No.

JAPAN INTERNATIONAL
COOPERATION AGENCY (JICA)

MUNICIPAL COUNCIL OF MAPUTO
THE CITY OF MAPUTO
THE REPUBLIC OF MOZAMBIQUE

THE STUDY ON THE MASTER PLAN AND FEASIBILITY STUDY FOR THE ROAD DEVELOPMENT OF THE CITY OF MAPUTO IN THE REPUBLIC OF MOZAMBIQUE

FINAL REPORT

SUMMARY

October 2001

Oriental Consultants Company Limited

Japan Engineering Consultants Company Limited

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JR
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PREFACE

In response to a request from the Government of the Republic of Mozambique, the Government of Japan decided to conduct The Study on The Master Plan and Feasibility Study for The Road Development of The City of Maputo in The Republic of Mozambique and entrusted the study to the Japan International Cooperation Agency (JICA).

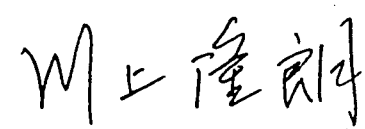
JICA selected and dispatched a study team headed by Mr. Kazuro Yanagida of Oriental Consultants Company Limited and consisted of Oriental Consultants Company Limited and Japan Engineering Consultants Company Limited to the Republic of Mozambique, three times between November 2000 and October 2001. In addition, JICA set up an advisory committee headed by Mr. Yasuhiro Sako, Director of Information System Division, Planning Department, Kinki Regional Development Bureau, Ministry of Land, Infrastructure and Transport between November 2000 and October 2001, which examined the study from specialist and technical points of view.

The team held discussions with the officials concerned of the Government of the Republic of Mozambique, 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 the 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 the Republic of Mozambique for their close cooperation extended to the teams.

October, 2001



Takao Kawakami
President
Japan International Cooperation Agency

Letter of Transmittal

October, 2001

Mr. Takao Kawakami
President
Japan International Cooperation Agency
Tokyo, Japan

We are pleased to submit to you the final report on The Study on The Master Plan and Feasibility Study for The Road Development of The City of Maputo in The Republic of Mozambique.

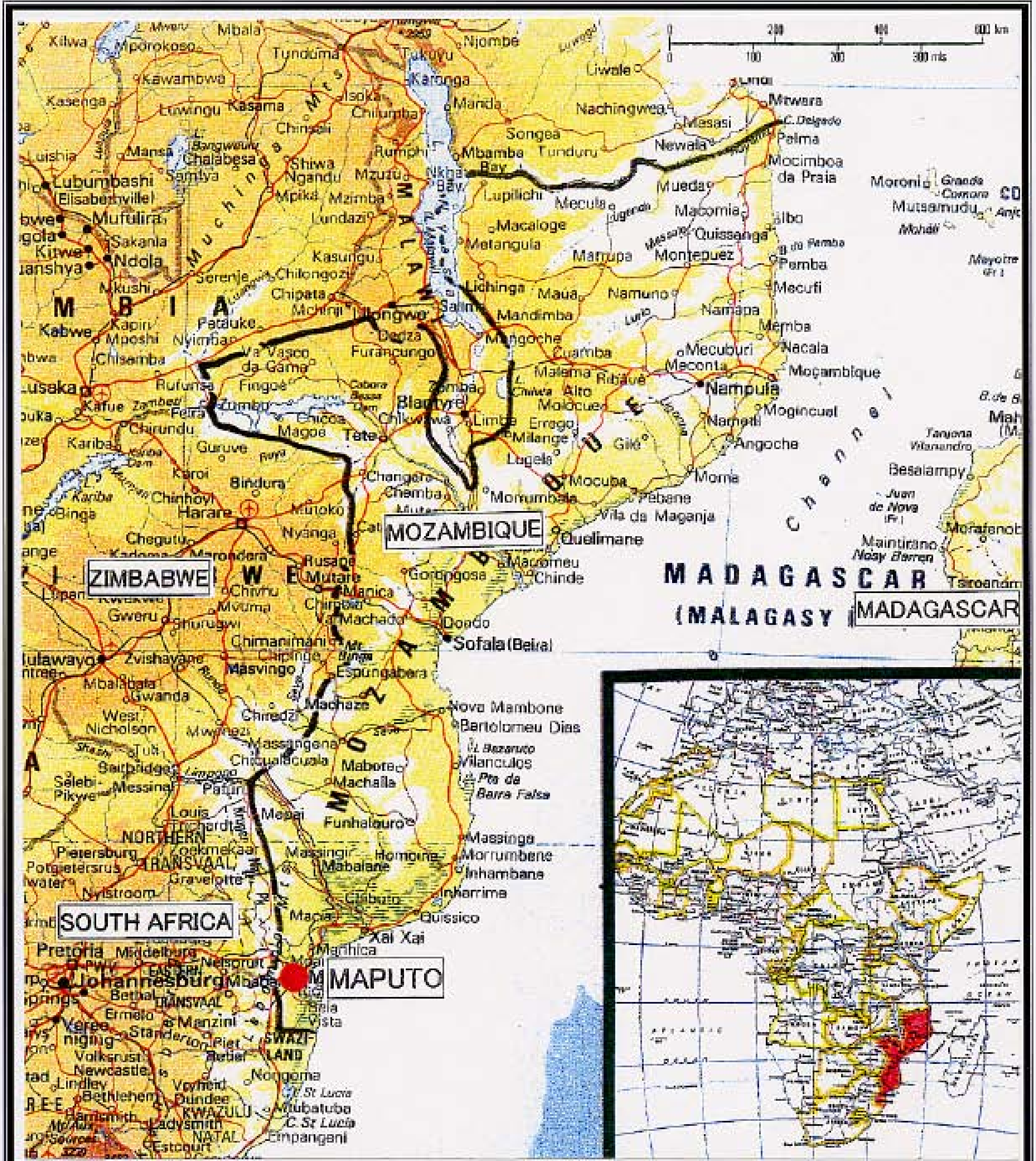
This study was conducted by Oriental Consultants Company Limited, under a contract to JICA, during the period from November 2000 to October 2001. In conducting the study, we have examined the feasibility and rationale of the study with due consideration to the present situation of Mozambique and formulated the most appropriate project.

We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA, the Ministry of Foreign Affairs, Ministry of Land, Infrastructure and Transport, Japan Highway Public Corporation. The Municipal Council of The City of Maputo, the JICA South Africa office and the Embassy of Japan in Mozambique for their cooperation and assistance throughout field survey.

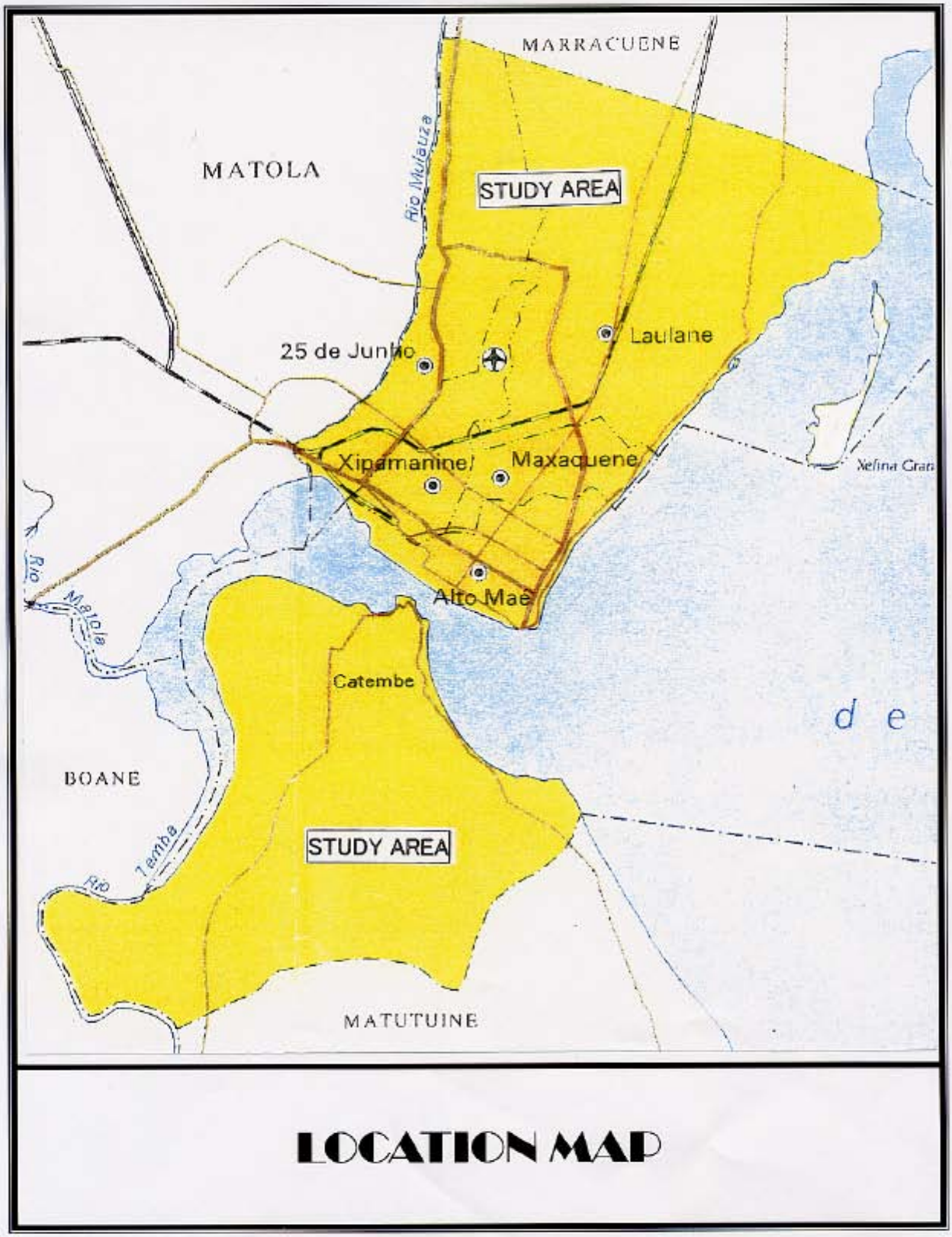
Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

Kazuro Yanagida
Project manager,
Study Team for The Study on The
Master Plan and Feasibility Study
for The Road Development of The City
of Maputo
Oriental Consultants Company Limited



LOCATION MAP



LOCATION MAP

Alternative Route of the Missing Link of Av. Julius Nyerere

Establishment of Bus Bays on Trunk Roads（Av. Vladimir Lenine）

SUMMARY OF THE STUDY

SUMMARY OF THE STUDY

1. BACKGROUND OF THE STUDY

Maputo City, the capital of Mozambique, has no established road development plan, and road expansion is lagging behind the recent growth of road traffic demand. In addition, existing road facilities are suffering progressive damage to the road structure, due to inadequacy and delay in maintenance, causing deterioration of the road service level.

The Mozambique Government requested assistance of the Japanese Government to implement the Study on the Master Plan and Feasibility Study for Road Development in the City of Maputo in the Republic of Mozambique (hereinafter referred to as the Study).

2. OBJECTIVES OF THE STUDY

The objectives of the Study are listed below:

1) Development of a Master Plan on the Maputo City Road Network (target year 2020),
2) Implementation of a feasibility study related to high priority projects, and
3) Proposition of a road structure appropriate to local conditions, proposals related to maintenance, and implementation of technology transfer through the project.

3. AREA COVERD BY THE STUDY

The Study area covers an entire City of Maputo excluding Inhaca Island. The Catembe area on the other side of Maputo Bay is included in the Study area.

4. PRESENT SITUATION ON THE EXISTING ROAD NETWORK

The rehabilitation and repair of major streets were conducted by the World Bank Programme, in length of 160km in Maputo city from April to September 1999. The major works were the pothole patching, resealing for paved roads, re-gravelling for gravel roads and cleaning of existing drainage. In spite of passing only one year after completion of this rehabilitation project, there are some potholes at intersections or flood prone areas, it is caused of traffic congestion. Main reasons are lack of appropriate drainage maintenance and poor performance of pavement rehabilitation. Furthermore major trunk roads such as Av. Julius Nyerere, Av. ONU etc., were seriously damaged by heavy rainfall in February 2000. Part of these roads are still disconnected and causing the traffic congestion in the city.

Furthermore the urbanization of the Maputo city is expected highly to continue, population and workforce population will be double in the year 2020.

5. ROAD ADMINISTRATION OF THE MAPUTO CITY

Since 1999, the MCM takes a full responsibility of construction and management for urban roads in Maputo. Road maintenance, management and operation are conducted by the relevant departments and it is causing confusion of jurisdiction of the maintenance for different to each part of road and drainage facilities. Furthermore there are problems as shown below, these are causing the delay of repair of pavement and drainage facilities.

- No maintenance plan for long period
- Jurisdiction of the road maintenance is different for each part of road and drainage facilities
- Poor performance for road management
- Shortage of budget for road management

6. FORMURATION OF THE ROAD DEVELOPMENT MASTER PLAN

6.1 BASIC POLICY

1) Road Development Plan

Basic policy for establishment of the road development plan was made based on the area development plan and future traffic assignment.

(1) Road Classification for Satisfaction of BHN and Improvement of PRSP and Local Area Environment

The road network system should be developed in a hierarchic manner based on the road classification proposed by the Study Team together with its functions. Proposed road classifications are ;

- Primary trunk roads and trunk roads : Trunk roads
- Collector roads and local area roads : Community roads

(2) Road Development to Solve Existing Road Problems

The existing road problems of the Maputo city identified are ;

- Deterioration of road pavement in urbanized area
- Heavy deterioration of community roads in sub-urbanized area
- Traffic congestion

- Poor drainage system
- Poor road maintenance

(3) Road Development to Enhance Future Traffic Efficiency

Expected heavy traffic congestions on major corridors should be solved by the following measures ;

- Av. da Mozambique : Widening to dual carriageway, or construction of new bypass
- Av. Julius Nyerere : Widening to dual carriageway on northern section, and reconstruction or new construction of bypass for missing link
- Av. Acordos de Lusaka : Increasing of traffic capacity by widening dual carriageway on entire section and improvement of intersections by grade separation or signalled junction
- Av. Vladimir Lenine : Increasing of traffic capacity by construction of proper bus stops and improvement of intersections
- Av. F.P.L.M : Extension and widening or strengthening of surrounding road network

(4) Road Development to Promote Metropolitan Development

In order to promote the concept of the Structure Plan of the Metropolitan Maputo, trunk road network should link with future road network efficiently.

2) Public Transportation Plan

Based on the future traffic estimation, future demand of bus traffic is expected to grow rapidly. In order to enhance the bus traffic efficiently, following concept for public transport development were proposed.

(1) Solve The Lack of Public Transport Services

- Open public transport operation by road rehabilitation of existing bus route and un-serviced collector roads

(2) Solve The shortage / Congestion of Bus Stops

- Construction of proper bus stops on trunk roads

(3) Solve The Slow Bus Operation

- Construction of proper bus terminals with enough space for markets near intersections of trunk roads

(4) Solve The Lack of Bus Informations

- Installation of information facilities at each bus stops and terminals

3) Urban Traffic Management Plan in the Central Business District (CBD) of the Maputo City

After implementation of the road development plan, future traffic congestion in the year 2020 will be solved drastically, however congestion in the city centre will be remained due to insufficient traffic management. Therefore the following traffic management measures should be introduced in the CBD of the Maputo city.

(1) Public Transportation Planning

- Removal of bus stops close to intersections, improvement of bus stops, establishment of bus stops on collector roads, introduction of bus lane

(2) Urban Traffic Management Measures

- Improvement of intersections (establishment of right-turn lane, improvement of traffic signals)

4) Road Maintenance Plan

The road and drainage condition in Maputo city is poor due to lack of the road maintenance, therefore the following sustainable road maintenance policy should be established.

(1) Efficiency of the Road Maintenance and Introduction of Privatisation

The road maintenance consists of three categories ; routine maintenance, periodic maintenance and emergency maintenance. Programme for routine and periodic maintenance should be established for to operate the proper road maintenance effectively. Furthermore the quality of road maintenance should be increased by the competition of each private enterprise for the introduction of privatisation.

(2) Introduction of New Road Department

It is necessary to restructure the existing organization and establish the new road department for systematic road maintenance, consisting the following five sections ; management section, road development planning / design section, road maintenance planning / design section, procurement section, emergency maintenance section.

6.2 ROAD DEVELOPMENT ALTERNATIVES

Based on the development concepts with the necessary measures to be improved for road development and public transport development, the following six alternatives for road development for long-term target (year 2020) were proposed.

Alternatives	Components
Do-Minimum (base case)	Existing road network and on-going road development projects will be consisted.
Plan 1	The basic plan, which the MCM is expecting and all the necessary measures have been incorporated.
Plan 2	Based on the preliminary evaluation of the conception plan, construction of alternative bypass for the missing link of Av. J. Nyerere and widening of Av. M. Ngouabi have been incorporated.
Plan 3	Adding grade separation and intersection improvements into the Plan 2 in order to strengthen traffic capacity of road network.
Plan 4	Adding construction of bypass of Av. Mozambique instead of widening of existing road into the Plan 4, 5, 6, to bear the future traffic demand on Av. Mozambique.
Plan 5	
Plan 6	

6.3 FUTURE TRAFFIC DEMAND FORECAST

In case of the Do-minimum case, the bottleneck links having more than 1.5 volume to capacity ratio could be identified as almost all links on the trunk roads by the year 2020. In case of Plans 1 and 3, the bottleneck links become minimum on the trunk road network. Expect in the city centre, bottlenecks especially at the intersections should be settled out through the improvement of intersections and traffic management plan. Therefore Plans 1 and 3 would be well matched to the long-term traffic demand and are recommendable. In case of Plan2, bottlenecks could be identified on the trunk road network and in the city centre. This network is not so well matched to the long-term traffic demand and accordingly Plan 2 alternative is not recommendable from the viewpoint of traffic efficiency. In case of Plan 4, Bottlenecks would become minimum on the trunk road network and this plan also could become one of the recommendable road network for further consideration. Bottleneck on the trunk road network could be identified in Plan 5 and 6 in the year 2020 and this shows both road networks are not recommendable from the viewpoint of traffic efficiency.

From these evaluations, the road networks which could meet the future traffic demand efficiently would be the Plan 1, 3 and 4 from the viewpoint of traffic functions required for long-term road development.

6.4 ECONOMIC / FINANCIAL ANALYSIS

The cost is needed to be discounted into economic cost, which deduct the fringe value of

market price, such as import tax, subsidy and wage regulation. Using the following equation, the Plan 3 is the most recommended plan in terms of economic efficiency.

Annualized Cost = Total Cost x R x [(1+R)^n]/[(1+R)^n - 1]

Where, R = discount rate (12%) and n = investment period (5 years)

	PCU-km	PCU-hour	VOC ($/day)	VOC (mil.$ / year)	① **Benefit (mil.$ / year)**	Total Cost (mil.$)	Net Total Cost (mil. $)	② **Cost (mil.$ / year)**	①/②
Do minimum (Base Case)	*4,543,801*	*337,439*	*1,850,576*	*675.5*	***0.0***	*12.0*	-	-	-
Plan 1	4,506,895	140,114	1,489,253	543.6	**131.9**	192.6	180.6	**50.1**	**2.63**
Plan 2	4,619,160	161,354	1,530,305	558.6	**116.9**	155.8	143.8	**39.9**	**2.93**
Plan 3	4,562,664	153,613	1,505,729	549.6	**125.9**	161.7	149.7	**41.5**	**3.03**
Plan 4	4,521,176	149,241	1,498,949	547.1	**128.3**	208.8	196.8	**54.6**	**2.35**
Plan 5	4,595,195	159,284	1,520,195	554.9	**120.6**	171.9	159.9	**44.4**	**2.72**
Plan 6	4,661,212	166,181	1,550,304	565.9	**109.6**	177.8	165.8	**46.0**	**2.38**

As seen in the following result of the financial analysis, about one third of the total cost can be covered by the road budget of the MCM. Meanwhile, fuel tax revenue and foreign aid are expected to cover of 25% and 44% of the total cost respectively.

	Term (2003 ~ 2010)	**Term (2011 ~ 2020)**	**Total (2003 ~2020)**	**%**	**Remarks**
Cost					
Development	68.3	65.4	133.7	74%	
Maintenance	20.7	25.3	46.0	26%	
TOTAL	89.0	90.7	179.7	100%	
Finance					
The MCM Budget	24.2	31.2	55.4	31%	Road Budget
Fuel Tax Revenue	18.6	26.9	45.5	25%	6% of fuel tax revenue from Maputo
Foreign Aid	46.1	32.7	78.8	44%	For imported materials
Other					Additional, if needed
TOTAL	89.0	90.7	179.7	100%	

7. IMPLEMENTATION PLAN

Implementation programme was planned in short-term, middle-term and long-term, furthermore its packages of the project were made by each drainage system / storm water basin.

Implementation programme of each project for the short, the middle and the long-term plans

are prepared based on the objectives of each term. Project road of the short-term plan is consisted with 57 km and its project cost is estimated as 37 million USD by the year 2005. Project road of the middle-term plan is consisted with 69 km and its project cost is estimated as 47 million USD by the year 2010. The short / middle-term plan should be implemented in approximately 9 years.

Road project of the long-term plan is consisted with 32 km and its project cost is estimated 34 million USD by the year 2020. The long-term plan should also be implemented in approximately 5 years.

Furthermore, the maintenance cost such as routine maintenance and periodic maintenance cost will be added until the target year in 2020 after completion of the project.

8. IDENTIFICATION OF THE FEASIBILITY STUDY PROJECTS

Based on the evaluation of the middle-term projects, the identification of the high priority project for the Feasibility Study has been conducted in order to meet a most important, necessary and consistent road development plan as shown below.

	Length	1 Importance		2 Necessity		3 Impact		4 BHN Access		5 Govern-mental Policy	6 Total	7 Priority Project for FS
		Road Class	Present Traffic	IRI	Congestion	Land Use	No. of Settlement	Public Facility	Emergency Vehicle			
	km											
A. Primary Trunk Road												
A.1 Widening of Av. de Mozambique + Rehabilitation of Northern Section	15.05	A	A	C	B	A(Com. Res)	19 A	A	A	A	A'	
B. Trunk Road												
B.1 Construction of Missing Link on Av. Julius Nyerere	4.80	A	A	A	A	A(Com. Res)	162/2=81 B	A	A	A	A	◎
B.2 Improvement of Av. Vladimir Lenine	3.20	A	A	A	A	A(Com.)	0 A	A	A	A	A	◎
B3. Improvement of Av. Acordos de Lusaka	2.85	A	A	A	B	A(Com. Res)	0 A	A	A	A	A	◎
B4. Improvement of Av. Angola	3.09	A	A	B or C	A	A(Com. Res)	0 A	A	A	A	A	◎
B5. Improvement of Av. Marien Ngouabi	1.88	A	A	A	A	A(Com./Res)	31 A	A	A	A	A	◎
C. Collector Road												
C1. Improvement of Industrial and Commercial Area Roads												
- Av. ONU												
- Av. Eduardo												
- Av. Josina Machel												
- Av. Fernao de Magalhaes												
- Av. Zedequias Manganhela	17.04	A	A	A	A or B	A	0 A	A	A	A	A	◎
C2. Improvement of Port Area Roads												
- R. Consiglieri Pedroso - Praca 25 de Junho - R. Marques de Pombal												
- R. do Bagamoyo - R. Joaquim Lapa												
- Av. Martires de Inhaminga - R. de Timor Leste												
C3. Improvement of Residential Area Roads												
Dist. 1	1.60	A	A	A	A or B	A(Com. Res)	10 A	A	A	A	A	◎
Dist. 2	10.23	A	A or B	A	B	A(Com./Res)	140 B	A	A	A	A	◎
Dist. 3	8.48	A	A or B	A	B	A(Com./Res)	126 B	A	A	A	A	◎
Dist. 4	28.41	A	B	A	B	B(Res.)	3 A	A	B	A	A'	
Dist. 5	25.58	A	B	A	B	B(Res.)	49 A	A	B	A	A'	
	122.17											
	A:Tru Colle		A>5,000	A:IRI > 8	A>1.0		A<50					
	B:Urb Ar Rd		B>2,000	B:IRI > 6	B>0.5		B<200					
	C:Rural		C<2,000	C:IRI < 4	C<0.5		C>200					

9. OBJECTIVES AND COMPONENTS OF THE PROJECTS

Feasibility Study Project has been selected as the High Priority Projects among the middle -term project of the road development plans proposed in the Master Plan. The objectives and components of the Project consists three categories; namely, road development plan, traffic management plan and public transport plan as outlined below.

1) Objectives of the Projects

The objective of the projects is shown in next table.

2) Project Component

The target year for the priority projects has been established as a year 2010 in order to prepare suitable scale of the projects to meet a future traffic demand in the target year.

- Road Development Plan
  1) Construction of Missing Link on Av. Julius Nyerere (total length = about 4.8 km)
  2) Improvement of Av. Vladimir Lenine
  3) Rehabilitation and Improvement of Av. Acordos Lusaka, Av. Guerra Popular (total length = 3.5 km)
  4) Rehabilitation and Improvement of Av. Angola (total length = 3.7 km)
  5) Rehabilitation and Improvement of Av. Marien Ngouabi (total length = 1.9 km)
  6) Rehabilitation of Industrial and Commercial Area Roads (total length= 6.03 km)
  7) Rehabilitation of Port Area Roads (total length =3.9 km)
  8) Rehabilitation of District 1 Area Roads (total length = 8.7 km)
  9) Rehabilitation of District 2 Area Roads (total length = 10.2 km)
  10) Rehabilitation of District 3 Area Roads (total length =9.5 km)

- Traffic Management Plan
  Construction of Right-turn lanes and signals (14 intersections) and control of on-street parking in intersection areas.

- Public Transport Plan:
  To provide suitable location and size of bus bays (22 bus bays) and one (1) terminal and to equip required function on to the bus terminal.

FS Project	Trunk Roads					Collector Roads		Residential Area Roads			Rehabilitation and Improvement of Traffic Management Facilities	Rehabilitation and Improvement of Bus Stops and Terminals
	1.Construction of Missing link on Av. Julius Nyerere	2.Improvement of Av. Vladinir Lenine	3.Rehabilitation and Improvement of Av. Acordos de Lusaka	4.Rehabilitation and Improvement of Av. Angola	5.Rehabilitation and Improvement of Av. Marien Ngouabi	1.Rehabilitation of Industrial and Commertial Area Roads	2.Rehabilitation of Port Area Roads	1.Rehabilitation of District 1 Area Roads	2.Rehabilitation of District 2 Area Roads	3.Rehabilitation of District 3 Area Roads		
1. General Target/Objectives, Target year: 2020	1. Protect/ improve Basic Human Needs and Community Environment 2. Contribute settlement of existing Road Ploblems 3. Enhance Future Traffic Efficiency 4. Promote the Metropolitan Development											
2. General Strategy for year 2020	1. Functional Classification of Road Network and Typical Closs-sections 2. Rehabilitation of Pavement and Drainage, Construction of Dual Carriageway (Lusaka, Angola and M. Ngouabi Rd.) and Improvement of Intersections in Central Area 3. Construction and Improvement of Dual Carriageway (Mozambiqu, Nyerere, Lusaka, Lenine, FPLM, M. Ngouabi Rd.) 4. Construction and Improvement of Outer and Middle Ring roads											
3. Project Objectives, Target year: 2010	1. Early Linking of Missing Link 2. Prevent Disaster 3. Basic Corridor for Future Extention	1. Decrease Traffic Congestion 2. Provide Better Public Transport	1. Smooth Vehicle Running 2. Decrease Traffic Congestion	1. -do- 2. -do-	1. -do- 2. -do -	1. -do-	1. -do-	1. -do-	1. -do-	1. -do-	1. -do- 2. -do- 3. Avoid Large-scale Investment	1. Provide Appropriate Bus Services 2. Settle Traffic Congestion
4. Project Measures/ Components for year 2010	1.Reconstruction of 2-lane Trunk Road 2.Measures for Land-slide and Drainage 3.Land Preparaion for Widening	1. Construction of Bus Bay 2. Improvement of Intersection	1. Pavement and Drainage Rehabilitation 2. Construction of Dual Carriageway	1. -do- 2. Intersection Improvement	1. -do- 2. -do- 3. Construction of Dual Carriageway	1. -do-	1. -do-	1. -do-	1. -do-	1. -do-	1. Installation of Right-turn lane and Signal 2. Control of On-street Parking 3. Traffic Control	1. Provide suitable location and size of bus bays/stations 2. Equip required Functions
Carriageway	Asphalt-concrete(As-con)	Concrete block (Block)	As-con	As-con	As-con	As-con	As-con	As-con	As-con	As-con	As-con	Block
Footpath	Bitumenous Surface Treatment(BST)	Block	Block	Block	Block	Block	Block	Block	Block	Block	Block	Block
Drainage	Open ditch	nil	U-shaped	U-shaped	U-shaped	U-shaped	U-shaped	U-shaped	Open ditch	Open ditch	U-shaped	U-shaped
5. Alternatives	1. Route Alternatives 2. Stage construction	nil	1. Widening of Right of Way	nil	nil	nil	nil	nil	nil	nil	nil	nil
Carriageway	Stabilized base/sub-base course (Stabilization)	Semi-rigid	Stabilization	Stabilization	Stabilization and BST	Stabilization and BST	Stabilization and BST	Stabilization and BST	Stabilization and BST	Stabilization and BST	Semi-rigid	Semi-rigid
Footpath	nil	BST	BST	BST	BST	BST	BST	BST	BST	BST	nil	BST
Drainage	nil	nil	L-shaped	L-shaped	L-shaped	Open ditch	L-shaped	L-shaped	nil	nil	L-shaped	L-shaped

10. Preliminary Engineering Design

10.1 DESIGN STANDARD

The recommendable Road Classification of the Feasibility Study Project has been evaluated based on ANE's and SATCC design standards.

10.2 HIGHWAY DESIGN

The two alternative routes of the missing link of Av. Julius Nyerere were selected through the evaluation of distance, connection with the collector roads, possibility of the usage of existing right-of-way. Furthermore the best alternative route was selected through the comparison of the two routes, "Master Plan route" was selected as the Feasibility Study Project road due to cheaper initial cost and better IRR.

10.3 PRELIMINARY COST ESTIMATION

Unit:mil.US$

Phase	Project Road Length (km)	Grand Total*			
		C/C		H/C	
(1) Construction Cost					
- Av. J. Nyerere	5.6	5.05	(11.60)	0.53	(0.50)
- Av. V. Lenine	---	0.13	←	0.00	←
- Av. A. Lusaka	2.8	1.76	←	0.00	←
- Av. Angola	3.7	2.05	←	0.00	←
- Av. M. Ngouabi	2.6	1.43	←	0.12	←
- Industrial/ Commercial Area	6.0	2.29	←	0.00	←
- Port Area	3.9	1.53	←	0.00	←
- District 1 Roads	8.7	3.61	←	0.00	←
- District 2 Roads	10.2	3.62	←	0.50	←
- District 3 Roads	9.5	4.28	←	0.18	←
- Traffic Management Facilities	---	2.80	←	0.00	←
- Bus Stops and terminals	---	0.56	←	0.14	←
Sub Total (a)		**29.12**	**(35.67)**	**1.47**	**(1.44)**
(2) Structural Strengthening Cost		0.56	(0.56)	---	---
Sub Total (b)		**0.56**	**(0.56)**	**---**	**---**
Total Construction Cost (a)+(b)		**29.68**	**(36.23)**	**1.47**	**(1.44)**
(3) Consultant Fee (DD/SV=10% of Construction Cost)		2.91	(3.57)	---	---
(4) Contingency for Price Escalation and Physical Change (10% of Construction Cost)		2.91	(3.57)	---	---
(5) Administration Cost of Mozambique Government (1% of Construction Cost)		---	---	0.29	(0.36)
Sub Total (6) = (3) + (4) + (5)		**5.82**	**(7.13)**	**0.29**	**(0.36)**
Total (1) + (2) + (6)		**35.50**	**(43.36)**	**1.76**	**(1.80)**

* : C/C: Construction Cost ( ) = Julius Nyerere Plan 4
H/C: House Compensation including Relocation of Utilities
Exchange Rate 1 US$ = 22,000 Mts = ¥125.00 (July 2001),
or 1 Mt = ¥0.00568

11. IMPLEMENTATION PROGRAMME

The Directorate of Roads and Bridges, the Municipal Council of Maputo is recognized as the government agency responsible for the execution of the implementation of the Project. And National Roads Administration is also the executing agency for supporting the Municipal Council of Maputo.

Based on the proposed drainage systems for each storm water basin, each component of the Feasibility Study Projects has been combined into the following Packages. Also the overall implementation schedule for each project was set up, and the priority order of the project road was set up through the consideration of the following factors, construction schedule, land acquisition, compensation for house and buildings, relocation of utilities, design and execution of preparatory works.

Priority	Proposed Roads
1 st (Package C)	- Rehabilitation of pavement and drainage on Industrial and Commercial Area Roads (L = 6.03 km) - Rehabilitation of pavement and drainage on Port Area Roads (L = 3.9 km) - Rehabilitation of pavement and drainage on District 1 Area roads (total length = 8.7 km) - Improvement of Bus Bays and Bus terminal (23 numbers)
2 nd. (Package A)	- New construction of the Bypass missing link of Av. J. Nyerere (L = 5.6 km) - Improvement of Av. V. Lenine - Improvement of Av. A. Lusaka (L = 2.8 km) - Construction of the Bus terminal at the Combatentes Plaza - Rehabilitation of pavement and drainage on District 3 Area Roads (total length = 9.5 km)
3 rd. (Package B)	- Widening of Av. G. Popular (L = 0.7 km) - Improvement of Av. Angola (L = 3.1 km) and S. Cabral/Largo de Deta (L = 0.6 km) - Improvement and widening of Av. M. Ngouabi (L = 1.9 km) - Rehabilitation of pavement and drainage on District 2 Area Roads (total length = 8.7 km) - Improvement of Intersections in the CBD (14 intersections)

Package No.	Proposed Facilities to be Implemented	Project Road Length (km)	High Priority Projects to be implemented in the Short-term Plan					
			1 st. year	2nd. year	3rd. Year	4th. Year	5th. year	
			2002	2003	2004	2005	2006	2007
Preparatory Works	Land Acquisition, House Compensation, Relocation of Utilities, Engineering Services	----						
Package A	Road and Public transportation Projects in Polana-Canico area	19.6						
Package B	Road, Public Transportation and Traffic Management Projects in Altmae, Central, Polana-Cimento, Coop and Sommerschield area	16.5						
Package C	Road and Public transportation Projects in Altomae and Polana-Cimento area	18.6						
Package D	Structure Strengthening of Road Maintenance Organization	----						

12. PROJECT EVALUATION

12.1 Economic Analysis

Economic analysis is conducted with streams of discounted benefit and costs with which the project life is assumed at 20 years and discounted rate is set as 12%. The results of the analysis for the whole projects are all favorable as B/C=2.7, NPV=41.5 million USD, and IRR= 27.9%.

For economic analysis of each project, virtually all of projects are feasible from economic point of view, since B/C none of the projects is less than 1 (or IRR=12%). Especially, projects of trunk roads such as Av. Lusaka and Av. Julius Nyerere are highly effective compared with collector roads.

12.2 Financial Analysis

Even though the main part of the costs are expected to be covered by the international grant, it is the MCM to pay around total of 4 million USD for costs required for the MCM. It is obvious that the limited project budget (0.5 million USD) of the MCM can not cover around 1 million USD of the annual cost requirement. The study addresses the fuel tax revenue, none of which is used for Maputo in spite of fuel tax paid by drivers in Maputo, to be an additional source of funding.

13. ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

In summary, the environmental impact assessment shows that the impact of the project on the roadside environment and the surrounding areas will be less than the allowable level for the assessed items and it will be possible to maintain the quality of the environment at an appropriate level.

To mitigate the negative impacts and maximise the benefits, possible measures to deal with all of the environmental issues in the future are recommended to ensure that the city of Maputo will be with the favourable urban environment being created.

14. CONCLUSION AND RECOMMENDATIONS

14.1 CONCLUSION OF THE FEASITIBITY STUDY PROJECT

1) Effect of the Project

- Improvement of Traffic Congestion on the Trunk Roads Network

Time saving by execution of the Feasibility Study Project are estimated as follows.

- Improvement of Av. V. Lenine : 574 pcu-h/day
- Improvement of Av. A. Lusaka : 767 pcu-h/day
- Improvement of Av. da Angola : 109 pcu-h/day
- Improvement of Av. M. Ngouabi : 277 pcu-h/day

- Increase of Traffic Capacity In CBD by Improvement of Intersections
- Improvement of The Public Transport Services

The passenger time saving of the bus transport by improvement of the local area roads will give the benefit for low-income people because the bus is the main mode of transport for low-income population.

- Improvement of Traffic Functions by Establishment of Bus Bays and Bus Terminals
- Contribute PRSP through Rehabilitation of Local Area Roads in District 2 and 3

Area drainage network will be constructed through the project, it will prevent the storm water disaster and improve the community environment through the secure of good traffic conditions and creation of good access to public community facilities.

- Improvement of Roadside Environment

Road development is expected to reduce the emission level from vehicle operation by optimise travel speed, at 325 ton of carbon oxides, 19 ton of nitrogen oxides, and 174 ton of carbon dioxides in a year 2010.

2) Economic Evaluation

The results of the analysis for the whole projects are all favorable as B/C=2.7, NPV=41.5 million USD, and IRR= 27.9%. For economic analysis of each project, virtually all of projects are feasible from economic point of view, since B/C ration of each project is more than 1 (or IRR=12%).

3) Environmental Impact Assessment (EIA)

In summary, the environmental impact assessment shows that the impact of the project on the roadside environment and the surrounding areas will be less than the allowable level for the assessed items and it will be possible to maintain the quality of the environment at an appropriate level.

14.2 RECOMMENDATIONS FOR IMPREMENTATION OF THE PROJECT

In order to materialize the projects, the Study team recommends that MCM takes the following actions.

1) Financial Measure Required

According to the financial analysis for the projects, it is reconfirmed that the MCM is able to prepare around 0.5 million USD of annual budget exclusively for the project implementation. However the financial situation of the MCM is not wealthy enough, it is impossible to bare whole project cost of 38 million USD by MCM. Therefore the study team suggested to MCM to share some of responsibility in administration cost, routine maintenance cost, and value added tax payment while the main component of costs such as construction cost, engineering cost, etc. will be supported by the international grants.

In addition, the study team suggested to MCM to consider the following financial resources:

- To ensure the MCM own budgets and the return of the fuel tax during projects activities,
- To ensure the foreign budget for the periodic and routine maintenance, and
- To establish the Road Fund account in the MCM.
- Allocation of local budget for house compensation

2) Proper Planning for Re-settlement of Residents

- Budget allocation for house compensation
- Alternative location for displaced people
- Fulfil requirements of life for the re-settled people
- Consensus with re-settled people through discussions

3) Improvement of Storm Drainage System

(1) Recommendable Road Drainage System

- U-shaped drain with cover : urbanized area and local area road in narrow ROW
  (Pre-cast concrete type will be more preferable for repair)
- V-shaped open drain : trunk roads in sub-urban area, local area roads
  (concrete or stone pitching)
- K or L-shaped drain : local area roads in narrow ROW.
  (concrete blocks)

(2) Routine Maintenance of Roadside Drainage by MCM and Resident People

- Routine / periodic maintenance of drainage facilities, consisting cleaning, repair and

reconstruction of drainage facilities, should be conducted by the new road department of MCM.

- Cleaning, dredging, prevention of garbage dumping etc., should be done by the resident people.

  (Enlightenment of such action should be initiated by district offices in cooperation with the new road department of MCM)

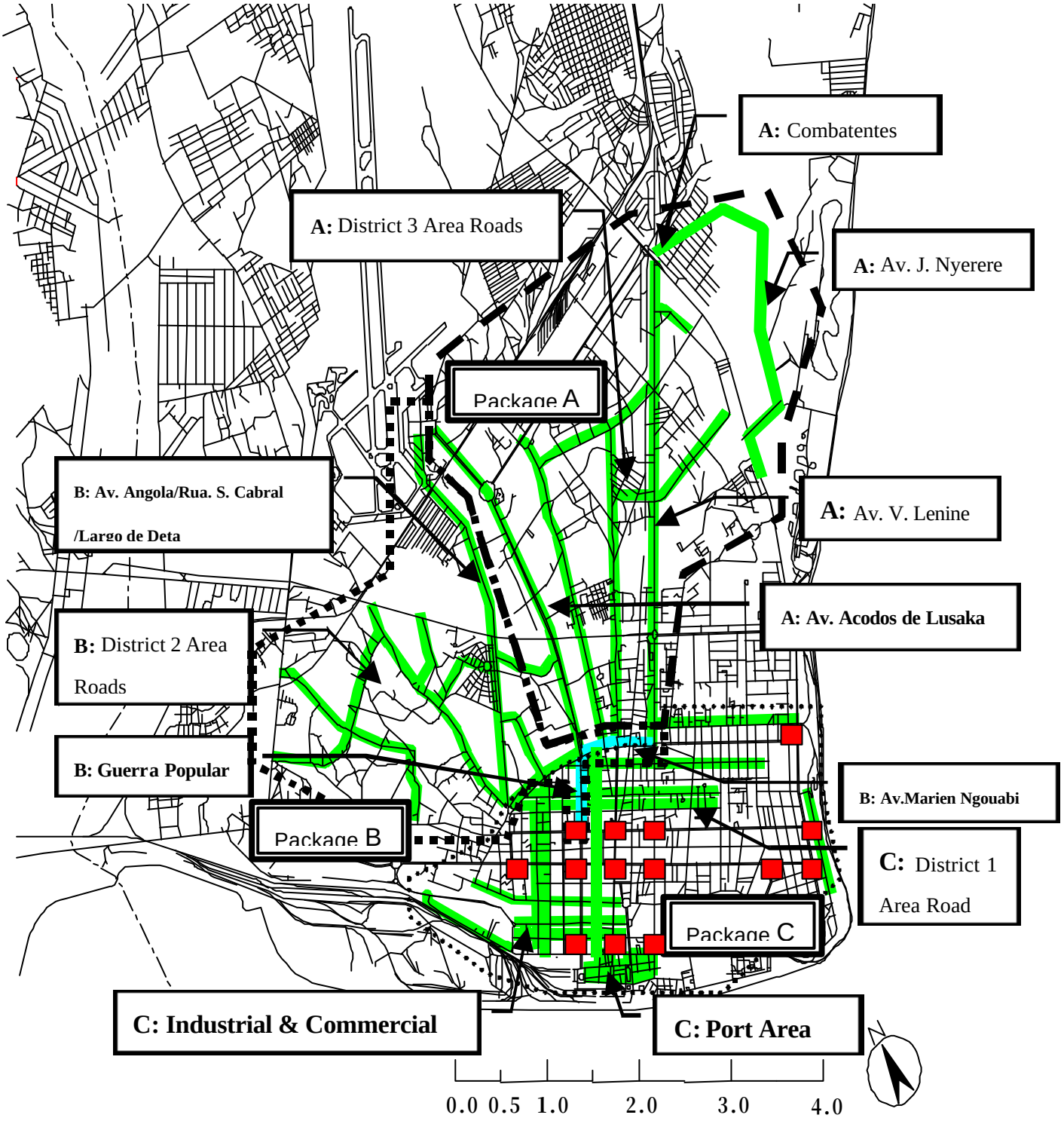
(3) Improvement of Area Drainage System by MCM

- Project for improvement / restoration of local area drainage system should be conducted by relevant department of MCM.

  (It should be proceeded in parallel with the progress of the road development projects)

4) Structural Strengthening of the New Road Department

- Establishment of New Road Department (Organization)
- Introduction of Privatizaion on Road Maintenance Work
- Establishment and Implementation of for Maintenance Programme (Basic Policy and Technical Issue)
- Structural Strengthening of the New Road Department (Construction of the Training Room, Procurement of the Expert for the Road Maintenance, Installation of Maintenance and Training Equipments, On the Job Training for Road Maintenance, Technical Support by ANE)


A: Combatentes
A: District 3 Area Roads
A: Av. J. Nyerere
Package A
B: Av. Angola/Rua. S. Cabral /Largo de Deta
A: Av. V. Lenine
A: Av. Acodos de Lusaka
B: District 2 Area Roads
B: Guerra Popular
B: Av.Marien Ngouabi
Package B
C: District 1 Area Road
Package C
C: Industrial & Commercial
C: Port Area
0.0 0.5 1.0 2.0 3.0 4.0

FINAL REPORT

TABLE OF CONTENTS

ABBREVIATIONS

(In alphabetical order)

AASHTO	:	American Association of State Highway and Transportation Officials
ANE	:	Administração Nacional de Estradas (National Road Administration of Mozambique)
B/C	:	Benefit / Cost Ratio
BHN	:	Basic Human Needs
CBD	:	Central Business District
CBR	:	California Bearing Ratio
CO	:	Carbon Monoxide
dB	:	Decibel
DBST	:	Double Bitumen Surface Treatment
DSM	:	Directorate of Municipal Service
EIA	:	Environmental Impact Assessment
EIRR	:	Economic Internal Rate of Return
FIRR	:	Financial Internal Rate of Return
GDP	:	Gross Domestic Products
HDI	:	Human Development Index
HDM	:	Highway Development Management
HNMS	:	Highway Network Management System
IEE	:	Initial Environmental Examination
IRI	:	International Roughness Index
IRR	:	Internal Rate of Return
JICA	:	Japan International Cooperation Agency
MCM	:	Municipal Council of (the city of) Maputo
Mt	:	Meticals
NO_2	:	Nitrogen Dioxide
NOx	:	Nitrogen Oxides
NPV	:	Net Present Value
OD	:	Origin-Destination (matrix)
pcu	:	Passenger Car Unit
ppm	:	Parts per Million
PRSP	:	Poverty Reduction Strategy Paper
PSI	:	Present Serviceability Index
ROCS	:	Road and Coastal Shipping Projects
ROW	:	Right-of-Way
SATCC	:	Southern African Transport & Communications Commission
STRADA	:	System for Traffic Demand Analysis
TPM	:	Transportes Públicos de Maputo (Municipal Public Transportation Operator)
UNDP	:	United Nations Development Programme
VAT	:	Value Added Tax
VOC	:	Vehicle Operation Cost
WHO	:	World Health Organization

The following foreign exchange rate is applied in the study :

1 US dollar = 22,000 Meticals = 125.00 Japanese Yen (July 2001), or

1 Meticals = 0.00568 Japanese Yen

PART A

MASTER PLAN

CHAPTER 1 : INTRODUCTOIN

1.1 BACKGROUND OF THE STUDY

Maputo City, the capital of Mozambique, has no established road development plan, and road expansion is lagging behind the recent growth of road traffic demand. In addition, existing road facilities are suffering progressive damage to the road structure, due to inadequacy and delay in maintenance, causing deterioration of the road service level.

The Mozambique Government requested assistance of the Japanese Government to implement the Study on the Master Plan and Feasibility Study for Road Development in the City of Maputo in the Republic of Mozambique (hereinafter referred to as the Study).

1.2 OBJECTIVES OF THE STUDY

The objectives of the Study are listed below:

(1) Development of the Maputo City Road Network for Master Plan (target year 2020),
(2) Implementation of a feasibility study related to high priority projects, and
(3) Proposition of a road structure appropriate to local conditions, proposals related to maintenance, and implementation of technology transfer through the project.

1.3 AREA COVERED BY THE STUDY

The Study area covers an entire City of Maputo excluding Inhaca Island. The Catembe area on the other side of Maputo Bay is included in the Study area.

1.4 WORK SCHEDULE OF THE STUDY AND ORGANIZATION OF THE STUDY TEAM

The Study began in the beginning of the November 2000 and has conducted for the draft final report at the middle of the September. An overall work flow illustrating inter-relationship of each activity in the Study is presented in Figure 1.4.1. The organization of the Study Team, the Advisory Committee of JICA, the Steering Committee of the Maputo City and the counterpart personnel assigned are summarized in Figure 1.4.2.

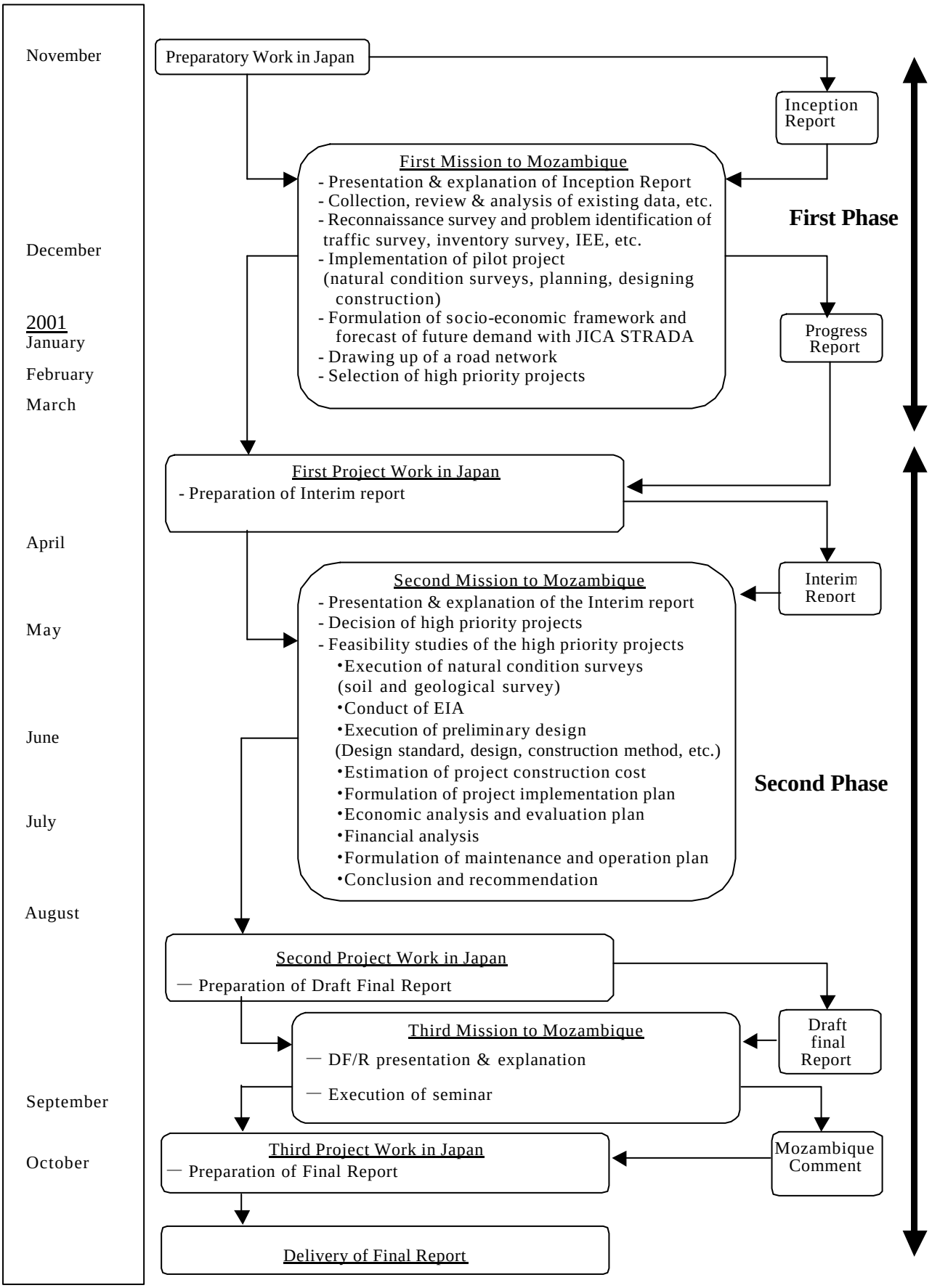


Figure 1.4.1 Work Flow Diagram

Figure 1.4.2 Organization Chart

CHAPTER 2 : PRESENT SITUATION

2.1 NATURAL CONDITIONS

1) Topography

The terrain is generally flat and there are no high mountains, but the old city rises to a highland in the southeast, projecting like a peninsula 66 m above sea level. Such relatively high terrain continues to Kenneth Kaunda Av., with Embassy Street on the north side and to Vladimir Lenine Av. on the west side.

Lowlands in the city, in areas such as Malhangalene, Maxaquene, Mafalala and Munhuana, are occupied by squatters. These areas were completely inundated by the flood caused during Cyclone Eline in February 2000.

The terrain dips while undulating gradually in a fan pattern toward the inland. The urban area is developed around the highland and spreads toward the lowland. The area in which the Mavalane International Airport exists is relatively elevated and was not affected by the flood.

2) Climate and Hydrology

The average temperature in Maputo is about 19℃ in July (winter) and about 26℃ in January (summer). In any case, the annual average maximum temperature is about 31℃ and the annual average minimum temperature is 13℃. Annual precipitation in Maputo is about 900 mm. Heavy flooding due to abnormal weather, such as the one that occurred in February 2000, may occur.

3) Geology

Geological features of Maputo include mostly red silt mixed with sandy soil. These strata dip from east toward the west. The lowland is covered with yellowish white sandy soil. The bottom layer of the red silt-mixed sandy soil is distributed toward the north at altitudes ranging from zero to –20 m. The substratum consists of clay-mixed sand, about 40 m thick at the southern end of the city.

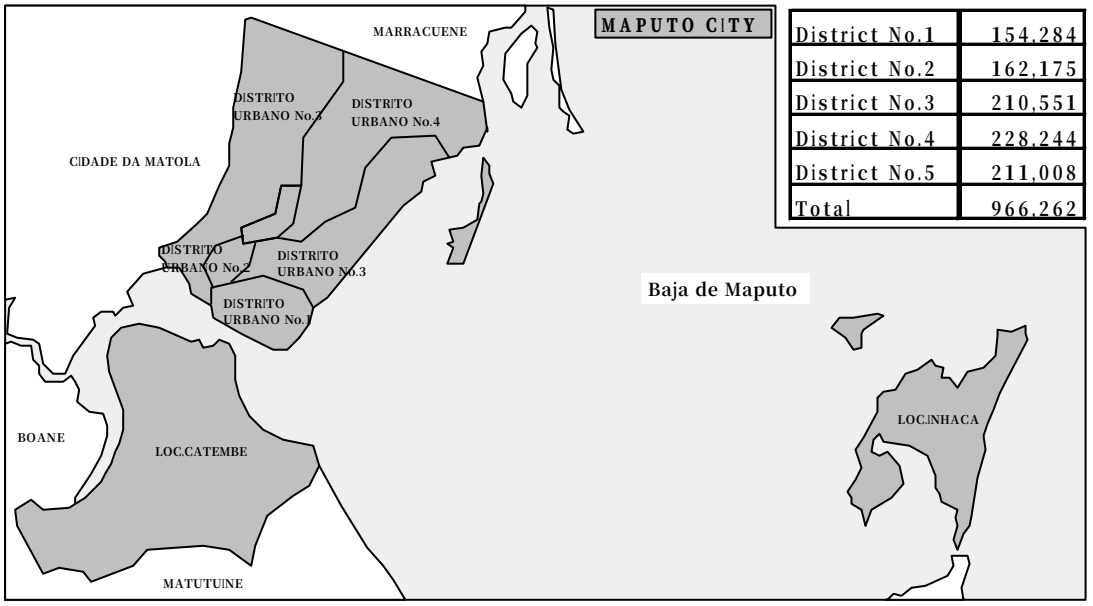
Most characteristic is the fact that two faults exist on both sides of the City. The distance

between eastern and western fault positions is about 8 km. The fault on the east side runs almost straight from the southeastern end along Friedrich Engels Av. and Julius Nyerere Av. to the north-northeast. The fault on the west side, which is called the Infulene valley, runs nearly parallel to the one on the east side. The Infulene River flows through this valley.
The shift in the fault on the east side is as high as about 30 m. The fault on the west side is about 10 to 20 m, varying toward the north. Furthermore, the movement of fault will be almost nothing, because the occurrence probability of earthquake is very small.

2.2 SOCIO-ECONOMIC CHARACTERISTICS

1) Administrative Structure of Municipal Council of Maputo

Maputo consists of five districts named as "Urban District No.1", "Urban District No.2", "Urban District No.3", "Urban District No.4", and "Urban District No.5" including each District population in table as shown in Figure 2.2.1.



Source: Anu rio Estat stico 1998 Cidade de Maputo, Instituto nacional de Estat stica

Figure 2.2.1 Location of Administrative Districts and population

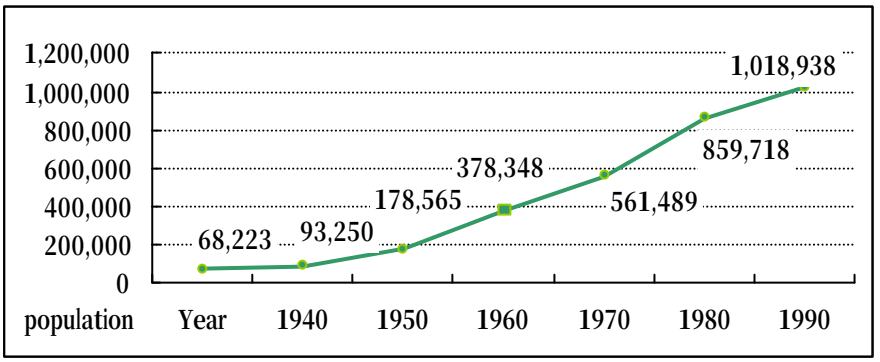
Urban District No.1 including the old city and municipal office, embassies, major educational facilities, hospitals, a commercial and industrial area, and port area. Most of the cultural facilities are located in this district.

Urban District No.2 is located on the western side of Urban District No.1, in which the Road and Bridge Department and Water and Sanitation Department, which are in charge of this

project, locate their offices. Urban District No.3 on the northern side of Urban District No.1 contains a lot of private markets. Urban District No.4 on the further northern side of Urban District No.3 contains public markets. Urban District No.5 is on the western side of Maputo and in the neighborhood of Matola. There are several private markets and three universities.

2) Population

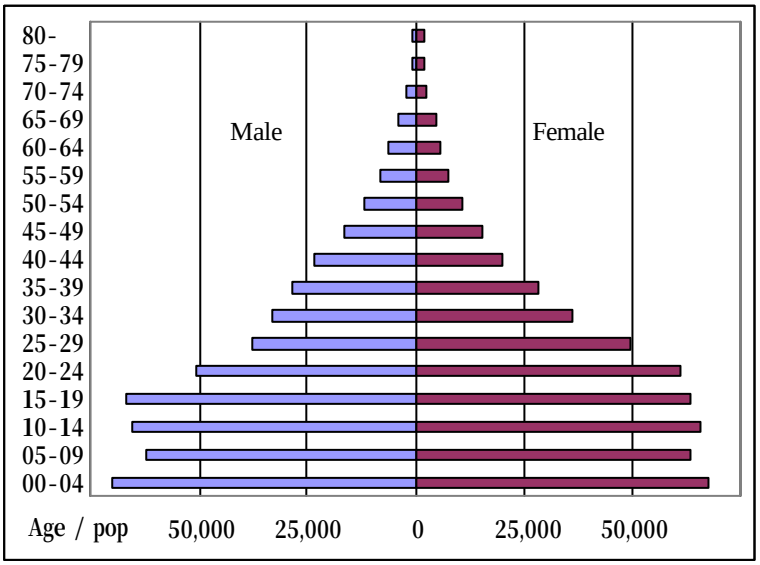
As the capital of Mozambique, Maputo city receives more population than any other cities. According to the latest statistical record (1998), Maputo has its population of 997,268 (488,352 for male and 508,916 for female), which accounts for 6.1% of the total population of the country. According to the projected statistics, Maputo expects more than 1 million populations in the year of 2000 as shown in Figure 2.2.2.



Source : Anuário Estatístico 1998 Cidade de Maputo, Instituto Nacional de Estatística

Figure 2.2.2 Trends of population growth in Maputo

The pyramid chart of Maputo's population in Figure 2.2.3 indicates that most of city dwellers are young ages under 30, which accounts for 72.8% of the total population.



Source : Anuário Estatístico 1998 Cidade de Maputo, Instituto Nacional de Estatística

Figure 2.2.3 Age structure of population in Maputo in 1998

Most of the city dwellers are native Mozambican (98.4%), and the second majority group "Portuguese" is far behind as it possesses only 0.4% of the total population. The first language is Portuguese followed by some native languages as shown in table 2.2.1.

Table 2.2.1 Races, Religion and languages in Maputo

Race	%	Religion	%	Language	%
Mozambican	98.4%	Cathoric	20.8%	Portugues	31.8%
Portuguese	0.4%	Zinonism	39.4%	Xichangana	28.7%
Indian	0.1%	Muslims	4.4%	Xironga	17.5%
Pakistan	0.1%	Protestant	9.3%	Xitsuwa	2.4%
Others	0.6%	Others	22.4%	Others	18.7%
Not-known	0.4%	Not known	3.7%	Not-known	0.9%
TOTAL	100.0%	TOTAL	100.0%	TOTAL	100.0%

Source : Anuário Estatístico 1998 Cidade de Maputo, Instituto Nacional de Estatística

Workforce population of Maputo in 1997 is 300,959, in which the largest sector is commercial (35.9%) followed by public service (12.9%), industrial (9.8%), and agriculture (9.6%). If simply compared with the estimated workable population aged from 20 to 59 (around 439,000), the unemployment rate can be roughly estimated to 31%. The national statistical office of Mozambique estimates the national unemployment rate of economically active population at 19.1% in 1998. Therefore, the unemployment rate of Maputo is also assumed around 20%.

3) Socio-Economic trend

Maputo plays the leading role in the socio-economic development of Mozambique. According to the latest UNDP study on Human Development Index, Maputo enjoys the highest HDI and GDP per head compared to other parts of Mozambiqueas shown in Table 2.2.2. HDI consists of three important aspects of development such as life expectancy, education (literacy and school enrolement), and average income.

Table 2.2.2 HDI and Socio-Economic indicators of Maputo and other areas in 1998

Province	HDI	Life Expectancy	Literacy rate (adult)	School enrolement	GDP per head (US$)
South	**0.427**	**50.6**	**61.0**	**49.6**	**460**
Maputo city	0.602	59.0	85.0	66.1	1,340
Maputo province	0.407	52.1	65.7	62.1	174
Inhambane	0.304	47.5	45.8	33.3	170
Gaza	0.301	47.0	47.3	36.8	147
Centre	**0.266**	**40.7**	**37.3**	**45.9**	**185**
Manica	0.337	44.5	42.3	81.2	184
Sofala	0.302	42.8	43.8	30.4	306
Tete	0.284	44.3	33.2	60.1	158
Zambezia	0.173	37.5	29.7	11.9	126
North	**0.212**	**40.6**	**28.1**	**23.5**	**159**
Niassa	0.225	42.7	31.0	32.4	120
Cabo Delgado	0.202	39.9	25.0	28.8	143
Nampula	0.198	40.4	28.3	9.2	166
National	**0.282**	**42.9**	**39.5**	**33.2**	**237**

Source: UNDP 2000

Table 2.2.3 shows an interesting picture of structures of economic activities in Maputo city and whole national economy.

A reader can visualize a clear difference of Maputo city which is exceeding whole national values them in respect to commerce, transport and construction field.

Table 2.2.3 Comparison of economic activities in share of GDP in 1998

	Maputo City (A)	National (B)	A-B
Agriculture	0.1	22.7	-22.6
Livestock	0.2	2.3	-2.1
Forestry	0.5	2.5	-2.1
Fisheries	0.1	3.3	-3.2
Mining	0.2	0.3	-0.1
Manufacturing	13.2	10.0	3.3
Electricity and Water	0.7	2.4	-1.7
Construciton	18.2	8.2	10.0
Transport (communication	14.3	10.1	4.2
Commerce	30.7	22.2	8.5
Restaurants and hotel	1.1	1.0	0.1
Public Administration	4.3	3.1	1.2
Finance and insurance	1.4	1.0	0.4
Real Estate and business	5.1	3.7	1.4
Education Service	2.3	1.6	0.6
Health Service	0.7	0.5	0.2
Other services	6.9	5.0	1.9
TOTAL	100.0	100.0	0.0

Source: UNDP 2000

2.3 ROAD FACILITIES

The items of road facility are classified into road, intersection, traffic safety, drainage and public facility. Each facility is not enough and poor for traffic signal, road control signs, information signs, drain types and bus bay spaces and so on. Therefore, traffic congestions, traffic accidents and overflows by storm water are sometimes occurring in Maputo city.

2.4 FINANCIAL REVIEW OF ROAD BUDGET

1) Financial System of the MCM

Department of Planning and Budget is the legitimate financial management office of the MCM. The municipal budgetary process is organized as described in Figure 2.4.1.

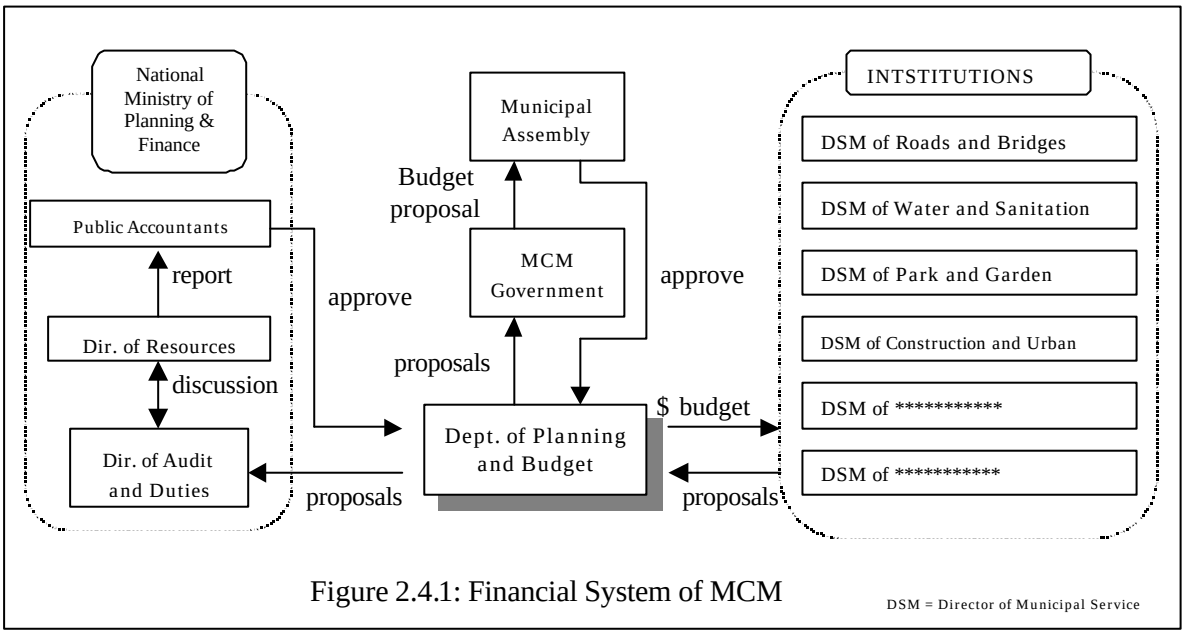


Figure 2.4.1: Financial System of MCM

Source: Interview with financial officers

In the 2000 plan, the Municipal Council of Maputo (hereinafter referred to as "the MCM") stated that the revenue and expenditure of year 2000 are 87 billion Mt and 96 billion Mt respectively. But this budget was low 9.5 billion Mt in comparison with 1999.

Currently, there is no special tax related to road development collected by the MCM. In the total expenditure of 1999, about 34% were disbursed for capital goods, within which 16.8 billion Mt (equivalent to 19% of total revenue) was used for construction. In the budgetary plan of year 2000, however, this construction expenditure was decreased to about 5% (equivalent to 5.2 billion Mt) of the total expenditure. It is because the budgetary plan of year 2000 estimated the expected revenue in a very pessimistic view so that it decreased the

construction budget rather than changing a stiff structure of recurrent expenses such as staff salary.

2) Budget for roads

To distinguish the "road budget" is not an easy task since there are several institutions or agencies to execute the investment of road construction and maintenance. In 2000, the number of road-related institutions has been increased to seven from four in 1999 as shown in Table 2.4.1.

Table 2.4.1 Institutions related to roads

In 1999	In 2000
DSM of Construction and Urbanization	DSM of Construction and Urbanization
	DSM of Roads and Bridges
DSM of Urban Service	DSM of Salubrity and Cemetery
	DSM of Park and Garden
	DSM of Public works
DSM of Water and Sanitation	DSM of Water and Sanitation
DSM of Transport and Traffic	DSM of Transport and Traffic

*DSM = "Director of Municipal Service" Source: interviews with counterparts

While DSM of Road and Bridge is a main institution for road construction, each institution takes a particular part of road maintenance at its responsible field as shown in Figure 2.4.2.

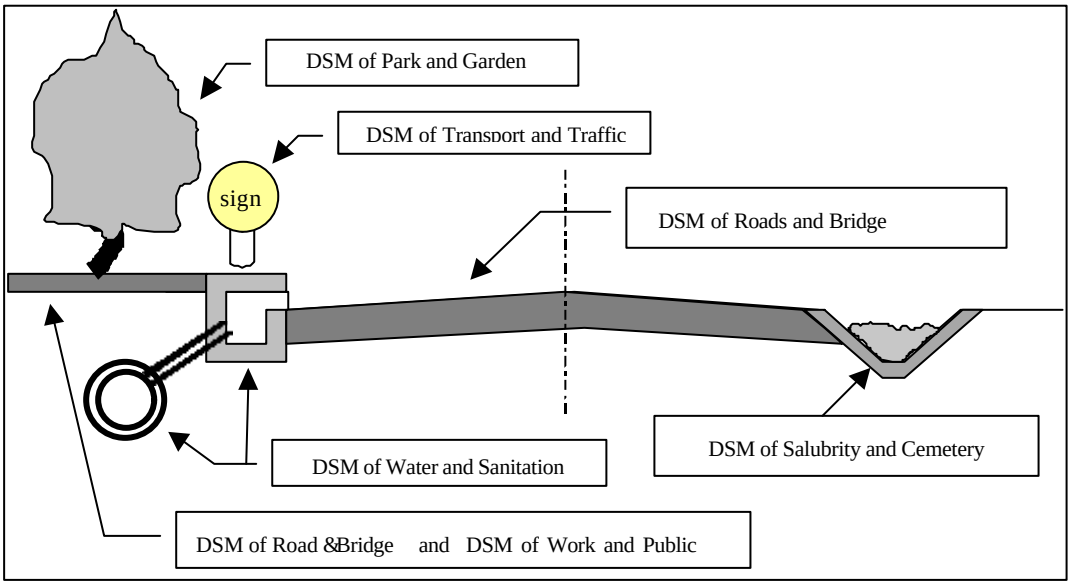


Figure 2.4.2 Jurisdictional Division for Road Maintenance among Institutions

In 1999, about 48 billion Mt were disbursed to the four road-related institutions. In 2000, after institutional restructuring, the share of the budget has also been surged to 84 billion Mt, within which investment budget were summed to 45 billion Mt, according to the secondary revised budget plan.

The DSM of Road and Bridge is the primary body for the construction and maintenance of a main part of roads, while the DSM of Transport and Traffic is responsible for the installation and maintenance of complement items of road traffic such as safety bumps and traffic signs.

The DSM of Road and Bridge is the largest shareholder and is allocated 20 billion Mt for investment which is nearly the half of the total investment budget for the road-related institutions. The DSM of Transport and Traffic has expected to receive 4 billion Mt. Therefore, a sum of 24.3 billion Mt (equivalent to around 1.6 million US dollars at the year 2000's exchange rate of 15,237 Mt per US$) is thought as the investment budget for road construction and maintenance.

Table 2.4.2 shows the expenditure for investment of each institution.

Table 2.4.2 Comparison Of Plan and Execution in Projects Of Road-Related Institutions until September Of 2000

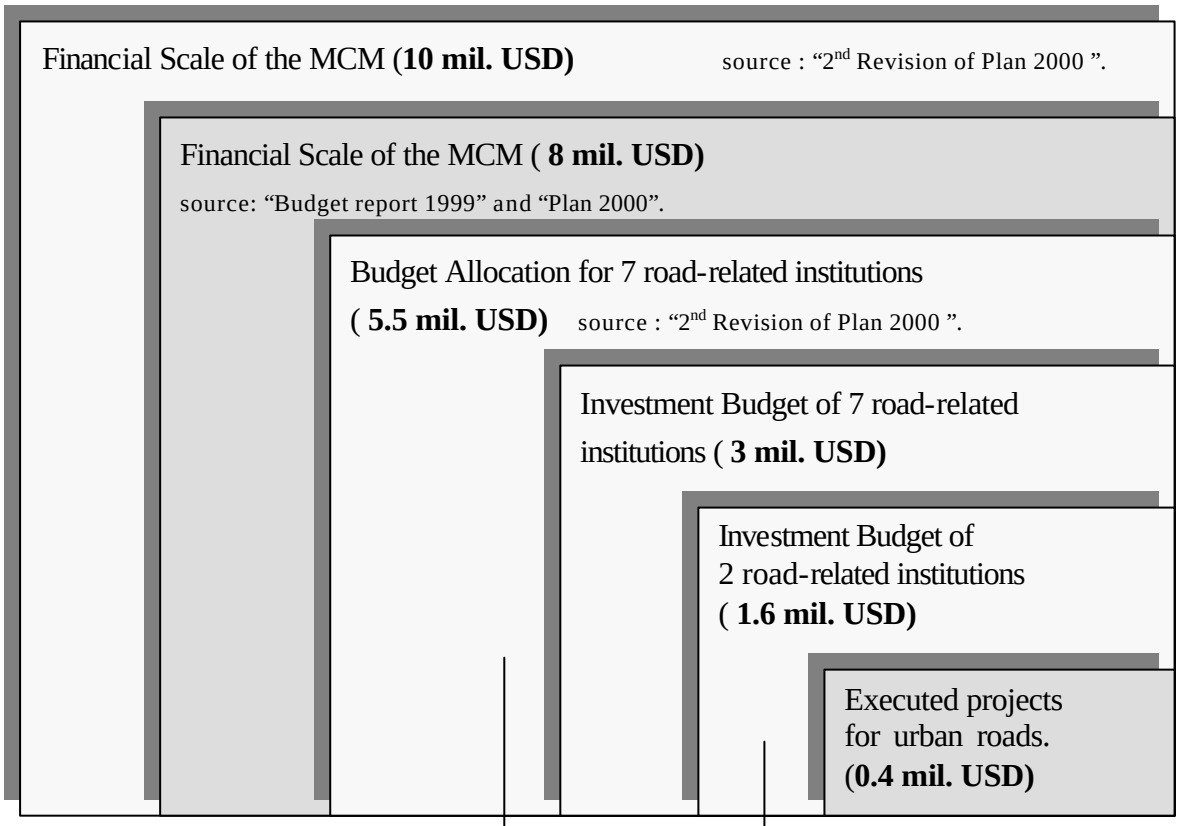
Unit: '000 Meticas

	DSM of Water and Sanitation	DSM of Construction and Urbanization	DSM of Road and Bridge	DSM of Public Work	DSM of Park and Garden	DSM of Salubrity and Cemetary	DSM of Transport and Traffic	TOTAL
ALL								
Planned Projects	14	4	24	10	17	6	7	82
Projects Budgets	10,679,727	1,470,000	15,925,484	1,690,568	3,003,616	6,240,000	4,421,443	43,430,838
Excuted Projects	6	2	11	3	15	3	3	43
Excuted Budgets	1,867,571	538,228	4,314,994	1,192,068	246,290	837,134	1,423,373	10,419,658
Road-Related								
Planned Projects	2	0	24	0	2	0	7	35
Projects Budgets	1,396,000	0	15,925,484	0	399,701	0	4,421,443	22,142,628
Excuted Projects	0	0	11	0	1	0	3	15
Excuted Budgets	690,891	0	4,314,994	0	202,458	0	1,423,373	6,631,717

Source: Secondary Revised 2000 Budget

3) Financial considerations for the formulation of the Master Plan

While the Master Plan is expected to be the most advanced and effective plan in terms of capability of growing traffic demand in the future, there are several issues which the study team has to take into account in the formulation of the Master Plan from the financial point of view as shown in Figure 2.4.3.



List of road-related institutions

1. DSM of Roads and Bridges……a main institution for road development
2. DSM of Transport and Traffic……a main institution for road development
3. DSM of Construction and Urbanization
4. DSM of Salubrity and Cemetery
5. DSM of Park and Garden
6. DSM of Public works
7. DSM of Water and Sanitation

Note 1: Executed projects of 2 institutions are counted from "Mapa de execucao de orcamento de invetmento do mes de fevereiro/00" and "Fundamentacao da proposta da 2. Revisao do orcamento 2000".
Note 2: Exchange rates for 1999 and 2000 are 12,775 and 15,237 Meticas per US dollar respectively.

Source: Data collection by the study team.

Figure 2.4.3 An Image Map of Financial Scales of Road Investment of the MCM

4) Financial Difficulties

There are several critical problems on the financing of the road development and maintenance in Maputo. Road development and maintenance needs constant financial backups. Most of the countries prepare purpose-oriented duties and tax for roads, such as fuel tax, vehicle registration duties, passage toll, etc. They are not only reliable sources for road development, but also theoretically plausible in terms of returns to beneficiaries, i.e. the road-users pay the tax for improvement of roads that they use.

ANE (Administration of National Roads) is eligibly to receive 80% of total fuel tax revenue, however, this regulation does not seem to be kept. This is because of the government fiscal policy to use the fuel tax as one of the financial resources to cover up a constitutive fiscal deficit.

The MCM has not received any part of these road-oriented tax revenues, in spite of the fact that Maputo's vehicle drivers surely pay the fuel tax.

CHAPTER 3 : PRESENT ENVIRONMENTAL CONDITION

3.1 GENERAL

An Initial Environmental Examination (hereinafter referred to as "IEE") has been conducted three items, which are social environment, natural environment and environmental pollution as shown in 3.1.1. There are five potential impact issues in IEE.

Table 3.1.1 Initial Environmental Examination

Social Environment	Natural Environment	Environmental Pollution
- Demography and Social Environment - Resettlement - Economic Activities - Road and Traffic - Public Facilities - Split of Community Cultural Property - Solid Waste	- Topography and Geology - Soil Erosion - Superficial Water - Ground Water - Flora and Fauna - Meteorology	- Air Pollution - Water Pollution - Noise and Vibration

3.2 FINDINGS

1) Resettlement

It is regulated in "Law on Land Use" that the government of Mozambique owns the whole land and the individual or collective people have the right to use the land given by the government. Generally, a compensation system for resettlement is agreed upon in the talks between local people and the Maputo city government to pursue resettlement with help of consultants.

There are a lot of commercial shops, restaurants, residential buildings settled along roads and streets. It is anticipated that a resettlement will be required due to the widening of the existing roads or new construction roads. The number of houses to be resettled for the master plan and prioritized projects should be carefully studied to estimate in order to minimize the affect of construction on habitant's life.

2) Flood Hazards

The expansion of city has drastically changed the natural situation. Due to the vegetation was removed for construction of houses and agricultural purposes, the land became exposed to storm water. Drainages were constructed for storm water in the 1980's. In 1989 small ravines are formed between the plateau and the coastal area, and these became more and more developed after each heavy rain.

In 1998 the erosion damages were very significant due to the heavy rain. Av. Julius Nyerere was cut and a lot of houses were destroyed at just near Eduardo Mondolane University. Especially, in February 2000, the intense and continuous rains caused the enormous ravines on Av. J. Nyerere. In short, neglected maintenance of drainages led to the destruction of almost all of them.

3) Flora and Fauna

Mangroves near Maputo have been almost devastated. A vestige area remains only in Costa do Sol. The cause that mangroves were destroyed is the expansion of residential areas, fuel-wood collection, changes in salt water composition, water contamination by domestic waste water and solid waste disposal. A proposal, which classifies into the existing wet area as a protected area where no construction will be allowed was propounded to the MCM. If this plan was sustained, the mangroves will have a chance to survive.

4) Air Pollution

Standard on air Quality

Mozambique has not established own standard on air quality. The air quality standard is generally referred to "world-standards" by the WHO (World Health Organization) (the World Bank were adopted the WHO Guidelines values for Bank's projects).

Existing Air Quality

Air quality survey was carried out at 7 sites along the proposed roads by using colorimetric method that measures in changing of color in the chromair, using comparator that directs to read the concentration in ppm.

The analysis details of samples collected at 7 sites are summarized in Table 3.2.1 and 3.2.2. The result of concentration of NO_2 (Nitrogen Dioxide), SO_2 (Sulphur Dioxide) and CO

(Carbon Monoxide) on weekdays and holidays is lower than the WHO guideline values.

Table 3.2.1 Summary Results of Air Pollutant Survey (Weekday)

No.	Location		Substance (Averagin time: 1hour)		
			NO_2 (Nitrogen Dioxide)	SO_2 (Sulphur Dioxide)	CO (Carbon Monoxide)
			$\mu g/m^3$	$\mu g/m^3$	mg/m^3
1	Av. 25 de Setembro	S2	307.5	285.6	21.5
2	Av. Kenneth Kaunda	S5	255.0	220.7	17.3
3	Avenlda de Angola	S7	311.7	300.2	22.8
4	Rua 2.500	S8	266.5	257.0	19.2
5	Av. da Namaacha	S10	246.0	171.3	16.3
6	Av. de Mocamblque	S11	225.5	165.0	17.0
7	Av. Julius Nyerere	S12	215.2	157.0	14.4
WHO Guideline Values			400	350	30

Table 3.2.2 Summary Results of Air Pollutant Survey (Holiday)

No.	Location		Substance (Averagin time: 1hour)		
			NO_2 (Nitrogen Dioxide)	SO_2 (Sulphur Dioxide)	CO (Carbon Monoxide)
			$\mu g/m^3$	$\mu g/m^3$	mg/m^3
1	Av. 25 de Setembro	S2	287.1	265.0	19.3
2	Av. Kenneth Kaunda	S5	240.5	220.8	17.0
3	Avenlda de Angola	S7	300.6	292.7	20.4
4	Rua 2.500	S8	255.0	250.5	17.5
5	Av. da Namaacha	S10	248.2	170.0	17.2
6	Av. de Mocamblque	S11	220.0	162.4	16.5
7	Av. Julius Nyerere	S12	210.2	150.5	14.0
WHO Guideline Values			400	350	30

5) Noise and Vibration

Standard on Noise and Vibration

In Mozambique, there are not own established standards on noise and vibration. The World Bank's noise guideline is applied. Regarding vibration, the World Bank has not any standard. Thus, vibration regulation limit for road areas is applied Japanese one.

Existing noise and vibration level

Noise and vibration survey was carried out at 12 sites along the proposed roads in January 2001. During 10 minutes (continuously from per two hours) noise and vibration were measured using SL-4001 sound level meter and VM-52A vibration level meter. The surveys were carried out on weekdays and holidays, during day and night times.

The analysis details of samples collected at 12 sites are summarized in Table 3.2.3 and 3.2.4.

Table 3.2.3 Summary of Road Traffic Noise Level Leq (dB)

1	Location		Category of Areas	Daytime (07:00～22:00)			Nightime (22:00～07:00)		
				Weekday	Holiday	Guideline Values	Weekday	Holiday	Guideline Values
1	Av. 24 de Julho	S1	Commercial Districts	66.4	63.0	70	52.5	51.4	70
2	Av. 25 de Setembro	S2		65.6	62.2		52.7	50.3	
3	Av. Julius Nyerere	S3		60.2	57.9		51.5	49.6	
4	Av. Mao Tse Tung	S4		53.5	51.6		43.0	42.0	
5	Av. Kenneth Kaunda	S5	Residential and Institution Districts	53.3	52.0	55	42.0	41.2	45
6	Avenida Vladimir Lenine	S6	Residential Districts	54.1	52.8		43.4	42.3	
7	Avenlda de Angola	S7	Industrial Districts	66.2	64.5	70	53.8	51.7	70
8	Rua 2.500	S8	Residential Districts	52.2	51.0	55	41.5	40.2	45
9	R. Dr. Lacerda	S9		51.4	50.8		40.8	40.6	
10	Av. da Namaacha	S10	Agricultural Districts	53.8	52.7	55	43.1	42.4	45
11	Av. de Mocamblque	S11	Residential Districts	54.0	53.3	55	39.2	37.8	45
12	Av. Julius Nyerere	S12		52.6	50.3		43.2	41.0	

Table 3.2.4 Summary of Road Traffic Vibration Level L_{10} (dB)

1	Location		Category of Areas	Daytime (07:00～22:00)			Nightime (22:00～07:00)		
				Weekday	Holiday	Request Limit	Weekday	Holiday	Request Limit
1	Av. 24 de Julho	S1	Commercial Districts	40.4	38.5	70	37.0	35.8	65
2	Av. 25 de Setembro	S2		38.5	37.1		35.5	33.2	
3	Av. Julius Nyerere	S3		38.4	35.6		35.2	33.3	
4	Av. Mao Tse Tung	S4		34.0	32.5		31.6	31.2	
5	Av. Kenneth Kaunda	S5	Residential and Institution Districts	33.1	32.8	65	30.8	30.1	60
6	Avenida Vladimir Lenine	S6	Residential Districts	36.6	35.3		34.2	31.7	
7	Avenlda de Angola	S7	Industrial Districts	38.9	38.2	70	36.6	36.0	65
8	Rua 2.500	S8	Residential Districts	34.5	32.8	65	31.9	30.8	60
9	R. Dr. Lacerda	S9		32.6	31.8		30.3	30.2	
10	Av. da Namaacha	S10	Agricultural Districts	35.5	33.8	65	32.6	31.7	60
11	Av. de Mocamblque	S11	Residential Districts	35.0	34.2	65	31.2	31.0	60
12	Av. Julius Nyerere	S12		33.8	32.8		31.5	30.8	

CHAPTER 4 : PRESENT ROAD NETWORK SYSTEM

4.1 GENERAL

The total road length in Maputo City is 830km as shown in Table 4.1.1.
Among the total roads in Maputo, there are only tow roads, such as Av. de Namaacha (No.2) and Av. de Mozambique (No.1), maintained by the National Road Agency (hereinafter referred to as "the ANE") and the others are maintained by the Maputo City.

Table 4.1.1 Road Lengths of Maputo City Roads

District	Road Length (km)	Road No.	Paved (km)	Unpaved (km)
District 1	152.2	423	96.7 (63.5%)	55.5 (36.5%)
District 2	77.9	216	28.1 (36.1%)	49.8 (63.9%)
District 3	163.7	543	19.2 (11.9%)	144.3 (88.1%)
District 4	236.2	547	19.6 (8.3%)	216.6 (91.7%)
District 5	200.2	511	26.3 (13.1%)	173.9 (86.9%)
Total	830.2	2,240	190.1 (22.9%)	640.1 (77.1%)

The national roads are classified into three categories according to the ANE information and the jurisdiction as primary, secondary and tertiary roads.

4.2 RECOMMENDABLE ROAD CLASSIFICATIONS AND URBAN ROAD STANDARD

1) Recommendable Road Classification

In order to clarify the classification system to be applied to the urban roads in Maputo, a new road network system has been proposed by the study team based on the ANE's classification as well as the trunk road classification recommended by the structure plan of metropolitan Maputo.

The main point of the newly proposed road network system is as follows:

- Road function is classified into four categories: Primary trunk roads, trunk roads, collector roads and local area roads.
- Full access control should be introduced to high-class roads with heavy and

high-speed traffic. On the other hand, low class roads should be limited low speed and low traffic with introduction safety and better environment.

Table 4.2.1 and Figure 4.2.1 show the recommendable road classification to be applied for the urban road network system in Maputo.

2) Recommendable Urban Road Standard.

There is no road classification and no road design standard for the urban roads being established in Maputo.

In order to clarify the urban road designing to be applied to this study, the study team has proposed a new design standard width and a new geometric design stand based on the ANE's design standard as well as SATCC design standard.

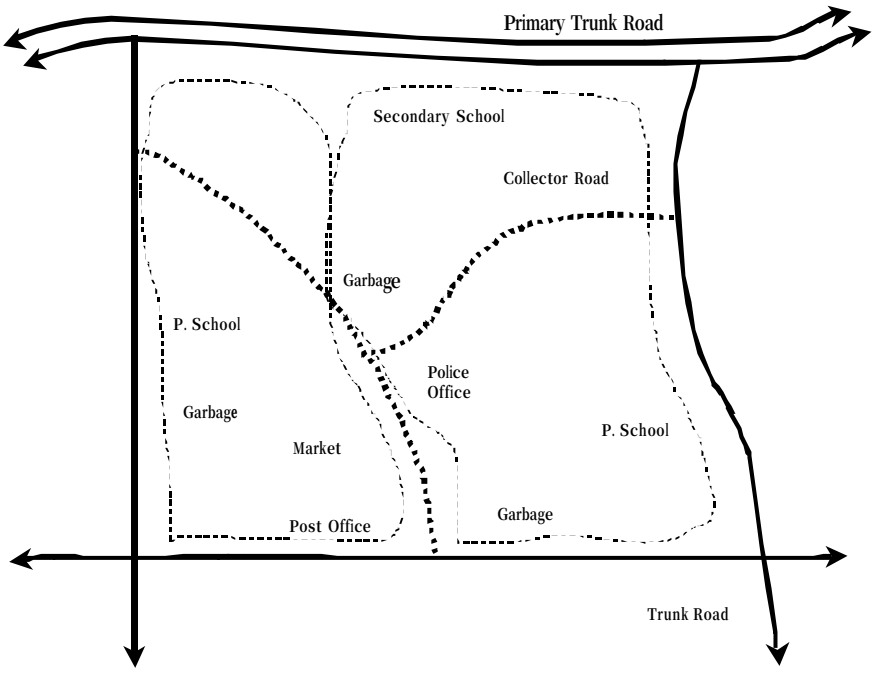
The main point of the newly proposed standards is as follows:

- Standard width is classified by four classifications of roads, two types of roads where the roads are passing and by numbers of lane.
- Standard width is showing each component of typical cross-sections and recommended right of way.
- Geometric design standard is classified by design speed and is consisting of horizontal and vertical alignment.

Table 4.2.2 and 4.2.3 shows the components of the proposed standard width and the geometric design standard to be applied for the study of urban roads in Maputo.

Table 4.2.1 Urban Road Classification

Function \ Road Case			Primary Trunk Road	Trunk Road	Collector Road	Local Area Road
Roads to be Connected	Inter/Inter National Highway		○	○	—	—
	Primary Trunk Road		○	○	△	—
	Trunk Road		○	○	○	△
	Collector Road		△	○	○	○
	Local Area Road		—	△	○	○
City/Center to be Access	National Capital		○	△	—	—
	Regional Capital		○	○	—	—
	District Center		△	○	△	—
	Community Center		—	△	○	○
	Each Housing		—	—	○	○
Access to Community Facilities	School	Primary	— 25% → 6% △		○ 5% → 94% ○	
		above Primary	△ 67% ○		○ 33% △	
	Market		△ 50% △		○ 50% ○	
	Hospital		△ 78% ○		○ 22% △	
	Police office		△ 84% ○		○ 16% △	
	Post Office		△ 92% ○		○ 8% △	
Trip Length			Very Long	Long	Medium	Small
Traffic Volume			Large	Large	Medium	Small
design Speed		Urban	60-80km/h	60-80km/h	30-50km/h	20-40km/h
		Rural	80-100km/h	80-100km/h	60-80km/h	50-70km/h



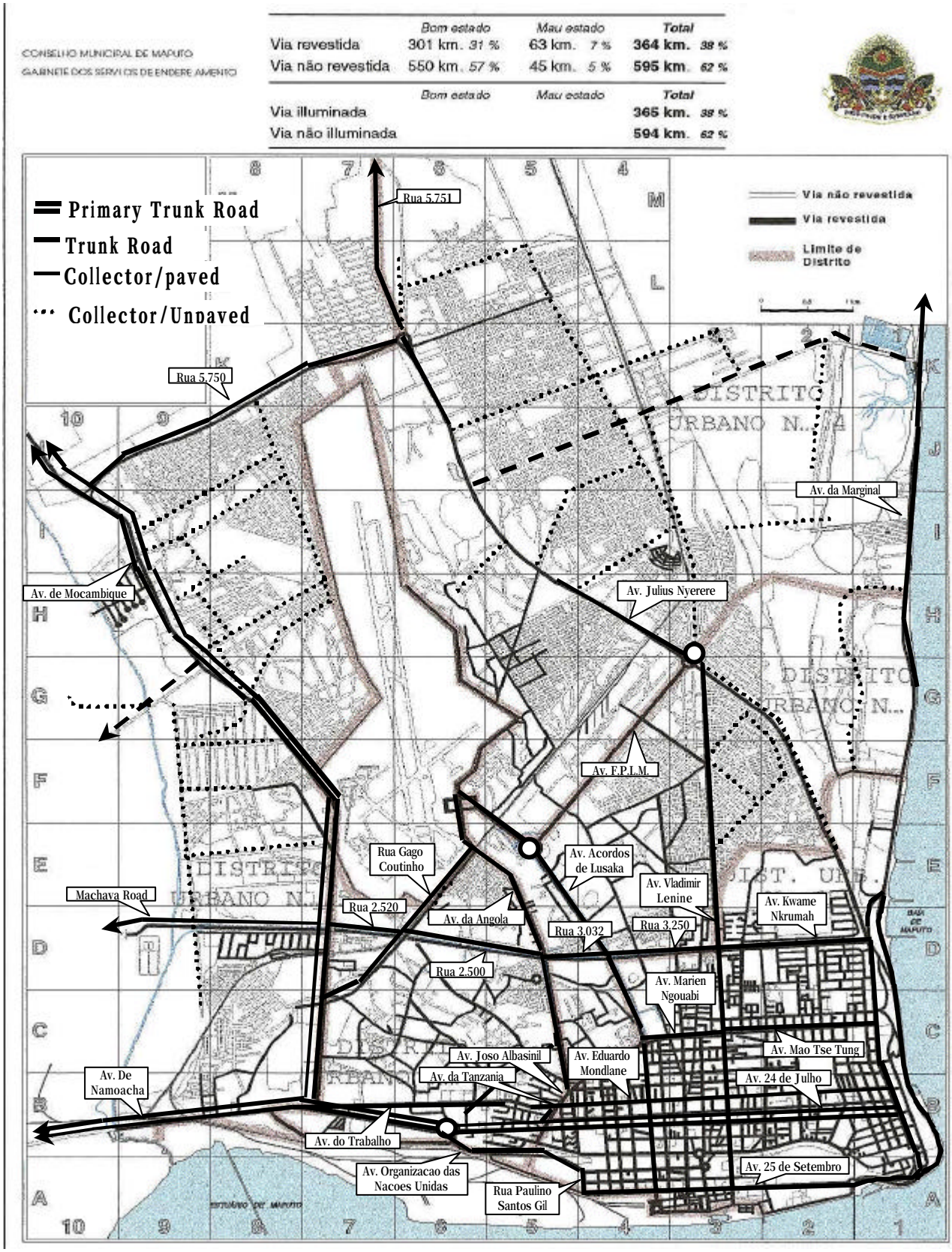


Figure 4.2.1 Existing Road Network Classification

Table 4.2.2 Proposed Standard Width for New Construction

Road Classification	Land-use Pattern	Road Type	Lane No.	Design Traffic Volume (pcu/day)	Design Speed (km/hr)	Lane width (m)	Carriage-way Width(m)	Shoulder (m)		Paking Lane both side(m)	Central Strip (m)	Sidewalk both side (m)	Drainage System	Utility Space both side (m)	Total Road Width (m)	Recommended Right of way (m)	Pavement Type	
								Left side	Right side								Recommend	Alternative
Primary Trunk Road	Urban Area	Street	4	<40,000	60-80	3.25	13.00	0.50	0.25	2.50	6.00	3.00	L,U	3.00	37.50	40	AC	-
			2	<10,000	60-80	3.25	6.50	0.50	-	2.50	-	3.00	L,U	3.00	24.50	40(25)	AC	-
	Semi-urban /Rural	Road	4	<80,000	60-80	3.50	14.00	1.25	0.25	-	6.00	1.50	OD	5.00	40.00	40	AC	-
			2	<13,000	60-80	3.50	7.00	1.25	-	-	-	1.50	OD	5.00	27.50	40	AC	DBST
Trunk Road	Urban Area	Street	4	<40,000	50-70	3.25	13.00	0.50	0.25	2.50	6.00	3.00	L,U	3.00	37.50	40	AC	-
			2	<10,000	50-70	3.25	6.50	0.50	-	2.50	-	3.00	L,U	3.00	24.50	40(25)	AC	-
	Semi-urban /Rural	Road	4	<80,000	50-70	3.25	13.00	0.75	0.25	-	6.00	1.50	OD	3.00	35.00	40	AC	DBST
			2	<13,000	50-70	3.25	6.50	0.75	-	-	-	1.50	OD	3.00	22.00	40(25)	AC	DBST
Collector Road	Urban Area	Street	2	<8,000	40-50	3.00	6.00	0.50	-	-	-	2.00	OD/LU	1.00	13-20	13-20	AC	Concrete Block /DBST
	Semi-urban /Rural	Road	2	<8,000	40-50	3.00	6.00	0.50	-	-	-	1.50	OD	(1.5)	13-20	13-20	AC	DBST/Stab.M
Local Area Road	Urban/Semi urban/Rural Area	Street	2	<3,000	20-40	3.00	6.00	-	-	-	-	-	OD	2.00	10.00	10	AC	Concrete Block /DBST
			1		20-40	4.00	4.00	-	-	-	-	-	OD	2.00	6.00	6	AC	DBST/Stab.M

L,U: L-side ditch , U-Shaped drain(W=0m, both side)
OD : Open Drain (W=2.0m,both side/ except Local Area)
OD : Open Drain (W=1.5m,Local Area Road 2lane-both sode, 1 lane-one side))

Table 4.2.3 Proposed Geometric Design Standard

Classification	Design Speed (km/h)	Horizontal Alignment		Vertical Alignment		
		Minimum Radius Curve (m)	Minimum Radius Curve without superelavation (m)	Maximum Gradient (%)	Minimum Vertical Curve (m)	
					Crest	Sag
Primary Trunk Road	80	280	3,500	4	4,500	3,000
	70	210	2,600			
	60	150	2,000	5	2,000	1,500
Trunk Road	70	210	2,600			
	60	150	2,000	5	2,000	1,500
	50	100	1,300	6	1,200	1,000
Collector Road	50	100	1,300	6	1,200	1,000
	40	60	800	7	700	700
Local Area Road	40	60	800	7	700	700
	30	30	500	8	400	400
	20	15	200	9	200	200

SATCC

Classification	Design Speed (km/h)	Horizontal Alignment		Vertical Alignment		
		Minimum Radius Curve (m)	Minimum Radius Curve without superelavation (m)	Maximum Gradient (%)	Minimum Vertical Curve (m)	
					Crest	Sag
Primary Trunk Road	80	250	3,500	5	4,500	3,000
	70	190	2,600			
	60	140	2,000	6	2,000	1,500
Trunk Road	70	190	2,600			
	60	140	2,000	6	2,000	1,500
	50	90	1,300	6	1,200	1,000
Collector Road	50	90	1,300	6	1,200	1,000
	40	60	800	7	700	700
Local Area Road	40	60	800	7	700	700
	30	30	500	8	400	400
	20	15	200	9	200	200

4.3 EXISTING ROAD PAVEMENT CONDITION

The Rehabilitation and Repair of 160km of major streets in Maputo were conducted by the World Bank Programme from April to September 1999. The major works were the pothole patching, resealing for paved roads, re-gravelling for gravel roads and cleaning of existing drainage.

During the survey period, the study team conducted the road pavement condition survey applying the International Roughness Index (IRI) established by the World Bank in 1986 together with the road inventory survey. The degree of the IRI is classified into twenty grades as follows:

Table 4.3.1 The Standard of IRI

Quantitative Evaluation	Roughness IRI (m/km)	
	Paved Road	Unpaved Road
Smooth/ Good	2 (routine maintenance)	4 (maintenance)
Reasonably smooth/ Fair	4 (periodic maintenance)	8 (reconstruction/ mainte.)
Medium rough/ Poor	6 (overlay)	12 (reconstruction)
Rough/ Bad	8 (reconstruction)	15 (reconstruction)
Very rough/ Very Bad	10 (reconstruction)	20 (reconstruction)

Based on the both of the surveys, the actual road pavement condition for totally 222.4km of the classified roads is shown in Table .4.3.2 and Figure 4.3.1.

Table 4.3.2 Road Pavement Condition by Classification

	IRI	2		4		6		8		10-20		Total(km)	
District 1	Primary Trunk Road	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-
	Trunk roads	0.0	0%	1.6	6%	24.1	86%	0.2	1%	2.2	8%	28.1	100%
	Collector Roads	0.0	0%	0.0	0%	21.5	87%	3.1	13%	0.0	0%	24.6	100%
	Local Area Roads	0.0	0%	0.0	0%	16.6	74%	6.0	26%	0.0	0%	22.6	100%
	District 1 Total(km)	0.0	0%	1.6	2%	62.2	83%	9.3	12%	2.2	3%	75.3	100%
District 2	Primary Trunk Road	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-
	Trunk roads	0.0	0%	1.4	12%	9.5	79%	1.0	8%	0.0	0%	12.0	100%
	Collector Roads	0.0	0%	0.0	0%	2.7	33%	1.3	16%	4.3	52%	8.3	100%
	Local Area Roads	0.0	0%	0.0	0%	0.3	11%	0.1	6%	2.1	84%	2.5	100%
	District 2 Total(km)	0.0	0%	1.4	6%	12.5	55%	2.5	11%	6.4	28%	22.8	100%
District 3	Primary Trunk Road	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-
	Trunk roads	0.0	0%	0.0	0%	11.2	67%	3.1	19%	2.4	15%	16.7	100%
	Collector Roads	0.0	0%	0.0	0%	1.1	10%	0.8	7%	8.9	83%	10.7	100%
	Local Area Roads	0.0	0%	0.0	0%	0.4	6%	0.2	3%	6.2	91%	6.8	100%
	District 3 Total(km)	0.0	0%	0.0	0%	12.7	37%	4.1	12%	17.5	51%	34.2	100%
District 4	Primary Trunk Road	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-
	Trunk roads	0.0	0%	0.0	0%	13.4	77%	0.0	0%	4.1	23%	17.5	100%
	Collector Roads	0.0	0%	0.0	0%	0.0	0%	1.6	60%	1.0	40%	2.7	100%
	Local Area Roads	0.0	0%	0.0	0%	2.5	21%	1.6	14%	7.6	65%	11.7	100%
	District 4 Total(km)	0.0	0%	0.0	0%	15.9	50%	3.2	10%	12.8	40%	31.9	100%
District 5	Primary Trunk Road	0.0	0%	8.3	100%	0.0	0%	0.0	0%	0.0	0%	8.3	100%
	Trunk roads	0.0	0%	0.0	0%	5.3	100%	0.0	0%	0.0	0%	5.3	100%
	Collector Roads	0.0	0%	0.0	0%	2.5	12%	0.0	0%	19.2	88%	21.8	100%
	Local Area Roads	0.0	0%	0.0	0%	3.7	16%	0.0	0%	19.2	84%	22.9	100%
	District 5 Total(km)	0.0	0%	8.3	14%	11.5	20%	0.0	0%	38.5	66%	58.2	100%
Total	Primary Trunk Road	0.0	0%	8.3	100%	0.0	0%	0.0	0%	0.0	0%	8.3	100%
	Trunk roads	0.0	0%	3.1	4%	63.5	80%	4.3	5%	8.7	11%	79.5	100%
	Collector Roads	0.0	0%	0.0	0%	27.8	41%	6.8	10%	33.4	49%	68.0	100%
	Local Area Roads	0.0	0%	0.0	0%	23.5	35%	7.9	12%	35.2	53%	66.6	100%
	District 1- 5 Total(km)	0.0	0%	11.3	5%	114.8	52%	19.0	9%	77.3	35%	222.4	100%

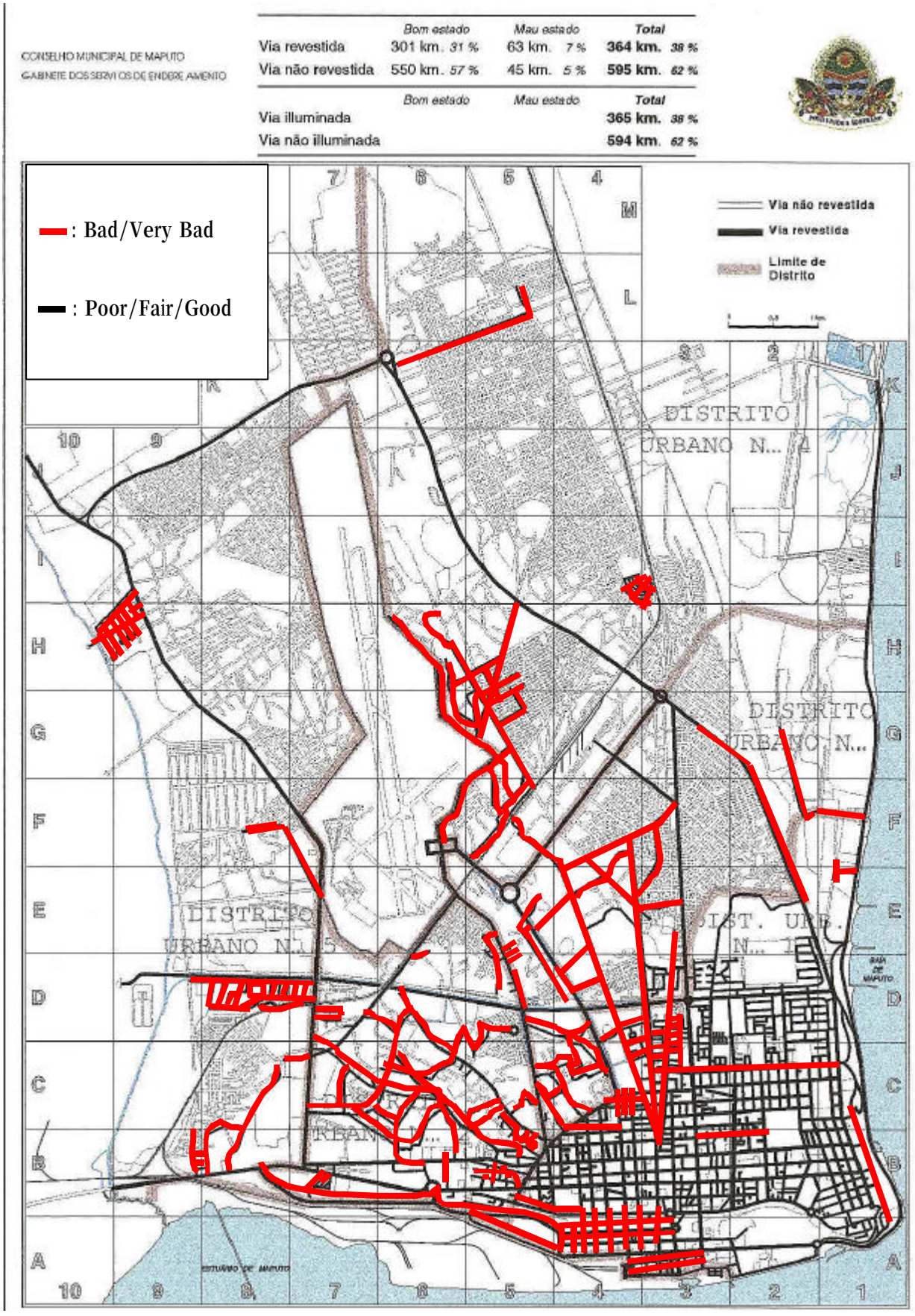


Figure 4.3.1 Existing Pavement Condition

4.4 EXISTING DRAINAGE CONDITION

The drainage systems in Maputo city consists of pipe drain and open drainage systems. The drainage system in District 1 is pipe drain installed up to the outlet collected by the catch pit located between carriageway and sidewalk. But almost of catch pits are blocked by soil/garbage due to lack of cleaning and flushing so that the drainage capacity are reduced.

There are flood prone area and erosion area caused by lack of proper drainage system, outlet and lack of drainage maintenance. The heavy erosion of Av. Julius Nyerere at Polana Caniço"A" was caused not only by the heavy rain but also by the blockage of the existing pipe drain with lacking of the drainage maintenance. The open drain is suitable for easy maintenance in Maputo City preventing of blocking by soil/garbage. It should be installed of the proper drainage along the objective roads. The existing drainage system and the problems of drainage are shown in Fig. 4.4.1.

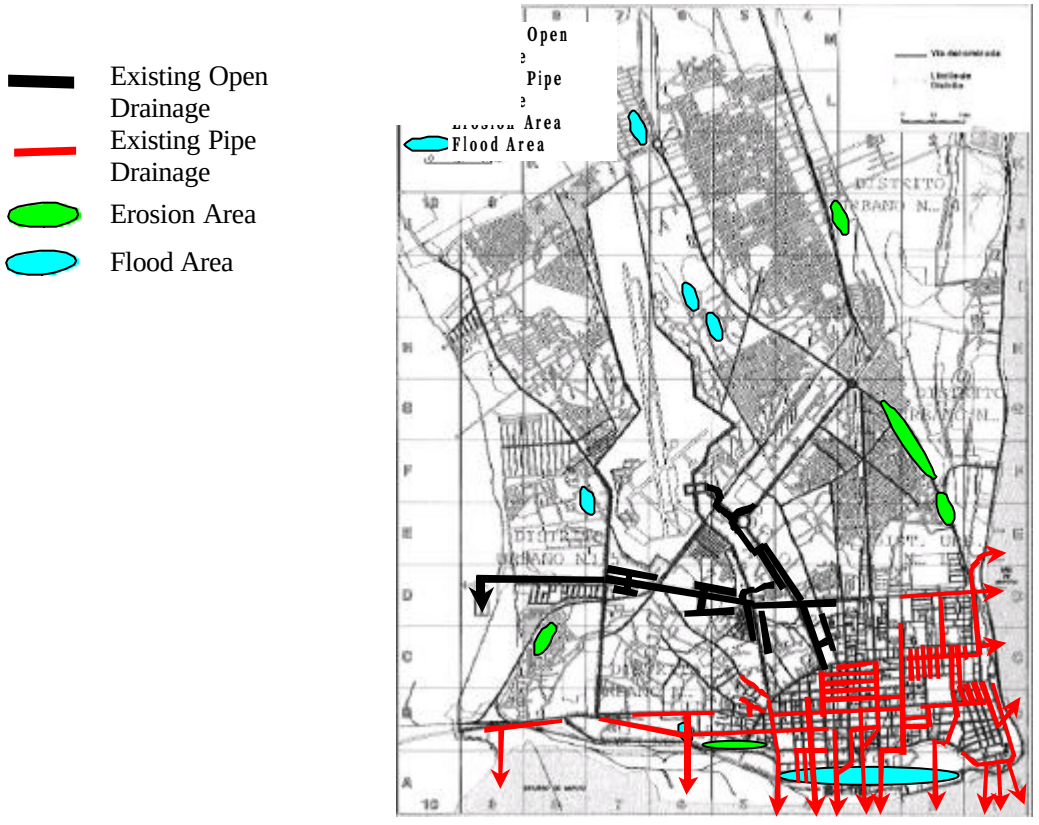


Figure 4.4.1 Existing Drainage System and Problems of Drainage

4.5 MAINTENANCE

The existing problems with maintenance system are lack of maintenance budget, no maintenance programme for long term, non functional maintenance organization, lack of knowledge of road maintenance, limited maintenance equipments and so on. Therefore it is impossible to maintain the road and drainage facilities. And also jurisdictions of the road maintenance are different for each road and drainage facilities that it is impossible to maintain systematical as shown in Figure 4.5.1.

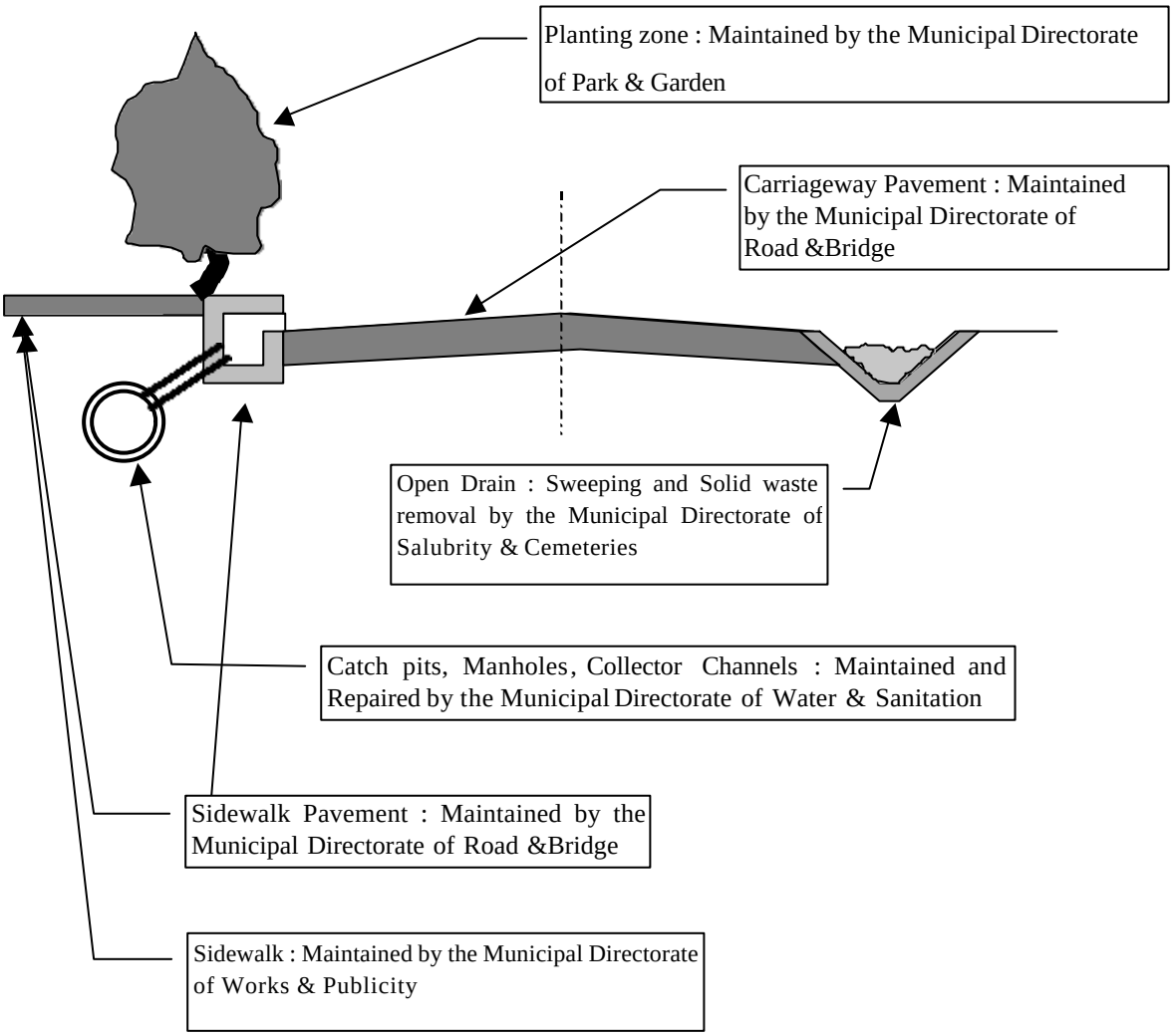


Figure 4.5.1 Jurisdictions for Road Maintenance

4.6 PUBLIC TRANSPORT

Public Transport in Maputo city consists of three categories, international, national and local transport. The central government has authority to give licenses to the international and the national transport, while the local government authorizes the local transport.

TPM (Transportation Public of Maputo) is the national transport in Maputo. An organization of a bus company in Matola is also under consideration. TPM points out three subjects to concern, such as insufficient service yard, residential areas where are not served by buses due to the poor road network, and traffic accidents caused by pot holes on the road (see Figure 4.6.1).

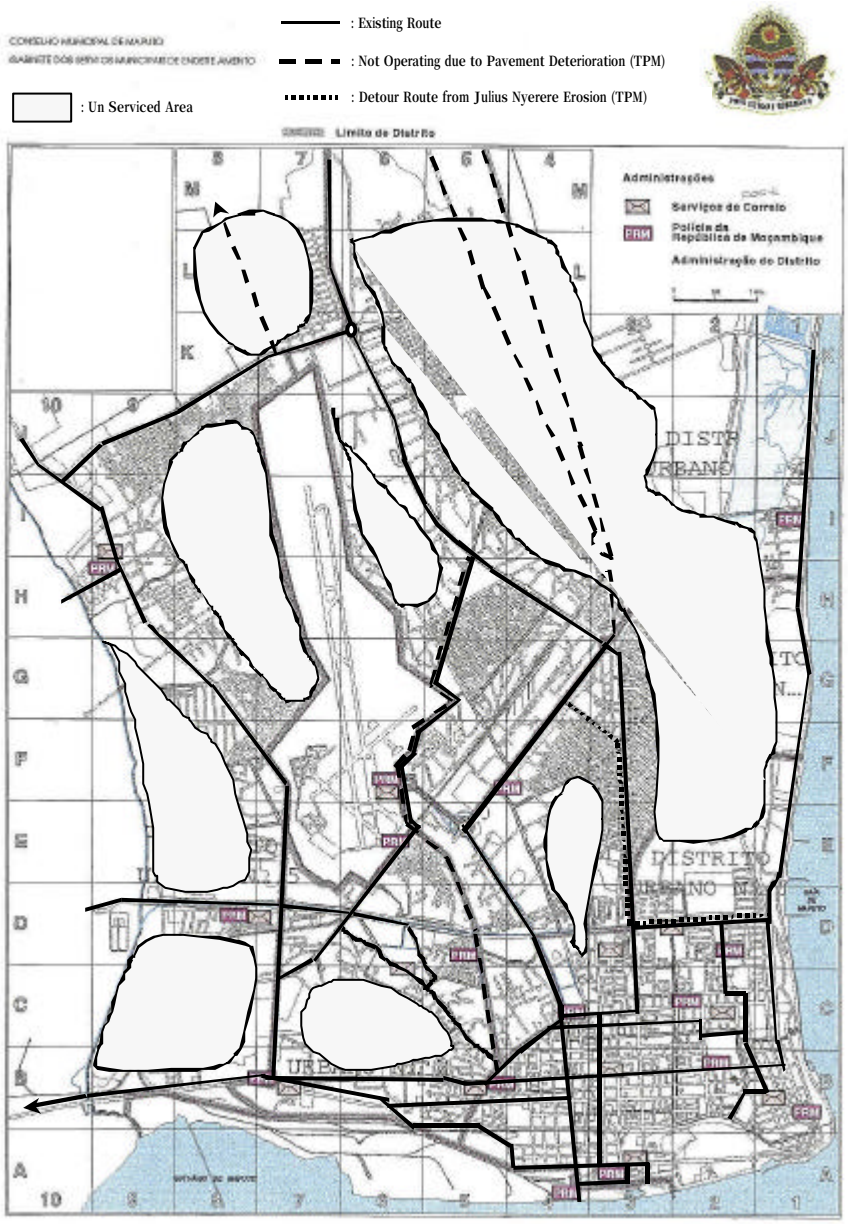


Figure 4.6.1 Bus Route