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# Urban Transport Policy for Greater Maputo

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# 1. Introduction

Mozambique is a developing country with a per capita income of \$345. More than one million people, most of them with low incomes, live in the city of Maputo. Most Mozambicans do not own a car and are not expected to own one in their lifetime. The majority depend on public transportation, largely buses, for the trips of daily life—to get to work, to shop, to conduct business, to go to school, and to run errands. The majority of the lower income population of Maputo lives on the outer edges of the city, and depends on bus transportation to reach work and conduct other daily activities.

In 2005, just within the City of Maputo, 2,500 buses—mostly mini-buses—handled an estimated 350,000 daily passenger-trips (see Figure 1-1). Though these small buses provide an essential service for most people, business and civic leaders are calling for them to be replaced with full-size buses, which are perceived as more suitable to a modern urban environment. They argue that full-size buses will alleviate the congestion and chaos produced by the large fleet of small buses, and that big buses will provide a higher level of service—one that is scheduled, predictable, safer, and generally more efficient. Proponents of existing arrangements argue that the current service is sufficient in providing reasonable transport at reasonable fares for the majority of the population, given Mozambique's limited financial resources and public budget. They hold that the efficiency of private enterprise responds fast to changing demands and does not burden the public budget. In contrast, a publicly owned bus company tends to be inefficient and require ever-increasing subsidies. Furthermore, the small buses provide employment for many households, which will lose their incomes if service is assigned to large operators of full-size buses, whether public or private.

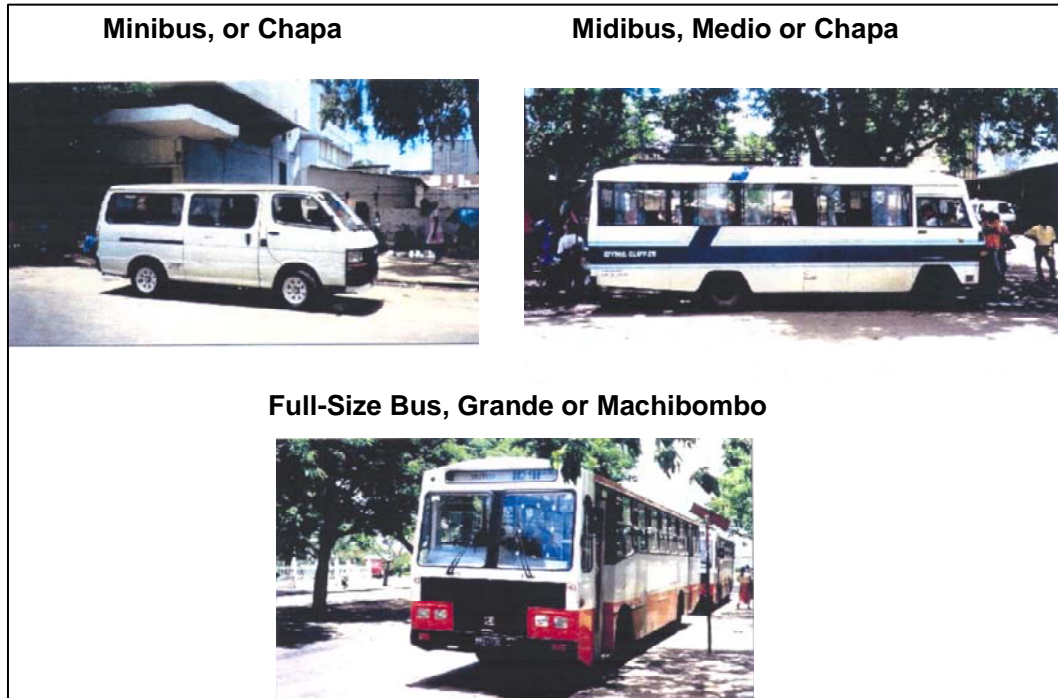
In the context of this debate, the Confederation of Mozambican Business Associations (CTA) has commissioned this study on urban transport policy in Greater Maputo to assess these issues in light of international best practices. In this study, “urban public transport” refers only to bus transportation for pay. It does not include other forms of public transport such as taxis and transport organized by employers.

## **OBJECTIVES**

The objective of this study is to help the private sector and the Government of Mozambique examine issues related to the development of an urban transportation policy, with emphasis on Greater Maputo. The study

- Assesses the current operation and future needs for public transportation in Greater Maputo;
- Summarizes Mozambique's policy framework affecting any urban transport policy;
- Describes international best practices suitable to Mozambique; and
- Recommends next steps, including studies and legal changes.

Figure 1-1  
*Typical Buses Operating in Maputo*



SOURCE: JICA (2001).

## METHODOLOGY

Conducted in Maputo from November 25–December 15, 2006, the study is based on review of information and data available in Maputo, review and consultation with stakeholders in the bus industry in Greater Maputo (Maputo City and Matola Province), and on the author's experience and expertise. Other than field observation, no independent surveys were conducted. Information and data were gathered through

- Meetings and interviews with service providers and stakeholders of the bus industry in Greater Maputo, including officers of bus associations and companies, municipal and national officers in charge of transportation and municipal service, CTA, the Federation of Road Transport Association, and representatives of USAID and the World Bank (see Appendix B).
- Direct observation of urban transport, traffic, and public transport in Greater Maputo, including rides on buses and routes during different periods of the day.



- Review of previous studies, in particular the 2001 Master Plan Study for Road Development in the City of Maputo, prepared for the Japan International Cooperation Agency (JICA).<sup>1</sup> The JICA study is the most comprehensive of recent years. It presents road and traffic conditions, demand projections and forecasts, alternative development scenarios, including economic evaluation and environmental assessments, and selected feasibility studies.
- International studies and reports on urban public transportation, and the professional experience of the consultant in developed and developing countries.

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<sup>1</sup> JICA and the Municipal Council of Maputo, City of Maputo, The Republic of Mozambique. The Study on the Master Plan and Feasibility Study for Road Development of the City of Maputo, in the Republic of Mozambique, Final Report, October 2001. Oriental Consultants Company Limited and Japan Engineering Consultants Limited.



## 2. Socioeconomic and Road Data: Status and Projections

To establish a baseline for assessing the operation, problems, needs and solutions of public transport in Greater Maputo, we here discuss basic socioeconomic conditions in Maputo that affect demand for transport, describe road conditions and plans for infrastructure improvements, and summarize estimates of current and future demand for bus transport. Data are drawn largely from the JICA study of 2001. That study has a 20-year planning horizon based on international professional standards. It was developed for the period 2000-2020, and its baseline data were from 2000-2001. Five years have passed since the study was published, which implies some changes in population, employment and road development, but the order of magnitude for this baseline year of 2006 has not changed significantly since 2001. Moreover, master plan projections and plans for 2010 and 2020 have not changed.

### **ADMINISTRATIVE DISTRICTS**

The government allocates bus routes by district, of which the City of Maputo has five (Figure 2-1). District 1 includes the old city and most commercial, administrative, governmental and civic activities—the Central Business District (CBD). District 2 is west of District 1 and includes municipal facilities such as water and sanitation. Districts 3, 4, and 5 to the north of the CBD are largely residential and where most of the low-income population resides.

### **POPULATION AND EMPLOYMENT**

#### **Baseline Population, Maputo 1997**

The most recent official data on population is the 1997 Census of Population and Habitation. Total population in 1997 was close to 1 million and the land area occupied by the city was (and is) about 6,444 hectares. District 1 had a population of about 130,000, District 2 about 160,000, and Districts 3-5 more than 200,000 (Table 2-1).

Figure 2-1  
Districts of Maputo

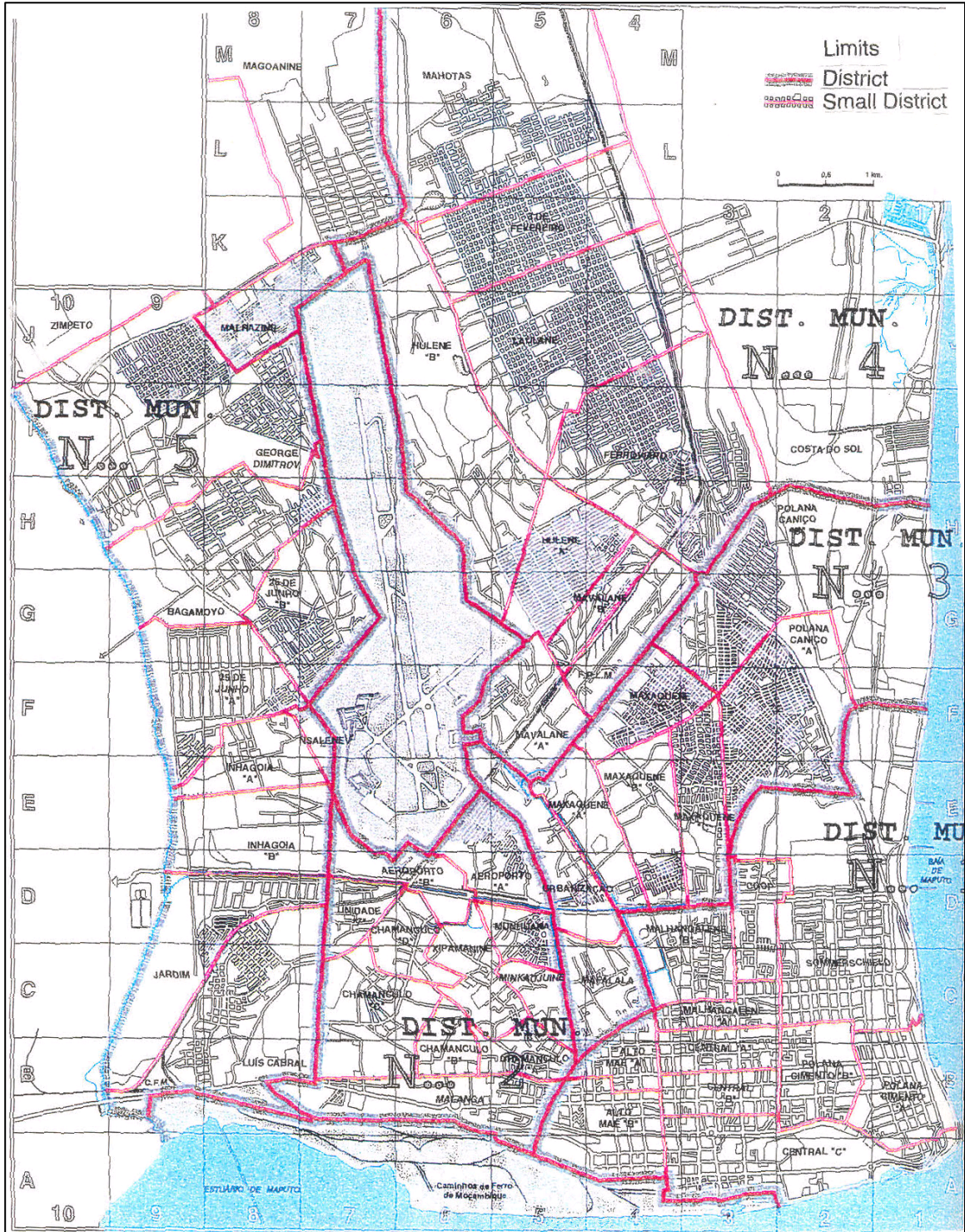


Table 2-1  
*Maputo's Population and Land Area, by District, 1997*

District	Population		Area (Hectares)	
	Number	% Total	Number	% Total
1	133,759	14	1,333	21
2	162,750	17	687	11
3	210,551	22	1,043	16
4	228,244	24	1,811	28
5	211,008	22	1,570	24
Total	946,312	100	6,444	100

*Note: District 1 data do not include Catembe, Inaka.*

*SOURCE: JICA ( 2001); Census of Population and Habitation, 1997.*

## Employment and Population Projections, Greater Maputo

The JICA study assumed the following annual population growth rates:

- 2000-2010—2.28 percent in Maputo and 7.28 percent in Matola
- 2010-2020—3.7 percent in both Maputo and Matola.

Based on employment data in 2000, the report assumed an employment proportion (employment/population) of 31 percent in Maputo City and 29 percent in Matola City. Using these assumptions, Table 2-2 presents population and employment projections up to 2020. We estimated figures for 2005 as a mid-point average between data for 1997 and 2010. In 2005, an estimated 1.23 million lived in Maputo City, with 380,000 employed; close to 0.7 million lived in Matola City, with about 200,000 employed. The total for Greater Maputo is approximately 1.85 million of which 580,000 are employed. By 2010 the total for Greater Maputo is 2.23 million residents with 0.7 million employed. And by 2020 the total is 3.33 million residents and 1.0 million employed.

Table 2-2  
*Population and Employment Projections, 2000 -2020 (in 100's)*

Year		Maputo City	Matola City	Total
1997	Population	997	425	1,422
	Employment	301	124	425
2005	Population	1,228	696	1,847
	Employment	381	202	583
2010	Population	1,366	955	2,321
	Employment	423	277	700
2020	Population	1,960	1,370	3,330
	Employment	608	397	1,005
Proportion Employed (%)		31	29	30

*Note: 2005 figures estimated by consultant.*

*SOURCE: JICA ( 2001).*

### ***Implications***

According to an origin-destination survey conducted for the JICA study, travel to work by car users during the morning period constitutes more than half of trip purposes. We assume that the same holds for bus users. Some short work-trips are by foot. Nevertheless, a substantial portion of these trips require motorized transport, which for the majority of the population means by bus. The same holds for many other daily trips. In summary, the magnitude of population and employment in Greater Maputo and the heavy dependence of the population on buses deserves serious consideration.

## **ROAD NETWORK**

### **Conditions**

Most of the poor roads in the City of Maputo are in the outer neighborhoods (Table 2-3 and Figure 2-2). The road conditions of 2000 are still largely present. The city has 830 km of roads, distributed among 2,240 roads. About 64 percent of the roads are paved in District 1; in Districts 3 and 4 only about 20 percent are paved. The National Road Agency maintains only two roads: Av. De Namaacha in District 2 and Av. De Mozambique in District 1. The city maintains the rest of the roads.

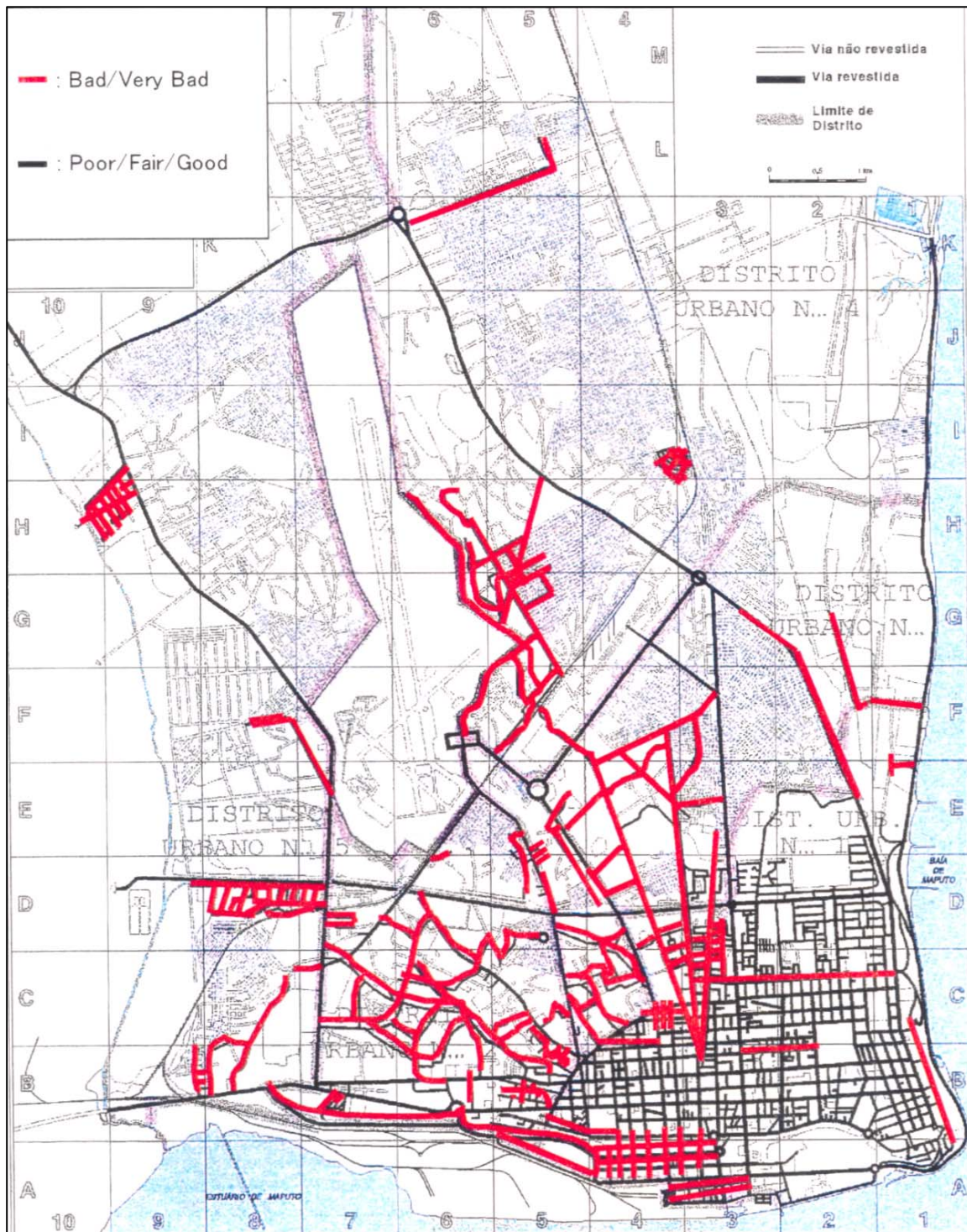
Table 2-3  
*Road Length in Maputo City, by District, 2000*

District	Number of Roads	Length (km)	% Paved
1	423	152	64
2	216	78	28
3	543	164	19
4	547	236	20
5	511	200	26
Total	2,240	830	23

### ***Implications***

According to TPM's management, full-size buses cannot operate well on unpaved or poor roads. In contrast, the small mini-buses can and do operate on these roads. The road conditions, particularly in the poor outer districts and in rural Matola, explain the dominance of the small buses in Maputo. They are filling a void and providing service everywhere—including the poor neighborhoods.

Figure 2-2  
Road Pavement Conditions, Maputo 2000



SOURCE: JICA (2001).

## Proposed Road Classification and Number of Lanes

In 2000, the City of Maputo lacked a system of road classification. The JICA study proposed a scheme of four categories: primary trunk, trunk, collector, and local area. The study recommended introducing full access control to high-class roads with heavy and high-speed traffic (primary trunk and trunk) and limiting low-class roads (collector and local) to low speed and low traffic, while introducing safety standards and general environmental improvements. The study proposed a new design standard width and a new geometric design standard, based on ANE design standards. Figure 2-3 shows the proposed road classifications, and Figure 2-4 shows the number of lanes. Most of the primary trunk and trunk roads are 4-6 lanes, while collector and local roads are two lanes.

### *Implications*

Classifications of roads and buses affect each other. Main transit corridors can operate most efficiently on high-capacity primary trunk and trunk roads of 4-6 lanes, with collector and local roads used for local service. Public transport planners in developed and developing countries believe that improving buses' level-of-service requires giving "priority treatment" to buses over private cars. Popular forms of priority treatment are

- Exclusive or semi-exclusive bus-lanes in which buses can operate at high speed, without interfering with the general traffic (high occupancy/bus lanes in the United States); and
- Automatic "green lights" at light-controlled intersections.

Exclusive bus lanes can be implemented only on high-capacity roads of 2-6 lanes, namely primary trunk and trunk roads with one lane reserved for buses and taxis, at least during peak periods. This solution is quite applicable to Maputo. Plans for bus lanes in Maputo are presented later in this report. Providing automatic green lights is less applicable because Maputo has few traffic lights and controls major intersections with wide traffic circles. Furthermore, this solution requires high-tech instrumentation not applicable in developing countries.

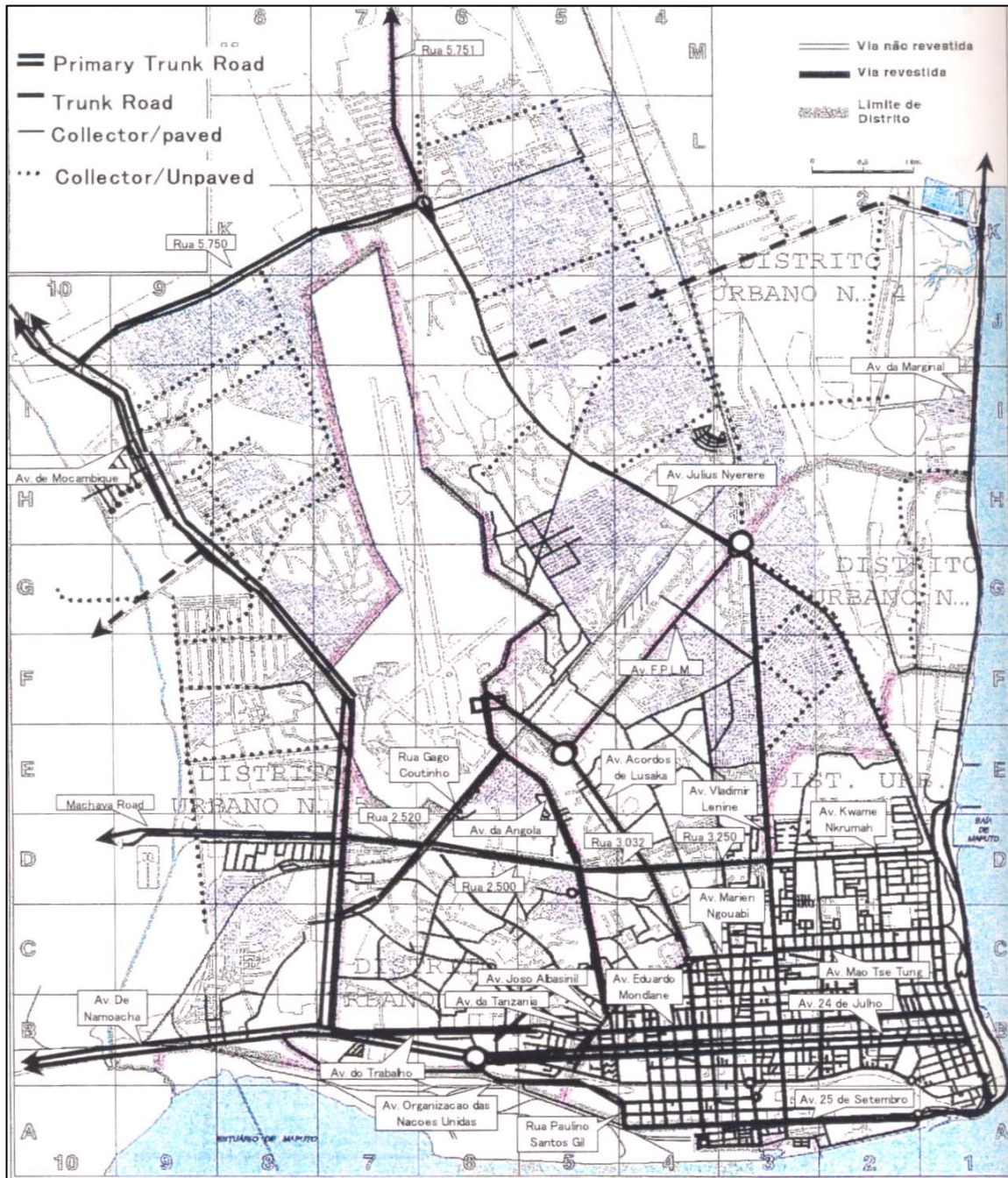
## Network Statistics and Traffic Forecasts

Table 2-4 presents selected road network statistics for 2000, based on the calibrated model of JICA for 2000. Table 2-5 presents trip generation and traffic forecast for daily (16 hours) bus and cars trips, and their passengers, in the City of Maputo for 2000–2020.

- **Speed and Volume/Capacity.** The average travel speed on the network in 2000 (about 31km/hr) is high for urban areas and the average volume/capacity is reasonable (as long as it is below 1.0). But these averages are somewhat misleading. Closer analysis indicates that some major arteries are congested ( $V/C > 1.0$ ) and likely to become even more congested unless infrastructure development and other mitigation measures are implemented. Nevertheless, these figures reflect the subjective assessment that traffic in Maputo is not congested, compared to cities of similar size in sub-Saharan Africa and other developing countries.

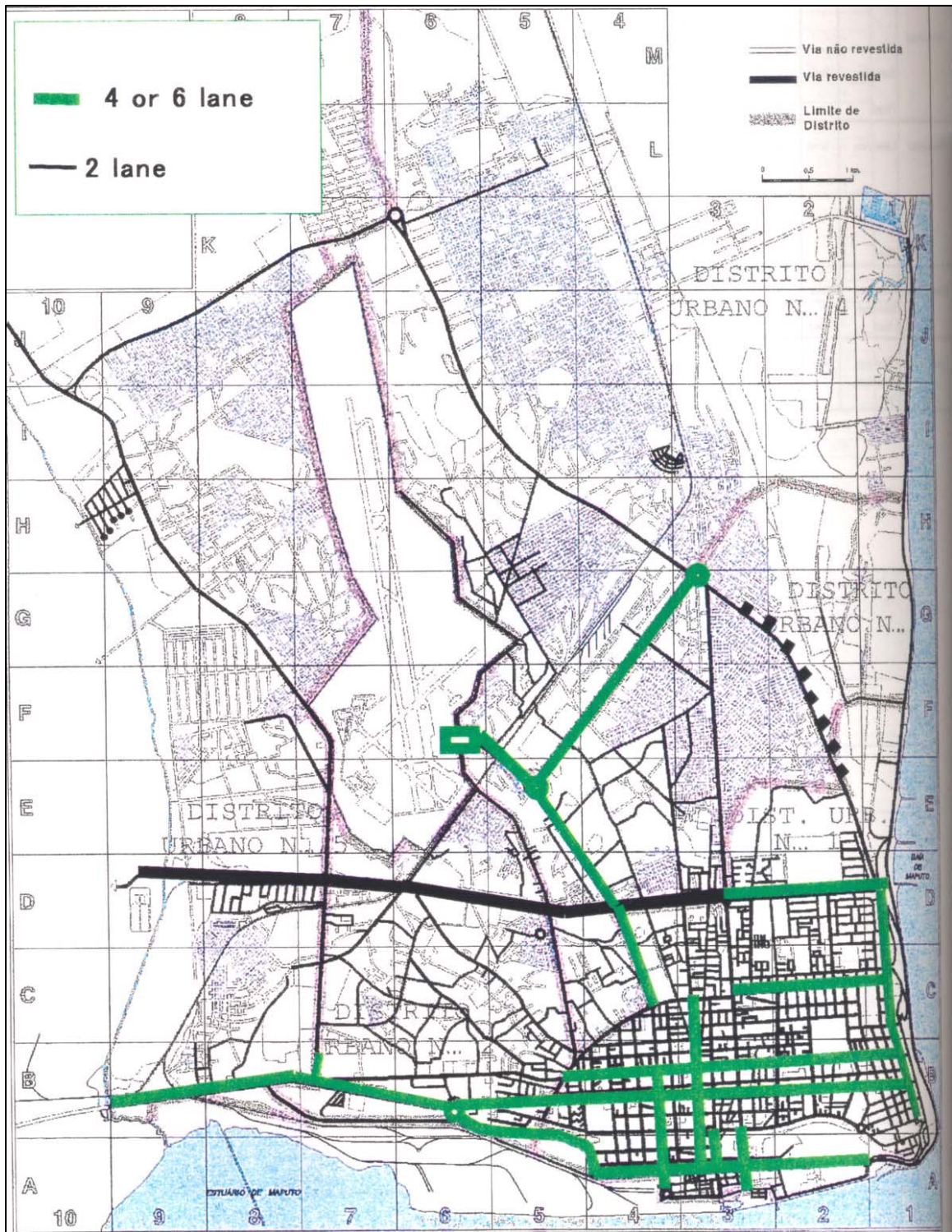


Figure 2-3  
 Proposed Road Classification, Existing Roads



SOURCE: JICA ( 2001).

Figure 2-4  
Proposed Number of Lanes



SOURCE: JICA (2001).

Table 2-4  
*Network Statistics Summary, 2000*

Attribute	Average Value
Speed	30.6 kph
Volume to capacity	0.59
Trip length	
Bus	11.1 km
Car	6.3 km
Goods	8.4 km
Vehicle occupancy	
Bus	19.2
Car	2.1
Goods	3.6

SOURCE: JICA (2001).

Table 2-5  
*Trip Generation and Traffic Forecast, "Medium" Growth Scenario (3%-4% p.a.), Maputo*

	2000	2005	2010	2020
Pop. (1000's)	1,090	1,228	1,366	1,960
Bus				
No. in Maputo City	NA	1,765	NA	NA
Passenger-trips (16 hrs.)	290,737	347,164	403,591	573,644
Bus trip rate per person	0.42	NA	NA	NA
Car				
Ownership	27,162	45,630	64,097	115,497
Trip rate per car	3.8	3.6	3.5	3.3
Car trips (16 hrs.)	105,480	164,910	224,339	381,141
Passenger car trips (16 hrs.)	221,508	346,310	471,112	800,396
Cars owned per 1000 of pop.	28.7	37.8	46.9	58.9

Notes: Passenger car trips assumes average 2.1 passengers per car. Number of buses for 2005 not in JICA study. Another 1,466 in Matola, some of which operate in Maputo.)

SOURCE: JICA (2001); figures for 2005, consultant.

- **Average Trip Length.** In 2000, the average trip length in JICA's study area (Maputo City) was 11.1 km for bus, 6.3 km for car, and 8.4 km for goods vehicle. The longer trip length for buses is common, as bus routes tend to be longer than an average car trip. This length was close in magnitude to the average route reported by the bus associations of Maputo and Matola.
- **Average Vehicle Occupancy.** In 2000, average vehicle occupancy was 19.2 passengers for bus, 2.1 for car, and 3.6 for goods vehicles, which tend to carry passengers (particularly in rural areas). This bus occupancy is an average between the common 15-seat bus and the less common 25-seat bus, and was close in magnitude to the occupancy observed by the consultant

and reported by regular bus users in Maputo. It reflects the fact that most mini-buses (15-seat) are overcrowded and carry more passengers than they are licensed to.

- **Traffic Forecast.** JICA’s forecast of a “medium growth scenario” assumes an annual growth rate of 3 percent to 4 percent up to 2020 (Table 2-5). (JICA also presented low and high growth scenarios not shown here).
  - **Bus.** In 2000, buses handled about 290,000 daily (16) passenger-trips in Maputo. Our estimate for trips in 2005 is approximately 350,000 trips; these are expected to reach about 400,000 in 2010 and 575,000 in 2020. The average bus trip rate per person by car was about 0.42. JICA indicated that this is a relatively low rate for comparable population and cities. It is explained in part by the large number of walking trips and that many goods vehicles also carry passengers. The combined motorized rate for buses and good vehicles was estimated at 0.46 (about 1/2 a bus-trip per person).
  - **Car.** In 2000 there were about 27,000 daily (16 hours) car-trips, carrying about 105,000 people (assuming average occupancy of 2.1 passengers). Our estimate for current trips (2005) is approximately 45,000 car-trips and 165,000 passenger-trips (including driver). The number of car-trips is expected to reach about 64,000 in 2010 and 115,000 in 2020. And the corresponding number of daily passenger-trip reaches approximately 225,000 and 380,000. The car occupancy rate of 2.1 reflects the fact that many car users in Maputo use professional drivers (1 of the 2.1 is the driver). And drivers make many “empty” trips to pick up and drop off owners. The number of trips would have been lower if most drivers were owners, not professionals. Worldwide, trip generations by car tend to be much higher than those by bus. Car owners tend to take trips that otherwise would not have been made. And in Maputo the rate is even higher because of empty trips.
- **Car Ownership.** Car ownership, measured as cars per 1,000 population is very low—28.7 in 2000 and 37.7 in 2005. It is forecast to reach 46.9 in 2010, and 58.9 in 2020. In eastern Europe average ownership is about 350-450, and in the United States more than 500.

### ***Implications***

Given Mozambicans’ low income and low car-ownership, buses will continue to be the main mode of transport. Even though the passenger daily trip rate by bus is relatively low (estimated 0.42), overall demand is large, close to 350,000 trips today, within the JICA study area (Maputo City and Catembe), and is projected to reach about 575,000 in 2020. Buses are undoubtedly the more efficient mode in Maputo: close to 20 passengers per bus per trip versus 2 per car per trip. And most buses (15-seaters) are not much longer than the average car, and occupy about the same road space. In 2005, approximately 1,765 local buses (mostly small) registered in Maputo City, and additional buses registered in Matola and operated in Maputo. These buses handled about 350,000 daily passenger-trips; 45,000 cars handled only about 165,000 passenger-trips. Thus, given bus and passenger volumes, buses in Maputo deserve treatment at least equal to that of cars.

# 3. Bus Operation in Greater Maputo

The urban passenger transport industry in Greater Maputo (Maputo plus Matola Province) has an estimated 3,500 vehicles, mostly 15-seat reconditioned mini-buses and reconditioned 25-seat midi-buses, privately owned and operated. Many are single-vehicle owner-operator enterprises. The number of private firms in the industry is estimated to be 1,000 in Maputo and another 600 in Matola. The great majority are family-run small enterprises operating on routes designated by the municipality and charging a fare dictated by the national government—currently 5.0 Mtn for a single ride on most routes in the city and 7.5 Mtn for Maputo-Matola rides (and longer routes in Maputo). These enterprises do not receive any government subsidies, credits, or other financial support.

The small buses operate without schedules, stop wherever passengers ask to board or disembark, tend to carry more than the designated seating capacity, tend to halt traffic when stopping en-route, and are accused of causing many accidents. Each bus is licensed to operate on only a single route, which is indicated on the front and back windows with the names of the originating and destination terminals (or major stops). The buses depart whenever they are full, which is frequent given their small size, large number, and high passenger demand; during peak periods the buses depart about every ten minutes. They operate under the umbrella of two associations:

- Association Transport Maputo (ATROMAP), which operates in the City of Maputo and has a fleet of 2,001 buses; and
- Union Transport Maputo (UTRAMAP), which operates in Matola, and between Maputo and Matola, and has a fleet of 1,466 buses.

Maputo's publicly owned municipal bus company, Transportes Publicos de Maputo (TPM), operates buses that can carry up to 90 passengers (35 seats and the rest standing). Operations, however, are marginal. Of a fleet of 80 buses only about 35 are operational. Buses run on the same routes as the private buses but charge a lower fare as a matter of government policy. The fare for the Maputo-Matola route is only 4.5 Mtn. TPM has severe financial and management problems, and is partially subsidized.

## **GOVERNMENT POLICY AND PLANS**

Public transport in Maputo consists of three categories: international, national, and local. The central government issues licenses for international and national transport, while local

governments manage and license local transport. In Greater Maputo the local governments are the Municipality of Maputo and of Matola.

## Licensing and Operations

The local government determines bus routes, and issues licenses to bus operators, private or public, to operate on these routes. The government determines the alignment and number of buses on each route, but consults with associations and companies in planning routes. The government also formulates fare policy and determines fares. The local government is responsible for managing or supplying related infrastructure, such as bus terminals, stops, and bays. At present, facilities are minimal; the city lacks stops and bays and the terminals are just tracts of land on streets, intersections, or local markets, without any organized facilities.

To be licensed, a bus owner must meet some minimum requirements. These include

- Certification of inspection, which assures that the vehicle is in good mechanical condition;
- Insurance, to cover any damage to passengers or third parties;
- Business registration, to assure that the operator follows common business procedures;
- Residential registration, to assure that the owner resides within the local government's jurisdiction;
- Police certificate, to assure that the owner has no criminal record or significant traffic violations, to assure the safety and security of passengers;
- Tax registration certification, to assure that the owner will pay income tax, as required by law, on bus operation.

Certifications in Maputo are renewed every six months. Once requirements are met, an owner is issued a license to operate on a single route, as indicated on the front and back windows of the bus.

A fleet need not meet any minimal requirements for size. A single owner-operator can operate in the same manner as an owner of several buses or a company. The operator need not be a member of an association or company, but every operator must join the route-system managed by either ATROMAP or UTRAMAP. The operator pays 20 Mtn per day to the association to cover the costs of conductors who manage terminal operations. This fee is not a government requirement, but a common practice.

## Vehicle Size Plans

To reduce the number of buses on city streets and to increase vehicles' capacity, the policy of Maputo's municipal government is to allow older small buses to be replaced with only 25-seat midi-buses. It is not clear if similar policy is being implemented in Matola, but it seems likely that it will be as the National Ministry of Transport wants to increase the size of buses. The midi-buses, however, are significantly more expensive. A reconditioned midi-bus costs about US\$15,000 versus a US\$7,500 for a small bus. This puts a financial burden on small operators, most of whom do not qualify for bank credit and must pool financing from family members.

## Replacement Bus Plans

Many business and civic leaders are calling for small buses to be replaced with full-size buses more suitable to a modern urban environment. They assert that full-size buses will alleviate the congestion and chaos produced by the large fleet of small buses, and that big buses will provide a higher level of service—one that is scheduled, predictable, safer, and generally more efficient. In lieu of this the Ministry of Transport is contemplating purchase of new full-size buses to replace some or all of the service provided by small buses. The details of the government's plans are not yet known.<sup>2</sup> Before the plan can be assessed, the questions in Exhibit 3-1 need to be answered. At the very least government plans should be fully transparent and openly discussed before any decisions are made.

### Exhibit 3-1

#### *Questions Regarding Government Plans for the Bus Industry*

---

- From where will the buses be imported? (Some say China, others South Africa or Brazil.)
  - How many buses will be imported?
  - How many small buses will they replace? Some or all? On which routes? At what pace?
  - What financial and technical arrangements have been made with the source country?
  - Will the buses be received as a donation or under special financial terms (e.g., low interest)?
  - Who will be eligible to receive a new bus? TPM, which is already an inefficient operator? Association members, such as those who received the previous shipment of new Chinese buses? Others, such as those close to the political machinery? Or the winner of an international competition for a concession to operate?
  - What will be the financial terms for recipients? Who will finance the buses to the recipients (Government of Commercial Banks)? At what interest rate?
  - How will small operators be able to raise capital for such a purchase? (A new full-size bus costs US\$150,000-200,000, or about 10 times the cost of reconditioned mini-bus; no market for used buses exists.)
  - What will the government do with mini-bus operators who will be unemployed?
  - Who will guarantee the supply of spare parts for the new buses? (Many buses are cannibalized due to lack of spare parts.)
  - Who will guarantee bus replacement policy over the long-term (when these buses get old)
- 

## BUS ASSOCIATIONS AND COMPANIES

### Association Transport Maputo

The information was derived from a discussion with Raquel Vieira, ATROMAP's Vice-President. A bus operator since the age of 17 and owner of three buses, Ms. Vieira has been the association's vice president for several years.

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<sup>2</sup> We made several attempts to meet with officials of the Ministry of Transport and Communication to learn more about the plan, but to no avail.

ATROMAP operates just within the City of Maputo. Its 62 voluntary associates run their buses along 10 main routes and a number of subroutes. The government, not the association, provides a license to operate on a given route—but operators must operate within the association's route system. The one-time membership registration is 3,000 Mtn (US\$120); the monthly fee is 100 Mtn (US\$4); and the daily fee per bus, for members and nonmembers alike, is 20 Mtn (US\$0.8), which covers the cost of conductors at bus terminals and other association costs. The advantage of membership is access to special government programs (e.g., access to purchase of new, 34-seat buses, from Japan, at a cost of 800,000 Mtn (US\$32,000) per bus, through the MOT and the Government of Japan, with easy financial terms.)

### ***Vehicles and Ownership***

ATROMAP's route system carries 2,201 vehicles, most of them reconditioned diesel 15-seaters imported from Japan and Korea. Most buses are from production year 1995, and were reconditioned in 2000. Most members own 3-5 vehicles, some up to 12 vehicles. The most popular make is Toyota.

### ***Operation***

A bus crew consists of a driver and a money-collector. Some crews are owner-operators, some employees, and some lessees. Buses depart the terminal whenever they are full, not according to a schedule. There are no bus stops. The peak morning time is 5:00–09:00; mid-day is 9:00–14:00; and the evening peak is 14:00–21:00. On the average, there are about 20 passengers per one-way trip, including boarding and alighting (15-seat bus).

### ***Input Costs***

- Purchase price of reconditioned 15-seater: 180,000 Mtn (US\$7,200); used to be 140,000 Mtn (US\$5,600)
- Purchase price of reconditioned 34-seater: 400,000 Mtn (US \$16,000)
- Gasoline –US\$1.15/litter
- Diesel–US\$1.05/litter
- Average fuel consumption: 4-5 km/litter
- Daily fee per bus– 20 Mtn. (US\$0.8)
- Driver salary–3,000 Mtn per month (US\$120)
- Conductor salary–1,500 per month (US\$60)

### ***Fare***

One-way fare in Maputo on most routes is 5.0 Mtn (US\$0.20), longer routes are 7.5 Mtn (US\$ 0.30).

### ***Issues***

- ***Minimum revenue.*** Rent per bus per day is approximately 1,000 Mtn (US\$40); the renter buys fuel. A one-way bus trip earns about 100 Mtn (20 rides x 5 Mtn/ride). Ten daily trips are required to cover rent (which does not include fuel).



- **Vehicle size.** The city wants to increase vehicle size to 22 seats and does not approve replacement of a 15-seat with another 15-seat vehicle. This may present a problem, financial and operational, for many small operators.
- **Larger companies.** Creating larger companies of 20 or more vehicles per company will improve management and operational efficiency and facilitate access to commercial financing.

## Union Transport Maputo

The information was derived from a discussion with Cossa Leonardo, UTRAMAP President for the past seven years.

UTRAMAP operates between Matola and Maputo and comprises 6 associations, controlling 23 bus routes. There is no formal requirement to join the Union; the government provides a route license and 90 percent of bus operators operate within the Union route system. One time membership registration is 2,500 Mtn (US\$100). Most members do not pay the monthly fee of 100 Mtn (US\$ 4). The daily fee per bus for members and nonmembers alike is 20 Mtn (US\$0.8), which covers the cost of conductors at the terminals and other Union costs.

### ***Vehicles and Ownership***

UTRAMAP operates 1,466 vehicles, about 80 percent of them reconditioned diesel 15-seaters imported from Japan and Korea. The union has some 34-seaters, but riders prefer the 15-seaters, which offer higher frequencies, maneuverability and speed. The most popular make is Toyota. Most members own 2 vehicles, some up to 10. There are three types of owners:

- Transporters, whose main economic activity is transport and who are usually union members;
- Part-timers who drive part-time and hire help; and
- Investors who lease their buses (business people, including government officials).

Any introduction of large buses (34-60-seaters), should be gradual and will be impeded by problems with obtaining credit and spare parts.

### ***Operation***

A bus crew consists of a driver and a money-collector. Some crews are owner-operators, some employees, and some lessees. Buses depart the terminal whenever they are full, not according to a schedule. There are no bus stops. The peak morning time is 5:00–09:00; mid-day is 9:00–14:00; and the evening peak is 14:00–21:00. The Matola–Maputo trip distance is 12-13 km; peak trip time is 30-45 minutes and off-peak is 20-30 minutes. During the morning peak of 4 hours, the union handles about 6-7 one-way trips per bus; during evening peak of 7 hours about 10-11 one-way trips per bus; and during the 5 hours of midday about 5 one-way trips per bus. The daily total (16 hours) of trips per bus is 21-23 one-way trips, with about 20 passengers per trip, including boarding and alighting (15-seat bus).

### ***Input Costs***

- Purchase price, reconditioned 15-seat vehicle (US\$7,500)
- Purchase price, reconditioned 25-seat vehicle (US\$13,000–\$18,000)
- Registration (one-time upon purchase)—45,000 Mtn (US\$1,800)

- Insurance, annual—4,500 Mtn (US\$180)
- Tires—2,000–2,500 Mts (US\$80-100) per tire
- Gasoline—US\$1.15/litter
- Diesel—US\$1.05/litter
- Average fuel consumption: 4-5 km/litter
- Daily fee per bus – 20 Mtn. (US\$0.8)
- Driver salary—3,000 Mtn per month (US\$120)
- Conductor salary—1,500 per month (US\$60)

### ***Fare***

One-way fare from Matola to Maputo is 7.5 Mtn (US\$ 0.30); on TPM the fare is 4.5 Mtn (US\$0.18).

## **Transportes Publicos de Maputo**

The information was derived from a discussion with Silvestre Constantino, TPM's Administrator. Mr. Constantino is an experienced hauler and bus operator. Owned by the Municipality of Maputo, TPM has been in service for many years, even before Mozambique's independence. It operates only full-size buses that carry up to 90 passengers, of which 34 are seated.

### ***Vehicles***

Only 35 of TPM's fleet of 80 full-size diesel buses is operational. The fleet includes 13 relatively new Chinese buses (Jutong) of which 10 are operational; 6 new MAN diesels, made in South Africa; 20 old MAN buses from South Africa, production years 1998-2000, of which 12 are operational; and numerous Mercedes Benz buses, about 12 years old, most of which are not operational.

### ***Personnel***

TPM employs 490 people—173 drivers, 123 conductors, 87 mechanics, and 107 administration and support staff—or more than 11 people per operational bus.

### ***Operation***

The bus crew includes a driver and money-collector. By schedule, buses depart terminals once every hour, with headways of one hour. Travel time between origin and destination is approximately one hour. The total nominal network is 61 routes, of which only 27 are now being run because of a shortage of buses. The routes are identical to those used by mini- and mid-buses. Every bus runs for three 7-hour shifts per day, with operation hours of 4 AM to midnight (20 hours per day). Time for maintenance is limited.

### ***Input Costs***

- Cost breakdown not available, but about 70 percent of operational costs are for fuel
- Driver salary—3,500 Mtn per month (US\$120)
- Conductor salary—1,500 Mtn per month (US\$60)

- Fares cannot cover operational costs, so the municipality provides a subsidy, but even that falls short of amounts TPM requests.

### **Fare**

Subsidized one-way fare from Maputo to Matola is 4.5 Mtn (US\$0.18); the fare on private mini-buses is 7.5 Mtn (US\$0.30).

### **Issues**

- Replacement parts and maintenance are expensive. The overworked buses break down frequently; about 10 buses break down each day.
- Most of the fleet is extremely old, and many of the buses are obsolete. Nevertheless, no fleet renewal plans exist.
- Mr. Constantino believes that the public prefers full-size buses, which are less crowded. He claims that whenever TPM buses and mini-buses arrive at the same time, riders tend to board TPM's buses. He also believes that the small mini-buses contribute to congestion and traffic accidents.
- Mr. Constantino believes that operation of full-size buses should be competitive and be provided by concession to the best bidder. He believes that TPM, with a renewed bus fleet, could win such a competition.

Overall, TPM's bus services are marginal. It has only 35 operational buses, compared to about 3,500 small buses operated by the private sector. In addition, quality of service—frequency, travel speed, and comfort—is poor. Buses depart only once per hour; private mini-buses depart at least every 10 minutes during peak period, travel faster, and are more nimble. There is no evidence that full-size buses are less crowded than mini-buses.

Because TPM is inefficient—employing about 11 people for each operational bus (compared to the 4 people employed to run mini-buses in two shifts of 8-10 hours)—it requires public subsidy. TPM suffers the problems typical of publicly owned bus companies in developing countries: old depleted fleet, inefficient operation, constant need for subsidy.

## **ROUTES**

### **Maputo**

Table 3-1 shows data on bus route traffic in the City of Maputo for 2005, listing the distribution of each bus route according to district location, origin and destination, and number of vehicles, by size. Recall the designation of bus routes is by district; subtotals in Table 3-1 are by district. Drawing on this data, we estimated the total seating capacity of the fleet in each route (last column). Note that 15-seaters are mini-buses; 26 and 29-seaters are midi-buses operated by the private sector; and the 34-seaters are full-size buses, probably owned by TPM.

Table 3-1  
 Bus Route Data, Maputo Municipality, 2005

Municipal District (M.D.)	Route No.	Origin / Destination	Via	Vehicles, by Seating				Total Vehicles	Est. Total Seating
				15	26	29	34		
2	1	Xipamanine/A. Voador	G.Popular/E.Mondlane	75				75	1,125
2	2	Xipamanine/Museu	Marien Ngobi	67				67	1,005
		<b>Sub-Total M.D. No. 2</b>		<b>142</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>142</b>	<b>2,130</b>
4	1	Costa do Sol/A.Voador	E.Mondlane	34				34	510
4	2	P.combatentes/A.Voador	Kar Max/V.Lenine	99				99	1,485
4	3	P.Combatentes/Museu	H.Central/Praca O.M.M						NA
4	4	P.Combatentes/Xipamanine	Compone/Shoprite	84				84	1,260
4	5	P.combatentes/A.Voador	Praca dos Herois	40				40	600
4	6	Hulene/A.Voador	"	137				137	2,055
4	7	Albazine/A.Voador	"	92	7	24	5	128	2,428
4	8	Laulane/A.Voador	"	4				4	60
4	9	Albazine/Museu	"	3	4	1		8	178
4	10	Albazine/A.Voador	"	5				5	75
4	11	Hulene/Museu	"	56				56	840
4	12	Albazine/Museu	"	45	3	4		52	869
4	13	Laulane/Museu	"	2	1			3	56
4	14	Hulene/A.Voador	"	4				4	60
4	15	Hulene/Xipamanine	A.v de Angola	80				80	1,200
4	16	Albasine/Xipamanine	"		1	1		2	55
4	17	Hulene/Museu	E.Mondlane/A.v de Angola	4				4	60
4	18	Magoanine/Museu	"	2	1			3	56
4	19	Laulane/Museu	"			1		1	29
		<b>Sub-Total M.D. No. 4</b>		<b>691</b>	<b>17</b>	<b>31</b>	<b>5</b>	<b>744</b>	<b>11,876</b>
5	1	Magoanine/A.Voador	E.Mondlane/A.v Ang.	43	1	2		46	729
5	2	Malhazine/A.Voador	"	53	7	8		68	1,209
5	3	Malhazine/Museu	"		1	1		2	55
5	4	Malhazine/A.Voador	"	2				2	30
5	5	Magoanine/Museu	"	1				1	15
5	6	Malhazine/Museu	"	2	1			3	56
5	7	Magoanine/A.Voador	"	1				1	15
5	8	Magoanine/Xipamanine	"						NA
5	9	Benfica/P.Combatentes	Hulene/Malhazine	63				63	945
5	10	Matendene/P.Combatentes	"	2				2	30
5	11	Matendene/Museu	Benfica	5	7	21	33	66	1,988
5	12	Benfica/Museu	"	24	20	37	1	82	1,987
5	13	Zimpeto/Museu	"	18	45	63	13	139	3,709
5	14	Malhazine/Museu	Benfica	7	55	85	2	149	4,068
5	15	Drive In/Xipamanine	A.v de Angola	49		2		51	793
5	16	Benfica/Xipamanine	A.v de Angola	40				40	600
5	17	Benfica/A.Voador	Marginal/Oliveiras	28	1	1		30	475
5	18	Zimpeto/A.Voador	"		1	1	2	4	123
5	19	Matendene/A.Voador	"		2	2	2	6	178
5	20	B.Jardim/Costa do Sol	"	35	3	6		44	777
5	21	Malhazine/Museu	"	1	4	8		13	351
5	22	Zimpeto/Museu	"		2			2	52
		<b>Sub-Total M.D. No. 5</b>		<b>374</b>	<b>150</b>	<b>237</b>	<b>53</b>	<b>814</b>	<b>18,185</b>
Marracuene	1	Mateque/P.Combatentes	"	23				23	345
Marracuene	2	Muchafutene/P.Combatentes	"	2				2	30
Marracuene	3	Gwava/P.Combatentes	"	1				1	15
Marracuene	4	Mateke/Museu	"				1	1	34
		<b>Sub-Total M.D. Marracue</b>		<b>26</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>27</b>	<b>424</b>
Matola	1	M.Socimol/Museu	"		5	3	1	9	251
Matola	2	Congolote/Museu	"			1	1	2	63
Matola	3	Z.Verde/Museu	"		8	9		17	469
Matola	4	P.Lumumba/Museu	"	1		1		2	44
Matola	5	Z.Verde/A.Voador	"	1				1	15
Matola	6	P.Lumumba/A.Voador	"	1				1	15
Matola	7	Sao Damanso/Museu	"		1			1	26
Matola	8	Z.Verde/P.Combatentes	"	2				2	30
Matola	9	Museu/Liberdade	"		1	1		2	55
Matola	10	Liberdade/Xipamanine	"			1		1	29
		<b>Sub-Total M.D. Matola</b>		<b>5</b>	<b>15</b>	<b>16</b>	<b>2</b>	<b>38</b>	<b>997</b>
<b>57</b>		<b>TOTAL ALL MUNICIPAL DISTRICTS</b>		<b>1,238</b>	<b>182</b>	<b>284</b>	<b>61</b>	<b>1,765</b>	<b>33,612</b>
		<b>PERCENT OF TOTAL</b>		<b>70%</b>	<b>10%</b>	<b>16%</b>	<b>3%</b>	<b>100%</b>	

Source: Department of Transport and Transit of the Maputo City Council

In 2005, the City of Maputo licensed 1,765 buses for public transport: 70 percent were 15-seaters, 10 percent 26-seaters, 16 percent 29-seaters, and only 3 percent full-size buses. The latter is probably an overestimate because TPM operates only about 35 buses even though 61 are certified.

The buses run on 57 routes. The distribution of routes by originating district was as follows: District 2 had two routes, District 4 had 19 routes, District 5 had 22 routes, in Marracuene 4 routes, and in Matola 10 routes. (District 1 is not listed, probably because most routes terminate there and listing would have resulted in double counting.)

Estimated total seating capacity of the fleet registered in Maputo City is approximately 33,600. Assuming 25 percent factor for overcrowding the passenger-carrying capacity of this fleet approaches 40,000. Most of this capacity is provided by privately owned small vehicles. The estimated capacity of TPM's 35 operational buses is only about 3,500 spaces.

## Matola

Table 3-2 shows bus types by route in Matola, based on data from a partial list of 61 companies. These companies, operating on 10 routes, have a fleet of nearly 1,000 vehicles (out of a total of 1,466 under UTRAMAP). Of these, 75 percent were 15-seaters, 20 percent 26-seaters, and only 5 percent 34-seaters vehicles.

Table 3-2  
*Bus Types by Bus Route, Matola (61 Companies)*

Route	Bus Size (seat)			
	15	25	35	Total
1	259	26	3	289
2	87	0	0	89
3	77	0	0	80
4	45	0	0	49
5	39	0	0	44
6	40	0	0	46
7	32	7	0	46
8	86	0	0	94
9	43	155	43	250
10	35	10	0	55
Total	743	198	46	987
Percent	75	20	5	100



# 4. International Best Practice

No single best practice for urban public transport exists, perhaps because of the wide variety of operational modes. Ownership may be private or public; vehicles may be small, full-size, or articulated buses; operation may be by schedule or vehicle capacity; company sizes are mixed; routes may be allocated by state monopoly or concession. A best practice that works well in one city might fail in another. Understanding of trends prevailing worldwide and some familiarity with the experience of public transport in developed and developing countries, however, can be enlightening.

## TRENDS

Trends in public transport are based on growing awareness that it improves the urban environment and is essential to its smooth functioning. Many cities that once invested largely in facilities to accommodate private cars have concluded that road demand is endless and can never be met, and that public transport must be supported as a complementary means of transport, particularly for work commutes and peak hours. Some cities, such as Singapore and London, have even curtailed the use of private cars in city centers by imposing high fees on entering cars. By now it is well established that public transport should be treated at least as an equal to the car, and in many instances as a preferred mode of transport.

Many cities, mostly in developed countries where car ownership is high, subsidize public transport and take measures so it can compete with the automobile. Public transport is understood to

- Facilitate work commutes and economic activities;
- Reduce congestion, particularly during peak periods;
- Reduce environmental impacts (air pollution);
- Reduce demand for urban land, allowing for dense development along public transport routes and terminals;
- Provide transport for the young, the elderly, and the poor;
- Reduce investment on car-related infrastructure; and
- Equalize social welfare through subsidies and lower fuel prices for public transport

This understanding has given rise to three interrelated trends:

***Improving levels of service.*** To attract passengers and retain high ridership in developed countries, public transport should improve levels of passenger service. This entails

- Increasing speed,

- Reducing travel time,
- Increasing frequency,
- Increasing reliability (on-time performance and consistency),
- Increasing travel comfort – seating rather than standing on longer trips,
- Reducing crowdedness,
- Improving road safety,
- Improving passenger security, and
- Using a single fare, from origin to destination, regardless of operator and transit mode.

***Giving public transport priority treatment.*** To increase the attractiveness and level-of-service in public transport, and to put it on at least equal footing with the private car, cities are initiating measures to increase travel speed, reduce congestion caused by private cars, and improve road safety. Popular measures include (1) exclusive and semi-exclusive lanes (high-occupancy vehicle lanes in the United States, bus-lanes in Europe); and (2) automatic “green lights” at traffic lights.

***Developing and investing in bus infrastructure.*** To achieve these goals cities are investing in facilities for buses and other forms of public transport, including bus lanes, stops, and terminals; combined bus terminals for local and intercity bus transport; and subsidies (largely for capital investment in vehicles).

## EXPERIENCE

### North America and Western Europe

In the United States, the country with the strongest free-market orientation, all urban bus (and urban rail) companies are publicly owned and operate as monopolies within municipal boundaries. In Western Europe, with a stronger welfare-state tradition and social democracy, many local bus companies are privately owned and compete to provide services under concession. In many European countries—England, Germany and Sweden—several private bus companies may operate in the same urban area.

Public transportation in western countries, even in countries with high demand and a well developed dense public transport network, such as Holland, requires subsidies. In the best case, the fare-box revenue covers operating costs; and in many instances, particularly in North America, not even that. In the western countries about half of operating costs are attributed to labor (the salary of a bus driver in the United States can reach \$50,000). Capital costs are also quite high because the public demands and expects new vehicles. For example, the purchase price of a European bus in Israel is approximately 200,000 Euro. This may explain the high rate of public ownership in the United States. Public transport companies in the United States are such losing enterprises that no private enterprise is willing to take them over. In general the operational characteristics (high capital and labor cost) of bus companies in the West, have little relevance to developing countries.



## Developing Countries

The low income and low car ownership of developing countries spurs demand for public transportation. Most of the traveling public does not have any other means of transport. This makes public transport in general and urban public transport in particular a viable economic enterprise. Under appropriate and competitive operational schemes, supply of public transport can cover both capital and operational costs, and be profitable.

Because the traveling public is a "captive audience" and because it is poor, it accepts low levels of service, but at the right (low) price. To reduce input costs, most small buses are reconditioned units bought at about the one-third the cost of a new vehicle. They are poorly maintained—also to cut cost. But they provide service for a reasonable fare. Buses may be old, noisy, smoky, and overcrowded, and operate without a schedule but as long they carry passengers from origin to destination for a reasonable fare in a reasonable amount of time they will remain popular. This is what some transport planners describe as "poor service for poor people." And in that respect, Maputo is not different than other developing countries. A similar argument, however, can be applied to other public services, such as housing, education, and health.

Urban public transport in many developing countries is similar to Maputo's. Much of the fleet consists of privately owned, reconditioned small vehicles run "chaotically" throughout the city. In addition, one may find in the same city full-size buses, privately or publicly owned. And as in Maputo, publicly owned bus companies tend to be inefficient and losing financial enterprises, while the private companies are profitable.

The types of vehicles vary. Many African cities use transit vehicles in the urban core and pickups with back entrances in rural areas (i.e. "Matola" in Tanzania). Transit vehicles are also common in Jordan and Afghanistan. In Manila and the Philippines, the prevailing mode is "Jeepny"—a mixture of Jeep and Pickup with back entrance.

What is common to all of these vehicles is that they are used, relatively small, highly maneuverable, and carry 15-20 passengers. They operate effectively in narrow unpaved alleys as well as in congested city streets. Replacement parts and tires are readily had because they are identical or nearly identical to those used by cars; and the buses can be serviced by small garages, which have experience in repair of small vehicles. Full-size buses, however, require special spare parts, repair, and maintenance—which is why so many full-size buses in developing countries are cannibalized.

In summary, public transport in Maputo is not significantly different from transport in other developing countries.



# 5. Assessment of Bus Industry

The following assessment of the bus industry is based on the review of bus operations in Greater Maputo and of previous studies and plans, as well as international experience in the supply and operation of public transport.

## POSITIVE ATTRIBUTES

### Functional

Perhaps the most important attribute of bus transport in Greater Maputo is that it works, with highly fragmented ownership (about 1,500 companies and 3,500 vehicles) and without much direction from or interference by the government. And this is not as simple as it sounds. The system could have failed for various reasons, but it hasn't and it in fact works.

### Productive and Dependable

It is estimated that the existing vibrant system produces, on a regular basis and over well-defined routes, about 350,000 daily passenger-trips by bus within the City of Maputo alone, and probably about 500,000 person-trips in the combined area of Maputo-Matola. This is done daily throughout the year without significant breakdowns. In fact, this system allows the city to work and function on a daily basis. Without it, city life as it is known would not exist.

### Highly Competitive

The system is highly competitive. Consisting of many sellers (bus operators) and buyers (passengers), where no individual alone can affect the price or quantity of the good (passenger-trips), it is almost a textbook illustration of a market economy. Competition allows the fare to remain relatively low and the supply and frequency of trips relatively high.

### Minimal Government Involvement

The government sets licensing rules for the bus operators, determines fares (through some negotiation with associations to prevent price “dumping” and ensure a reasonable fare for the public), plans bus routes (also in cooperation with the associations, which have the “pulse” of demand), and assign a route to each licensed bus. With the exception of TPM, Maputo's bus industry is almost entirely private. The government does not invest in or subsidize any private, small bus operations. Where it is involved in supplying full-size bus service through TPM, operations are inefficient and require annual subsidy.

## **Well Developed Route Network**

The network of bus routes throughout Greater Maputo is extensive and seems to provide good coverage for the majority of the population. Greater Maputo has approximately 80 bus routes: the city has 57 and Matola 23 (plus additional subroutes). The majority of the population seems to be within reasonable walking distance of the routes.

## **Accessible**

In focusing on downtown Maputo, the existing network reaches major markets and centers of employment, thereby facilitating employment, commerce, and other civic activities.

## **Serves Poor, Transit-Dependent Population**

The system serves the majority of the population, which is poor. Most Mozambicans are poor and depend on public transport for all daily needs—work, shopping, commerce, health. Some describe it as a “poor system for poor people”—but the system serves the population that it intends too, and at reasonable level-of-service for the existing fare.

## **Contributes to Informal Employment**

The small bus industry employs many people, directly and indirectly, and contributes to the income of poor households and the informal local economy. The informal sector is estimated to employ about 90 percent of Mozambicans, so it is essential to employment, income, and social welfare. Our preliminary estimate is that the small bus industry in Greater Maputo directly employs up to 14,000 people as drivers and money-collectors alone.<sup>3</sup> It also directly employs conductors at each terminal. In addition, the industry employs maintenance workers in private informal repair shops and garages, as well as suppliers of spare parts and fuel. It indirectly employs vendors at bus stations. The magnitude of this "ripple effect" employment is unknown, but could easily be another 10 to 20 percent of those directly employed. Thus, the small bus industry probably employs more than 15,000 people in the informal sector.

## **NEGATIVE ATTRIBUTES**

### **Highly Fragmented**

Consisting of 1,500 companies operating 3,500 buses, the industry may be too fragmented. Small individual owners may operate inefficiently because they lack management skills and access to commercial credit. Many “eat capital” when they defer preventive and routine maintenance to the point of vehicle deterioration. Deferred maintenance can also make vehicles unsafe and lead to accidents. Unable to secure loans to maintain and replace vehicles, small operators depend on personal and family resources.

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<sup>3</sup> Based on 3,500 buses, each employing 4 people per day (2 per mini-bus), and 2 shifts per day (each 10 hours): 3,500 buses x 4 workers/bus = 14,000 workers.

The solution may be a cooperative of 50-100 members who negotiate as a group with credit institutions; obtain training in management, maintenance, and safety (perhaps from donors or NGOs); and self-impose professional standards. Current associations do not do this. They have very few registered members, and do not provide any meaningful services to the majority of bus drivers operating in their route systems, other than charging them 20 Mtn per day for managing waiting lines in the terminals. The sentiment for creating cooperatives was expressed by UTRAMAP management, which believes that doing so would likely improve management, efficiency, safety, and access to credit and government programs. One counterargument is that ultra small companies save on management expenses and other inefficiencies of large operators.

## **Unsafe Vehicles and Road Safety**

The government and the elite assert that small buses are unsafe and contribute significantly to road accidents. Experience elsewhere indicates that this claim has merit. Reconditioned vehicles are not as likely to be as mechanically reliable as new vehicles. They also tend to be poorly maintained and prone to safety problems. Such problems can be addressed by improving safety inspections and enforcement, and by training drivers and repair shops. If the industry were less fragmented (e.g., organized in cooperatives), government and/or donors could provide concentrated training. The counterargument is that while the vehicles are used and poorly maintained they cost little, and this keeps fares cheap.

## **Congestion and Road Safety**

Another complaint is that small buses cause accidents by not obeying traffic laws and by driving chaotically. Buses stop randomly so passengers may board or alight, not at bus stops—for there are none—but in traffic. Large groups of passengers block traffic, sometimes entire sections of road, because there are no bus bays. The problem is more severe on two-lane roads, where there is no room to pass.

We had neither the time nor resources to compare the road safety record of small buses to that of other vehicles (in any case the quality of such data is expected to be very poor). Nevertheless, certain things should be considered in that respect. The buses produce many vehicle-km (each bus may produce about 1,000 vehicle-km per day, assuming 10 km per bus-trip and 20 trips per day). Any comparison of road safety records should be on the basis of vehicle-km or passenger-km, not sheer number. And even the casual observer can see that some private cars (45,000 in Maputo City) also do not obey traffic laws and park anywhere. The issue of safety and buses may be magnified because buses tend to be very crowded; accidents involving them tend to be horrific with many casualties, and thereby cause public outcry.

Still, the problem is real and should be addressed through better enforcement and the provision of infrastructure—better roads, bus stops, and bus bays. Such measures could substantially reduce congestion and traffic accidents caused by buses.

## **No Hierarchy**

The bus industry in Maputo lacks hierarchy. In theory, the hierarchy should be similar to road hierarchy (classification), proposed by JICA: large buses should operate on primary trunk and

trunk roads, and smaller buses on collector and local roads. Trunk roads have more capacity and higher demand and can accommodate large vehicles at high speed and high frequency. The bus stops on the primary, higher class routes can be spaced at long distances, up to 500 meters, to reduce time for getting on and off. Stops on secondary roads can be spaced about 300 meters apart. This hierarchy would improve road use and bus capacity.

Note that small buses cannot provide mass transit. Why? The length of one full-size bus is equivalent to the length of 2 to 2.5 midi-buses—but it takes 5 to 6 midi-buses to carry the same number of passengers as a full-size bus (90-100). Articulated buses, which operate in many parts of the world, have almost double the capacity of a full-size bus. Operating full-size buses in bus-lanes can provide mass transit on wheels. Several countries (e.g., Brazil) provide very successful mass transit by bus. But this success requires investing in exclusive bus-lanes.

This optimal hierarchy has not developed in Maputo because roads in certain residential and rural areas cannot handle full-size buses. Over the long term, Maputo should develop a bus hierarchy and introduce larger vehicles in bus lanes in high-demand corridors. The current (2005) demand, in Maputo Municipality alone, is an estimated 350,000 bus passenger-trips per day (and in Greater Maputo probably close to 500,000). JICA forecasts demand for more than 400,000 by 2010 and 575,000 by 2020 in Maputo City (and in the same proportion over 800,000 in 2020 in Greater Maputo). Meeting such demand will require developing a bus hierarchy and providing full-size bus service in high-demand corridors, and providing “priority treatment” for buses.

### **Lack of Infrastructure**

Most noticeable is the lack of sufficient and appropriate infrastructure for buses. The existing terminal and final bus stops are either on-street parking or unpaved lots and market areas. No bus stops or bays exist. Buses stop everywhere and block traffic. In addition, no information on routes or stops is published—not even such minimal information as which route operates on which street. Mozambique law requires that 5 percent of the fuel tax be used to improve the transportation system. But this sum is channeled directly to the National General Fund. (According to the Ministry of Transport and Communication, it intends to use this fund to purchase the full-size buses, but this is not confirmed yet.) Undoubtedly, the fund should be used to improve infrastructure for buses, the most important mode of travel for most Mozambicans.

### **Inefficient Publicly Owned Bus Company**

TPM has the problems typical of publicly owned bus companies in developing countries: old depleted fleet, inefficient operation, constant need for subsidy. Only 35 of a fleet of 80 is operational and many buses are cannibalized. For each operational bus, TPM employs 11 people (versus the 4 employed by private operators). Service quality is also low; buses depart only once per hour, and are slower and less maneuverable than small buses.

## 6. Recommendations

Recommendations offered here are for the short term (2007–2008, or perhaps up to 2010) and the long term (2010–2020, and later). The recommendations also address specific issues in the government’s plan to replace the current operation of small buses with full size-buses—the issue that was the impetus for this study.

### SHORT-TERM RECOMMENDATIONS

As indicated in Chapter 5, the current system works, and its positive attributes seems to outweigh its negative ones. The system is productive, dependable, and highly competitive. It operates on a well-developed network of routes with minimal government involvement, providing ready access to centers of employment and commerce and contributing significantly to employment in the informal economy. It is the major service for the poor who depend on it for transportation to and from work, school, and shopping. Though it may seem chaotic and may contribute to problems with road safety and congestion, it takes most people where they want to go at a reasonable frequency and for a reasonable price. Hence, the following recommendations:

***Leave the system "as is."*** For 2007–2008 (or perhaps up to 2010), allow the bus industry in Maputo to continue operating in its current mode. Do not interfere and do not introduce new rules. Let the private sector continue supplying services with minimal government intervention.

***Improve enforcement.*** Improve enforcement of traffic laws for private cars as well as buses to improve safety, reduce congestion, and alleviate traffic bottlenecks.

***Start investing in bus facilities.*** The government should start investing in bus infrastructure, especially bus lanes on crowded two-lane roads. Doing so will provide immediate relief on the worst roads (e.g., Lenine Av.).

### LONG-TERM RECOMMENDATIONS

***Develop and implement bus hierarchy and priority treatment.*** Maputo needs to develop a bus hierarchy and introduce larger vehicles in bus lanes in high-demand corridors. The current (2005) demand, in Maputo Municipality alone, is an estimated 350,000 bus passenger-trips per day. JICA forecasts more than 400,000 by 2010 and 575,000 in 2020 in Maputo City (and in the same proportion over 800,000 in 2020 in the Greater Maputo Area). This demand justifies developing a hierarchy of bus operations. Large buses should run on primary trunk and trunk roads, and smaller vehicles on collector and local roads, with integration of these services. This includes provision of priority treatment and bus-lanes on major bus corridors.

***Develop a public transport master plan.*** The development of road hierarchy requires analysis and study. The proposals for bus lanes in the 2001 JICA study are a good starting point. That study, however, was for a road master plan not the bus system. Recommendations for the bus system were a byproduct. An efficient and equitable operational bus system for conditions in Maputo should be based on a distinct public transport master plan. The study should cover the Greater Maputo Area (Maputo and Matola), which operates as a single urban entity from a socioeconomic view point. The JICA study covered only the Municipality of Maputo. Our brief study and recommendations are no substitute for a comprehensive public transport master plan.

***Invest in bus infrastructure.*** The government should invest in bus infrastructure, especially bus lanes on crowded two-lane roads to greatly improve bus operations. The government should supply fixed infrastructure for efficient bus transport, while the private sector supplies buses and services. Investments should include city streets used by buses and bus stops, bays, terminals, lanes, and other priority treatment for buses. Part of this investment should be covered by the dedicated 5 percent fuel tax. Appendix A presents some selected plans for infrastructure development adopted from the 2001 JICA study.

***Assist in improving efficiency of operators.*** The government can help make bus operations safer and more efficient (1) by developing training in management and maintenance to be provided by government agencies or by donors and (2) by offering tax and other financial incentives, such as access to commercial credit, to encourage creation of effective operational cooperatives and larger companies.

## **IMPLICATIONS OF GOVERNMENT PLANS**

Many government, business, and civic leaders are calling for small buses to be replaced with full-size buses more suitable to a modern urban environment. They assert that full-size buses will alleviate the congestion and chaos produced by the large fleet of small buses, and that big buses will provide a higher level of service—one that is scheduled, predictable, safer, and generally more efficient. In lieu of this the Ministry of Transport is contemplating purchase of new full-size buses to replace some or all of the service provided by small buses. The details of the government's plans are not yet known. Before the plan can be assessed, the questions in Exhibit 3-1 need to be answered. At the very least government plans should be fully transparent and openly discussed before any decisions are made. The following section addresses some of the implications of the proposed plans.

### **High Capital Costs**

The cost of new full-size bus is about US\$150,000-US\$200,000—approximately 20 times the price of a reconditioned mini-bus. A full-size bus can carry about 90-100 passengers—only about 5-6 times the capacity of a mini-bus. Full-size buses have an economic life of 10-12 years, during which time they accrue high mileage and become obsolete. No significant market exists for used full-size buses, as it does for mini-buses. Thus, using full-size buses implies buying new vehicles. The high capital cost of full-size buses will not be within the means of current small-bus operators. It is reasonable to assume that local government companies (such as TPM), foreign



concessionaires, or businesses with close ties to the government will be the winners of this venture.

## **No Rationale for Replacing Entire Fleet**

We do not foresee a need to replace the fleet of small buses with full-size buses. Even long-term plans for bus hierarchy have room for small and large buses. And current road conditions in Districts 3-5 warrant continued use of small buses as full-size buses cannot operate there.

The current fleet in the Municipality of Maputo (not including Matola) has a fixed seating capacity of 33,000 (moving capacity depends on departure frequency). To replace the entire fleet of small buses will require about 100 full size-buses (33,000 seats at 100 spaces/full-size bus = 330 buses). This does not guarantee enough supply of moving capacity. The estimated cost of 330 new buses is approximately US\$50 million (US\$150,000 x 330 = US\$50 million). It is questionable where the government will obtain such an amount. And this is only for the Municipality of Maputo. The actual number of full-size buses to be purchased is unknown. But even a purchase of 100, about the size of the nominal fleet of TPM, is approximately US\$15 million.

## **Spare Parts and Maintenance**

The lack of spare parts for and poor maintenance of full-size buses in developing countries, as exemplified by TPM, is well known. It is not clear how this problem will be handled with the new fleet. How will the program guarantee adequate supply of spare parts and qualified mechanics in the long run? Spare parts for small buses are less of a problem. Many of them are identical to spare parts for cars, and are easier to obtain. If this issue is not addressed, the new fleet will likely be cannibalized, just as TPM's fleet is now.

## **Employment**

We estimate that about 14,000 people are employed directly in the small bus industry as drivers and money-collectors. Supporting industries, such as repair shops, suppliers of spare parts and fuel, and station vendors employ many more. Most of them are part of Mozambique's massive informal sector. Eliminating some or all of these jobs will create hardship for the working poor now in the small bus industry.

## **Inefficiency**

TPM is an example of inefficient full-size bus company. The best measure of its inefficiency is the ratio of workers per operating bus: 11 per bus versus 4 in the small bus industry. On the basis of our experience in Mozambique and other developing countries, we suspect that such inefficiency will repeat itself in any full-size bus program.

## **Lack of Complementary Actions**

If the purchase of new buses is to be financed by the fuel tax or any other government resources, financing for urgent actions, such as investment in bus infrastructure and traffic management of cars and buses, will be lacking.



# Appendix A. Examples of Bus Infrastructure Development

This appendix presents examples of planning for infrastructure development, adopted from the JICA study of 2001. They include

- Planning for the proposed bus network in Figure A-1, including
  - Hierarchy—Trunk bus line (blue); bus lanes (double blue); branch bus routes (green)
  - Bus stops with bays—Bus stop with 1 bay (white circle); with 2 bays (black circle)
  - Bus terminals—Local (yellow circles, denoted as A, C, D); long-distance (purple circles, denoted as F, E)

Table A-2 presents the corresponding proposed infrastructure developments.

- Figures A-2 and A-3 show plans for bus network improvements downtown, where the main determining factor in the location of bus stops and bus bays is a walking distance up to 400 meters to each station (circles in Figure A-3).
- Figure A-5 shows improvements on Av. Vlademir Lenine, due to construction of a bus bay.

Figure A-1  
Proposed Bus Hierarchy and Infrastructure

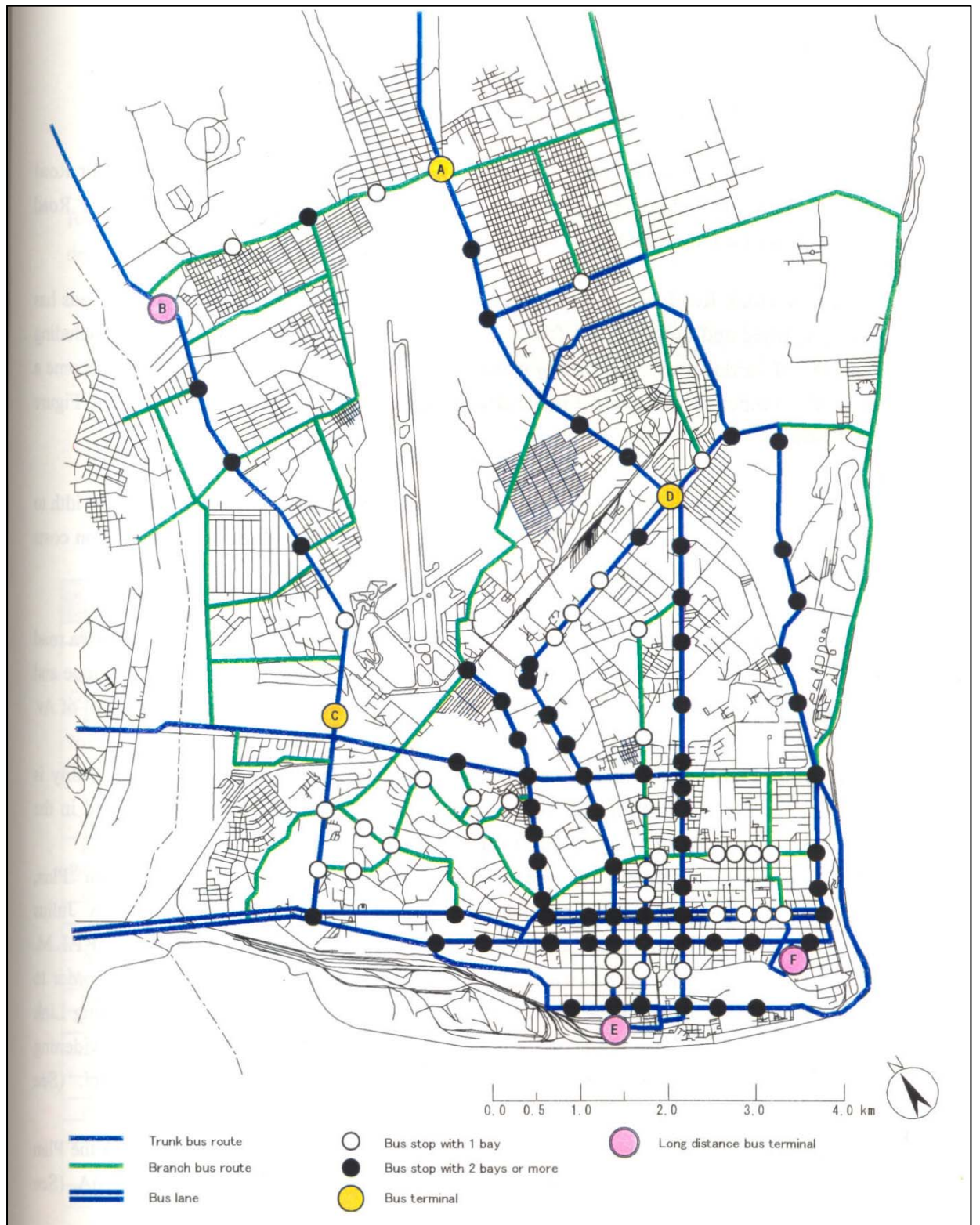


Table A-2

*Proposed Development of Bus Stops, Bays, and Terminals, Maputo (JICA 2001)*

No.	Road	Project Category	Project Type			Total
			Terminal	Bay	Roadside	
T1	Av. Julius Nyerere	Road development		5		9
		Public transportation	1			
		Traffic management		3		
T2	Av. Vladimir Lenine	Public transportation		9		12
		(excluded)			3	
T3	Av. Acordos do Lusaka	Road improvement			4	4
		Public transportation				
T4	Av. Guerra Popular	Road development			2	4
		Traffic management		1		
		(excluded)			1	
T5	Av. da Angola	Road improvement			5	5
T9	Av. Marien Ngouabi	Road development			5	5
T10	Av. da FPLM	Public transportation			5	5
	Av. 25 de Setembro	Traffic management		2		5
		(excluded)			3	
	Av. 24 de Julho	Traffic management		4		9
		(excluded)			5	
	Av. Edward Mondlane	Traffic management		4		9
		(excluded)			5	
	Av. Mao Tse Tung	Traffic management				3
(excluded)				3		
C2/C32	Av. da Malhangalene (1375/3259)	Road rehabilitation		3		3
C16	Av. Martires de Inhaminga (1006)	Public transportation	1			1
C21	Rua 2282/2265	Road rehabilitation		3		3
C22	Rua 2275	Road rehabilitation		1		1
C23	Rua de Xipamanine (2291)	Road rehabilitation		1		1
C24	Rua dos Imaos Roby (2289)	Road rehabilitation		3		3
C25	Rua 2315/2313	Road rehabilitation		2		2
C26	2309/2324	Road rehabilitation		1		1

Figure A-2  
Planning for Bus Network Downtown Maputo (400- meter Stop Spacing)

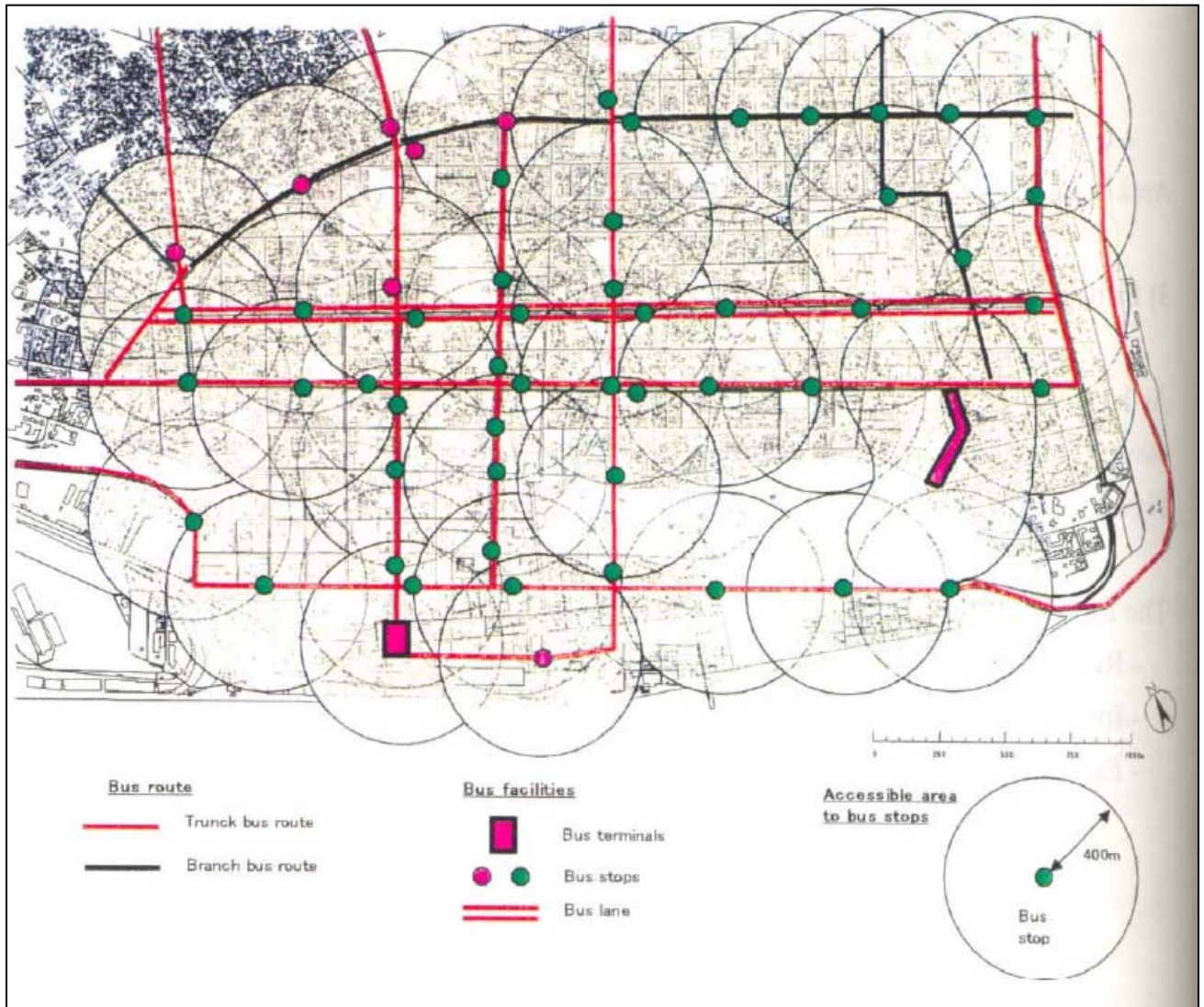


Figure A-3  
*Proposed Bus Improvements Downtown*

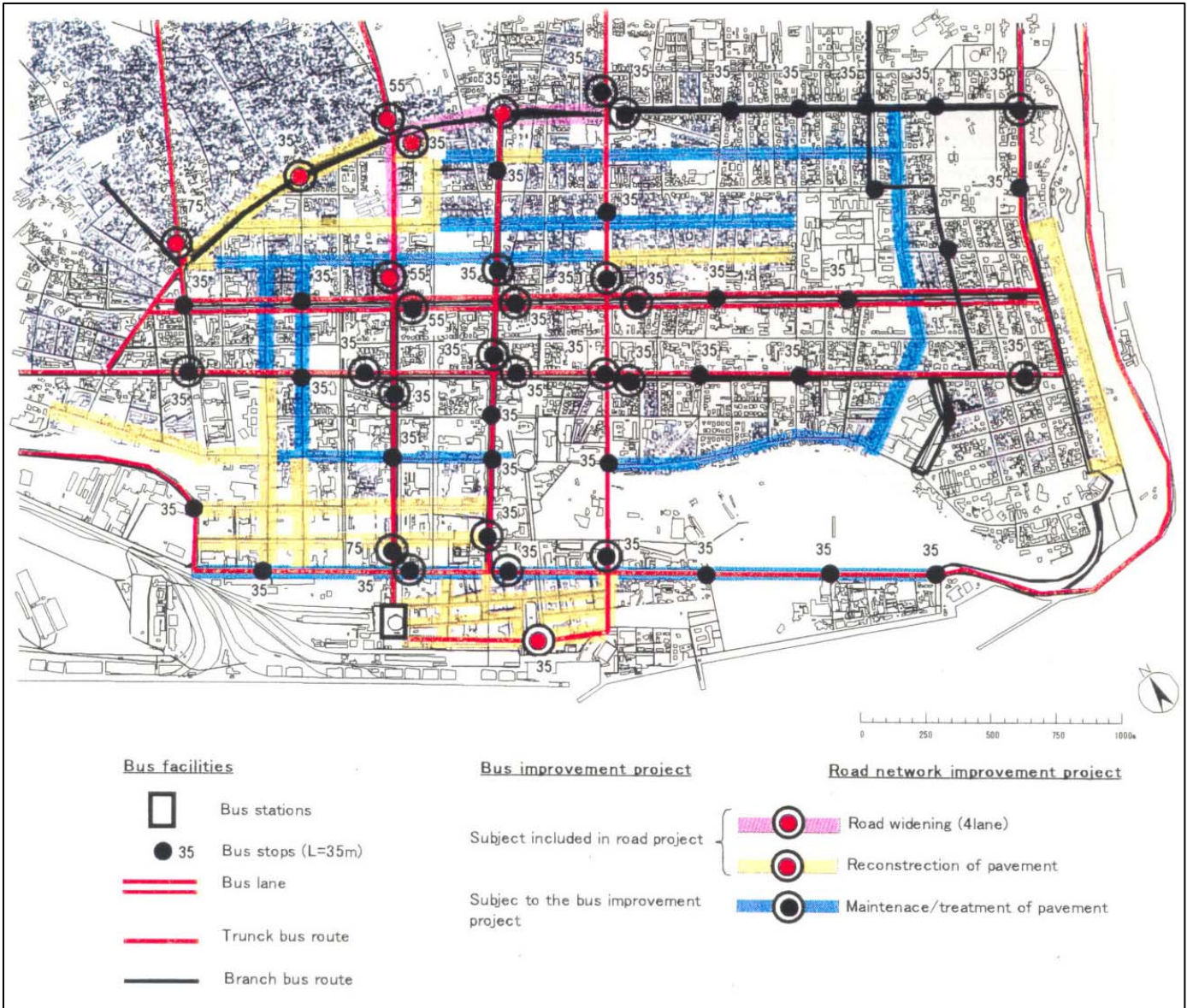


Figure A-4  
*Establishment of Bus Bays on Trunk Roads (Av. Vlademir Lenine)*





# Appendix B. Meetings

N°	Date	Name	Institution/Department.		Position	Cel. Phone	Telephone	Email
	27/11/2006	Steering Committee Bus Study	USAID Mozambique, CTA, Natnan Assoc, FEMATRO					
1	27/11/2006 to 15/12/2006	Timothy W Born	USAID Mozambique		Trade and Investment Program, Team Leader		21 35 21 70	<a href="mailto:tborn@usaid.gov">tborn@usaid.gov</a>
2	27/11/2006 to 15/12/2006	Time Knott	USAID Mozambique		Program Manager		21 35 21 76	<a href="mailto:tknott@uadid.gov">tknott@uadid.gov</a>
3	25/11/2006 to 12/12/2006	Jim Laflaur	CTA	Conference of Business Associations of Mozambique	Senior Economic Adviser	82 3097 280	21 491914	<a href="mailto:jim.lafleur@cta.org.mz">jim.lafleur@cta.org.mz</a>
4	27/11/2006 to 15/12/2006	Ashok Menon	Nathan Associates	Trade and Investment Project - Mozambique	Director, Trade Policy Advisor			
5	27/11/2006 to 15/12/2006	Laurence Gadaga	FEMATRO	Federation of Road Transport Associations of Mozambique	Manager, Local Assistance to Bus Study	82 79 32 150		
6	27/11/2006	João José	DTTC - Maputo	Maputo City Traffic & Transport Directorate	Director		258 21 32 59 54	
7	28/11/2006	Leonardo Cossa	UTRAMAP	Maputo Transporters Union	Chairman	82 38 42 950		
8	28/11/2006	Raquel Vieira	ATROMAP	Maputo Road Transport Association	Chairman	82 84 67 620		
9	29/11/2006	Rogério Manuel	FEMATRO	Federation of Road Transport Associations of Mozambique	Chairman	84 30 20 201		
10	30/11/2006	Bembele	Municipal Council		Transport Councillor			
11	30/11/2006	Matsinhe	DPTC - Matola	Provincial Directorate of Transport & Communications - Matola	Policy Technician		258 21 72	
12	04/12/2006	José Chembeze	World Bank, Mozambique		Transport Specialist		258 21 48 23 60	<a href="mailto:jchembeze@worldbank.org">jchembeze@worldbank.org</a>
13	04/12/2006	Kinio Fukazawa	JICA	Japanese International Cooperation Agency	Deputy Resident Representative Representative	82 30 74 510	258 21 48 63 57	<a href="mailto:fukazawa.kimio@jica.go.jp">fukazawa.kimio@jica.go.jp</a>
14	05/12/2006	Victor Fonseca	CMCM - Dept. Estr./Pontes	Municipal Council of the City of Maputo	Director	82 39 15 910	258 21 40 82 52	<a href="mailto:vfonseca71@hotmail.co">vfonseca71@hotmail.co</a>
15	05/12/2006	Silvestre Constantino	TPM	Maputo Public Transport	Administrator (Technical Dept.)		258 21 32 22 99	
16	05/12/2006	Teresa Chissequere	CMCM - Dept. Mapeamento		Director	82 31 35 630	258 21 32 32 78	<a href="mailto:thery00_54@yahoo.com.br">thery00_54@yahoo.com.br</a>
17	05/12/2006	Ana Fernanda Nhampango *	Ministry of Transport and Communication		Director of Economics and Investment	21 430 152		
18	12/06/2006	Olivio Pinto*	Ministry of Transport and Communication, National Directorate of Surface Transport		National Director	21 32 38 17		
19	12/12/2006		Conferencia Do Sector Privado Regiao Sul **					

\* Only introductory meeting, no discussion

\*\* Participation and presentation in the conference, Transport Sector