,400	2lane	4	
13	Blv du 3 Septembre	1,600	2lane	4	
14	Chaussee du Peuple Murundi	2,800	2lane	4	
15	Blv du 28 Novembre	6,720	4lane	2	EU
16	Blv Yaranda	1,400	4lane	10	Eu
17	Blv de l' Uprona	2,760	L=2280 4lane	6and10	EU
	Total	43,940			

EU: Ongoing project by EU

IRI : International Roughness Index

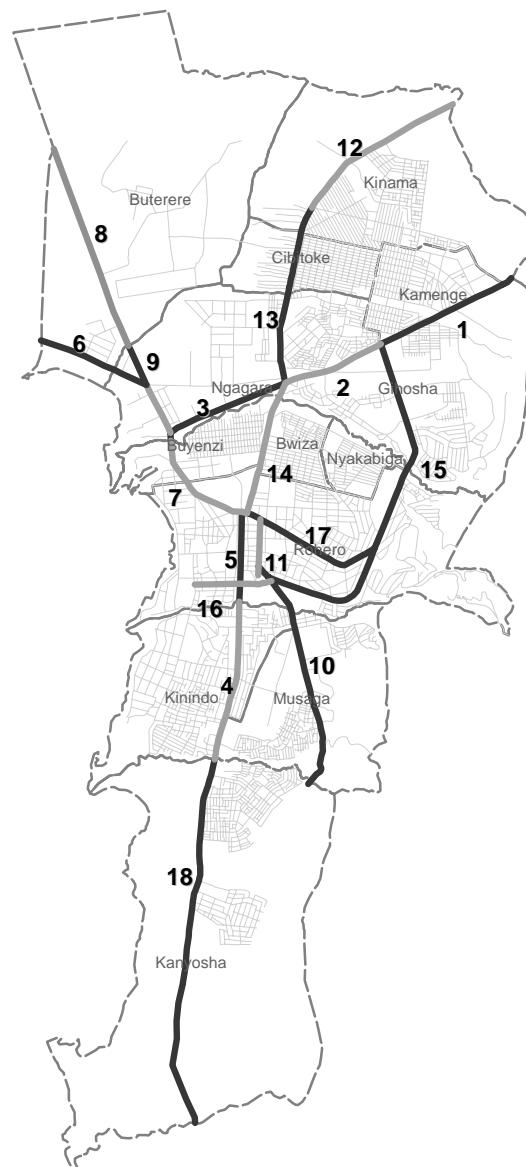


Figure 2.4.3 Principal Arterial Road Network in Bujumbura City

(2) Arterial Road

There are not so many roads which can be classified as arterial road in the road network, but 15 streets connecting to the districts and radiating from the main roads can be classified as arterial roads (Refer to Table 2.4.3). The total length of these 15 streets is 31.0km. All these roads will become 2-lane asphalt paved roads when the Project is completed including the link roads planned by the EU.

Regarding the pavement conditions of Av. du Large, Av. de la Plage, Av. du Tanzanie, etc., which can be classified as semi-frame road, some pot-holes at junctions are partially observed.

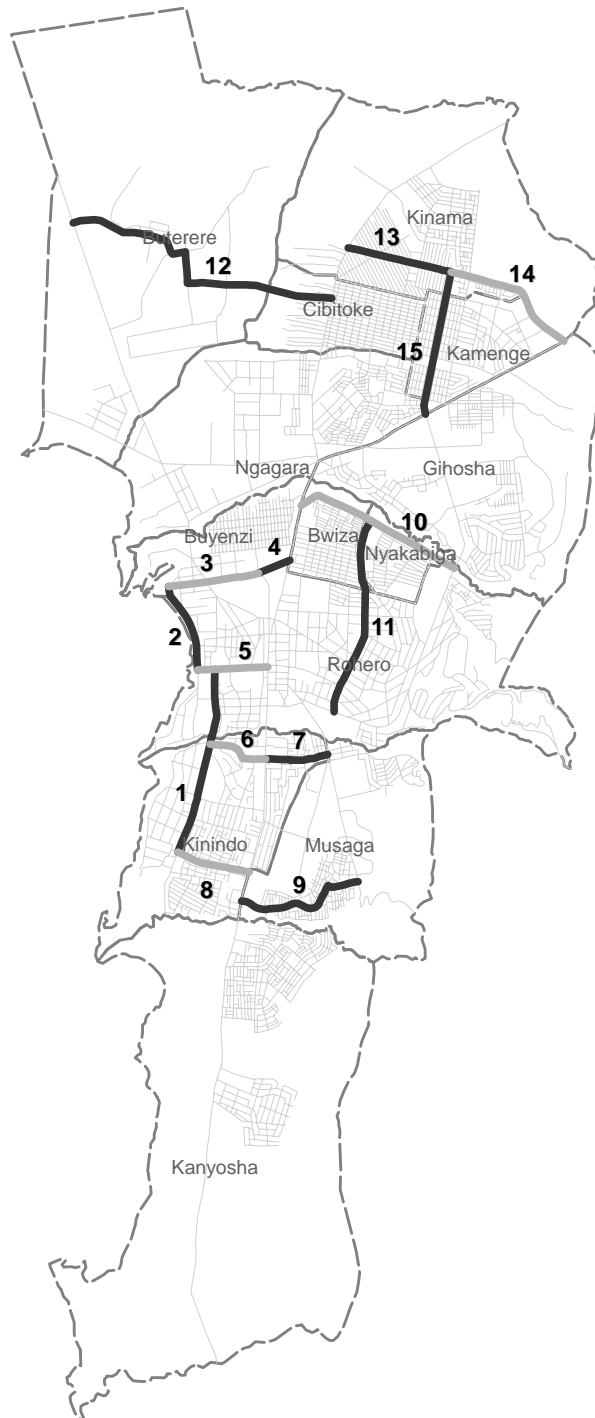


Figure 2.4.4 Arterial Road Network in Bujumbura City

Table 2.4.3 Arterial Roads Network in Bujumbura

Number	Name of Road	Length (m)	Carriageway	IRI	Remarks
1	Av du Large	3,960	2lane	4	
2	Av de la Plage	1,440	2lane	5	
3	Av du Tanzanie	1,600	2lane	4and6	
4	Avenue de l'Hopital	560	2lane	4	
5	Av. Du 13 Octobre	1,200	2lane	4	
6	Av Nzero	970	2lane	10	EU
7	Rue Gasibe	1,000	2lane	10	EU
8	Av Rusama	1,240	2lane	4	
9	Blv Mutaga	2,150	2lane	10	EU
10	Av de l'Imprimerie	2,690	2lane	10	EU
11	Av Muyange+ZoneNyakabiga	2960	2lane	10	EU
12	Dess.Mutakura Buterere	4,840	2lane	10	EU
13	Ch. Kinama	1,720	2lane	5	
14	Rocade Kamenge	2,400	2lane	10	EU
15	Blv de l'Unite	2,240	2lane	5and 8	
Total		30,970			

EU: Ongoing project by EU

IRI : International Roughness Index

(3) Collector Road

Figure 2.4.4 shows collector roads network in Bujumbura city which are connecting the principal arterial or arterial roads. Most of collector roads are unpaved, and surface conditions are very bad. Total length of those roads is 66.9km in which 17 streets of 26.3km are under the paving projects by EU.

(4) Local Road

Although there is some unevenness seen in the stone pavement, it is possible to drive with the approximate speed of 10-20km/hr. As the maintenance of the unpaved roads is poor, there are many roads on which only trucks and 4WD vehicles can run. The roads, for which land was acquired but vehicles cannot run, need to be developed and has been included in the classification of unpaved roads.

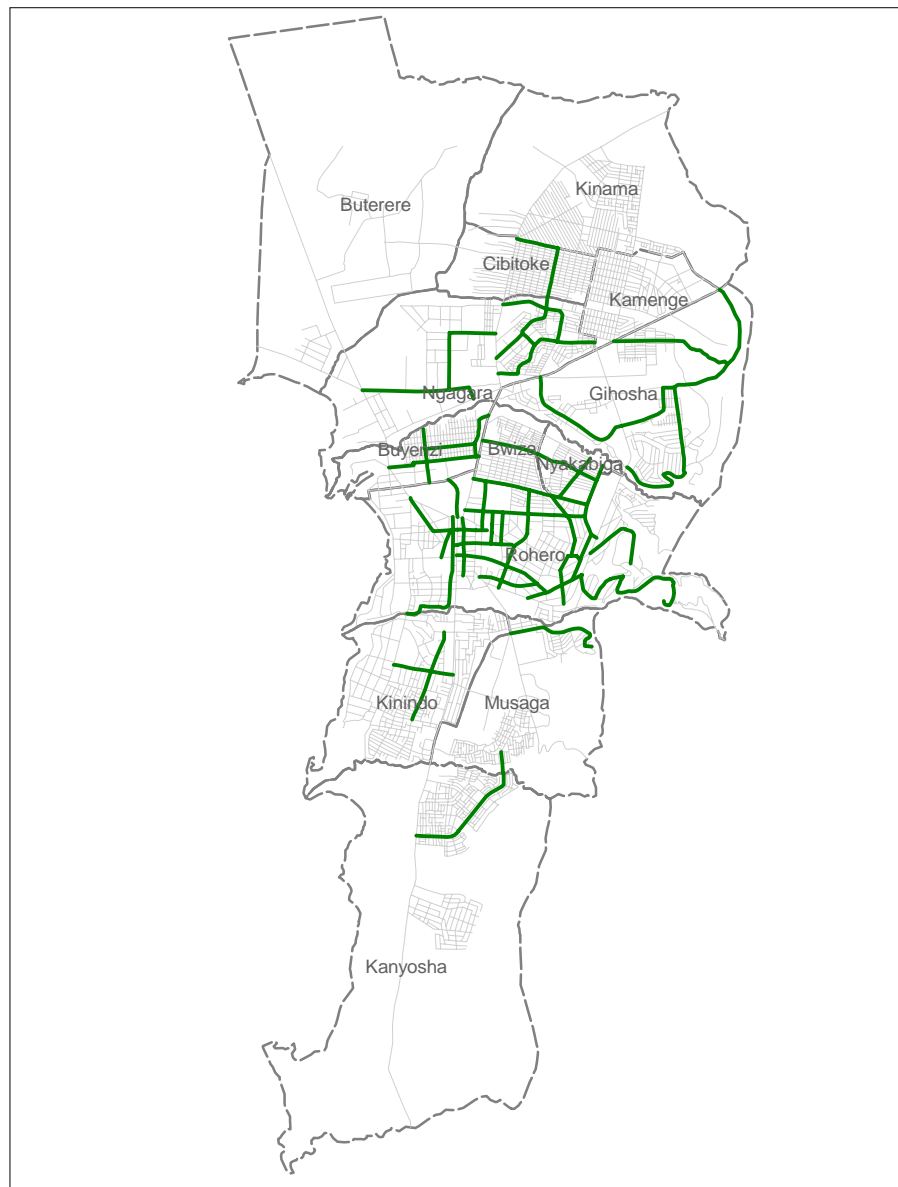


Figure 2.4.5 Collector Roads Network in Bujumbura City

2-4-5 Road inventory

(1) Road Pavement

The paved roads in the city can be classified as asphalt paved roads and stone paved roads where block stones are laid. The major roads in the city are paved with asphalt concrete surface course of around 2.5 to 5cm in thickness.

Table 2.4.4 Road Length by Community

Community	Area (km ²)	Population (person)	Road length (km)			
			Paved	Stone	Unpaved	Total
Buterere	18.3	33,500	4.38	0.00	19.18	23.56
Kinama	8.0	61,423	5.46	0.99	57.93	64.38
Cibitoke	2.7	60,436	3.12	0.00	42.28	45.40
Kamenge	2.6	42,068	4.43	0.00	41.10	45.53
Ngagara	8.7	21,901	22.16	3.86	39.56	65.58
Gihosha	8.9	50,843	17.69	0.00	44.27	61.96
Buyenzi	1.7	49,850	5.31	1.19	22.22	28.72
Bwiza	1.5	40,554	3.02	0.57	24.66	28.25
Nyakabiga	1.2	25,034	1.57	0.00	15.87	17.44
Rohero	13.8	14,711	52.23	24.30	47.08	123.61
Kinindo	6.3	23,162	8.17	4.92	56.89	69.98
Musaga	7.5	78,541	12.82	0.79	28.16	41.77
Kanyosha	8.3	42,892	2.99	0.00	36.20	39.19
Total	89.5	544,915	143.35	36.62	475.40	655.37

Source: JICA study team

Note: Roads at the boundaries of communities are counted in the both communities.

Table 2.4.5 Roads Index by Community

Community	Pavement Ratio (%)	Road density (km/km ²)	Length per pop. (m/person)
Buterere	18.6	1.3	0.70
Kinama	10.0	8.0	1.05
Cibitoke	6.9	16.8	0.75
Kamenge	9.7	17.5	1.08
Ngagara	39.7	7.5	2.99
Gihosha	28.6	7.0	1.22
Buyenzi	22.6	16.9	0.58
Bwiza	12.7	18.8	0.70
Nyakabiga	9.0	14.5	0.70
Rohero	61.9	9.0	8.40
Kinindo	18.7	11.1	3.02
Musaga	32.6	5.6	0.53
Kanyosha	7.6	4.7	0.91
Total	27.5	7.3	1.20

Source: JICA study team

There are eight (8) communities where the pavement ratio is below 20%, however the pavement ratio for the whole city is 27.5%, which is low.

The public development cooperation is deliberately providing streets for all the communities except Buterere. Therefore, only Buterere is facing the problem of road density. The road density is less in the communities having much undeveloped areas.

There are seven (7) communities in which road length per capita is less than 1m, though the

population density of those communities is high.

(2) Road Cross Section

Most of the roads have 2-lanes with 6.0 to 7.0m wide carriageways. Footpaths are provided on the shoulders and the road drainage is provided outwards from the footpaths. There are some underground road drainage facilities in the city centre, but due to the poor maintenance, many of them are buried, broken and non-continuous causing the functional loss as drainage network. The capacity of the drainage facilities is also insufficient and the road itself is frequently flooded and becoming the drainage line at the time of high intensity periodical shower.

Table 2.4.6 shows the element width of road cross section of each route in Bujumbura city.

4 Lane Road

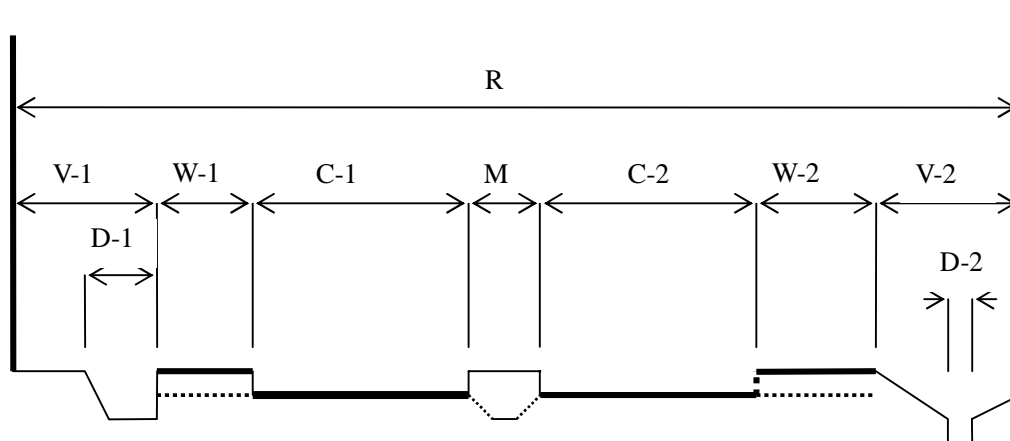


Figure 2.4.6 Cross Section Elements of City Roads

2 Lane Road

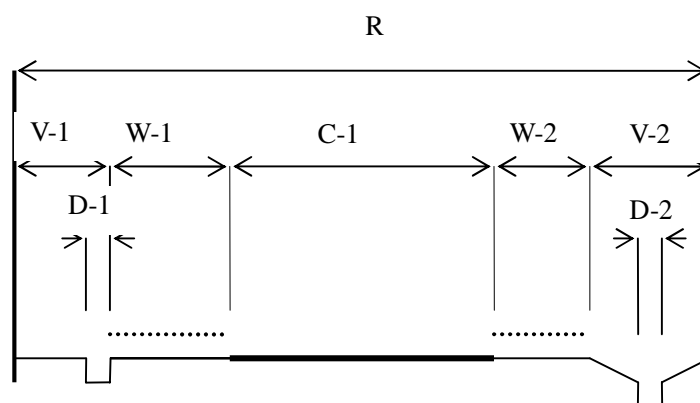


Figure 2.4.7 Cross Section Elements of City Roads

Table 2.4.6 Width Element of Road's Cross Section (1)

No	Name of Road	Vacancy 1 (Drainage 1)		Walkway 1		Carriageway		Median		Carriageway 2		Walkway 2		Vacancy 2 (Derange 2)	
		V-1 (D-1)	V-1 (D-1)	W-1	C-1	M	C-2	W-2	V-1 (C-2)	V-1 (C-2)					
1	Boulevard Mwambutsa			4.20	7.00							4.20			
2	Boulevard du 28 Novembre	1.00		3.55	7.00	4.00	7.00					3.50	1.00		
3	Gasenyi Route	1.60(1.60)			7.65							2.60	1.30(1.30)		
4	Route Nationale 1			4.00	14.00							4.70	1.80(1.80)		
5	Boulevard de l'Unite	0.55		2.00	7.00							1.80	5.60(0.60)		
6	Chaussee Kinama			2.60	6.00							2.30	2.50(2.50)		
7	Route Nationale 9	2.20(2.20)		4.40	7.00							2.30	6.00		
8	Avenue Butaganzwa	2.00(0.40)		1.75	7.00							1.80	1.00		
9	Avenue Misugi	1.00(1.00)		1.75	7.00							0.80	3.10(0.40)		
10	Boulevard du 3septembre	5.00		1.00	7.00							2.45	3.40		
11	Chaussee de l' OUA	8.00		2.50	7.00							2.50			
12	Access of chaussee de l'agriculture	4.60(0.40)		1.50	7.15							1.50	6.00		
13	Chaussee de l'Agiliculture	10.20		1.40	7.00							1.60	9.50(0.50)		
14	Boulevard de la Nation	7.30(3.30)		2.00	7.00							1.50	6.10(3.30)		
15	Route Nationale 5	7.30(3.30)		2.00	7.00							1.50	6.10(3.30)		
16	Route Nationale 4	1.50(0.40)		1.80	6.00							2.00	5.00		
17	Boulevard du premier Novembre	1.70		1.90	7.00							4.10	7.20		
18	Avenue du Maris(Boulevard du premier novembre)			4.10	8.90	5.00	8.90					4.10	6.30(4.10)		
19	Boulevard du premier Novembre			6.70	7.00							1.20			
20	Boulevard du premier Novembre			4.00	6.00	7.20	6.00					4.00	0.90		
21	Avenue du Marais(no name)			2.20	7.00							2.40			
22	Avenue de la Tanzanie			8.40	10.20							6.50			
23	Avenue du marais	5.85(0.55)		1.00	7.00							1.00	7.15(0.55)		
24	Avenue de la Plage			1.90	6.00							2.00	6.00(0.50)		
25	Avenue du Large	6.00		4.20	7.00							2.50			
26	Avenue Nzero	10.00			4.00								13.80		
27	Avenue Muhirza	3.35(0.35)		0.50	7.40							0.45	2.20(1.00)		
28	Rue Rusama	1.90(1.10)		0.30	7.40							1.50	1.00		
29	Boulevard Mwezi Gisabo(Route Nationale 3)	5.50		1.25	6.00							1.50	6.40(1.10)		
30	Boulevard Mutaga	4.50(1.10)		1.70	5.50							4.60			
31	Boulevard Muminwa	2.10(1.10)		2.40	7.40							5.00	3.10(1.10)		

Source: JICA study team

Table 2.4.7 Element Width of Road's Cross Section (2)

No	Name of Road	Vacancy 1 (Drainage 1)		Walkway 1		Carriageway		Median	Carriageway 2		Walkway 2		Vacancy 2 (Derange 2)	
		V-1 (D-1)	V-1 (D-1)	W-1	C-1	C-2	M	C-2	W-2	W-2	V-1 (C-2)	V-1 (C-2)		
32	Avenue Gasibe	0.80(0.50)	14.00										5.45(0.85)	
33	Access Boulevard Ntare Rushatsi(no name)		5.80									1.50	0.9(0.9)	
34	Boulevard Ntare Rushatsi	2.00(0.40)	7.00	1.60									.50(0.50)	
35	Boulevard Ntare Rushatsi(bad road)	1.20(1.20)	8.70											
36	Boulevard du 28 Novembre	2.50	6.00	2.50				7.80		6.00		3.00		
37	Chaussee du Prince Louis Rwagasore	0.40(0.40)	6.40	0.10								1.20		
38	Chaussee Prince Louis Rwagasore (out side)	2.80	6.20	1.40								0.50	4.10(0.50)	
39	Chaussee Prince Lois Rwaggore (inside)	3.80	8.60	1.20								1.90	5.60(1.10)	
40	Boulevard de l'Uprona (Botanika)		10.20	3.40				4.05		10.20		2.80		
41	Chaussee du Peuple Murundi	7.00	7.00	2.90				1.80		7.00		1.80	6.50(1.20)	
42	Avenue del'universite	1.70(0.40)	7.00	1.90								1.80	1.25(0.40)	
43	Avenue de l'hospital		7.00	6.90								1.60	7.30(0.40)	
44	Boulevard de la Tanzanie	1.50	7.00	2.50								2.20	2.90(0.40)	
45	Boulevard du 28 Novembre	10.00	6.00	2.50				7.00		6.00		4.70	0.30(0.30)	
46	Avenue du Stade		6.70	7.00								2.20	2.70(0.40)	
47	Avenue de la Ntahangwa	8.90	9.00									4.70		
48	Avenue de l'imbo		9.00	3.10								3.50		
49	Avenue Murembwe	1.70(1.00)	6.00	1.50								5.70		
50	Avenue du 13 Octobre	12.00	6.00									2.50	10.80	
51	Avenue Murembwe (outside)	3.55(0.85)	7.00	1.75								2.00	4.20(0.60)	
52	Avenue Kigira	4.10(0.60)	6.80	1.70								1.90	2.60(0.50)	
53	Access Boulevard du 28 Novembre	7.00	7.30	1.20										

Source: JICA study team



Figure 2.4.8 Nos. of Lanes of Road Network

2-5 PUBLIC TRANSPORT CONDITION

2-5-1 Public Transport Systems in Bujumbura City

Public transport systems in Bujumbura city are shown as follows. Ministry of Transport, Posts and Telecommunications has the jurisdiction over all the public transporters in Bujumbura city.

Table 2.5.1 Public Transport Systems in Bujumbura City

Mode	Organization	the competent authorities
Bus	OTRACO	Ministry of Transport, Posts and Telecommunications
	Private Bus Association	Ministry of Transport, Posts and Telecommunications
Taxi	No association	Ministry of Transport, Posts and Telecommunications
Bike Taxi	AMOTABU	Ministry of Transport, Posts and Telecommunications
Bicycle Taxi	SOTAVEBU	Ministry of Transport, Posts and Telecommunications

2-5-2 Bus Transport

The public transportation organizations currently operating in Burundi includes OTRACO, in the public sector, and the private-sector bus companies.

OTRACO provides public transportation services connecting paved inter-city trunk roads and un-paved inter-rural roads.

On the other hand, private-sector bus companies are using wagon-type minibuses with an average of 14-seat to 30-seat capacity. However, this service is limited to Bujumbura city, with a large demand, and also on paved trunk roads connecting Bujumbura with some rural cities. Further, since minibuses of private companies do not depart unless the seats are filled, and since there is no specific operation schedule, it goes without saying that the system does not fully meet the level of convenience and time efficiency provided by the private services.

2-5-2.1. Existing Bus Transport Condition

Bus Passenger Survey and Bus Drivers Interview Survey were carried out due to get hold of the existing situation of bus operation in Bujumbura city.

(1) Bus Driver Interview Survey

Bus driver interview survey was carried out to have idea and to confirm the bus operation condition in Bujumbura city.

Survey Date: March 1 & 5, 2007

Survey Point: City Center Bus-terminal

No. of samples: 14 bus routes, 5 drivers/each bus route; Total no. of samples = 70 samples.

The items of interview to private minibus bus driver are as follows.

- Seating capacity
- Average no. of round trip per day
- Bus operation period
- Average trip time from origin to destination
- Existing problems

(2) Passenger Interview Survey

Bus passenger survey was carried out to confirm the existing bus passenger movement and get background information on bus passengers, such as why they were using the minibus, the problems they experienced, their attitudes to the cost and the origin and destination of their trip. To get a representative sample it was decided to use one surveyor per route and collect forty forms per route.

Survey Date: May 3 & 4, 2007

Survey Point: City Center Bus-terminal,

No. of samples: 16 bus routes, 40 passengers/each bus route; Total no. of samples = 640 samples.

The items of interview to private minibus bus passengers are as follows.

- Origin of current trip
- Destination of current trip
- Trip purpose
- Waiting time at bus stop
- Frequency for using bus transport
- Problems for the existing bus services

Table 2.5.2 Overall Bus Passenger Survey Programme

Bus Type	Bus Route	Survey Point	Date	No. of Samples
Private Bus (City Bus Service)	PV1. Ville – Gatumba	Surveyed to the passengers at City Center Bus Terminal on May 3, 2007. Surveyed to the passengers at the bus station of the final destination on May 4, 2007.	May 3 & 4	40+40
	PV2. Ville – Buyenzi			40+40
	PV3. Ville - Bwiza-Jabe			40+40
	PV4. Ville – Nyakabiga			40+40
	PV5. Ville – Cibitoke			40+40
	PV6. Ville – Ngagara			40+40
	PV7. Ville – Kamenge			40+40
	PV8. Ville - Mutanga North			40+40
	PV9. Vile – Gasenyi			40+40
	PV10. Ville – Musaga			40+40
	PV11. Ville – Kanyosha			40+40
	PV12. Ville – Kinindo			40+40
	PV13. Ville – Kibenga			40+40
	PV14. Ville – Ruziba			40+40
	PV15. Ville – College			40+40
	Total:			
(Rural Bus Service)	PR1. Ville – Bujumbura Rural	City Center Bus Terminal	May3,4	40+40
	PR2. Ville – Gitega	Kamenge Bus Terminal	May3	40
	PR3. Ville - Kayanza – Ngozi	Kamenge Bus Terminal	May3	40
	PR4. Ville – Bubanza	Kamenge Bus Terminal	May3	40
	PR5. Ville – Cibitoke	Kinama Bus Terminal	May4	40
	PR6. Ville - Ijenda - Matana – Rutana	Musaga Bus Terminal	May4	40
	PR7. Ville - Rumonge - Makamba	Kinindo Bus Terminal	May4	40
OTRACO (City Bus Service)	OV1. Ngagara- Grand Bureau/ Chanic	Surveyed to the passengers inside the each vehicle by OTRACO bus conductors.	May 3 & 4	
	OV2. Gikungu/ Nyakabiga - Chanic			
	OV3. Musaga- Chuk			
	OV4. Musaga- Chanic			
	OV5. Kanyosha- Chanic			
	OV6. Gatumba- Grand Bureau			
	OV7. Gatumba- Gasenyi			
	OV8. Ville- Ruziba			
	OV9. Ville- Gatumba/Frontiere			
	OV10. Ville- Kanga/ Kinama			
OTRACO (School Bus Service)	OS1. Kinindo- Lycee Vugizo	Surveyed to students, teachers at each school.	May 3 & 4	
	OS2. Musaga- Kinindo-Lyceee Vugizo			
	OS3. Kinindo- Ecole Indep			
	OS4. Kinindo- SOS			
	OS5. Ngagara- Lycee Vugizo			
	OS6. Ngagara- E.I.B			
	OS7. Musaga- Vugizo			
	OS8. Kinindo- La Colombiere			
	OS9. Universite Lumiere			

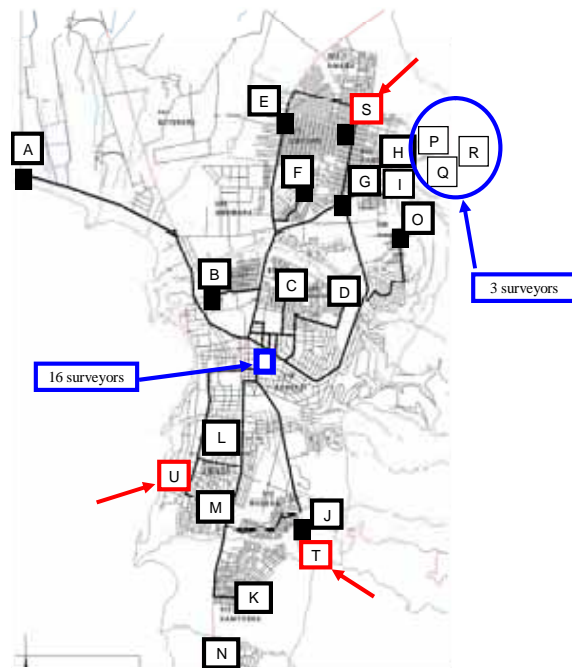


Figure 2.5.1 Location of Bus Stations operated by Private Buses in Bujumbura City

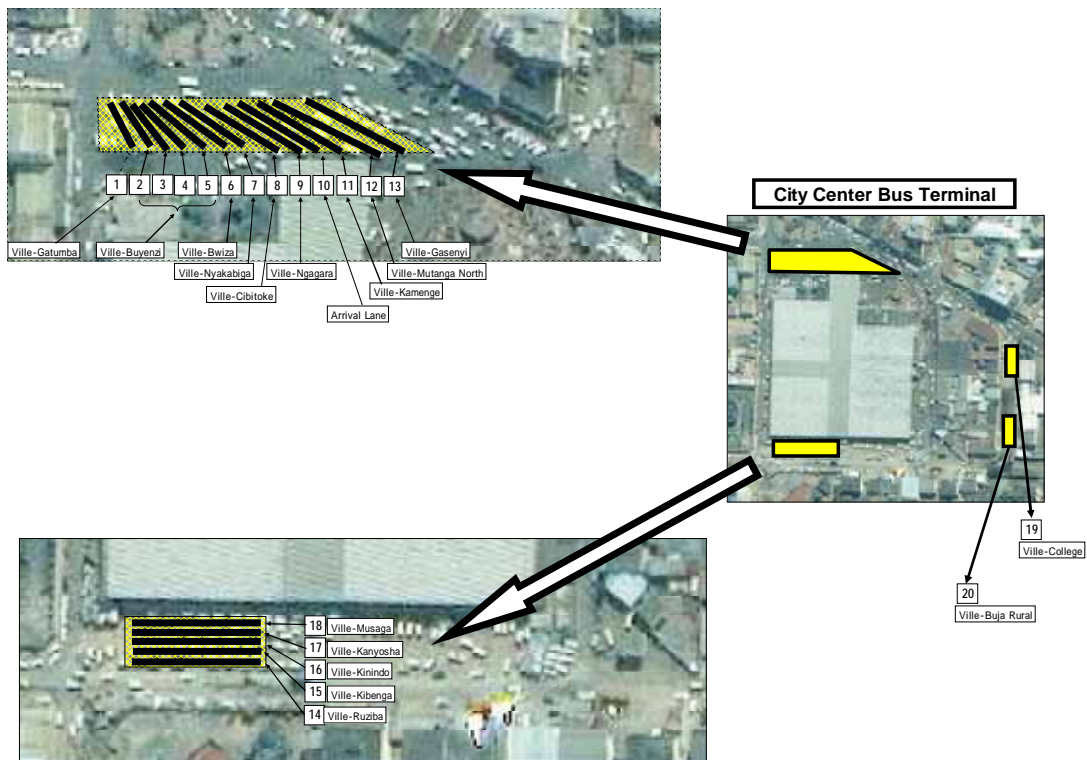


Figure 2.5.2 Location of each Bus Stations operated by Private Buses at City Market Bus Terminal

CHAPTER 2 PRESENT CONDITION OF THE STUDY AREA

Table 2.5.3 Estimated Daily Total Number of Bus Passengers

Estimated Daily Total Number of Passengers on Private Bus										
	Total No. of Vehicles (units)	Estimated No. of Operated Vehicles (units) (90%)	Estimated Frequency No. of Operation/ Round Trip/day	Capacity			Estimated No. of Passengers/Vehicle (round trip)		Estimated Total No. of Daily Passengers	
				No. of seats	Max. Capacity	Average Capacity	Average Occupancy Ratio	Average Passengers/vehicle		
	a	b = a x 0.9	c			d	e	f = d x e	g = b x c x d x 2	
Bujumbura City Bus Service										
1 Ville- Kamenge/Mutakura/Ngagara	149	134.1	5.0	30	35	32.5	0.85	27.6	37,045	
2 Ville- Nyakabiga	68	61.2	4.6	14	18	16.0	0.85	13.6	7,657	
3 Ville- Biwiza-Jabe	49	44.1	4.6	14	18	16.0	0.85	13.6	5,518	
4 Ville- Buyenzi	63	56.7	4.4	14	18	16.0	0.85	13.6	6,786	
5 Ville- Musaga	56	50.4	6.2	14	18	16.0	0.85	13.6	8,499	
6 Ville- Mutanga North-Gasenye	67	60.3	5.6	14	18	16.0	0.85	13.6	9,185	
7 Ville- Kinindo-Kanyosha-Kibenga	83	74.7	6.0	14	18	16.0	0.85	13.6	12,191	
8 Ville- Gatumba	59	53.1	2.0	14	18	16.0	0.85	13.6	2,889	
8' Ville- Gatumba	5	4.5	2.0	30	35	32.5	0.85	27.6	497	
9 Ville- College	42	37.8	5.4	14	18	16.0	0.85	13.6	5,552	
Sub-total	641	576.9							95,819	
Interurban Service										
1 BJM - Gitega	63	56.7	1	14		14.0	0.85	11.9	1,349	
2 BJM - Kayanza-Ngozi	69	62.1	1	14		14.0	0.85	11.9	1,478	
3 BJM - Cibitoke	42	37.8	1	14		14.0	0.85	11.9	900	
4 BJM - Bubanza	37	33.3	2	14		14.0	0.85	11.9	1,585	
5 BJM - Ijenda-Matana-Rutana	82	73.8	1	14		14.0	0.85	11.9	1,756	
6 BJM - Rumonge-Makamba	69	62.1	1	14		14.0	0.85	11.9	1,478	
6' BJM - Rumonge-Makamba	2	1.8	1	30		30.0	0.85	25.5	92	
Sub-total	364	327.6							8,638	
Total	1005	904.5							104,458	

e: average occupancy ratio: $(1.0+0.7)/2$
 Estimated occupancy ratio(inbound):100%
 Estimated occupancy ratio(outbound):70%

Estimated Frequency was calculated based on the bus driver interview survey.
 90%: Estimated Operational Ratio

Table 2.5.5 Results of Bus Passengers Interview Survey

Q1) Age Structure in years	Q2) occupation	Q3) male / female	Q5.1) Trip Purpose	Q6) Walking time
1) below 15 2) 15 to 20 3) 20 to 30 4) 30 to 50 5) Over 50	1) at school 2) at university 3) employed 4) employed plus study 5) self employed 6) looking for work 7) work at home	1) male 2) female	1) To Home 2) Education 3) Job 4) Business 5) Market 6) Social 7) Health	1) less than 100m 2) between 100-500m 3) between 500m and 1km 4) between 1-5kms 5) more than 5 kms
25 237 545 358 71 1236	199 136 212 73 463 102 40 1225	669 535 1204	11 39 56 180 49 407 41 783	607 346 119 87 107 1266
Q7) Waiting time	Q8) Walk to destination	Q9.1) more Taxi/Bus	Q9.2) Number bus use	Q10) Frequency
1) less than 5 minutes 2) 5 - 10 minutes 3) 10 - 20 minutes 4) 20 - 30 minutes 5) More than 30 minutes	1) less than 100m 2) between 100-500m 3) between 500m and 1km 4) between 1-5kms 5) more than 5 kms	1) Yes 2) No	1) 1 2) 2 3) 3 more	1) daily 2) weekly 3) monthly
369 541 192 91 67 1260	495 435 167 59 103 1259	462 759 1221	225 203 46 474	1088 65 18 1171
Q11) If price lower would you travel more?	Q12) Satisfied	Q13) Yes satisfied!	Q14) Not satisfied!	Q15) Improvement measures
1) Yes 2) No	1) Yes 2) No	1) enough daily operation 2) stable operation 3) enough bus route 4) enough bus stop/stations 5) comfortable 6) reasonable 7) others	1) not enough operation 2) not stable 3) not enough bus route 4) few bus stop/stations 5) not comfortable 6) expensive 7) No information 8) others	1) increase operation 2) Stable Operation 3) Increase Bus Route 4) Provision of Bus stops/ε 5) Good Services 6) Information 7) others
973 241 1214	290 935 934	100 133 38 86 63 36 54 510	235 295 706 509 669 690 168 195	329 396 765 545 784 453 332 3604

CHAPTER 2 PRESENT CONDITION OF THE STUDY AREA

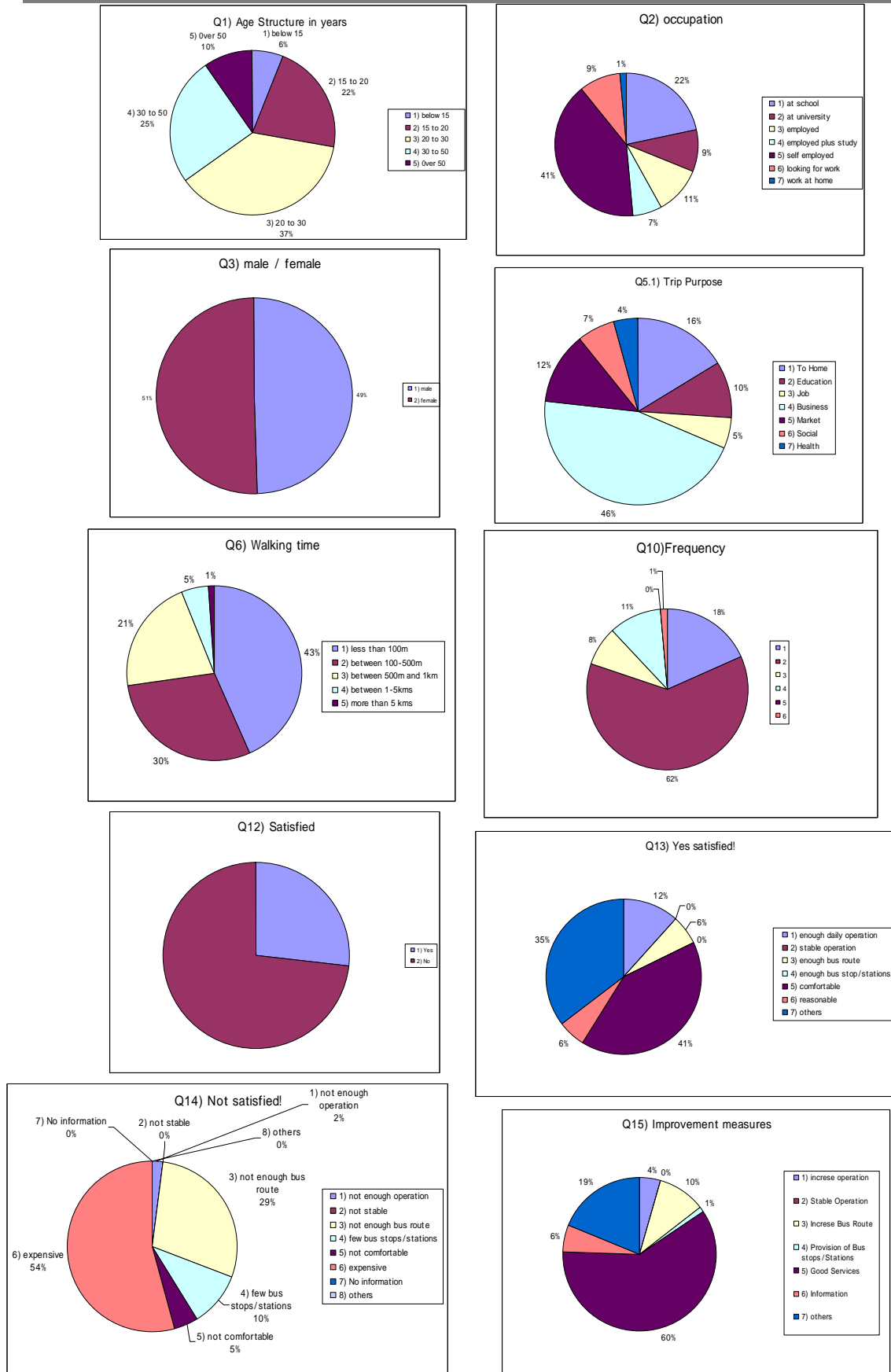


Figure 2.5.3 Answers of Passengers Interview

2-5-2.2. OTRACO

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 chart is shown in Figure 2.5.4. Under the Board of Administrators and the General Manager, 1 manager, 4 departments and 8 sections are in charge for respective duties.

Table 2.5.6 Budget and Staffs of OTRACO

	2000	2001	2002	2003	2004	2005	2006
Annual Budget (USD)	563,849	616,943	662,632	774,747	787,113		
Number of Staffs	86	88	95	96	96	94	94

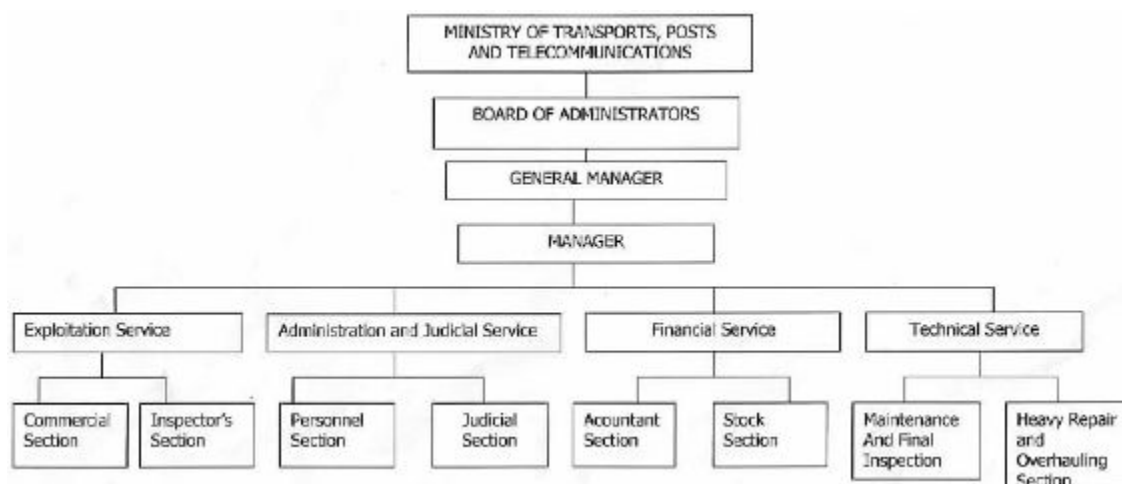


Figure 2.5.4 Organization Chart of OTRACO

(1) Vehicle Condition

At present, OTRACO owns only 68 vehicles (the administrative vehicles are not included) out of which about 60% is in operation. And the number of buses for 40 passengers has already exceeded 50% of the total. Present vehicle condition and the condition by manufacturing year are listed as below.

Table 2.5.7 Present Vehicle Condition of OTRACO BUS

Seat No	Running	Good Condition*	Grounded	Total	Ratio
100	8	3	3	14	20.6
60	4	3	8	15	22.1
40	30	6	2	38	55.9
26	0	0	1	1	1.5
Total	42	12	14	68	100.0
Ratio	61.8	17.6	20.6	100.0	

*for waiting repair

Table 2.5.8 Condition by Manufacturing Year

Seat No	100	60	40	26	Total	Ratio
1983	0	3	0	0	3	4.4
1984	4	0	0	0	4	5.9
1989	5	12	0	1	18	26.5
1999	0	0	2	0	2	2.9
2000	0	0	9	0	9	13.2
2002	2	0	7	0	9	13.2
2003	2	0	7	0	9	13.2
2005	1	0	8	0	9	13.2
2006		0	5	0	5	7.4
Total	14	15	38	1	68	100.0

The ratio of vehicles older than 20 years or more are about 40%. It can be mentioned that these vehicles are still able to operate because of their body being produced very strong enough at those days. However, it seems that the operation of these vehicles will decrease extremely in near future considering the economy and efficiency on procurement of spare parts (parts are not being produced) and increasing maintenance time by ageing.

(2) Bus Operation Condition for the Bujumbura City Bus Service

OTRACO provides Bujumbura city bus services for 10 ordinary bus routes and 9 special bus services to schools. Originally ordinary bus routes were 18. OTRACO bus routes are now decreased from 18 to 10, because of lack of enough running buses.

List of Bus routes and Bus route map operated by OTRACO are shown below.

CHAPTER 2 PRESENT CONDITION OF THE STUDY AREA

City line	From	To	Operation (Time Table)		No. of Daily Operation	No. of operation days/week	Trip No./day	Capacity	Capacity (Max)	Bus Type	No. of Passengers/day	cumulative capacity of daily passengers	cumulative max capacity of daily passengers	Occupancy Ratio	Occupancy Ratio(max capacity)	Fare/person (FBU)	
U1-U18	U1 Ngagara	Grand Bureau	7:00-7:30	17:30-18:00	Mon-Fri	2	5	26	40	Medium Bus	70	52	80	1.35	0.88	200	
	U2 Ngagara	Chanic										0	0				
	U3 Gikungu	Grand Bureau										0	0				
	U4 Gikungu	Chanic	6:45-7:25	12:00-12:30	13:30-14:00	17:30-18:00	Mon-Fri	4	45	60	Large Bus	180	240	1.00	0.75	200	
	U5 Nyakabiga	Chanic										0	0				
	U6 Musaga	Chanic	6:45-7:25	12:00-12:40	13:20-14:00	17:30-18:10	Mon-Fri	4	62	100	Large Bus	210	248	400	0.85	0.53	200
	U7 Musaga	Chanic	7:00-7:30	12:00-12:30	13:30-14:00	17:30-18:00	Mon-Fri	4	62	100	Large Bus	210	248	400	0.85	0.53	200
	U8 Kanyosha	Chanic	6:20-6:50	12:00-12:30	13:30-14:00	17:30-18:00	Mon-Fri	4	45	60	Large Bus	200	180	240	1.11	0.83	200
	U9 Cibitoke	Chanic										0	0				
	U10 Gatumba	Grand Bureau	6:30-7:10	12:00-12:40	13:20-14:25	17:00-17:45	Mon-Fri	4	62	100	Large Bus	180	248	400	0.73	0.45	200
	U11 Gatumba	Gaseyi	6:30-7:10	15:00-15:45			Mon-Fri	2	45	60	Large Bus	120	90	120	1.33	1.00	200
	U12 Kamenge	Ville										0	0				
	U13 Ville	Ruziba	6:30-15:00	7-strips			Mon-Fri	7.5	26	40	Medium Bus	300	195	300	1.54	1.00	200
	U14 Ville	Vugizo										0	0				
	U15 Ville	Gatumba Frontiere	6:30-15:00	6-trips			Mon-Fri	6.5	26	40	Medium Bus	300	169	260	1.78	1.15	200
	U16 Ville	Gaseyi										0	0				
	U17 Ville	Kanga	7:30-15:00	4trips			Mon-Fri	4	26	40	Medium Bus	120	104	160	1.15	0.75	200
	U18 Ville	Kinama										0	0				
School Line	S1 Kinindo	Lyce Vugizo	6:15-6:50	13:00-13:45		2	5	62	100	Large Bus	100	124	200	0.81	0.50	200	
	S2 Musaga	Kinindo-Lyce Vugizo	6:15-6:50	13:00-13:45	14:30-15:10	17:30-18:10	Mon&Wed	2(3),4(2)	62	100	Large Bus	90	173.6	280	0.52	0.32	200
	S3 Kinindo	Ecole Indep	6:15-6:50	13:00-13:45	14:50-15:20	17:30-18:00	Mon&Wed	2(3),4(2)	26	40	Medium Bus	50	72.8	112	0.69	0.45	200
	S4 Kinindo	SOS	6:15-6:50	13:00-13:45	14:20-14:55	17:30-18:10	Mon,Wed,Fr	2(2),4(3)	45	60	Large Bus	80	144	192	0.56	0.42	200
	S5 Ngagara	Lyce Vugizo	6:15-6:50	13:00-13:45	14:30-15:10	17:30-18:10		4	45	60	Large Bus	60	180	240	0.33	0.25	200
	S6 Ngagara	E.LB	6:15-6:50	13:00-13:45	14:30-15:10	17:30-18:10		4	26	40	Medium Bus	40	104	160	0.38	0.25	200
	S7 Rohoro	L.Y.C.Kamenge										0	0				
	S8 Musaga	Vugizo	6:15-6:50	13:00-13:45	14:20-14:55	17:30-18:10		4	62	100	Large Bus	100	248	400	0.40	0.25	200
	S9 Kinindo	La Colombiere	6:15-6:50	13:00-13:45	14:20-14:55	17:30-18:10		4	26	40	Medium Bus	40	104	160	0.38	0.25	200
	S10 Kinindo	Sem. St. Joseph										0	0				
	S11 Kinindo	Michel Archange										0	0				
	S12	Universite Lumiere		7:10-7:50	12:00-12:45	13:20-14:00	17:30-18:10	Mon-Fri	4	62	100	Large Bus	90	248	400	0.36	0.23

Table 2.5.9 Bus Routes by OTRACO

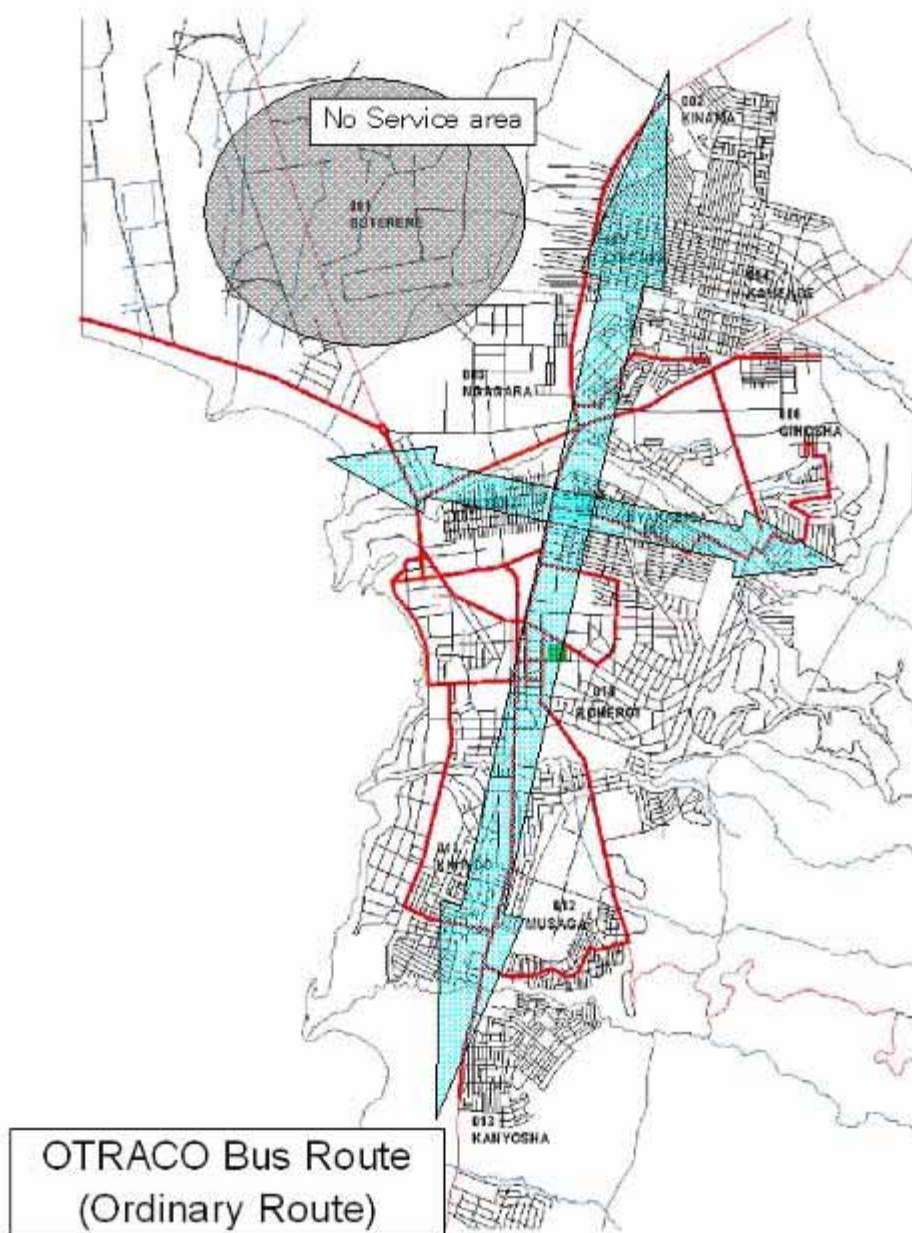


Figure 2.5.5 OTRACO Operation Bus Route

2-5-2.3. Private Bus Operators

There is a private bus operators association in Bujumbura. However, this association is not well organized. Each bus operator individually provides the bus services to the bus passengers.

Most of the operating buses are right hand drive and second hand vehicles from Japan. Private bus operators have difficulties for the procurement of new left hand drive vehicles, as there is none to provide financial supports to the private bus operators.

Private buses do not operate until the vehicle is full of the passengers, as a result, the bus terminal and bus stations are always crowded.

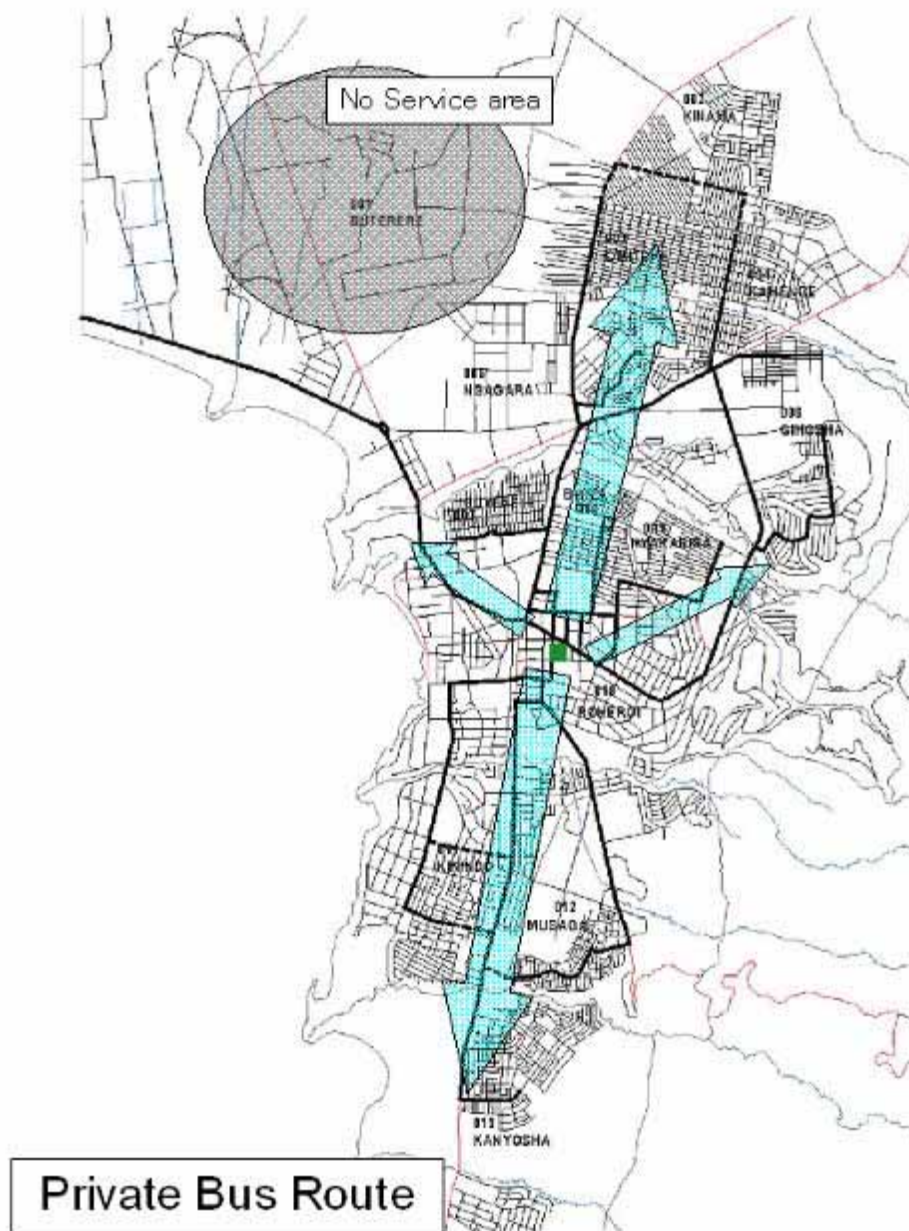


Figure 2.5.6 Private Bus Route

2-5-3 Taxi, Bike Taxi, Bicycle Taxi, others

(1) Taxi

Taxi operates individually in Burundi and so there is no association for taxi here. Each owner has the vehicles for the taxi and employs the drivers. Taxies are parked at the parking spaces approved by the Bujumbura City Council.

(2) Bike Taxi

AMOTABU (Association Moto Taxi Burundi) was established as the association of Bike Taxi in Burundi in 2004. There are 4,000 drivers who are members of AMOTABU in Burundi. No. of

operated bike taxis in Bujumbura City are 1,370 bikes. Minimum fare for Bike Taxi within Bujumbura City is 500FBu.

The result of the hearing of existing problems to AMOTABU are shown as follows,

- deteriorated road
- lack of traffic safety education for the drivers
- lack of financial support
- lack of enough parking space
- inspection center is only located at Bujumbura

(3) Bicycle Taxi

SOTAVEBU (Solidarity Taxi Velo Burundi) was established as the association of Bicycle Taxi in Burundi in 2005. There are 6,453 bicycle taxi drivers who are members of SOTAVEBU in Burundi. Out of them, some 5,732 bicycle taxi drivers are working in Bujumbura city. Generally the owner of the bicycle provides the bicycle to the driver. 1 bicycle is operated by 2 drivers. The numbers of presently running bicycle taxi in Bujumbura city is 2,866. Numbers of bicycle taxi drivers at each commune is shown as follows:

Table 2.5.10 Operated No. of Bicycle Taxi in Bujumbura City

Commune	No. of Bicycle	No. of Drivers
Buterere	126	251
Kinama	722	1,443
Cibitoke	77	154
Kamenge	573	1,145
Ngagara	92	184
Buyenzi	173	345
Bwiza	529	1,057
Nyakabiga	60	119
Gihosha	80	160
Rohero	76	151
Kinindo	92	183
Musaga	85	170
Kanyosha	185	370
Total	2,866	5,732

Resource: Result of the interview to SOTAVEBU

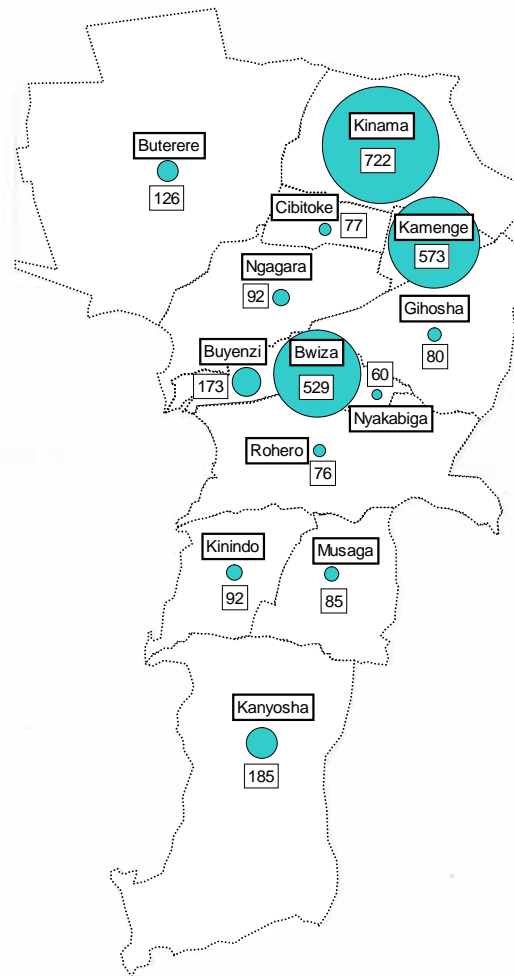


Figure 2.5.7 Registered Bicycle Taxi in Commune

The fare of bicycle taxi is between 100 and 300 FBU within Bujumbura city. Bicycle taxi is a mode of reasonable transportation for the low income residents in Bujumbura city.

Bicycle taxi is driven along the carriageway of the trunk roads, and it is very dangerous to drive a bicycle in that way carrying a passenger at the rear. The routes for bicycle taxi should be changed from trunk roads to the feeder roads.

Existing problems of bicycle taxi are as follows:

- Deteriorated road condition
- Lack of traffic safety education for the drivers
- Identification of registered bicycle drivers (introduction of the uniform for the drivers)
- Introduction of the insurance