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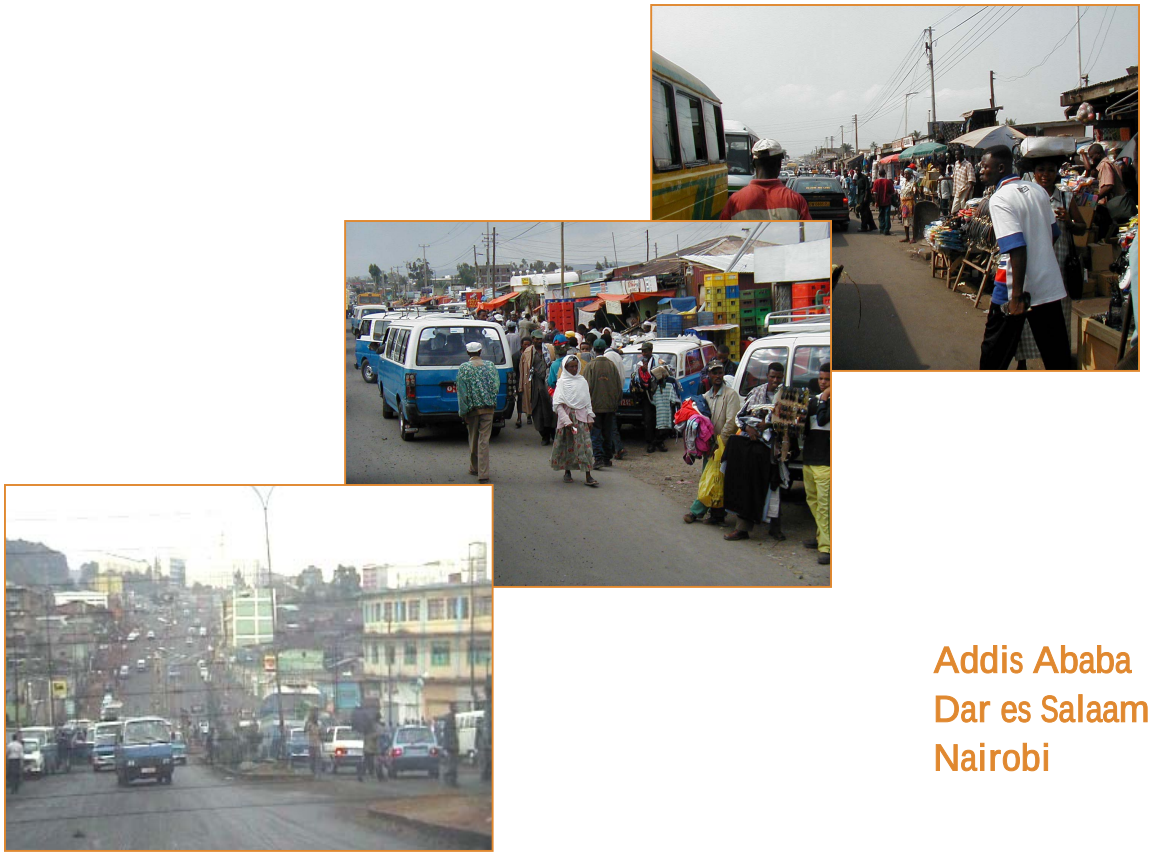
Scoping Study

Urban Mobility in Three Cities



Addis Ababa
Dar es Salaam
Nairobi

Africa Region
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Scoping study
Urban mobility in three cities

Prepared by
Transport Research Laboratory

The sub-Saharan Africa Transport Policy Program (SSATP) is a joint initiative of the World Bank and the United Nations Economic for Africa (UNECA) to facilitate policy development and related capacity building in the transport sector of sub-Saharan Africa.

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FOREWORD

In 2002, a comprehensive scoping study was carried out on the status and development of urban mobility in three sub-Saharan African cities, Addis Ababa (Ethiopia), Nairobi (Kenya) and Dar-es-Salaam (Tanzania).

The purpose of the study was to collect a representative sample of the sub continent in terms of size, regional spread and availability of data as a first step to identify key issues affecting urban mobility in the related cities and prepare Action Plans leading to policy reforms.

The study included the analysis of elements such as (i) institutional and regulatory arrangements on urban mobility, including the role of the municipalities in the policy making process and the impact of the decentralization process in the related countries on urban mobility funding and infrastructures interventions; (ii) financing of the urban mobility system through public budget (national and local) as well as contribution of the operators; (iii) data on road accidents; (iv) accessibility to public transport system together with key elements on tariffs, market share within the modal split and evolution of motorization; (v) existence of an urban planning mechanism and analysis of its relevancy; (vi) the role of the urban transport sector in terms of employment generation; (vii) an other overall assessment on issues such as traffic management and law enforcement.

The findings of this study – presented in this Working Paper - have been presented at the twelve Steering Committee Meeting of the SSATP-Urban Mobility which was held in Maputo, Mozambique, early July 2002. They are expected to be debated at national workshops to be organized early 2003 in each city with the main stakeholders of the sector. The event's outputs would provide the background for Action Plans and facilitate the preparation of an Urban Mobility Policy in each city.

Within such a perspective, the Urban Mobility Component of the SSATP confirms the key role a sound policy reform is expected to play to improve urban mobility in sub-Saharan Africa.

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ACKNOWLEDGEMENTS

This report has been prepared for the SSATP (urban co-ordinator and study task manager: Patrick Bultynk) by a team consisting of Teferra Mengesha (independent consultant, Addis Ababa), Professor Theo Rwebangira and Hannibal Buire (University of Dar es Salaam), Tom Opiyo (University of Nairobi), and Chris Baguley and Phil Fouracre (both of TRL). Many stakeholders in urban transport in the three cities were interviewed as part of our enquiries and we gratefully acknowledge their kind support. However, the views expressed in this report are solely those of the team, and should not be ascribed to any of these stakeholders or the SSATP/IBRD management.

1 SUMMARY

In many respects the status and development of urban transport in the three cities is quite similar. Private operators dominate the public transport market and all three have followed a similar pattern of regulatory development: they started with a single (private or publicly owned), vertically integrated bus company. These firms had expensive operations, dictated by high safety standards and the demands of organized labor. Though protected from competition (monopoly rights and franchise agreements) they were unable to raise fares for political reasons (a *quid pro quo* for their competitive protection), and incapable (because of lack of finance) of coping with the large increases in transport demand which followed in the wake of strong urban growth. In some cases, the market responded ahead of deregulation and private entrepreneurs started providing illegal transport services even before deregulation, under the open view of the authorities.

In the 1980s and 90s, these cities deregulated the market and reduced entry restrictions. However, many constraints remained on the existing bus company. This led to unfair competition, as new entrants had a much freer hand on their operations. Private operators of small vehicles quickly managed to capture a large slice of the market, which still remains in their hands.

Easier market entry and a weak regulator has probably resulted in a more frequent but less reliable and comfortable level of service, as well as bad driving and safety standards due to the high fragmentation of the market. There are thousands of operators who place high expectations on their drivers. Competition on routes leads to speeding, congestion, bad parking, and consequent impact on road safety.

Addis Ababa exhibits the biggest divergence from this basic model of public transport development in that it still subsides the operations of a big bus company. The difference in fares charged between big and small buses is significant.

The cities also demonstrate relatively similar models of institutional development. In each, responsibility for urban transport has been devolved to the city, though some other agencies (at national and regional levels) play a role. However, for the most part the city is inactive in regulating or planning the sector; its prime contribution is in the maintenance of the road network, though even here it may be relying on the center for funding and/or human resources.

In many respects transport works tolerably well in each of the cities. Large volumes of passengers are transported by public transport on a daily basis, and many can accomplish their travel

needs routinely[1]. In other respects, however, the system has many faults. The quality of travel on public transport is poor, unreliable, and very often unsafe and insecure. The roads themselves, and associated pedestrian facilities, are badly maintained and managed, contributing to the problems of commuting, the unsafe nature of travel and general congestion in the central areas. The costs of travel are too high for the urban poor to make regular use of public transport, and alternative means (walking and cycling) are not only onerous (for longer distance commuting) but also receive little encouragement in the way of facilities. Though not yet a major problem, the environmental hazards of city transport can only get worse.

There are good reasons for investing in city transport. It is widely recognized that cities make an important contribution to the national economy, and clearly an efficient transport system supports the productivity and growth of the city. And with cities competing with one another in the global economy, effective transport must help in the development of a competitive advantage. Transport can also contribute to pro-poor policy in a very positive way, providing access to opportunities, and enhancements to security (through reduced isolation), as well as providing job opportunities in the sector.

In each city there is a keen awareness amongst the professional staff (from various agencies) that many of the urban transport problems arise because there is no leadership or coordination. Funding is of course a problem, but is made worse (from the perspective of the transport sector) because transport has no clear 'champion' and takes low priority in the outlook (and budget) of the municipality. It would be fair to say that the transport profession knows what could (and should) be done (in the way of measures and technologies) for redressing transport problems, but that the organizational structure is unable to respond in a coherent and focused manner.

This report concludes that the only way to derive significant improvements in the performance of the urban transport sector is to reorganize the way in which urban transport is planned and developed. Once this has been achieved, technical interventions have a greater chance of achieving a positive impact on the urban transport sector.

By way of introduction to the cities under review, Table 1 summarizes the key characteristics of urban transport as currently pertains in the three cities.

[1] While the public transport system in a typical city of sub-Saharan Africa may look chaotic on the surface, it should be seen within the cultural norms of African cities, and not necessarily judged against western models.

Table 1. Summary characteristics of urban transport in the three cities

	Addis Ababa	Dar es Salaam	Nairobi
City statistics:			
-population (m)	2.57 (growth rate 3.1% per annum)	2.2 (growth rate 5% per annum)	2.14 (growth rate 5% per annum)
-area (sq. km)	530.14		696
-national income per capita (US$)	100	245	350
-car ownership (per 1000 population)	23	26	20
-mode split			
▪ Walk	70%	42%	47%
▪ NMT	negligible	3%	1%
▪ Public tran.	26%	43%	42%
▪ Car	4%	6%	10%
Public transport -share of total trips by:			
▪ Big bus	27%	~2%	30%
▪ Minibus	72%	~98%	70%
▪ Taxi	1%	Negligible	Negligible
Road safety			
▪ Fatalities per 100,000 pop.	1.9	5.8	9.7
▪ Fatalities per 100,000 vehs.	36.0	46.0	57.9
▪ Fatalities per million veh. km	141.8	174.0	320.9

Table 1. Summary characteristics of urban transport in the three cities

	Addis Ababa	Dar es Salaam	Nairobi
Public transport market	In 1986, it was estimated that about 70% of the city population depended on walking. In 1988 it was estimated that about 55.9% of the population used walking. According to current indications, the 1986 estimate is still applicable, as confirmed by the survey carried out by the Addis Ababa Master Plan Revision Office. The Anbessa Bus Enterprise, a parastatal under the city council, moves around 27% of all public transport passengers. It operates a fleet of 415 conventional buses (102 old and 363 new), with an average age of 6 years, and provides scheduled services along 85 routes as well as non-stop rapid services (express service). About 10 routes are provided with additional express services. The Enterprise is reporting a small operating surplus of 1.1 million Birr in 1998/99 (1 U.S$ =8.79 Ethiopian Birr) after experiencing heavy losses for several years. Although there is a system of flat fares, there is a range varying with distance, 25 Ethiopia cents for up to 9 km), 35 Ethiopian cents up to 9.9 kilometers, 50 Ethiopian cents for 9.9 up to 14.2 km, and so on. The highest fare is 2.25 Birr for a distance of about 44 km) extending to the peripheral areas to the west and south of the capital. Additional 10 Ethiopian cents per trip are charged for express services. A new fare of 250 Birr has been introduced for use by government employees for unlimited number of trips over a three-month period. The remaining 73 percent of public transport passengers move by private operators, which have about 500 taxis and 7997 mini-buses in urban and sub-urban area of Addis Ababa.	The public transport system in Dar es Salaam consists entirely of road-based services. For many years, the only company legally allowed to operate transport services was the state bus company UDA; however, this never managed to cope with market demands. For this reason, many private operators co-existed with the state company. From 1983, the market was deregulated and the state company lost even more market share to private operators, as they were completely free to work. Most of the market now is in the hands of the thousands (approximately 7,000) of *Dala dalas* (small vehicles with capacity between 16-36 passengers).	The public transport service in Nairobi is made up of conventional buses operated by Kenya Bus Service (KBS) under its Bus Track subsidiary and the *Matatus* which are typically 18-35 seat mini-buses. KBS has also recently been developing a premium minibus service (Metro Shuttle) targeted at more affluent communities. There are around 9,900 *Matatus,* 300 big buses and 30 Metro Shuttles operating in Nairobi. Conventional bus services were also produced by a public sector bus company, Nyayo Bus Services. However this could not compete with the private sector and was wound up in 1992. The rapid expansion of the population of over 5% per year has put a considerable strain on the public transport system and causes high levels of congestion in peak periods.

Table 1. Summary characteristics of urban transport in the three cities

	Addis Ababa	Dar es Salaam	Nairobi
Institutional and regulatory framework	The road transport industry was deregulated in 1992 as part of the liberalization of the economy. The city Administration is directly involved in setting fares for the Anbessa City Enterprise as it also has the power to allow subsidies for its operation. The city Administration, through the Road Transport and Communications Bureau reviews and approves the schedules and fares of mini-buses. The conventional taxis that provide exclusive services have the flexibility to set fares depending on demand. Factors of politics relating to the poor have become the real impetus for the city administration in subsidizing passenger fares of Anbessa (by 21 cents per trip). It could be stated that there are conflicts between financial sustainability in urban transport and broad objectives of reducing the cost burden on the poor. Government intends to privatize the Anbessa City Bus Enterprise, but it will take time as the economic and social dimensions of poverty are of serious political concern.	Entry into the market is not severely restricted by the government, although it is very difficult to raise capital. The licensing authority does impose some quality qualifications: new drivers must have passed through a training course (run by the National Institute of Transport), and crew are now expected to wear uniforms. Vehicles are also numbered and allocated to a specific route which is identified (on the vehicle) by a color coding system. For *Dala dalas*, services are unscheduled, and vehicles depart when they are full. Routes range from 3 to 30 km. *Dala dala's* drivers generally 'hire' the vehicle from the owner, and are expected to return a daily rent, as well as cover the fuel and other running costs.	KBS originally operated under the terms of a city franchise under which KBS provided scheduled services with fares controlled by the City Council. The Council undertook to provide and maintain the transport infrastructure. However, in recent years KBS did not seek to renew the franchise (which had in any case largely lost any significant value), as from 1973 there was direct competition with the *Matatus*, and from 1986 (until 1992) with Nyayo. *Matatus* are not subject to any formal kind of regulation after the deregulation of bus services in 1994. Operators are organised into route associations, which attempt to limit new entrants to routes. There is a quasi control of fares by the authorities, though individual drivers may vary fares with the time of day and month. The authorities also try to impose some control on routing, and in particular parking in the central areas. *Matatu* owners do not (willingly) pay company taxation, while KBS (as a big business) has to, leading to unfair competition along the same routes. However, since 1999 *matatu* operators have to pay the Transport Licensing Board (TLB) annual tax.

Table 1. Summary characteristics of urban transport in the three cities

	Addis Ababa	Dar es Salaam	Nairobi
Financing of public transport	There are no alternative sources of financing outside the commercial banking system. There are difficulties in meeting short and long-term requirements for funds. The capital market, either subscription to a public issue or through stock exchange is yet to be developed. The private urban transport sector has not been able to attract the interests of the commercial banking system. The Anbessa City Bus Enterprise has, however, been able to have access to the credit facilities of the commercial banking system and soft loan arrangements and grants from external sources. The Government has provided guarantees for loan financing for the procurement of buses from bilateral agencies. In general, there are difficulties in meeting the financial sustainability of public transit partly due to low fares and partly due to lack of access to equity capital. There are also no provisions for parking and terminal facilities. The Anbessa City Bus Enterprise was subsided a sum of 15 million Birr in 2000/2001.		Both conventional buses and *Matatus* operate commercially. Both are unlikely to make large profit. Earlier owners of KBS have sold out because they could not sustain continual financial loss. The strategy of the new owners of KBS has been to substantially reduce its cost base through contracting-out most of its big-bus operations (Bus Track). The targeting of more affluent commuters with premium services has also helped to raise average fare revenues. *Matatu* operators reduce their operating costs by lowering quality and safety standards, and by putting the onus on the drivers to earn a sufficient daily rental of the vehicle.

Table 1. Summary characteristics of urban transport in the three cities

	Addis Ababa	Dar es Salaam	Nairobi
Effects of public transport regime	Developments since the mid-1990's indicate a trend towards a mismatch between demand and supply in public transport. For Anbessa there are problems of vehicle and driver utilization during peak and off-peak hours. This is primarily due to nature of the market segment (the low-income earners and students) that it serves. The mini-buses and the exclusive rider conventional taxis are facing declining productivity particularly as a result of the mid day gap (in demand) extending from around 10:30 a.m. to 2:30 - 3:30 p.m. The problem is exacerbated by congestion during peak hours that affect running speeds and stopping. Low levels of utilization (reduced frequencies) and fares may contribute to inadequate financial returns and ultimately end up with an old fleet of mini-buses.	After the government allowed private operators to provide transport services for the city in 1983, they quickly grew to dominate with a 90% market share by 1989. The public bus transport company UDA has seen its market share decline to just 2%, with only 12 buses operating in the year 2000. The predominance of *dala-dalas* services leads to inefficiencies in trunk corridor services relative to conventional stage buses. *Dala dalas* increase congestion, are less economic in road space utilization, and have lower comfort levels than big buses Proliferation of a wide range of vehicles. The system of recompense for *Dala dala* drivers encourages speeding, aggressive overtaking, poor parking and frequent vehicle stops.	The franchising of conventional bus services to KBS initially worked well under earlier ownership. Although fares were 'decontrolled', *Matatu* operators provided strong competition on routes. KBS invested in a high quality bus operation that made a profit for a number of years. Fares for *Matatu* operators on competing routes were lower than in other areas. The administrative burden on authority was low and the operations actually made small profits for the City Council, which was a minority shareholder. Declining road standards due to storm damage in 1997/8 and increasing congestion have made the operation of the buses increasingly difficult The operation of *Matatus* and the lack of regulation has had a number of undesirable effects: Accident levels are high, drivers work long hours and race between stops to pick up passengers Congestion is high, particularly at stops in the city center with drivers dawdling at stops to pick up passengers Operators are also open to corruption from cartels who 'regulate' stops Conflicts between operators, route associations and other interest groups is high, sometimes breaking out in violence.

Table 1. Summary characteristics of urban transport in the three cities

	Addis Ababa	Dar es Salaam	Nairobi
Safety	In general, the rates of motor vehicle accidents, fatalities and serious injuries as a ratio of the vehicle fleet in the city are high. Although, a decline in the ratios was recorded in 2000/2001, the overall trend prior to that pointed out vividly that the situation had been worsening. An assessment of motor vehicle accident data management, cause analysis, traffic policing and public awareness as well as vehicle inspection indicate weaknesses towards improvement of road safety. Additionally, traffic code that meets the requirements of current and evolving situations is lacking. There are only 359 traffic policemen (only 52 supported by motor cycles), one ambulance for emergency situation and old mobile radios that are ineffective for communication. The application of computers for accident data management has been constrained by lack of skilled personnel, hard ware and software. There is problem in co-ordination between the Road Transport and communications Bureau, the Traffic police and the Addis Ababa City Roads Authority	Dar es Salaam is the only one of the 3 cities to exhibit clear signs of accident casualties increasing steadily over the past 6 years. It has a National Road Safety Council of which the Regional Commissioner is Chairman. A full council meeting is held every 3 months with the various sub-committees (which can include non-executive committee members) meeting monthly. There are 14 members of the Committee representing all key ministries. The accident database in Dar es Salaam is computerized and should theoretically be the most comprehensive of the 3 cities. However, in practice a number of problems were found, chiefly associated with hardware failures (and poor backup procedure). This coastal capital city is different to the other cities in having only three arterial roads: For at least part of their length, all three roads have been upgraded in recent years to dual carriageways. A number of major crossroads along these routes have been signalized and these appear to be in good repair. Separate cycle ways have been built along some of the arterial roads (i.e. Those that have been upgraded) as bicycles are, unlike Addis Ababa, very common for both personal transport and transport of goods. There are also significant numbers of tricycles and handcarts. The Ministry of Works has commissioned a local consultant to develop a road safety audit procedure for Tanzania.	Nairobi outwardly appears to be a more highly developed city, having many high-rise buildings with a vehicle fleet that may be, on average, younger than the other two cities. However, there are more vehicles in use and its accident fatality rate is the highest of the 3 cities. There are six main arterial routes leading into the city center with an outer ring road serving the eastern side of the city. Many roads are in a very poor state of repair with cracks, potholes, virtually no road markings and are without any pedestrian footway provision. This is primarily due to internal problems with funding to the Road Maintenance Department of Nairobi City Council. The situation is now so acute that only 3 out of 22 signalized intersections in the city are currently working. Continual police control is thus essential at all these junctions. Vehicle speeds appear to be higher. Pedestrians also seem to appreciate the danger more in this city, as almost all will choose to walk on the earth shoulder. Nairobi used to have a Road Safety Council but this is no longer operating. There is a real sense of insecurity in Nairobi, particularly after the hours of darkness, with many residents actively avoiding a number of areas of the city after nightfall, largely due to fear of attack and robbery. Coincidentally the risk of road accidents appears to be remarkably high at nighttime: with about 47 per cent of all accidents occurring in darkness.

2 INTRODUCTION

2.1 BACKGROUND

The SSATP program is a partnership between the World Bank, donors and partner countries, aimed at facilitating Transport Policy Reform in Sub-Saharan Africa. As indicated in the Terms of Reference, the objectives of the Urban Mobility Component of SSATP are:

- To consolidate and expand urban transport policy reforms through dialogue and institutional co-ordination
- Identify ways to provide affordable, safe and environmentally sustainable mobility
- At the regional level, strengthen African expertise in planning, provision of transport services, regulation and research in the urban transport sector
- Disseminate best practices in other countries of the region and expand the exchange of information at the regional level.

The present terms of reference relate particularly to the first of these goals, but also make a contribution to the other goals. The specific objectives of the assignment are:

- Provide a comprehensive information on accessibility, safety, efficiency and financing of the urban mobility system in selected cities of Sub-Saharan Africa.
- Analyze the economic, institutional, technical and financial context under which transport services have been created since the early 90s, developed and managed by formal and informal transport operators
- Identify the opportunities and priorities for sound urban mobility policy reforms in these urban centers

The immediate beneficiary of this study is the Urban Transport Component of the SSATP. The study will form the basis for the preparation of an Urban Mobility Policy Development Program for SSATP. This will set measurable objectives with performance indicators, make strategic choices on institutional, financial and regulatory arrangements, and design implementation options.

The work described in this report comprises a review of five key issues in each of three cities, namely Nairobi, Dar es Salaam and Addis Ababa. The key issues are:

- Institutional and regulatory arrangements on urban mobility, including the role of the municipalities in the policy making process and the impact of the decentralization process in the related countries on urban mobility funding and infrastructure interventions

- Financing of the urban mobility system through public budget (national and local) as well as contribution of the operators
- Data on road accidents
- Existence of an urban planning mechanism and analysis of its relevancy
- The impact of the urban transport sector on urban employment and household expenditures

The output, contained in this draft report, is an action plan identifying complementary needs based interventions and policy reforms leading to safe, efficient and less polluting transport in the three selected cities.

2.2 STRUCTURE OF REPORT

This report consists of a main overview of transport in the three cities, supported by a detailed report for each individual city. The overview (Sections 3 - 7) draws on the city reports, and provides a commentary on the key approaches and lessons from each city. It does not try to present the detail of the current status of transport in each city, though some broad comparative material of transport performance is documented. Furthermore, each city report documents the findings from the small-scale surveys that were undertaken as part of the study. Where appropriate, some of these survey findings have been referred to in the overview.

As well as addressing the main issues outlined in the Terms of Reference, the main text also attempts to develop an Action Program in Section 7. This is generic in nature, being non-specific to any of the cities, though applicable to all. The action plan suggests a general 'way forward', though it will be apparent that some of the cities may already have advanced further than others along the suggested path.

While every effort has been made to capture the nature of urban transport in the three cities, it is inevitable that the picture presented is not entirely accurate. The survey material is limited (in size and coverage), the commentary and observations of stakeholders is necessarily biased, the 'formal' system and procedures that are perceived may mask a multitude of hidden activities, links and networking that may actually 'drive' the sector's performance. However, it is believed that the picture presented is at least indicative of what is happening, and certainly identifies key issues, approaches, and lessons learned.

3 INSTITUTIONAL AND REGULATORY ISSUES

3.1 URBAN TRANSPORT POLICIES

None of the three cities has an explicit urban transport policy: a draft document (which has not yet been officially adopted) exists for Tanzania, and Addis Ababa has the semblance of a partial (but not stated) policy. The evidence for the latter is seen in the fact that the authorities are still prepared to subsidize big-bus operations for the poor, as well as monitoring (and covertly controlling) minibus routes and fares. In both Dar es Salaam and Nairobi, regulations are largely limited to quality control. Even so, it is widely acknowledged that, as in Addis Ababa, routes and fares are subject to the scrutiny of the authorities. It is certain that fare increases could not be introduced without the collusion of government. Though policy is not explicit, urban transport is clearly seen as a local (city)[2] issue in each of the three cities.

3.1.1 Dar es Salaam

The Draft National Transport Policy for Tanzania devotes significant and comprehensive attention to the urban sector. It addresses separately road infrastructure, other infrastructure (rail, tram and water), road services, traffic flow and management, land use planning, transport for the disadvantaged, public vehicle design standards and specifications, institutional arrangements, environmental considerations, rail transport and urban transport planning and financing. A number of policy directions are suggested for each of these topics and these broadly reflect the overall vision of having *"efficient and cost-effective domestic and international transport services to all segments of the population and sectors of the national economy with maximum safety and minimum environmental degradation"*.

Of particular interest for this report are the following policy directions:

- **Financing**. Urban residents should contribute towards maintenance of roads in their areas through direct involvement or through user charges.
- **Private participation**. Private sector participation in road funding and management decision-making forums. Increase private sector participation in the provision of transport and alternative transport services. Urban authorities should identify and mobilize resources including those from the private sector.

[2] Some care has to be taken in using the terms 'city' and 'municipality', since Dar es Salaam (as explained later) has both a city council, as well as three municipal councils. In general the local authority is referred to as the city council, though in this report, the terms are used interchangeably (synonymously) in the case of Nairobi and Addis Ababa.

- **Institutional development**. Enhance capacity building for future urban road traffic demand. Have in place a strong operator union(s) and for efficient and effective transport services. Reviewing the existing institutional set-up in view of improving inter-agency co-ordination/co-operation, and hence streamlining the institutional functions and responsibilities. Improving the capacity of urban authorities.
- **Standards**. Technical specification for buses, including appropriate bodies to be drawn by the ministry responsible, and gazetted. Design of residential areas should be done in tandem with provision of adequate transport infrastructure. Enforcement of traffic management measures alongside maintenance, rehabilitation, construction and operation of urban road infrastructure as a low-cost undertaking to improve utilization of the limited road capacity.
- **Infrastructure**. The potential of rail as an efficient and cost-effective mode of mass transit should be considered and feature in the long-term plans in view of the rapidly growing transport demands. The use of non-motorized transport (NMT) and mass passenger transit need to be considered as an alternative to ever increasing vehicular traffic.

In the absence of the adoption of this policy, transport development in Dar es Salaam continues to be 'ad hoc'. In the manner of 'laissez-faire' the minibus sector (*dala dala*) now dominates urban transport services; some order has been introduced at the initiative of the Regional Licensing Authority, which has devised a system of color-coding buses for specified routes, and encouraging the use of larger-sized vehicles (so-called city bus) on some long-distance orbital routes. There are few market entry restrictions, apart from those governing vehicle safety, and the vehicle color coding in respect of route. Fares are not controlled by government, though there seems to be tacit acceptance that fares would not be increased without government approval. Even so, there has been no increase in the basic rates since the mid-90s.

The parastatal urban bus company, UDA receives no public support and is barely providing any urban transport services. UDA has been in decline since it lost its monopoly of urban operations in the early-80s. The monopoly was lost because UDA could not maintain adequate services; contributory to this was the decline in capitalization of UDA in the mid-70s, when government support for bus investment became limited[3]. Initially UDA still retained control of the operations of the *dala dala*, but it soon lost this privilege as its own output continued to decline.

The primary road network in Dar es Salaam has been substantially rehabilitated over the last twenty years, and is supported by some traffic management measures (signals and one-way schemes). Some 30% of the Road Fund is allocated to the urban road sector.

[3] Though UDA was making profits on its operations, there was insufficient investment funding after paying tax, and it was reliant on government support to cover fleet acquisitions.

3.1.2 Addis Ababa

While Addis has no stated urban transport policy, there are some issues where government has clearly intervened and maintains an interest. The most significant of these issues concerns the big-bus company Anbessa which is a parastatal, formerly part of central government, and now part of the municipality. Anbessa receives revenue support, and also donor support (through government negotiations) for new fleet acquisitions. As a result, it is able to provide a service with modern vehicles and at a fare substantially below that of the taxis (cars and small buses with a capacity between five and twelve seats). The revenue support that Anbessa receives is undoubtedly coming under increasing scrutiny from the municipality, and there are intentions to privatize the company in the near future (though as yet there is no timeframe). It would probably be fair to say that a private owner of Anbessa would want to increase fares substantially in the absence of subsidy. In the meantime, Anbessa provides a service that is affordable to the poor.

The taxi sector has been allowed to develop since the early 80s, when a fuel crisis impacted on use of private vehicles; Anbessa was unable to meet the demand, and restrictions on the import and use (by the private sector) of smaller vehicles were lifted. There are few stated restrictions[4] on the taxi services, apart from those relating to safety. As noted above, vehicles can only have between 5-12 seats. There is no quantity licensing or route allocation, and fares are not imposed by the government.

Some 10% of the road fund is allocated to the urban sector, of which about half goes to Addis. The primary road network in the city is fair, with substantial on-going work in the construction of the ring road. Some traffic management measures have been put in place.

3.1.3 Nairobi

The city has no clear urban transport policy, either explicit or implicit. There are no restrictions (apart from those concerning vehicle safety) on entry to the public transport sector, and fare levels are not controlled by the government.

The erstwhile Kenya Bus Service (KBS) has to reinvent its services, and since being taken over (from Stagecoach Holdings Limited, a UK transport investor) by Kenyan businessmen in October 1998, is now split into three different 'brands', namely Express, Metro Shuttle and Bus Track. The Express serves the inter-city transport, mainly to the western parts of the country. The Metro Shuttle uses 33-seat minibuses that provide quality services to middle and high-income communities at a premium fare (approximately 1.5 to 2 times the normal fare charged for use of *Matatus* and big bus services). Bus Track operates the remaining KBS big buses on city routes.

[4] The city does monitor and control routes and fares, though this is not a declared policy.

Until 1992, KBS had a monopoly franchise for stage-carriage services in Nairobi, but the franchise (which by then had little value - see below) was not pursued when it came up for renewal. As well as providing this protection, the Municipality also took a 25% stake in the company (United Transport Overseas Services, a private company owned by a British parent group) for many years (from 1966). But this official support did not protect the big-bus company from the gradual encroachment of the minibuses (*matatu*), illegally at the start (from the early 60s) and on a legal footing from 1973. The enforcement of the bus franchise was not forthcoming as travel demand could not be met by the bus service alone. Thus from 1973 the KBS franchise was to all intents and purposes ineffective.

For a brief period (1986-92), central government created and invested in its own parastatal, Nyayo Bus Service Corporation (NBSC) which provided big-bus services (using approximately 300 vehicles) in Nairobi. Ultimately the project failed.

3.2 INSTITUTIONAL ORGANIZATION

3.2.1 General observations

In each of the cities both national and local governments, as well as their agencies, make some contribution to the urban transport sector. The divisions in responsibility are not always clear-cut, and an issue often raised by observers and 'players' is the lack of co-ordination between institutions. Misunderstandings and poor collaboration happen at various levels and between various parties. Divisions occur between sector ministries (for example, ministries representing transport, local government, road infrastructure, and policing, all of which have some interest in urban transport), as well as between central and local government, and their agencies. Inevitably too, there may also be divisions within any organization. Some of the organizations have very ill defined remits and/or poor funding.

Overlaid against this framework has been the devolvement of powers and responsibilities to local government. On the one hand there has been reluctance on the part of central government officials to yield their interests, while on the other hand the local bodies have not always had the resources (both monetary and human) to take on their new role. The debate is still very strong in Addis, where devolvement is still in its formative stages. Both Nairobi and Dar es Salaam have been decentralized for a longer period, but have themselves faced difficult times. In both cities there have been periods when city government has been put in the hands of a centrally controlled Commission, because of inadequacies in the performance of the city council.

A further complication is that although (as noted earlier) city transport is now seen very clearly as a city responsibility, it is still not treated as a single entity. For example, roads are (by-and-large) planned and developed in isolation from transport services; and traffic safety, and related

issues like driver training and vehicle inspections are dealt with separately. Furthermore, whereas road maintenance has some semblance of secured funds (through, for example, road funds), attention to safety issues and transport services is weakened by uncertain funding.

3.2.2 The role of central government and its agencies

The main role of central government, now that urban transport has largely become a city responsibility, is to frame laws, set standards and guidelines, and where appropriate, source funds and control budgets. The laws and standards that influence transport are very wide-ranging (e.g. traffic, employment, environmental, financing, etc. as well as laws for creating specific bodies which have a transport role, e.g. road fund boards). And thus there is a wide range of sector ministries which may have some impact on transport performance. Principally, however, the Ministry of Transport is most likely to be concerned with traffic law (though in the case of Dar es Salaam it is still the Ministry of Home Affairs that has oversight of this), while the Ministry of Local Government has responsibility for urban development issues, including transport. In Tanzania, urban roads which are designated as national roads are the responsibility of a Ministry of Public Works through its road agency (Tanzania Roads Authority). New legislation affecting any aspect of urban traffic and transport will inevitably require inputs from these and other ministries, and this requires skilled and patient planning and negotiation.

As well as devolving some of their powers to Agencies, central government also works through departments. However, devolvement of centralized powers is reducing the role of some of these departments. In Ethiopia, a central Road Transport Authority still exists within the Ministry of Infrastructure, but most of its powers (for vehicle licensing, inspections, etc) have been conferred on the new regional Road Transport and Communication Bureaus (RTCB)[5]: thus the municipality of Addis Ababa (through its Road Transport and Communication Bureau) now licenses vehicles, and is more generally responsible for transport development in the city. Similarly, vehicle licensing responsibilities have been devolved to regions in Tanzania, though not in Kenya which has recently created a new central regulatory body, the Road Transport Board (RTB), to oversee the proper functioning of the transport sector. All vehicles, other than personal cars, require a license to operate from the RTB.

A road fund board has been created in all three countries; in Kenya it is still very much in embryonic state. While nominally independent agencies, they are very much tied into the activities of the roads ministry. The Board in Kenya is under the Ministry of Roads and Public Works, while the Ministry of Information, Transport and Communications is responsible for transport policies[6].

[5] The RTA retains responsibility for setting standards, but has no powers for enforcing these.

[6] This arrangement is a concern for the Road Fund Board since one of their remits is to develop transport policies, and this clearly conflicts with the obvious interests of the Transport Ministry.

Their (the road fund boards) significance for the three cities is that they are (certainly in the case of Dar es Salaam and Addis, and likely to be in the case of Nairobi) the source of a large component of urban roads maintenance funds. However, even such an 'assured' source of funding may have its weaknesses. For example, in Kenya the municipalities are not recognized by the Road Fund Board (within the terms of their duties and responsibilities) as 'proper' agencies for administration of road funds; the monies for urban roads have to be dispersed through the Ministry of Local Government (as an 'accountable' agent) to the city council. But the disbursement from this ministry to the city council is at best tardy.

The lack of a dedicated road safety budget in many countries has meant that safety improvements have had to compete with road maintenance needs. Road funds can also be used to alleviate this situation, and this is considered a particularly important aspect of road expenditure in Ethiopia. Here the Road Fund Board made a decision in 2000 to allocate a full three percent of its revenue to road safety projects. However, it still remains a key concern that this money, when allocated, will be used effectively.

The police force is a central function in both Nairobi and Dar es Salaam. Traffic policing is a career job, and hence expertise can be built up without fear of losing officers to other branches of policing (though of course, traffic police officers can be moved to other parts of the country). In Addis the Municipality controls (through the Addis Ababa Police Commission) the City Traffic Police, though they (the traffic police) also have some responsibility to the national police force.

The co-ordination of road safety issues is often dealt with at a national level through a Commission or Council. It is typically composed of interested stakeholders (central ministries, traffic police and some of the major transport operators, who can be a useful source of funding). Because funding is usually very limited, the activities of these organizations are restricted. Kenya had a National Road Safety Council which has presently ceased functioning. As it was not a statutory body, it had little support (funding and resources), and no powers apart from those vested in Council members as part of their regular positions. Tanzania has a Road Safety Council, while Ethiopia is in the process of forming a body in order to take advantage of the availability of road funding for safety initiatives[7].

3.2.3 Transport parastatals

There are only two city transport parastatals left in the three cities: Anbessa in Addis Ababa and UDA in Dar es Salaam. The latter has a fleet size of about 30 vehicles, which is less than 10% of its peak size in by-gone days. UDA has a very limited role as a carrier (a mix of some contract work, peak-hour operations, and non-city operations), and its future is uncertain. It is the subject of privatization, but its sale as a viable transport operator must be suspect.

[7] To include the General Managers of the RTA, the Ethiopian Roads Authority, the Road Fund Board and the Commissioner of Addis Ababa Police.

On the other hand, Anbessa still receives strong support from government (previously central government, but more recently from the municipality), and has a fleet totaling some 415 vehicles many of which are very recent acquisitions. Its current role is very clearly to provide affordable transport for the urban poor.

3.2.4 Regional government

Where there is an intermediate tier in government between central and local government, it is sometimes the case that this regional (or, in the case of a federal system, state) level has some involvement in transport. In the case of Ethiopia, the Municipality of Addis Ababa is treated as one and the same as a Region (Region 14), and its affairs are overseen by the newly created Ministry of Federal Affairs.

The relationship between Nairobi and the nation is very similar (to Addis Ababa), but transport in the city of Dar es Salaam is subject to some of the responsibilities of a Regional Government. This comes about through the activities of the Dar es Salaam Regional Transport Licensing Authority (DRTLA), a regionally based body (though located in the city of Dar es Salaam), under the regional Commissioner. This body is responsible for licensing vehicles for public transport operations. And it is this body which has also taken the initiative in trying to organize the color-coding of vehicles, and the gradual introduction of larger capacity vehicles (see section on Urban Transport Policies). DRTLA has also taken on the job of route allocation and other regulatory issues (like overseeing training of *dala dala* staff prior to issuance of their public service vehicle driver licenses). There does not seem to have been an obvious mandate for doing this, though it is very clear that it has had some good degree of success in reducing the chaotic nature of using the *dala dala*. What is of particular interest is that this initiative has been taken at a regional level, and without specific reference to any other interested parties (for example, the city council). It is also worth noting that the initiative has been taken at an individual level, and might well dissipate in the event of staff changes.

3.2.5 The organization and role of cities

Local government is now at the center of transport development in each of the three cities. City government is reflected in a unitary authority in both Nairobi and Addis Ababa, but Dar es Salaam has a City Council as well as three Municipal Councils which are subservient to the City. While the City Council has responsibility for transport and environmental planning and development, the Municipal Councils are responsible for road maintenance.

Through its departmental structure, the city (with the municipalities in the case of Dar es Salaam) controls (or has responsibility for) road development (maintenance, traffic management, etc), and land-use and urban transport planning. In the case of Addis Ababa, the city also has responsibility for the parastatal Anbessa. Though there is no obvious direct control of the minibus operations in any of the cities, each exerts some degree of influence. For example, as noted earlier, the RTCB in Addis Ababa maintains strong influence over the routing and fares

of taxi services; the Regional Commissioner of DRTLA has imposed standards on the *dala dala* operations in Dar es Salaam; the city authorities in Nairobi exert some control over routing, as their approval for routes and parking areas (in the central parts of the city) has to be obtained by the *matatu* operators.

The internal organizations of each city vary slightly: in Addis Ababa the Municipality (which is equivalent to a region) has both a City Road Authority, as well as the earlier mentioned Road Transport and Communication Bureau (for vehicle registration, issue of licenses and vehicle inspection work). By contrast, Dar es Salaam only has a City Engineers Department (and the Municipal Road Engineers Units at municipal level), the work of vehicle registrations (as noted above) being handled at regional level. Nairobi, like Dar es Salaam, only has a City Engineers Department, vehicle registrations being handled at national level (by the Ministry of Finance).

The City Engineer is responsible for both road maintenance and traffic management (including any road engineering safety measures). The Nairobi City Engineer, for example, controls transport through two Units: the Transport Unit handles planning and traffic management, while the Roads Unit is responsible for infrastructure maintenance.

Priority is given to the primary network; much of the secondary network in each city is badly maintained. While none of the cities has a maintenance management system, work is in hand in Addis Ababa to develop such a tool.

Various traffic management measures exist, but are not always well signed and maintained. Signals are mostly (apart from those at some recently improved junctions in Dar) old equipment (using fixed time controllers), which receive little attention. Hence signal timings are rarely altered (with changing traffic patterns), and many signals are now inoperative[8]. Maintenance is not usually out-sourced in any of the cities, though the contracts for installation of some recent signal sets in Addis Ababa include a maintenance component.

With decentralization of powers and responsibilities from central to local level, has come the problem of staffing city council cadres. The senior professional road staff in both the Nairobi and Dar es Salaam City Councils are on loan from central government (and receive their salaries through the central vote). Even at municipal level in Dar es Salaam, road engineers are central government staff.

Transport planning, as an on-going and continual process, is not undertaken in any serious manner by any of the cities. There have been earlier major transport planning studies (one-off exercises undertaken by expatriate consultants) in both Dar es Salaam and Nairobi. The work in Dar es Salaam (early '80s) focused on road developments, and many of the projects identified were subsequently implemented. The more recent work in Nairobi was broader in perspective,

[8] Nairobi is particularly poorly served, with only three out of 22 signalised junctions now operational. At one time Nairobi even had a small UTC system, but this is no longer functional.

covering both roads and transport services. Only Phase 1 of this work was completed, with recommendations (which are principally of a short term nature) yet to be implemented.

The absence of transport planning (and its continuity) was noted by many professional observers as a weakness. In all the cities the responsibility for transport planning exists, but is not addressed; in Addis Ababa, for example, the RTCB has the responsibility, but lacks the resources.

Each city has responsibility for urban development planning, and a master plan of some description (and antiquity) exists for each. In the case of Addis Ababa, the city supports an ongoing office for revising the plan. It is of interest (and encouraging for transport planners) that this office has undertaken some transport surveys. Somewhat inevitably perhaps, the planners see the need for a cross-city mass transit system, but they have also identified other more immediate concerns reflected elsewhere in this report (e.g. absence of infrastructure for non-motorized transport, increasing reliance on low-capacity vehicles). In all three cities, development control is a major problem.

3.2.6 Transport operators

In each of the cities, private entrepreneurs have a large stake in the provision of public transport services. Only in Addis Ababa is there a large presence of parastatal bus transport, while both Dar es Salaam (a parastatal) and Nairobi (a private enterprise) have organized bus operations (though in the case of Dar es Salaam it is a very weak organization making little contribution to city travel).

Developments in the operations of KBS in Nairobi, since the recent take-over (by Kenyan businessmen), are particularly interesting and could well serve as a model for the development of organized bus services elsewhere. In essence (and as noted earlier), KBS now operates as three separate units, only two of which (Metro Shuttle and Bus Track) are in the city. The two main innovations which KBS has adopted are:

- Market segmentation, targeting the Metro Shuttle buses at high and middle-income commuters who will pay more for a high quality service. A fleet of new quality vehicles has been acquired for this purpose.
- Contracting-out the operations of the big buses owned by Bus Track (a subsidiary of KBS). In effect Bus Track is a management company which owns a fleet of big buses which it 'leases' to so-called 'route-owners'. The latter are ex-employees of KBS who manage the routes operated by Bus Track. All operational staff are self-employed, and work for the route owner. Bus Track provides control and maintenance staff, and a cashier for each route. They also provide access to fuel and tyres (the supply being organized by KBS on a bulk-purchasing arrangement) and central workshop support.

Minibus associations of owners have been formed in each city, but unlike in other African states, they do not appear to wield strong influence, though of course individual owners are

often powerful in their own right (which creates its own sensitive problems for regulatory authorities in their enforcement activities). Even so Associations can always be potentially strong, simply by virtue of the fact that they can withdraw their services, and hence have a profound impact on city travel. But owners associations seem to have little control of quantity licensing, route allocations and similar activities which are often abrogated to them (in other countries) in the absence of strong municipal control.

Neither do the associations provide any support mechanisms for their members. They seem to act mainly as a focal point for lobbying government (both local and central). In Kenya, the *Matatu* Welfare Association undertakes negotiations with government bodies on issues of concern to operators, e.g. increases in insurance premiums and parking fees, traffic management.

In all three cities, minibus owners are entrepreneurs who are mostly engaged in non-transport activities, but who look to the transport sector as a way of employing small capital sums amassed in other enterprises. In this sense they are not transport professionals who have a committed interest in the development of the sector. Neither do they employ professional drivers.

3.2.7 Academic and professional support

Urban transport planning does not provide a strong career path for graduates, let alone post-graduates. As a result, the Universities either do not presently offer major courses or degree qualification in this discipline, or get little demand for the courses available. Civil engineering degrees do, however, include options on traffic and transport. Both Dar es Salaam and Nairobi Universities offer post-graduate courses which get little demand, while the University of Addis Ababa is in the process of developing a post-graduate degree course in traffic and transport.

Professional bodies representing transport specialists (which have the role of setting and maintaining standards, and promoting the profession and knowledge) do not exist as locally based institutions, except in Dar es Salaam. In the latter, the Tanzania Road Association provides a platform for transport professionals. Their Annual Road Convention is well organized and reported; in this way it helps to encourage the development of a recognized cadre, with a stronger voice in transport development.

4 FINANCING TRANSPORT DEVELOPMENT

4.1 ROADS DEVELOPMENT

4.1.1 The network

Table 2 sets out the main characteristics of the urban roads network of each city.

Table 2. Urban roads

	Addis Ababa	Dar es Salaam	Nairobi
Paved roads (km)	40	450	964
Unpaved roads (km)	1,000	690	188
Total road network (km)	1,040	1,140	1,152
Number of signalized junctions (operational)	26	25	3*

*A further 19 signalized junctions are not operational

None of the cities has a clearly defined road hierarchy, or urban road design standards. There is, however, a proposed system (awaiting ratification) in Nairobi, and Addis Ababa is likely to develop a system as part of the on-going maintenance management development work

Road maintenance includes the development of traffic management measures. None of the cities has a large number of signalized junctions, and as noted earlier, signal equipment is old and inefficient for its purpose. Nairobi has a particular problem with signal maintenance in that only three signalized junctions (out of 22) are currently operational.

4.1.2 Road maintenance funding

In both Dar es Salaam and Addis Ababa, urban road maintenance activities (which includes traffic management and safety engineering measures) receive a lot of its revenue from a central road fund. As noted earlier, for example, Addis Ababa City Road Authority receives about 5% of the national road fund.

In Tanzania, urban road maintenance activities are funded from a central national road fund board. Generally it has been the case that TANROADS (the national roads authority) and the municipalities receive less money as compared to their submitted budgeted expenditures. Table 3 presents road maintenance budget for financial year 2001/2002 for trunk roads, regional roads, which are under TANROADS, and regional roads, district roads and feeder roads that are

under the municipalities. The Dar es Salaam city municipalities budgeted road maintenance expenditure was about 3% of the total budgeted expenditures on maintenance activities.

In Nairobi, the city council was in direct receipt of funding from the national fuel levy up until about two years ago. Since then, the Kenya Road Fund Board (KRFB) has been set up to administer the road fund revenues (which include the fuel levy monies). As noted earlier, this has created a problem for the city council, in that monies cannot be disbursed to them directly by the KRFB; the monies have to be administered by the Ministry of Local Government on behalf of the city council. As a result, road maintenance funds do not reach the city council either at all or slowly and in limited amounts.

Road fund sources for maintenance should (though not yet in case of Nairobi) provide a relatively stable income, which may be supplemented from the less reliable city vote. The source of the road fund is largely fuel taxation, which is easily captured and administered.

New road works (for example the city ring road in Addis Ababa) are funded directly by the city, though in all likelihood with donor support (grants, soft loans, etc). Donors have been particularly active in Dar es Salaam whose primary network has been almost wholly rehabilitated over the past ten years.

The levels of expenditure budgeted for road development in each city are indicated in Table 3. It should be recognized, however, that budgeted figures are rarely achieved, due to shortfalls in revenues.

Table 3. Budgeted expenditures on urban roads[9]

	Addis Ababa 2000/01	Dar es Salaam[2]	Nairobi 2000/01
New roads	150mill Birr[1] (US$ 17.4 mi)		-
Maintenance / rehabilitation	56mill Birr (US$ 6.5mill)	2,178.4 m Tsh (US$ 2.3 mill)	209.2mill. Ksh (US$ 2.6 mill)
Other	48mill Birr (US$ 5.6mill)	46.0 mill Tsh (US$0.1 mill)	82.0mill Ksh (US$1.0 mill)
Total	254mill Birr (US$ 29.5m)	2224.4 m Tsh (US$ 2.4 mill)	291.2 mill Ksh (US$ 3.6m)

1 Funding allocated to construction of new ring road

2 84% of monies come from TANROADS, the remainder being funded from local government

[9] Exchange rates (local currency equivalent to US$1) used in this report are: Ethiopia - 8.6 Birr; Kenya - 80 Ksh; Tanzania - 942 Tsh.

4.2 PUBLIC TRANSPORT

4.2.1 Scale of operations

Table 4 indicates the scale of the public transport sector in each city.

Table 4: Public transport fleet

	Addis Ababa	Dar es Salaam	Nairobi
Big buses in regular daily use:			
Number	415	30	240[1] 60[2]
Seat capacity	41,500	3,000	35,000
Minibuses/shared taxis in daily use:			
Number	8,847	7,000	9,894[1] 33[2] 2,946[3]
Seat capacity	88,470[1]	273,000[1]	327,203
Total public transport seat capacity per 1,000 capita	50.6	125.5	169.3

Addis Ababa: 1 - the 'taxi' service in Addis consist of both minibus and saloon cars, defined as having a seat capacity between 5 and 12.
Dar es Salaam: 1 - dala dala have seating capacity ranging from 15 to 40.
Nairobi big buses: 1 - Bus Track; 2 - City Bus Co-operative
Nairobi minibuses: 1 - Small *matatu*; 2 - Metro Shuttle; 3 - big *matatu*

As has already been noted, public transport in each city is largely provided by the informal sector, though all three have an element of 'big-bus' operations (i.e. stage-carriage services operated by a single operator using large-size vehicles). Historically this latter type of operation was the main form of public transport in each city, but over the last ten to twenty years their fortunes have declined; in the case of the operator in Dar es Salaam (UDA), the fleet size is pitifully small, and government is trying to divest itself of what remains.

Large bus operations flourished in the protected regime offered by the franchise system favored in those times. In return for restricted competition, the franchised bus company offered the prospect of cross-subsidizing routes and services which might be less viable, e.g. to poorer communities, or during off-peak periods. While the franchise monopoly was open to abuse, it may have been easier for the local authority to control, in that it only had one effective body to regulate and work with.

In both Nairobi and Dar es Salaam, the original big-bus operator was from the private sector, whereas in Addis Ababa this type of service has been provided by a parastatal. Evidence from many sources suggests that the involvement of a private company is likely to result in greater efficiency and profitability. By and large, parastatal transport companies in the urban transport sector have required some form of subsidy to meet their operating costs. This has resulted from a combination of many factors, but in particular an over-inflated cost base (due to operating inefficiencies), and a drag on fare increases imposed by central or local governments. While private operators have managed to restrict the level of inefficient operations, they have not been able to cope with low fares, and an increasingly difficult operating environment (both physically due to increasing city size, poor road infrastructure and congestion, and politically).

Over time there were increasing pressures to open up the public transport market to a more competitive regime. Big bus operators could hardly finance fleet replacement, let alone the need to increase fleet size in response to city growth. Competition has come in the form of informal public transport (with other generic terms like para transit and intermediate public transport, and more localised terminology like *wiyuyit, dala dala* and *matatu*). These are small vehicles, often aged (and hence low investment cost), and owned by individuals in small fleet sizes. For example, the driver may be the owner, though more often the driver hires the vehicle from an owner for an agreed daily rate or percentage of the takings.

The productivity of the public transport fleet is estimated in Table 5.

Table 5: Estimated public transport fleet productivity

	Addis Ababa	Dar es Salaam	Nairobi
Daily km. per vehicle			
Big bus	170	-	240
Minibus	150	200	200
Daily passengers carried per vehicle			
Big bus	1,500	-	~1,200
Minibus	~300	~240	~300
Daily revenues earned per vehicle			
Big bus	1,100 Birr	-	~20,000 Ksh
Minibus	300 Birr	36,000 Tsh	8,000 Ksh

4.2.2 Funding for public transport

The minibus sector. In all three cities there is control (though it is not explicitly stated) over fares which public transport operators can charge. As a result there is tremendous pressure on operators to minimize their costs, and maximize their carriage of fare-paying passengers.

Earlier work in Nairobi (and other African cities outside the scope of this report) has demonstrated the nature of public transport financing at the micro-enterprise level. In essence, entrepreneurs can make a return on the small capital outlay (on the vehicle, which has low seating capacity and is unlikely to be new at time of acquisition) over a relatively short period (about one to two years). They achieve this by demanding of their drivers a fixed daily income, thus putting a huge burden on the driver to ensure high passenger loadings at whatever cost to service quality. Furthermore, the driver usually has to cover daily operating costs of the vehicle (fuel, running repairs, etc.) from his earnings.

The evidence from Addis Ababa suggests that minibuses cannot make sufficient returns in such a relatively short period. Analysis from field surveys indicates that on optimistic assumptions, the payback would not occur for at least six years. Owner-drivers confirmed the weak economics of the sector, and there is some concern that the average age of the vehicle fleet will steadily increase as a result.

Even where an adequate return on investment is possible, entrepreneurs are not motivated to invest large sums (in either bigger fleet size or larger vehicles), and much of their income is ploughed into other, non-transport ventures which may be less risky. (The risks in transport include terminal accident damage to the vehicle, higher than expected maintenance, and cheating on the part of driver and conductor - over which the owner has little control). Most investment is self-financed.

In these circumstances, and without any support from the authorities, there is little chance that the standards of public transport provision emanating from the micro-enterprise sector will improve (though as noted earlier, the authorities in Dar es Salaam have been successfully introducing some minimum service standards).

Against this background, a particular issue that is causing much concern in both Nairobi and Dar es Salaam is the carriage of students at half-fare. This is seen as a 'right' by many students and parents, though is clearly a drain on the revenues of the minibus operators who receive no recompense from schools, parents or authorities. The problem is exacerbated by the large volume of cross-city travel in which older students engage to access their schools of choice.

The big bus sector. In the big bus sector the funding circumstances are somewhat different. Anbessa, as has been noted earlier, receives municipal funding support in respect of both operations and investment. Since taking over this role from central government, the municipality is beginning to look critically at the financial demands of Anbessa; stricter control of the cost base and the setting of performance targets are now in hand.

KBS in Nairobi, as noted earlier, is currently addressing the problem of financing urban bus operations in two ways: market differentiation (targeting different markets with tailored services in order to maximize revenue yields) and streamlining the cost base of the Bus Track ser-

vice by contracting-out most of the operations, and reducing the administrative costs to an absolute minimum.

Bus Track is looking to invest in fleet replacement, but it is probably significant (in financial terms) that its management is keen to acquire low-cost vehicles (perhaps second-hand) which are durable for Nairobi's poor road infrastructure. Given that it could identify such vehicles, KBS should be able to approach the recognized financial institutions with a good business case in order to raise the necessary funding.

5 EXTERNALITIES

5.1 SAFETY AND SECURITY

Closely allied to the important role of transport in the city, and the travel needs of the poor, is the issue of safety and security. The poor are particularly vulnerable to the shocks in their livelihoods created by traffic accidents (the death of a bread-winner, for example). And while a decent transport system may reduce their isolation (in, say, poor ghettos) and insecurity, the downside may be that public transport and walking are targets for criminal activities and violence.

Traffic accidents are a major drain on productivity, and reducing this drain requires a concerted effort in education, enforcement and engineering. But the root of the problem may well be institutional in nature. There is often an inability to fund road safety activities in a sustained and effective way. In developed countries one particular government department or agency has tended to take the lead in attempting to improve safety. In the majority of cases this has been the road authority, in which special 'accident investigation units' are set up. These often have officers responsible for publicity and road safety education and, of course, forge strong links and coordinated action with the traffic police. Ideally, the road authority will have an annual budget specifically for safety work, and will have a team of full-time professional staff devoted to accident remedial work who are not diverted by responsibilities for other non-safety related tasks. Of the three cities Dar es Salaam may be the closest to achieving this ideal since there is at least a central government Road Safety Unit in the Ministry of Works, and also the Traffic Police have a computerized accident database for the city. However, the effectiveness of these will be discussed below.

5.1.1 Populations and vehicle fleet size: influence on road safety

In terms of population size of the three countries, Ethiopia has the highest number of inhabitants with over 65 million, with Tanzania second having 32 million, followed by Kenya with 29 million. However, Kenya has about five and a half times the number of registered vehicles of Ethiopia and about a third more vehicles than Tanzania. Table 6 lists the current estimated figures from various authorities in the three countries, though a national vehicle census has not been carried out in Kenya since 1999 and in Tanzania since 1993. An estimate for 2001 of total vehicles was provided by the Department of Planning in Tanzania.

Table 6 Population and vehicle fleet size for year 2001

	Country:		
	Ethiopia	**Tanzania**	**Kenya**
Population (million)	65.34	32	28.687 (1999)
National Total registered vehicles	117,972	501,243[1]	671,514[2]
National commercial vehicles	43,879	195,594[1]	308,852[2]
National % commercial	37.2%	39.0%	46.0%
	Capital city:		
	Addis Ababa	**Dar es Salaam**	**Nairobi**
Population (million)	2.57	2.2	2.143
Capital Total registered vehicles	74,383	81,520[1]	[3]
Capital commercial vehicles	29,793	36,093[1]	
Capital % commercial	40.1%	44.3%	

[1] Estimated from 6% annual growth since 1993

[2] Estimated from 6.9% annual growth since 1999

[3] No estimates available for registered vehicles in use in Nairobi

The population sizes of the three capital cities are remarkably similar ranging only from 2.1 to 2.6 million. This may be largely influenced by the fact that they were all established as capital cities in the same decade (the 1890's), although Dar es Salaam was established about 40 years earlier (about 1860) and Ethiopia's capital moved around this area, though becoming the capital around the same time.

The vehicle fleets of the three countries and cities, however, differ considerably. From the estimates given in Table 6 it can be seen that Kenya has almost six times more vehicles registered than Ethiopia, though only 34 per cent more than Tanzania. Also, a particularly high proportion (46%) of its fleet are registered as commercial vehicles.

The number of vehicles registered in a capital city may not be a reliable indicator of the vehicles actually in use in the city (and indeed none could be provided for Nairobi) as, after registering, there is no means of monitoring where individual vehicles are kept, where they or used, or their level of usage. Nevertheless the difference between estimates of numbers of vehicles used in Addis Ababa and Dar es Salaam is less than 10 percent, probably reflecting the similarity in the populations of the cities rather than national vehicle fleet size.

5.1.2 Road traffic accident databases

There is no national standardized and computerized database in any of the three countries. However, Addis Ababa Traffic Police are currently compiling their own database for the city

using Access, and Dar es Salaam Traffic Police have had the MAAP[10] software package since about 1995, supported by annual training courses provided by NORAD.

Table 7 shows a comparison of the information about each accident collected by the police in the three cities, indicating which are recorded on computer. Although this clearly shows that the accident database in Dar es Salaam should theoretically be the most comprehensive, in practice a number of problems were found, chiefly associated with hardware failures (and poor backup procedure). The accident report form used in Dar es Salaam has almost a hundred items of information which must be completed, but surprisingly the Chief of Police does not consider this large amount of detail to be problem. There is, however, a considerable backlog of accidents not yet entered (they are currently only part way through 1999 – almost 3 years behind real time). Worse still, part of the data resided on a second computer at police headquarters where data was being entered and, owing to a hard disk failure, a large proportion of the annual dataset for years 1997 and 1998 has been lost.

The Road Safety Unit at the Ministry of Works collects copies of the accident computer files for Dar es Salaam, but this does not appear to be at regular enough intervals (eg. to have provided another copy of the lost records for 1997 and 98). Also, although it may be used to justify targeted media campaigns, it does not appear to be used very extensively by the Unit; for example, to identify and monitor blackspot sites and be a first source of analysis and reference when investigating safety problems at specific sites.

Table 7 Comparison of items recorded in accident databases

Accident item		- recorded in:-		
		Addis Ababa	Dar es Salaam	Nairobi
General details				
1	Reference No.	)	)	!
2	Region		)	!
3	Police Station	)	)	!
4	Time	)	)	!
5	Date	)	)	!
6	Day of week	)	)	
7	No. of vehs. Involved		)	!
8	No. of vehs. Damaged		)	
9	No. of drivers injured		)	
10	No. of passengers s injured		)	
11	No. of pedestrians injured		)	
12	No. of participants			!
13	Severity of accident	)	)	

[10] MAAP is TRL's Microcomputer Accident Analysis Package available in Microsoft Windows version. The Ministry of Works and Traffic Police of Dar es Salaam are currently running DOS version 5

Accident item		- recorded in:-		
		Addis Ababa	Dar es Salaam	Nairobi
14	Speed Limit		)	!
15	Weather	)	)	!
16	Light conditions (& lighting)	)	)	!
17	Road Curvature		)	
18	Traffic movement- (1-way/2-way)		)	
19	Median		)	
20	Road surface type	)	)	!
21	Road surface condition	)	)	!
22	Road works?			!
23	Road width		)	!
24	Shoulder width		)	
25	Shoulder surface type		)	
26	Location type/junction type	)	)	!
27	Junction control		)	!
28	Signals operating?			!
29	Collision type		)	
30	How accident reported		)	
31	Hit and Run		)	
31	Road Works		)	
32	Witness statement	!	!	!
33	Witness name and address	!	!	!
34	Description of accident	!	!	!
35	Sketch of accident	!	!	!
36	State of investigation	)		
37	Investigating officer	!	!	!
Location of accident				
38	Region code		)	!
39	Name of town		)	
40	Road Name		!	!
41	Intersection		!	
42	Major or Minor road	)	!	
43	Road link between roads		!	
44	Km Post		)	!
45	Nearest 100m from post		)	
46	Map ref		)	
47	Node 1		)	
48	Node 2		)	

Vehicle/driver details				
49	Vehicle Owner name	)	!	!
50	Vehicle Owner address	!	!	!
51	Vehicle inspected? (Y/N)		)	
52	Expiry date		)	
53	Make/model		)	
54	Year of manufacture	)	)	
55	Vehicle Registration no.	)		
56	Third party insurance? (Y/N)		)	
57	Registration Region		)	
58	Vehicle type	)	) (12 categories)	! (9 categories)
59	Ownership type		)	
60	Road license no.			!
61	Insurance company			!
62	Insurance certificate no.			!
63	Vehicle maneuver	)	) (13 types)	
64	Direction of vehicle		)	
65	Vehicle damage		)	!
66	Nose to tail		)	
67	Loading		)	
68	Lighting defects		)	
69	Other vehicle defects		)	
70	Driver's Name	)	!	
71	Driver's address	)	!	
72	Telephone no.		!	
73	Male/Female	)	)	
74	Age	)	)	
75	Educational background	)		
76	Nationality		)	!
77	Seat belt or helmet used? (Y/N)		)	
78	Driver Injury severity		)	
79	Part of body injured		)	
80	License No.	)	)	!
81	License Class		!	!
82	License restriction		!	
83	License expiry date		!	
84	License place of issue		)	
85	License (Fill/Provisional/None)		)	
86	PMV Permit (Y/N)		!	
87	PMV No.		!	!
88	PMV expiry date		!	

89	Driving experience (years)	)	)	
90	Drink/driving		)	
91	Who was responsible for accident			!
92	Notice of prosecution served?			!
93	Driver error		) (10 Types)	
94	Driver offence 1		)	
95	Driver offence 2		)	
96	Driver offence 3		)	
Casualties details				
97	Passenger name		!	!
98	Passenger address		!	!
99	Seat belt or helmet use (Y/N)		)	!
100	On which vehicle travelling		)	!
101	Sex		)	!
101	Age	)	)	!
102	Injury severity		)	
103	Injury type		)	!
104	Position in vehicle		)	
105	Alcohol taken		)	!
106	Boarding vehicle?		)	
107	Pedestrian name		!	
101	Pedestrian address		!	
102	Pedestrian action		)	
103	Pedestrian age		)	
108	Pedestrian sex		)	
109	Pedestrian severity of injury		)	
110	Pedestrian part of body injured		)	
107	Pedestrian action		)	!
108	Pedestrian location on crossing?		)	!
109	Pedestrian school pupil?		)	

) Recorded on form and in database

! Recorded on form only, ie. not in database

In Addis Ababa, although the accident data might be more comprehensively recorded than in Dar es Salaam, its biggest weakness is in the lack of a location coding system. It is not therefore possible to quickly obtain a listing of blackspot sites together with the corresponding accident data.

In Nairobi, the lack of a computerized database again hampers safety investigation of hazardous locations as the paper accident records are not catalogued in any way by location. The only way to review the accident history of a particular site is to sort through police files manually

and extract particular records. This is clearly too time consuming for either the police or the road authority to carry out on a regular basis.

5.1.3 Accident and casualty statistics of the three cities

Table 8 lists the available road traffic accident and casualty totals for the past six years. It is recognized that under-reporting of accidents in developing countries is particularly acute. Indeed a recent safety study in Ethiopia (TRL and Ross Silcock 2001) estimated that more than twice the number of injuries on the roads occur than are actually reported to the police and even the number of fatalities will be 20 to 30 percent higher than the figures given. Despite under-reporting problems probably in all three countries the figures in Table 8 are quite consistent over the past six years. Fatalities are normally more likely to be the most reliably reported accident statistic, and Addis Ababa and Dar es Salaam have very similar numbers of fatalities per year at around 280. However, Nairobi suffers on average about 1.8 times the number of fatalities of the other two cities with over 500 deaths per annum. It is, however, apparent that only Dar es Salaam shows an indication of a worrying increasing trend in fatalities, which is also mirrored in its casualty statistics (solid lines in Figure 1).

Table 8 National and city road accidents and casualties

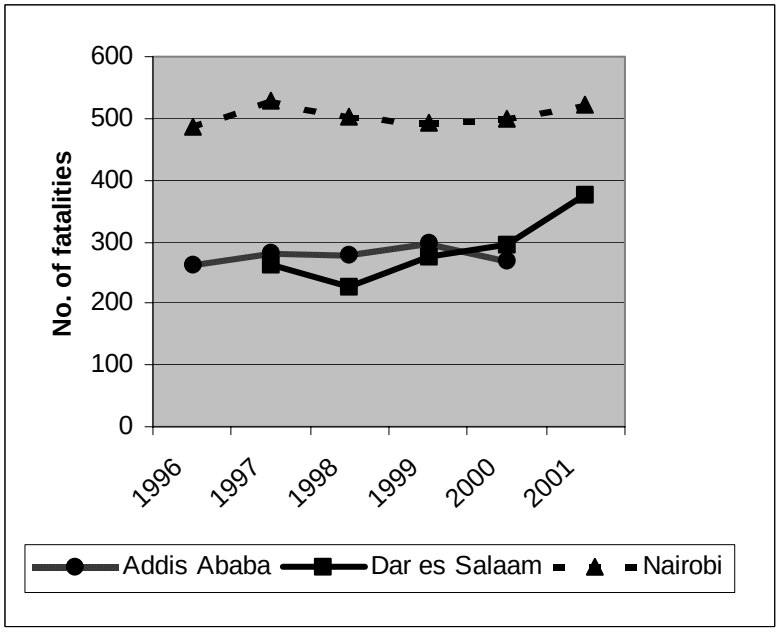
Year	Ethiopia			Tanzania			Kenya		
	Accidents	Casualties	*Fatalities*	Accidents	Casualties	*Fatalities*	Accidents	Casualties	*Fatalities*
1996	11,524	8,675	***1,715***	14,015	14,324	***1,809***	13,890	27,744	***3,000***
1997	13,302	9,128	***1,693***	14,335	14,115	***1,625***	14,849	28,773	***3,022***
1998	11,658	5,165	***1,274***	12,234	12,964	***1,583***	14,342	28,500	***2,972***
1999	11,450	5,092	***1,558***	13,478	14,457	***1,612***	14,291	30,021	***2,823***
2000	11,776	7,957	***1,261***	14,548	15,831	***1,737***	13,938	29,017	***2,819***
2001	-	-	-	13,877	14,433	***1,866***	13,407	29,408	***2,790***
	Addis Ababa			Dar es Salaam			Nairobi		
1996	6,852	1,865	***264***	4,214			4,776	5,934	***487***
1997	8,581	2,297	***283***	4,979	3,092	***264***	5,224	6,584	***530***
1998	7,345	2,159	***280***	4,137	3,140	***227***	5,337	6,573	***503***
1999	7,293	2,173	***300***	4,845	3,195	***276***	5,194	6,673	***493***
2000	7,203	2,114	***268***	5,542	4,158	***296***	4,959	6,353	***501***
2001	-	-	-	5,995	4,303	***375***	4,490	6,460	***521***

Note: For Ethiopia the figures actually span two Gregorian calendar years (e.g. 2000 is really July 2000 to July 2001, i.e. the Ethiopian year 1993).

When attempting to make safety comparisons between countries, two measures frequently used are fatalities per 10,000 registered vehicles and fatalities per 100,000 inhabitants, (and indeed the terms of reference for this study call on the former to be determined for the three cities). Although it could be argued that neither of these adequately takes into account exposure to risk, the latter reveals a ranking of the countries in the same order as one might expect from

their population sizes and the much higher number of road accident fatalities in Kenya. That is, from Table 9, Kenya's 9.7 fatalities per 100,000 inhabitants is two-third higher than Tanzania and five times the value of that for Ethiopia.

Figure 1. Road accident fatality and casualty trends in the three cities



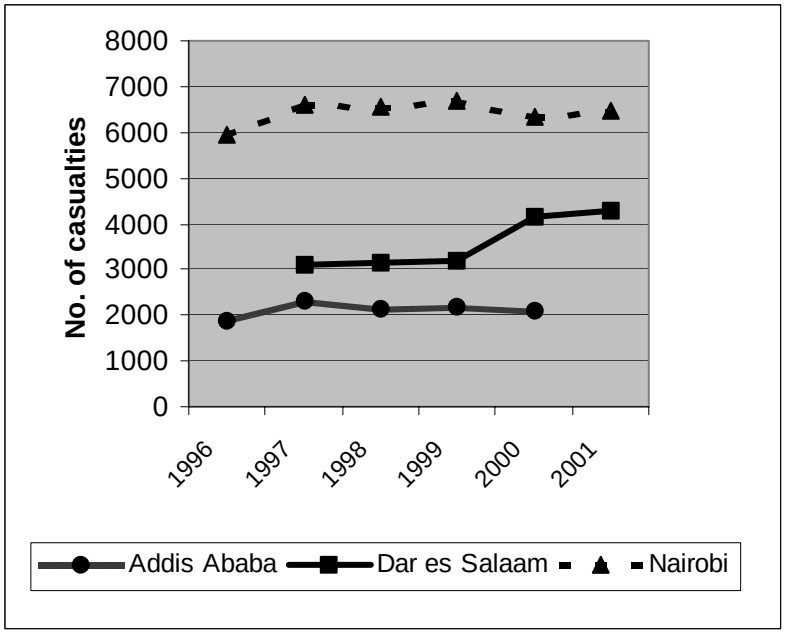


Table 9 National safety rankings

Country	Road accident fatalities 2001	Total accident casualties	Population (million)	**Fatalities/ 100,000 popn.**
Kenya	2790	29,408	28.7	**9.73**
Tanzania	1866	14,443	32.0	**5.83**
Ethiopia	1261	7,957	65.3	**1.93**

Country	Registered vehicles 2001	**Fatalities/ 10,000 vehs.**
Ethiopia	117,972	**106.88**
Tanzania	501,243	**37.23**
Kenya	671,514	**18.78**

However, when expressed in terms of vehicles that have been registered to use the road network the rank order of the three countries is completely reversed. Indeed, this statistic has been quoted in many different studies to emphasize the fact that Ethiopia has one of the highest fatality rates in the world. With 107 fatalities per 10,000 vehicles (and 143 in 1998), its fatality rate is almost three times higher than that of Tanzania and almost six times that of Kenya. Thus nationally this may give some indication of a much higher level of serious accident risk for any individual vehicle user in Ethiopia rather than Tanzania, which in turn has twice the rate of Kenya.

The same measures have been calculated for the three capital cities and are shown in Table 10. Although no actual estimate of the number of vehicles registered in Nairobi was available, if a conservative assumption of 90,000 vehicles is made, (given the country's larger vehicle fleet though slightly smaller city population size), then the ranking of the three cities is consistent for both types of measure. That is, whichever of the measures is considered, Nairobi has the highest fatality rate by a considerable margin followed by Dar es Salaam with, perhaps surprisingly, Addis Ababa as the safest of the three.

Table 10. City safety ranking

City	Road accident fatalities 2001	Total accident casualties	Population (million)	**Fatalities/ 100,000 popn.**
Nairobi	521	6,469	2.14	**9.7**
Dar es Salaam	375	4,303	2.2	**5.8**
Addis Ababa	268	2,114	2.57	**1.9**

City	Registered vehicles 2001	**Fatalities/ 10,000 vehicles**
Nairobi	(90,000[1])	**(57.9)**
Dar es Salaam	81,520	**46.0**
Addis Ababa	74,383	**36.0**

[1] Estimated

As indicated in the individual city summaries below, facilities for vulnerable road users are generally poor in the three cities. Table 11 shows a comparison of the split between total road accident casualties and those that recorded as pedestrians. Addis Ababa appears to be by far the

worst with almost 9 out of 10 accident victims being pedestrians, and although the other two cities are less than half this proportion, they are still relatively high when compared with developed country cities (in built-up areas in the UK, 18.7% of all casualties are pedestrians (DTLR, 2000)).

Table 11 Proportion of pedestrian casualties

	Addis Ababa (2000/01)	**Dar es Salaam** (1996)	**Nairobi** (2001)
Total casualties	2,114	2,539	6,460
Total pedestrian casualties	1,882	948	2,731
Percentage pedestrian	*89.0%*	*37.3%*	*42.3%*

The Traffic Police in each city record either the vehicles involved in all accidents, and in Nairobi this is additionally recorded as the road user primarily responsible for the accident. These totals for the most recent available year are shown in Table 12, together with the percentage involvement of each road user type (neglecting pedestrians responsible for accidents in Nairobi for comparison). It is difficult to make comparisons between several categories of vehicles from this table since it is likely that there is some confusion over classification of minibuses, 'van' type minibuses (i.e. *Wiyuyits, Dala dalas, matatas*), taxis and cars. Nevertheless, it would appear that however classified this is probably second or third to cars as the most common vehicle type involved in accidents.

Table 12 Vehicle primarily responsible/involved in accidents

	Addis Ababa (2000/01)		**Dar es Salaam** (1996)		**Nairobi** (2001)	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Carts	31	**!B14 Is Not In Table**	11	**!D14 Is Not In Table**	19	**!F14 Is Not In Table**
Bicycle	42	**!B14 Is Not In Table**	154	**!D14 Is Not In Table**	270	**!F14 Is Not In Table**
Motorcycle	43	**!B14 Is Not In Table**	136	**!D14 Is Not In Table**	163	**!F14 Is Not In Table**
Cars and utilities	3,025	**!B14 Is Not In Table**	3,935	**!D14 Is Not In Table**	1,238	**!F14 Is Not In Table**
Taxis	1,485	**!B14 Is Not In Table**	(with cars)		163	**!F14 Is Not In Table**
'Van' minibus	108	**!B14 Is Not In Table**	1,386	**!D14 Is Not In Table**	936	**!F14 Is Not In Table**
Minibus	122	**!B14 Is Not In Table**		**!D14 Is Not In Table**	649	**!F14 Is Not In Table**
Large Bus	438	**!B14 Is Not In Table**	205	**!D14 Is Not In Table**	45	**!F14 Is Not In Table**
Lorries	1,863	**!B14 Is Not**	446	**!D14 Is Not**	129	**!F14 Is Not**

		In Table		In Table		In Table
Others	46	!B14 Is Not In Table	30	!D14 Is Not In Table	293	!F14 Is Not In Table
Total	7,203	200000.%	258,423	0.%	3,905	-200100.%

There are greater proportions of cyclists and motorcyclists involved in accidents in Nairobi than the other two cities. Indeed, numbers of two-wheelers actually used in Addis Ababa are quite low. However, in this city there is a much higher involvement of lorries (about 26 per cent of all vehicles in accidents)

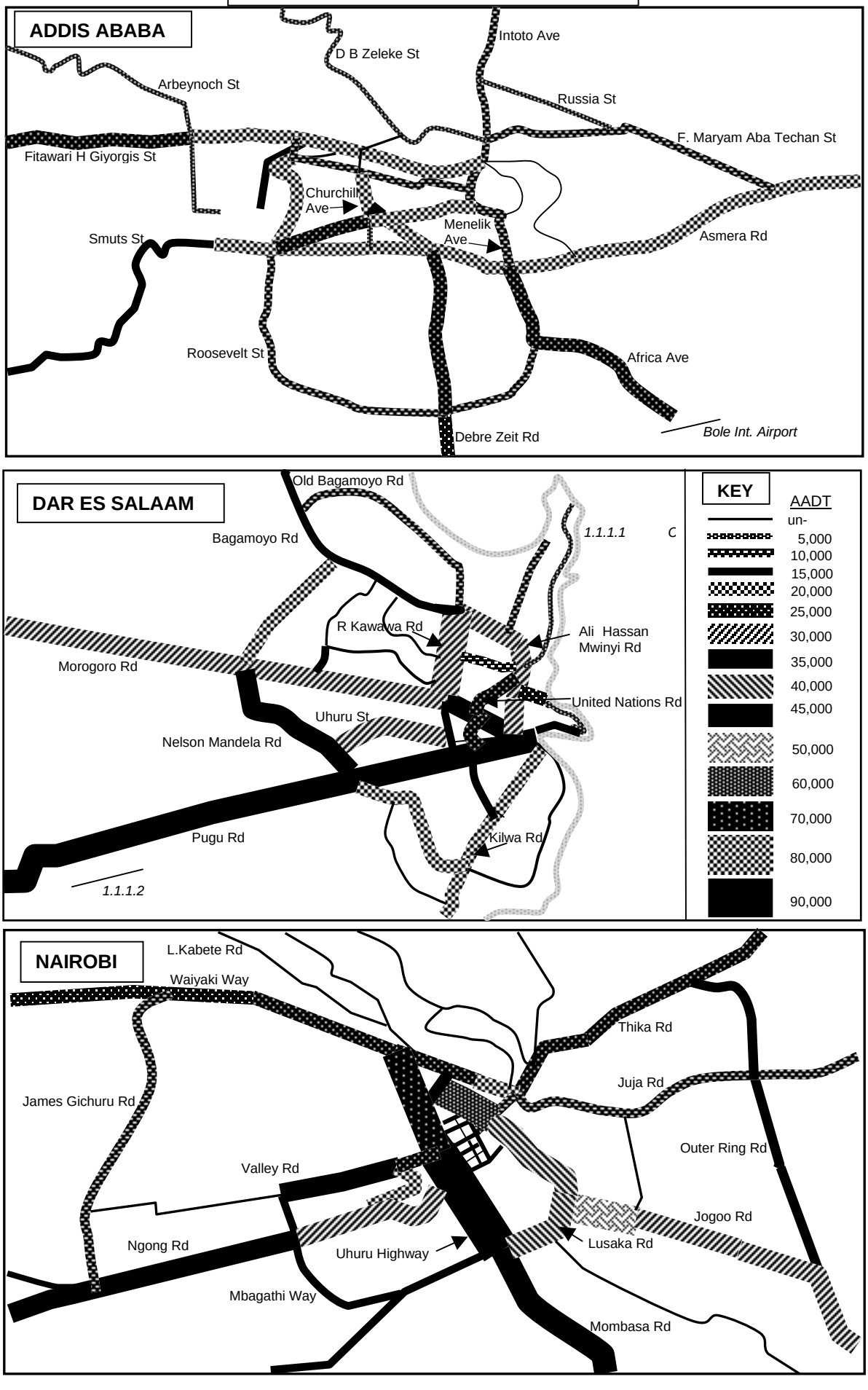
5.1.4 Traffic volumes

It is important to take account of traffic levels when considering road accidents as many studies around the world have demonstrated that the volume of traffic is one of the most important explanatory variables in the occurrence of collisions. As part of this study some limited traffic counts were made (as reported in Appendices A, B and C), and volume counts from other sources were also accessed (e.g. Post Buckley, 1998; JICA, 1996).

For comparative purposes corrections were made to older counts to unify the data to 2002 traffic levels on the basis of differences at the same monitoring points between the original and present day counts. Also, as traffic counts varied in their duration between studies, correction factors as suggested by Phillips (1979) were also applied to convert all counts to AADT. Thus, it must be stressed that after applying such corrections, the volume data should be regarded only as approximate, but is considered to give the best available indication of current daily traffic levels. The traffic flows are shown in Figure 2 as city route maps where flows are represented to the nearest 5 or 10,000 AADT.

There are about eight radial routes leading into the center of Addis Ababa and unfortunately fewer traffic volume measurements (made during a peak period at a selection of major intersections) than in the other two cities were available. However, these indicated slightly lower AADT levels than the other two cities (maximum of 27,000) and, based on the available measured values, estimates were made for the other routes. The peak flow counts were converted using the appropriate multiplier (Phillips, 1979) to AADT and are shown together with estimated values in Figure 2.

Figure 2 Major Routes and Traffic Volumes



In Dar es Salaam the three major arterial roads clearly carry large volumes of traffic into and out of the city center or industrial areas (particularly along Pugu Road). The latter road carries about 47,000 vehicles per day and Morogoro Road about 29,000, and are obviously high risk roads (see blackspots in Appendix E).

For Nairobi there are about six major arterial routes into the city with Jogoo road and Mombasa Road carrying the heaviest flows of approximately 30-50,000 vehicles per day. However, it is sections of road on the western side which ring the city center that carry the highest flow with levels of over 90,000.

5.1.5 City safety ranking by exposure to risk

It is suggested that the perhaps the best comparative statistic for safety in the cities can be made by making use of the above traffic flow figures. This will at least take account of the current exposure to risk on the major routes of the three networks and is presented in Table 13.

Table 13 City safety ranking by exposure to risk

City	Daily vehicle km on major city routes	**Annual fatalities/ 10^6 vehicle km**
Nairobi	1,623,339	**0.88**
Dar es Salaam	2,155,160	**0.48**
Addis Ababa	1,890,479	**0.39**

This confirms the rank order of the three cities of Table 10 but indicates that Nairobi carries by far the greatest risk of serious accidents on its network. Its fatality rate is almost twice that of Dar es Salaam and more than double that of Addis Ababa.

5.1.6 Addis Ababa road safety summary

Although Ethiopia has one of the lowest levels of urbanization in Africa at 15 per cent, there are considerable urban mobility problems. Although microbuses (including the covered pickup or *'wiyuyit'*) and taxis appear to make up the majority of motorized traffic (subjectively, as they are required to have the same blue and white paintwork), a study in 1996 (UNCHS, 1996) revealed that 70 per cent of journeys are by foot or donkey cart. The state of footways is extremely poor in Addis Ababa. It is thought that the topography of the city and the lack of adequate road space do not encourage the use of bicycles and, indeed, these are rarely seen. Motorcycles also do not appear to be very popular.

Ethiopia has one of the highest rates of road accident fatalities in the world (when expressed as a frequency per 10,000 registered vehicles), and 90 percent of fatalities in the city are pedestrians. Many people interviewed during the visit cited the lack of a footway, often on the narrower roads. Where footways exist in the center of the city, the surface is often in very poor condition or blocked by material: thus pedestrians tend to choose to walk in the carriageway.

There is a joint program between the education Bureau and the traffic Police where 'Student Traffic Police' starting at age 15 are given a 1-month training course (normally during vacation time). Despite uncertainties in their legal status, these Students actually direct traffic to enable school children to cross the road and can report offending drivers. There have not as yet been any reported cases of injury to these Students.

There are a few extremely wide sections of roadway and, although some crossing facilities have been provided these can still be quite difficult and intimidating for pedestrians to cross (see Figure 3 – the combination of zebra with a signal is essential as drivers will not normally give way at a conventional a zebra crossing).

As in many cities in developing countries appropriate road signs and road markings are somewhat lacking. However, in Addis Ababa there appears to be a number of junctions for which not only are markings absent but the priority road is unclear (see Figure 4) and consequently near-misses incidents are commonplace and the collision rate is probably high.

The head of the Unit for Road Construction and Signs in the City Authority chairs a Traffic Safety Committee which meets weekly with a representative from the Transport Department, the Police and his own department to discuss reported safety problems and agree how to tackle them. A report is made back to the Committee when measures have been implemented.

Fig. 3 Long zebra crossing Addis Ababa

Fig. 4. Unmarked and unclear priority

There is also considerable safety concern over the new ring road currently under construction by a Chinese company, as it is considered that inadequate provision has been made for pedestrians. Many footbridges are in fact being constructed but the pedestrian crossing demand well exceeds the number and locations where these bridges are being constructed. Also, the bridges are high, open and typically have two flights of steps on each side (with no disabled/cart/bicycle provision), and it is thought that a high proportion of pedestrians will choose not to use them. Even though the road is not yet fully open, many pedestrian casualties have already occurred, and pedestrians can frequently be seen climbing over the ~1m high 'New Jersey' type central barrier in order to cross the dual carriageway (Fig. 5). These include many children and several examples of lack of awareness by pedestrians of vehicle approach speed were observed during the visit. A study is recommended to determine the current crossing patterns of pedestrians. Where necessary additional bridges of more pedestrian-friendly design or even sub-ways should be constructed accordingly (though the increased expense and drainage work required for the latter, especially if not carried out during road construction, is acknowledged). Additional taller pedestrian barriers will also probably be necessary to channel pedestrians to these facilities.

Fig. 5 New ring road – pedestrian problem. Addis Ababa

Urban sprawl is a major problem for Addis and 70-80 per cent of the city is slum development. There is a need to create small sub-centers for commerce in the city. Currently, there are plans to build an E-W and N-S mass transit rail link.

Locally stated major problems/requirements in Addis Ababa. During the city visits interviews were held with senior personnel from the various institutional sectors that have road safety responsibilities, and the main problems and/or requirements raised are summarized below:

- The majority of casualties arise from pedestrian accidents (and about 70% of journeys are on foot). High proportions of these are school children.
- Causation of these accidents is a combination of pedestrians choosing to cross anywhere along a road and not at designated crossings and no respect of marked crossings by drivers, often traveling too fast.
- Street traders encroaching footways and the roadside force pedestrians to walk in the carriageway.
- Alcohol and use of chad (a chewed leaf with hallucinogenic properties) also contribute to many accidents: it is illegal to drive under the influence of these.
- Lack of experience of 'assistant taxi drivers' (untrained learners who the main taxi drivers often allow to operate their vehicle), though this is much more in the suburbs rather than city center.
- There is no safety education included in the school curriculum.
- Additional special English training needs to be introduced in the primary schools. The fact that English is used as the teaching language in all subjects in Secondary leaves many students with understanding difficulties. This presents a real barrier to learning.
- Animal carts and animals create additional hazards.
- There is a lack of trained staff to carry out safety investigations and design appropriate engineering or other improvements. A training course is needed in Addis Ababa (even a short course of a few weeks may be effective). There are safety experts at the universities but rarely do they have time to devote attention to safety problems in the city.
- Recruitment and retention of trained engineers to work for the City Authority is difficult owing to the low salary scales compared with what is offered in consultancies.
- There is little co-ordination between engineering and education initiative to improve safety, and regular awareness campaigns should be carried out.
- Addis Ababa is currently about 550 sq. km, with planned expansion extending it to 830 sq. km. The Traffic Police are under-staffed and unable to cope with this expansion. It is believed that for between 400 and 450 more officers are needed. {This number was calculated from the number required to direct traffic at the 28 signalized junctions and other necessary junctions (2 officers per junction with 3 shifts)}.
- Motorcycles and particularly radios for all the above additional police officers are in much need. Most of the existing police motorcycles are about 16 years old and radios about 5 years old with their batteries now lasting only about half a day.
- Other equipment needed includes about 6 to 8 ambulances and 7 hand-held alcohol breathalyzers (there are only 1 or 2 breathalyzers in Ethiopia but these are located at the police training school).
- Penalties for driving offences are insufficient
- It is the responsibility of the Road Transport Authority to collect fines from Road Traffic offences, but they rarely chase these up and a large number remain unpaid.

- Illegal parking of vehicles - restrictions are abused, though there are many complaints from drivers that there is nowadays nowhere to park and more space needs to be cleared with proper parking provision.
- More bridges or subways are needed together with footways.
- Use of thermoplastic markings is needed (there appears to be virtually no visible markings left anywhere in the city).
- Addis Ababa needs test center equipment for brakes lights and emissions.
- The Highway Code dates back to the 1930's and this together with a general improvement in the driving test is long overdue.

Some of the worst accident blackspots were visited as part of the study and these are documented with example photographs in Appendix D. A full analysis of the problems and detailed solutions are beyond the scope of this study but this is obviously recommended as one approach to safety improvement.

5.1.7 Dar es Salaam road safety summary

This coastal capital city is different to the other cities in having only three arterial roads: Bogamoyo Road heading north, Morogoro Road leading due west and Nyerere/Pugu Road leading principally to the airport. There is an inner ring road (Msimbazi Street) and outer ring road (Nelson Mandela Road) which has been dialyzed for most of its length. For at least part of their length, all three roads have been upgraded in recent years to dual carriageways.

There are thus a number of major crossroads along these routes which have been signalized and whose signals appear to be in good repair. Many of these involve relatively complex right turn filters (driving is on the left-hand side of the road in contrast to Addis Ababa – see Figure 6), though it would appear that drivers do generally know how to obey these filters. However, at busy times of the day the police are present at these junctions and will often overrule the signals by manual control of traffic streams. Unfortunately the signals systems do tend to be left running during this police control, despite the risk of a driver not seeing the policeman's hand signal for him to stop during a green signal phase.

Fig. 6 Signals with right filter phase

Fig. 7 Typical bicycle load in Dar es Salaam

The relatively flat plain on which Dar es Salaam stands has, it would seem, been conducive to encourage the use of the bicycle both for personal transport and transport of goods. There are also significant numbers of tricycles and handcarts (Fig. 7), although their actual number or their modal split is unknown. This very mixed mode use of the road system does cause occasional congestion problems, notably with handcarts and tricycles that restrict overtaking opportunities and can lock junctions (see Fig. 8).

Separate cycle ways have been built along some of the arterial roads (i.e. those that have been upgraded), and a new segregated cycle way is currently under construction along Nyerere Way (road linking airport and industrial area to the city center). Cyclists do use these lanes and also tend to use the wide footways where available rather than the dual carriageway (see Figure 9).

Fig. 8 Junction gridlock – Uhuru St/Lumumba St.

Fig. 9 Cycle use on wide footway. Dar es Salaam

Large road studs have been used in many locations to discourage drivers from lane changing (Figure 10). However, as these stand about 30mm above the road surface and have sharp edges (see Fig. 11) it is thought they may provide an additional hazard for motorcyclists, i.e. possible loss of control and laceration injuries if drivers fall off their vehicle and slide over the studs.

Fig. 10 Road studs to discourage overtaking.

Fig. 11 Severe road stud. Dar es Salaam

The Regional Commissioner for Dar es Salaam is automatically Chairman of the National Road Safety Council and the vice-Chairman is the Deputy Minister for Home Affairs. A full council meeting is held every 3 months with the various sub-committees (which can include non-executive committee members) meet monthly. The role of the Committee is to advise central and local government on road safety matters. There are 14 members of the Committee representing all key ministries (e.g. Home Affairs, Works, Transport) and even Radio Tanzania.

The Ministry of Works has commissioned a local consultant to develop a road safety audit procedure for Tanzania. This will involve a 7-step process including setting up the expert audit team, meetings, feasibility, preliminary, design stage, implementation and pre-opening audit reports. The target is for this to be carried out on all new or rehabilitated trunk road schemes, all urban traffic improvement projects, 50% of regional or district road constructions and 10% of feeder road rehabilitation or construction.

Locally stated major problems/requirements in Dar es Salaam. Following discussions with senior personnel from various institutional sectors, the main problems and/or requirements highlighted are summarized below:

- There is general inadequacy for the road infrastructure for the level of traffic now using it, characterized by narrow streets and a lack of footways.
- Speeding is considered to be a major problem, and there is a need for awareness campaigns for both drivers and pedestrians.

- There are no standards in existence for driver training
- Due to poor treatment of children by drivers, particularly those of public transport, duty policemen are needed simply to enable children to cross the road.
- Introduction of road safety training and awareness is required in the primary schools. There is currently only a pilot project in some primary schools where the Police have recommended important points that should be in the syllabus.
- One of the main safety problems identified is with the smallest buses (or *dala dala*) whose numbers have increased dramatically in recent years. These carry 16-18 people and together with minibuses of 30-45 seats are used within the city, whereas the larger 65-seater buses are used on intercity routes. The drivers of *dala dala* tend to be under 25 years old and are reckless. There are no formal contracts or special training for these drivers, and they are driven by the need to hand over an agreed amount of money to the bus owner at the end of each day, thus they tend to compete fiercely for passengers.
- Better training of drivers is definitely required. People traveling on top of loads on lorries are still common, despite its illegality.
- Driver licensing needs to be investigated, as not only are there many bogus licenses but also a very poor test procedure carried out in many Regions (if the test is done at all).
- There are four 'Ministries' that have road safety responsibilities: Transport (for driver and road fund licenses), Finance (for vehicle registration), Works and Home Affairs. SADC have recommended that the various activities are actually held under one umbrella.
- One major concern is over the age of vehicles. Very old vehicles tend to be a problem early morning or late at night (avoiding police checks), as these are used as taxis or *Dala dalas*. Most are imported with an average age of 10 years and, although checked on entry, no annual roadworthiness tests are made, apart from spot checks during Road Safety Week. A recent study has recommended a testing system be set up. The Road Safety Council is recommending either to ban the import of used cars or impose a 5-year maximum age limitation on all imports.
- Only about 10,000 commercial vehicles of the nation's vehicle fleet are inspected annually.
- Another main concern is the level of motorization. An attempt was made to restrict buses in the downtown area but this has not worked. The central licensing authority has been warned that no further buses should be permitted on certain routes but this has not been heeded.
- Despite the making many recommendations made by the Road Safety Council, central government do not appear to listen and certainly do not feedback responses.
- There are a number of problems in the quality of accident data; namely, those traffic police officers responsible for coding and inputting accident data are often transferred fairly quickly to other posts. MAAP needs to be installed at the police training college

and the police own trainers need to carry out regular training of their own officers who are new to accident reporting and the use of MAAP.

- Corruption is rife in the police and, by staying only in the office, a policeman is not enhancing his take-home pay! No officer has actually been assigned to ensuring accident data is collected comprehensively and accurately, and there appears little incentive for this.
- Location coding is often inaccurate and the direction if travel of vehicle at fault is causing confusion, and is virtually now worthless information. It is suggested that a simple text field describing the direction each vehicle had come from and is traveling towards be introduced on the form and in the database.
- NORAD has funded the training of officers in the use of MAAP now in 8 Regions since about 1994 but this is now at an end. Concern has been expressed about the sustainability and expansion of the system. There are 20 regions on the mainland and 5 on Zanzibar.
- General training in the application of accident investigation techniques is urgently needed.
- The 3 Municipal Authorities are not themselves using MAAP.
- The maximum fine that the law prescribes is only Ts20,000 (US$ 20) set in 1995 and this is insufficient to act as a deterrent. The only exception is in the case of a prosecution for a fatal accident, which may involve a custodial sentence.
- Only the court can decide whether a culprit should be banned from driving and cases often take 2 to 3 years to be completed
- Driving licenses and vehicle registrations are not computerized, and even if a driver's license has been confiscated, he can easily obtain another from another issuing region. It is hoped that SIDA will soon be funding a project to computerize licenses.
- Police motorcycles are in a poor state of repair and, indeed, most are completely broken down.
- The city needs to make provision for NMT's including segregation passes where possible and zebra crossings. Pushcarts are a major problem causing congestion and hazard and may have to be controlled by prohibition in some areas.
- Street trading requires better control as footways are often encroached.
- There are currently no restrictions on the use of HGV's in the central business district. A small lorry park was provided some time ago but has been now occupied by trading stalls.
- Parking is generally a major problem, particularly drivers being reluctant to pay parking fees. There is also little control over where *dala dala* stop.
- Oil-based paints have been used for road marking including zebra crossings but these are only effective for a very short time, and thermoplastic markings should be specified as standard.

Some of the worst accident blackspots visited as part of the study are documented with example photographs in Appendix E, though again a full analysis of the problems and detailed solutions are beyond the scope of this particular study.

5.1.8 Nairobi road safety summary

Nairobi outwardly appears to be a more highly developed city, having many high-rise buildings with a vehicle fleet that may be, on average, younger than the other two cities, and the wide two-lane roads often divided by a 1m median. However, there are still many roads, including several arterials that are in a very poor state of repair without any pedestrian footway provision. There are virtually no road markings on most roads and, although no objective measurements have been made, vehicle speeds appear to be higher. Pedestrians also seem to appreciate the danger more in this city as almost all will choose to walk on the earth shoulder despite its unevenness (Figure 12) rather than the asphalt road carriageway which would leave them in much closer proximity to moving traffic.

There are six main arterial routes leading into the city center with an outer ring road serving the eastern side of the city. The low-income housing is situated on the eastern side of the city with higher value properties on the opposite western side. The railway line from the east together with Jogoo Road divide the housing area from the major industrial area in the south-east.

Nairobi used to have a Road Safety Council whose members were re-appointed annually. However, this Council did not include an Act of Parliament when set up and consequently it is no longer operating. It would appear that the only safety publicity work currently being undertaken is that initiated by BP-Shell who tends to commission campaigns at times of public holidays. A recent proposal is to focus education programs locally at blackspots.

Fig. 12 Pedestrian use of rough shoulder

Fig. 13 Signal system out of order Nairobi

Due to internal problems with funding to the Road Maintenance Department of Nairobi City Council, very little road maintenance work has been carried out in the city. As well as the generally very poor surface quality of many roads there is a real problem with maintaining traffic signals. The situation is now so acute that only 3 out of 22 signalized intersections in the city are currently working. Continual police control is thus essential at all these junctions.

It is the traffic police, however, who appear to be doing most to combat accident problems in Nairobi. They carry out speeding and spot checks on drivers and vehicles, give lectures to schools and other organizations, and even air a weekly road safety radio program.

There is a real sense of insecurity in Nairobi, particularly after the hours of darkness, with many residents actively avoiding a number of areas of the city after nightfall, largely due to fear of attack and robbery. Coincidentally the risk of road accidents appears to be remarkably high at nighttime as consistently over the past six years 46 to 47 per cent of all accidents occur in darkness, (cf. 25.2 per cent of all injury accidents in built-up areas in the UK occur at night time (DTLR, 2000)).

Locally stated major problems/requirements in Nairobi. Following discussions with senior personnel from various institutional sectors, the main problems and/or requirements highlighted are summarized below:

- Driver behavior was highlighted as the biggest problem. Drivers do not drive consistently, exhibit any lane discipline, or appear to appreciate the dangers. There is very poor driver training and loopholes in the system such that too many forged licenses exist (these drivers having received no formal training).
- The behavior of *matatu* drivers is particularly hazardous, often darting in and out of traffic streams. They are driven by the need to raise an agreed amount for the *matatu* owner by the end of the day.
- The driving test is too simple, testing briefly a candidate's knowledge of road signs, a demonstration of manoeuvring using a model car, and only about 300m of driving on the actual highway.
- The police lack sufficient vehicles to get to the scene of many accidents and also equipment to rescue victims. Speed enforcement equipment is also old and inadequate and blood alcohol testers are much needed.
- The police still only use paper files for accident records and urgently need to improve their accident data by introducing a computerized system with appropriate staff training.
- The state of the roads with no markings, signs missing and potholes are all causing accidents, many as drivers swerve around potholes. Correcting the budget problems mentioned above is likely to alleviate this situation considerable.
- Equal attention should be paid to footways.

- The Transportation Department currently has only 2 engineers still working there and, although they are supposed to draw up safety improvements, little is done on a regular basis ('fire fighting' only) and even when, for example, road humps are recommended, the Maintenance Department has not had the funds to purchase materials for such installations.
- The distribution of schools and freedom of parents to choose their school leads to many children having to travel large distances.
- *Matatu* operators will often not accept children at half fare, or will refuse them entry in preference to full fare-paying passengers. The larger bus (KBS Bus Track) service has deteriorated such that journeys take several times the length of the same journey due to traffic and the stopping service. It is feared that they will be unable to compete with *Matatus* and would withdraw from service.
- School crossing patrols to help children on their way to and from school are not provided, though a system was tried for a period of about 1-year. Unfortunately this has not been continued but in rare cases a school will arrange for a person to act as a crossing warden.
- Road safety in schools should be included in the curriculum and should be infused within other subjects (like math, geography, etc).

As for the other cities, the worst accident blackspots in Nairobi that were visited as part of this study are documented with example photographs in Appendix F.

5.2 Environmental Issues

Each country has a legal and institutional framework for the management of the environment and sustainable use of natural resources. For example, in Tanzania the key legislation pertaining to the road sector and the environment before 1983 was:

- Highway Ordinance Cap 167 of 1959 with amendment in Act no. 40 of 1969, which provided for some element of public participation essential for an EIA process
- Traffic Ordinance Cap 168 of 1957 with amendment in Act no. 30 of 1973, which focus only on traffic control and road safety and there is nothing about environmental pollution caused by traffic.

In 1983 the National Environment Management Council (NEMC) was established following the adoption of National Environment Management Act no. 19. This was later transformed into the National conservation Strategy for Sustainable Development (NCSSD) in 1992. It was through the NCSSD that the Ministry of Tourism and later on the Ministry of Tourism and Natural Resources and Environment was formed. Consequently the policy of environment was enacted. However, of recent the Ministry for environment is in the Vice President's Office.

The National Environmental Policy (NEP, Dec. 1997), Chapter (iii) section (51) on the cross sectoral policies focuses on three main environmental objectives namely:

- Improvement in mass transport systems to reduce fuel consumption, traffic congestion and pollution
- Control and minimization of transport emission gases, noises, dust and particulates and
- Disasters/ spill presentation and response plans and standards shall be formulated for transport of hazardous / dangerous materials.

In 1997 the NEMC was empowered to oversee the enforcement and compliance (and technical arbitration) of environment standards, before then the NEMC played advisory role to the government only. However, to date there exists draft standards for air quality and wastewater. The Council has already developed Environment Impact Assessment (EIA) guidelines, which awaits government approval. Also, institutional framework for environment management which prescribes who should do what waits for government approval. It is envisaged that once all these documents are approved then the legal framework will follow for government approval.

While vehicle emissions are generally considered to be a major source of urban pollution, there is no evidence of serious monitoring of this hazard in the three cities, and there are no controls in place to reduce emissions through appropriate vehicle inspections.

An initiative taken in Kenya (by the Ministry of Energy in collaboration with the Kenya Bureau of Standards) to reduce vehicular pollution is the adoption of a new standard on unleaded gasoline in 1999. By end of July 2002, there will be a specification on unleaded gasoline. However, unleaded fuel is already available at some outlets in Nairobi.

6 TRANSPORT'S CONTRIBUTION TO URBAN DEVELOPMENT

6.1 TRAVEL DEMAND

Table 14 gives some of the key characteristics of travel in the three cities. The total level of daily travel demand is similar across all three, which is not unexpected in view of the similar population size in each. What is perhaps of greater interest is the estimated modal split, which indicates a much lower use of public transport in Addis Ababa as compared to the other two cities. The underlying reason for this is likely to be connected with Ethiopia's lower national income per capita (about one half to one third that of Tanzania and Kenya, respectively); this itself may also explain the lower provision of public transport in Addis Ababa as compared to both Dar es Salaam and Nairobi (see Table 4).

Table 14. Urban transport demand characteristics

	Addis Ababa	Dar es Salaam	Nairobi
Estimated daily trips (million)	4.9[1]	4.3[2]	4.8[3]
Estimated modal split:			
% trips by public transport	26	43	42
% trips by private car	4	6	10
% trips by NMT (including walk)	70	45	48
Share of public transport market:			
% trips by big bus	27	2	30
% trips by minibus/shared taxi	72	98	70
% trips by taxi	1	negligible	negligible
Average fare paid per journey (which may involve use of more than one vehicle):			
big bus	0.73 Birr (US$ 0.085)	-	21.3 Ksh (US$ 0.26)
minibus/shared taxi	1.3 Birr (US$ 0.15)	200 Tsh (US$ 0.21)	24.4 Ksh (US$ 0.31)
Average journey distance (km)			
Walk	5	2.2	4
big bus	17	-	12
minibus/shared taxi	7	7	14

1 Based on an average trip rate of 1.9 per capita per day
2 Based on an average trip rate of 1.96 per capita per day
3 Based on an average trip rate of 2.25 per capita per day

Average fare paid per journey on public transport varies quite significantly from city to city, but again probably reflects real differences in cost of living.

6.2 TRANSPORT AND THE POOR

Transport clearly plays an important role in the livelihoods of the poor. It provides the means to access opportunities and it provides employment (on a large scale in cities); and of course, an efficient transport system should contribute to a more productive city and economic growth.

Motorized vehicle ownership is inevitably low in the three cities, and hence the poor are critically dependent on public transport for mechanized access (i.e. for any lengthy trips). For one reason or another, cycling has not taken root in many African cities as an alternative means of travel. Although Table 14 indicates that a majority of trips are undertaken by NMT, the proportion on cycle is very small (at best 1 or 2 per cent). Safety is usually cited as a reason for low use of bicycles, but the initial investment cost is also a deterrent.

Walking (even long distances) has become a necessity where the public transport system has failed to provide capacity and/or where fare levels cannot be met (by the poor) on a consistent basis. In all three cities (and particularly Addis Ababa which is the least wealthy of the three), walking is a main means of city travel.

There is a body of evidence which suggests that the poor spend a considerable proportion of their income on necessary city travel. The surveys carried out as part of this study support this view (see Table 15), though a note of caution should be sounded. Transport surveys inevitably focus on transport issues, and usually individuals (rather than households); the data collected cannot usually be attributed to the household level. It is known, for example, from a household expenditure survey in Ethiopia, that a high proportion of urban household expenditure goes on food (an average for all households of 40.9%), whereas an average of only 4.8% goes on transport and communications. The same survey informs its readers that on average the poorer urban households (with declared incomes up to 4,199 Birr per month) spend more than they earn. This is clearly a complex area of study which requires very refined analysis.

Table 15: Expenditure on urban public transport

	Addis Ababa	Dar es Salaam	Nairobi
Estimated proportion of household income spent on public transport	3 - 37%[1]	17%	10 - 15%
Estimated total daily expenditure on public transport fares	1.6mill Birr (US$186,000)	361.2mill Tsh (US$ 383,000)	47.3 mill Ksh (US$ 591,000)
1 This range reflects differences in income levels; the lowest income groups (earning less than 200Birr per month) spend the highest proportion of their income on public transport, while the highest income group (earning more than 6,000 Birr per month) spend the lowest proportion.			

Total estimated daily expenditure on public transport ranges from US$ 186,000 in Addis Ababa to US$ 591,000 in Kenya (i.e. from US$ 0.07- 0.28 per capita). In Addis Ababa, about 6% of this expenditure is in the form of operating subsidy to Anbessa, the parastatal that runs the big buses.

The prospect of subsidizing fares (in support of the poor) rings alarm bells, because in the longer run it may encourage inefficiency and reduced productivity - which will ultimately impact on the poor in weaker services. Transport subsidies also take money away from other sectors where it might be more beneficial (health and education). Even so, it is clear from the modal split data (Table 14) that many journeys are undertaken by non-motorized transport. Earlier surveys (in both Nairobi and Dar Es Salaam, as part of the NMT studies of SSATP) have confirmed the fact that many travelers are too poor to afford regular use of public transport.

6.3 EMPLOYMENT IN TRANSPORT SECTOR

Urban transport is a major source of employment in any big city. Table 16 gives crude estimates of the numbers employed in urban transport in the three cities. The public transport service sector alone provides work for some twenty five to forty thousand operational staff. Support facilities (mechanics, fuel attendants, etc) might constitute another ten thousand jobs. The majority of all these jobs are in the private sector, and very few involve women. In each of the cities the number of traffic police is about 2-300, with slightly more in Addis Ababa.

While it has not been possible to enumerate all the employment in the transport sector, one observer in Addis Ababa estimated that the total is likely to be of the order 50,000. The figures that are available for Nairobi and Dar es Salaam would suggest that this might be a very conservative estimate for these two cities.

Table 16. Urban transport employment

	Addis Ababa	Dar es Salaam	Nairobi
Estimated public transport employees:			
Big bus	2,300		2,000
Minibus/shared taxi	22,100		39,200
Total	24,400	31,000	41,200
Traffic police	359	~200	300
City staff			
Professional: road engineers/planners		12/14	10
Vehicle registration team	428[1]	n/a	n/a
Regional staff			
Vehicle registration team	n/a	3 senior + support staff	n/a

1. The staff of the Road Transport and Communication Bureau

7 THE WAY FORWARD

7.1 THE CONTEXT

The purpose of an Urban Transport Policy is to establish the means by which Government sets out to achieve its urban transport objectives in support of national and urban development aims. In general, the development of urban transport takes place within the wider context of national and urban development. There are several aspects of this which typically have an important impact on urban transport in developing cities, namely:

- An economic recovery program which puts increasing emphasis on self-sufficiency, private enterprise and Government divestment of state-owned companies. This leaves Government's role to the regulation and taxation of urban transport operators, and control of infrastructure investment and maintenance
- As part of this recovery program, the liberalization of the economy has made it relatively easy, for example, to import public transport vehicles
- A decentralization program in which powers and responsibilities are being devolved from the Central Government to the regional and district Local Government administrative levels.
- The high urban growth rates which out-pace the provision of services, and is taking place in a largely unplanned manner, making it difficult to plan and program transport in harmony with urban development in the cities.
- Typically an emphasis on rural development which takes priority in resource allocations, and removes the focus from urban development (and as an inevitable consequence, urban transport)

The urban transport system is characterized by the congested central areas of the cities, poor quality of service from public transport, high exposure to road accidents, and poor environmental standards. This is seen in long commuting times and journey delays, lengthy waiting times for public transport both at and between terminals, high accident rates, and localized poor air quality. These have resulted from the many factors, including:

- Poor terminal organization and management, which restricts the optimum use of the available public transport capacity
- The use of small vehicles for public transportation, which contributes significantly to congestion on the roads
- The low 'affordability' threshold of the majority of the urban poor, who can only meet low public transport tariffs
- Lack of funding (local and foreign) available to operators, who are thus unable to replace their existing vehicle stock with more modern, efficient and comfortable buses

- The low capacity of the existing road network, and its inefficient use
- Poor planning and control procedures for land-use development, resulting in additional traffic congestion and safety hazards
- The low standards of road traffic awareness, vehicle maintenance, and driver behavior, which contribute to the high accident rates, particularly amongst pedestrians and children
- The poor upkeep of vehicles causes excessive vehicular emissions.

7.2 OBJECTIVES

To address these urban transport problems requires an approach aiming to meet broad objectives concerned with enhancing the effectiveness, efficiency and affordability of the sector, bearing in mind that the overall aim of urban transport development is to contribute to the improvement in the quality of life of the community. Thus, the over-riding objectives of urban transport are likely to encompass or promote the following:

- Growth. More productive transport can contribute to improved competitiveness of firms, efficiency in labor markets, and hence efficiency gains to the urban economy.
- Poverty relief. Many transport interventions can be targeted at the poor, improving their conditions of travel and access to opportunities and services; hence improving their productivity and well-being.
- Environmental care. Transport is a major source of accidents, emissions, noise, severance and other environmental hazards. It should be an objective of urban transport to minimize and, where possible, reduce these impacts.

7.3 POLICIES

Policies are the measures and mechanisms which governments adopt in order to achieve their goals and objectives. As such they may be highly influenced by the political environment. Even so, there are policies that have found widespread (though not always stated) acceptance, and these include the following:

- Ensuring cost-recovery and sustainability. Wherever possible, the costs incurred on transport development and operations should be borne by the users. Funding for public goods (like roads and the regulatory and planning bodies) should be from secure and sustainable user (where possible) sources (like road tolls, vehicle inspection fees, etc.)
- Maximizing use of existing capacity. Existing infrastructure and services should be made more productive (in terms of getting higher passenger throughput) by selective operational measures and low-cost investment

- Promoting private participation and competition. The efficiency benefits of private involvement in transport operations should be endorsed, and the support of the private sector should be further encouraged through incentives and risk sharing
- Regulating the sector only in respect of quality, externalities and competition. Controls should be kept to a minimum, though safety, environmental and quality standards must be maintained and more rigorously enforced
- Developing human resources. In support of sustainable development, there should be emphasis on developing the human resources of those engaged in the transport sector at all levels
- Providing necessary safety nets. Where efficiency arguments over-ride equity issues, there may be a case for giving support to the disadvantaged. Targeted subsidies, support for necessary retrenchment in the transport sector, and support for necessary resettlement programs (due to transport development) are examples that must be addressed as required.
- Involvement of stakeholders in the development process. The development process should be inclusive at all stages of the project cycle.

7.4 STRATEGY

A strategy is the way in which the policies are packaged and delivered. When associated with a time frame, and detailed resource allocations, targets and outputs, the strategy becomes an action program.

An outline (and generic) strategy for taking forward urban transport in the three cities might consist of the following broad initiatives:

- Define urban transport objectives, policy and strategy (as discussed above)
- Develop appropriate institutional mechanisms (organizations, procedures, etc.) for integrated and participatory development of city transport with sustainable funding and capacity development
- Confirm and develop the role of the private sector (both formal and informal)
- Confirm the technical measures and initiatives that will be adopted
- Develop the action plan and detailed programs (see Section 7.5)
- Execute the plan

This list largely reflects the sequence and priority of the initiatives that need to be taken. However, it is the contention of this report that the single most important issue that must be addressed in order to secure positive future development of urban transport concerns the nature of institutional mechanisms. If this issue could be resolved, many other technical initiatives would have much greater probability of success.

The following paragraphs explain the strategy in more detail.

7.4.1 Develop appropriate institutional mechanisms

Problem statement: Although overall responsibility for the development of urban transport is vested at city level, progress is hampered by the lack of co-ordination and co-operation between the many organizations which retain a vested interest. Furthermore, transport has a low priority in city affairs; its development has a low profile and little focus. Stakeholders (particularly users) have little or no influence.

To give the transport sector a higher profile, more focus, and a dedicated and professional cadre requires the development of an autonomous city transport agency, either within the city or central government structure. This requires the consolidation of the functions of a number of parallel bodies into one autonomous body with responsibility for area-wide regulation, planning and management of the transport network. This body will provide the focus for the private sector operators to address their concerns and, in turn, for the public sector to ensure effective regulation and management of a quality infrastructure, appropriate to the needs of the city.

A 'generic' division of responsibility between the primary agencies that at present exercise some influence over the urban transport sector is set out in Table 17.

Table 17. Possible division of responsibilities in the urban transport sector

Agency/ Stakeholder	Responsibilities		
	Ownership	Management/ Administration	Operations
Central Government	National Legislation National transport policy	Fuel Levy Supervision of national transport parastatals and agencies	Collection of fuel levies Financial and performance monitoring
Central Government Agencies	Any national transport parastatals or agencies (e.g. Road Fund Board, Highways Agency)	National roads	Design and construction of national roads
Local Government (City)	Bye-laws Master plans	Development planning and control	Implementing the planning controls
Transport Authority	Regulatory powers for control and development of city Transport Sector Dedicated funding sources Public transport terminals	Execution and administration of the city transport policy Transport planning and development	Disbursement of city transport budget Contract management Management of PPI Monitoring transport out-

Agency/ Stakeholder	Responsibilities		
	Ownership	Management/ Administration	Operations
		Supervision of all aspects of transport development on behalf of Municipality Development of city transport PPIs Maintenance and management of existing road network in city Traffic engineering measures Promotion and development of public transport Developing safety initiatives Collection of parking charges and public transport terminal fees Developing consultative techniques	put and performance Policy, planning and research support function Local traffic management measures Environmental, safety and security monitoring Involving the stakeholders.
Private sector (operations)-formal and informal	Bus fleet and ancillary support facilities Road construction and maintenance equipment	Bus operations Road maintenance and construction programs	Routing and scheduling Sub-contracting Vehicle maintenance Manpower training and recruitment Road maintenance
Private sector (training)	Training schools and support facilities	Driver training courses Vehicle maintenance courses Training standards	Training of drivers and mechanics
Academic and professional sector	University courses Professional bodies	Professional standards	Education of professional cadres
Users	Non-motorized transport (i.e. ability to walk and, in some cases, a bicycle)		Participation in transport development planning

It has to be said that the development of such an authority requires meticulous planning and the expenditure of much 'political' capital. The creation of a new authority implies the reallocation of existing powers and responsibilities, as well as the redirection of funds. It also re-

quires new legislation to create the body, and to vest it with its powers, responsibilities and duties, structure, funding, etc. This is a sensitive task, which will stand or fall on its political backing. The idea needs to be 'sold' at the very highest levels. Its duties and procedures must be thought through very carefully and evidently this is a complex task.

In order to function in an autonomous and effective way, such a transport authority needs an independent and secure source of funding, over which it has control (subject to any guiding principles and auditing requirements laid down in its legal underpinnings). The organization needs to be sufficiently independent so that it can develop its own professional cadres based on attractive salary scales sufficient to attract the best.

7.4.2 Develop sustainable funding mechanisms for a transport authority

Problem statement. The proposed transport authority requires a sound, sustainable and independent funding base in order that it can fulfil its duties.

At present finance from their respective national roads fund supports road maintenance in the cities of Addis Ababa and Dar es Salaam. It is likely that Nairobi will be similarly provided for when the Kenya Roads Board becomes fully operational, and can disburse funds directly to the city. In order to fully fund a transport authority to finance its regulatory, planning and development roles, and to raise the level of road maintenance expenditure, it may be necessary to seek other funding sources. Other potential revenue sources that could be explored include:

- Additional urban road user charges (in the form of tolls, parking charges, city road tax or area licensing fee, road pricing etc.)
- A levy on driver insurance premiums (possibly to specifically finance safety work)
- An employment tax dedicated to transport
- Betterment charges
- Net income from vehicle inspections and licensing, and driver licensing and testing
- Charges for use of public transport terminals

Some of these are unlikely to be feasible in the context of poor administration, and inability to efficiently collect existing local taxes. Private vehicle insurance is not yet mandatory in Ethiopia.

7.4.3 Confirm and develop the role of the private sector

Problem statement. The operations of urban transport are largely undertaken by the private sector (both formal and informal). However, their contribution is largely unstructured and itinerant; the entrepreneurs have seemingly little interest in the nature and development of the transport sector, and they do not encourage a professional attitude to transport provision. Moreover, there are still some additional areas where the private sector could further develop interest and investment, given the right lead by government.

It is appropriate that private enterprise will continue to provide the bulk (possibly all if Anbessa and UDA are successfully privatized) of public transport services in the three cities. But there is general agreement of the need to bring greater professionalism into the sector. This is taken to mean a greater sense of responsibility and commitment to the service provided. Professionalism is also sometimes taken to be synonymous with big business (as opposed to micro-enterprise), in the sense that a large bus company has more investment at risk, and is likely to take a much bigger interest in meeting (and growing) its market demand in efficient, effective and safe ways. It is doubtful (certainly in the short term) whether this latter interpretation could be achieved without giving considerable protection (from competition) to the bus operators prepared to invest in large fleets of big buses. The alternative must be to encourage greater responsibility in the minibus owners, and hopefully gradually generate a more secure market in which they can prosper and reinvest.

Thus with the current fragmented state of ownership, the only way that professionalism is likely to be encouraged is with the support and guidance of the authorities, and perhaps also through more effective self-discipline through the auspices of the owner-associations (though the efficacy of this may be doubtful, given the existing track-record of the associations).

This may be achieved through setting and enforcing appropriate service standards. The authorities in Dar es Salaam have achieved less chaotic travel conditions on *dala dala* through very simple measures (e.g. the requirement for vehicle color-coding and number identification, and driver and conductor uniforms). From such simple beginnings the standards can be gradually raised; e.g. a restriction on bus size on certain routes; the requirement for using off-street terminals; more rigorous inspections. The key to this program is monitoring and enforcement (with appropriate penalties), linked to the gradual increase in standards. It must be understood by all stakeholders that raising standards is likely to be accompanied by legitimate fare increases. But this must be the price of higher safety and quality.

Other linked initiatives will include education and training programs, stakeholder workshops, and user consultation. It all requires the overview of the proposed transport authority to manage such a program.

Other areas in which the private sector can support the transport authority include the provision of various services on its behalf (e.g. vehicle testing, monitoring services, survey work, consultative and advisory services, and all aspects of road maintenance, including traffic signal upkeep). The transport authority does not, in itself, need to be a large organization. It can rely for much of its output on the 'contracting out' of services.

7.4.4 Technical measures and initiatives

Problem statement. There is a range of well-tried and tested measures that can be introduced to improve the performance of urban transport, but as has been argued, the success of their implementation depends crucially on having the right institutional and regulatory framework

which can monitor and enforce these initiatives. One other aspect of introducing measures is to get the right balance between urban-wide major projects (e.g. road network additions) and local community needs (low cost schemes like pedestrian safety measures, speed restrictions, etc.)

The sorts of technical measure that should be introduced will be dependent on the policies adopted, but are likely to include those shown in Table 18.

Table 18. Examples of technical measures for improving urban transport performance

Improvements to:	Techniques	Desired outcome
Public transport performance	1. Traffic management measures to improve public transport performance (e.g. bus lanes, priority turns and signal settings). 2. Public transport user facilities (e.g. terminals, bus stands) 3. Development of standards (for public transport vehicles) 4. Financing mechanism to support transport micro-enterprises to invest in better vehicles 5. Training and education programs for public transport staff 6. Capacity building programs for public transport associations	Improved speeds and reliability, and hence higher vehicle productivity. Better quality of service Move towards using more efficient and safer vehicles Higher quality vehicles used to provide services Higher standards of customer care, and safer travel. Associations take a more responsible and positive attitude to sector development
Network performance	1. Traffic management measures to improve traffic flow (e.g. junction signals, modern controllers, one-way schemes) 2. Maintenance management systems (for road condition monitoring and prioritization) 3. Development of standards (for road design) 4. Network improvements (including attention to pedestrian and cycle traffic)	More efficient use of existing capacity Better resource allocation and attention to road deterioration problems Uniformity in design to help road-users, and better attention to safety. New infrastructure to ease current congestion, and to support safe and efficient travel by non-mechanized means.
NMT facilities	1. Development of design standards for NMT facilities 2. Development of NMT facilities (cycle tracks, side-walks, road-	Uniformity and consistency in design, to help road-users. To make travel by NMT safe and secure.

	crossings, etc) 3. Education and propaganda campaigns on use of NMT facilities	To raise awareness and encourage best use of facilities.
Externalities	4. Traffic management measures to improve safety (e.g. speed restrictors, pedestrian crossings) 5. Training and education programs for road safety (targeting vulnerable road users) 6. Training and education programs for improving driver behavior (e.g. training instructors) 7. Training and education programs for regulators and enforcers (e.g. traffic police, Transport Authority personnel) 8. Re-equipment of regulators and enforcers (e.g. hardware for supporting police to undertake their duties efficiently) 9. Development of vehicle testing facilities and programs, with appropriate equipment, staffing and training. 10. Mandatory third party insurance	Reduced speeds and fewer conflict points to reduce accident risks. To encourage greater awareness of road safety hazards and risk minimizing strategies. To make drivers more safety aware. To make enforcers more aware of their roles, responsibilities and impact. To improve productivity of enforcement agencies. To improve vehicle safety standards and reduce traffic emissions. To ensure that compensation is available to accident victims.

The balance between local and area-wide measures may be difficult to achieve, but a mechanism for assisting in the decision process is to make user participation a strong contributor to that process. The institutional framework must recognize this need.

7.5 AN ACTION PROGRAM

The action program that is presented in Table 19 is in the form of a logical framework. It presents the activities in a generic form (i.e. it is not city specific). At the level of this study it is not sensible to present a detailed program; it is better to provide the outline of general development initiatives, and the likely timescales that will be incurred.

Table 19. Action plan for improving urban transport

Narrative summary	Measurable indicators	Means of Verification (MOV)	Important Assumptions
Goal Pro-poor development of urban economy and livelihoods, with increased opportunities, enhanced environment and better security	Measurable increase in the standard of living and reduced levels of poverty	Published statistics and records.	
Purpose 1. To develop an efficient, effective and safe urban transport system 2. To develop a focal point to champion urban transport progress 3. To develop the capacity of the transport profession 4. To develop an inclusive process (involve stakeholders in transport development)	 1. Measurable increase in traveler satisfaction, reductions in congestion and pollution, improved journey times, and less risk. 2. An organization which has a high profile in public minds for action (number of projects being undertaken/completed) 3. Transport profession is a recognized cadre, and offers good opportunities for advancement. Universities offer post-graduate courses. 4. Platform created and opportunity to hear all 'voices'.	 Surveys undertaken by the Authority Public perceptions, press and media coverage. University courses offered graduation results. Salary scales offered. Surveys of public concerns, media coverage	(Purpose to goal) The only significant risk is if urban development takes a completely unforeseen and different course (to that expected), and transport is not 'primed' to support this change. Otherwise, an efficient transport system must be good for economic development.
Outputs 1. An urban transport policy 2. A new apex body for urban transport development 3. Improved quality and quantity in public transport provision	 1. An adopted and gazetted document (+1.5 year) 2. Legislative enactment (+4 years) Physical structure (+4 years) Funding mechanisms in place (+4 years) Professional cadres in place (+4 years) 3. Public transport standards documented (+4.5 years) Enforcement teams and complaint procedures in action. (+4.5 years) 10 % p.a. growth in proportion of medium/big	 Documentary evidence Documentary evidence (The Act of Establishment) Annual report published by the Authority to describe progress, staffing, accounts and budgets, plans and programs. Auditor's Report Documentary evidence in the Annual Report Surveys undertaken by the Authority; analysis of past and current survey statistics.	(Outputs to purpose) The purpose of the program will only be achieved if the Transport Authority is allowed to exert its responsibilities, duties and powers in an independent manner. All the activities, particularly in respect of dealings with the private sector, must be transparent.

	bus operations (+5 years) Reduction in travel times of 10% (+5 years)		
4. A greater level of private participation in urban transport	4. All public transport privately operated (+5 years) 90% of road maintenance contracted out to private sector (+5 years) 75% of regulatory, inspection, monitoring and planning activities contracted out to private sector (+5 years)	Documentary evidence published in the Annual Report Surveys undertaken by the Authority. Auditor's Report	
5. Better maintenance of urban roads	5. Road hierarchy and geometric design standards in place (+3.5 years) Maintenance management system in place (+4 years) All primary roads brought up to standard (+5 years) Program for secondary and access roads in place (+5 years) Failed signals to be repaired within 6 hours (+4 years) Signal replacement program at rate of two junctions per year (+5 years)	Documentary evidence in the Annual Report Reports from the Maintenance Management System Surveys undertaken by the Authority Auditor's Report	
6. Improved facilities for NMT	6. Design standards for NMT facilities in place (+4 years) Primary cycle network in place (+5.5 years) Cycling consistently achieves 2.5% of mode choice (+6 years)	Documentary evidence in the Annual Report Reports from the Maintenance Management System Surveys undertaken by the Authority Auditor's Report	
7. Reduced road accident rates	7. Road Safety Council established (+1 year) Special budget for road safety work in all relevant sectors (+2 years) Road safety engineering unit set up and expanded to regional units (+2 years) Computerized Police accident reporting system introduced/improved (+2 years) Police enforcement training improved (+1 year) Police enforcement equipment improved (+1 year)	Documentary evidence. Annual statistics published, access and use made in other institutions. Documentary evidence.	

	Road traffic laws and penalty system revised (+2 years) Driver training and testing revised (+2 years) Traffic safety included in school curriculum (+2 years) Vehicle inspection extended to all vehicle types over 5 years from manufacture (+5 years) Mass media and community safety campaigns devised (+1 year) Emergency rescue services and trauma management improved (+2 years)	Equipment in use and maintained. Documentary evidence. Documentary evidence and new legislation introduced. Documentary evidence. Documentary evidence and ambulances in service.	
Activities 1. A 'champion' and project team for planning the new Authority is appointed . 2. Create a stakeholder forum for developing an urban transport policy 3. Establishing the Transport Authority: Political sensitization Framing Terms of Reference and organization structure Defining procedures, resource (human, physical and financial) requirements and roles of staff Identifying and securing funding sources Developing legislative instruments Cabinet and parliamentary approvals and enactment Implementing the creation of the Authority (recruitment, office acquisition, financing arrangements, etc.) 4. Public transport improvements: Developing standards	1. In place by month 1 2. A series of regular stakeholder meetings in place by month 2. Procedures and targets agreed. 3. High-level political discussions (ministers, cabinet, parliamentary committees, etc.) undertaken over first year. Workshops, meetings, minutes, progress reports, appropriate proposals, budgets, targets, etc to define the plans and programs. Draft legislation and Cabinet Papers 4. Documentation of technical analysis and recommendations by new Authority	Appointment records Minutes of meetings and actions agreed Minutes and government papers indicating progress through the political system	(Activity to output) The program could not proceed without political support at the highest levels. Even with this support, the planning and implementation of the Authority will be subject to continual opposition from many diverse sources It is critical to the success of the program that a sustained funding base can be secured The project planning team needs high caliber and high profile leadership At implementation, the success of the program will depend critically on the caliber of staff employed, and in particular the performance of the Chief Executive

Defining procedures for implementing and enforcing standards			
5. Private participation Identify sectors (e.g. parking, road maintenance, planning and design services, inspection and monitoring services) and develop criteria for employing private support. Privatization of remaining parastatals (if necessary) - with necessary advisory services for the sale planning	5. Appropriate surveys and analysis initiated by new Authority	Published standards and procedures Published documents	
6. Road maintenance improvements Develop road hierarchy (if not already existing) Develop a maintenance management system Develop criteria and out-sourcing procedures for maintenance activities	6. Appropriate surveys and analysis initiated by new Authority		
7. Improved road safety Road safety action plan developed. Funding strategy adopted Training established for road safety professionals. Road safety units regularly investigating and improving locations, and evaluating work. Facilities for vulnerable road users improved. Road safety audit program introduced. Computerized accident database with accurate location mapping in use by all sectors. Traffic police training increased Police vehicles, communication and enforcement equipment, and computers acquired and in use. Traffic laws revised including compulsory third party insurance. Targeted enforcement policy devised and introduced. Driver test procedure revised	7. Plan published. Documentary evidence.	Published documents Significant reduction in accidents matching planned targets.	

Training procedures for examiners and instructors revised. Defensive driver training promoted especially for professional drivers. Training material for school teachers developed and implemented in primary curriculum. Safe routes to school schemes developed. Community, transport workers and mass media safety campaigns devised, implemented and evaluated. Ambulance and rescue equipment improved. Trauma management and facilities improved. Vehicle inspection procedures revised Adequate vehicle test equipment installed. Roadside vehicle inspections increased. Accident costing studies and other safety research programs introduced.			

The timescales suggested in this action plan are probably optimistic, bearing in mind the change that is being proposed. There are also two 'killer' assumptions, which would wreck the project if not fulfilled:

- The program could not proceed without political support at the highest levels
- It is critical to the success of the program that a sustained funding base can be secured.

A key task in the action plan is to appoint a 'champion' and supporting team to develop the project (for the creation of the Authority) from conception to fruition. Selection of this person will also be crucial to eventual success, since this person will need to deal with a complex raft of issues (finance, human resource, management, planning, external relations, etc.) as well as dealing with the politics of the program.

7.6 POVERTY IMPACT

The poverty aspects of the action program for urban transport development can be appraised in terms of the project's expected impact on creation of opportunities, empowerment and security for the poor. The exact nature of how transport benefits are distributed cannot certain (without detailed analysis), but any project design is clearly pro-poor if it focuses attention on the main means of transportation used by the poor, i.e. public transport and non-motorized transport (including walk). Table 20 indicates the probable links between the main components of an urban transport project and the potential to reduce poverty.

As part of the process of establishing a transport Authority, procedures need to be put in place whereby it can continually monitor the impacts of transport on poverty, and can also incorporate the perceptions and needs of the poor in its forward planning. Poverty assessment must be built into the project cycle, and should be applied at all stages, but particularly when projects are conceived and prioritized.

A series of indicators to support the process of poverty impact analysis can be devised as follows:

- Opportunity. Indicators that point to the availability and accessibility of the public transport service. Improvements are reflected in more capacity, better travel conditions, faster journeys, stable transport costs and/or outlays as a proportion of household expenditure
- Security. Indicators that point to the safety of using urban transport. Improvements will be reflected in reduced accident rates, and reductions in criminal activities.
- Empowerment. In this connection, an indicator is needed to demonstrate the involvement of the poor in the design and planning process. In the longer term, this indicator needs modifying to demonstrate whether that involvement is effective.

Over time, all the indicators and associated targets will need monitoring and modification to reflect experiences gained in their use. Particular changes to reflect gender nuances may, for example, be appropriate.

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Table 20. Poverty impact of urban transport developments

Project component	Key poverty dimensions			
	Economic opportunity		Empowerment	Security
	Growth	Redistribution		
Policy and institutional reform	A mechanism for creating a more effective and efficient operating environment, within which transport operators can be more productive, and hence cost-efficient and thus contribute to urban growth. Opens up opportunities for new investment in the transport sector, and hence increased employment. Improves competitiveness of firms, and efficiency of labor markets.	Priority interventions directed at enhancement of public transport performance and promotion of NMT are likely to be highly pro-poor.	Opportunities for significant involvement of stakeholders and local communities at many levels in the project cycle.	Improved transport will contribute to lowering vulnerability through greater ease of movement and access to opportunities, less exposure to accidents, and better quality of life. Enhanced conditions of travel support improved social networking. Improved quality may also reduce security (crime, sexual harassment, etc) concerns (which may currently engender fear of travel and hence social isolation).
Bus service enhancement:	Measures which can enhance the productivity of the bus service should be easily justified in economic and financial terms.	Buses are a main mode of transport for those urban poor who can afford to pay for travel. Productivity enhancements which make travel cheaper will extend the catchment of the poor (though it may be difficult to transfer such productivity improvements through to lower tariffs). Travel times for the poor should be reduced.	Increased accessibility within the city for the poor and hence strengthening of social and political connectivity.	Bus travel is a major source of insecurity (theft, sexual harassment, etc.) Enhanced quality of travel may contribute to reduced concerns.
Road network efficiency improvements	It should be possible to economically justify improvements to the road network on the basis of timesavings to road users.	If the focus of improvements is on the bus network routes, the urban poor (who are highly reliant on public transport) will be major beneficiaries from improved journey times.		The poor are likely to be most exposed to the externalities of road development – increased pollution, increased accident risks due to greater exposure to traffic, severance, re-settlement.
Non-motorized transport promotion	The economic justification of improvements to these modes may be difficult.	These are modes that are largely used by the urban poor. Any measures to encourage better performance or greater up-take are pro-poor in respect of users.	A direct response to the voice of the poor, which may have had little political influence in the past – giving attention to the modes used by the very poor	

9 APPENDIX A - ADDIS ABABA

9.1 INTRODUCTION

9.1.1 Background

The Scoping Study was commissioned by the Sub-Saharan Africa Transport Policy Program (SSATP) and was carried out by the TRL with the support of local professional staff. The study focused on the following aspects:

- Institutional and regulatory arrangements on urban mobility
- Financing of the urban mobility system
- Data on road accidents
- Urban planning mechanisms
- Urban transport and urban mobility and household expenditures.

The primary objective of the study is to highlight key issues and recommendations to form a basis for the preparation of an Urban Mobility Policy Development Program for SSATP

9.1.2 Purpose of the Report

This report sets out the approach and methods that have been employed, and overview of transport in Addis Ababa, traffic management, the role of the relevant authorities, a brief profile of the city, transport policy, institutional arrangements, the regulatory regime for the urban transport industry as well as more specific aspects relating to urban mobility. These aspects include operating cost of public transport, performance of public transport, road safety, financial and fiscal, and findings from surveys carried out as part of the assignment.

9.1.3 Approach and methods

The starting point was to obtain an up-to date appreciation of the existing transport network and services and of modal interchanges, together with a review of current government policies and programs concerning urban mobility in Addis Ababa. This was followed by an assessment of the overall objectives of public transport and the existing pattern of movement together with medium and long term trends in population change, settlement pattern and travel characteristics. Financing arrangements have also been examined with particular emphasis on 'transit financing' and the level of fares in relation to rational for subsidy. In a study of comparative economics between conventional buses operated by the Anbessa City Bus Enterprise and the para transit dominated by the mini-buses, an effort has been made in establishing common base for the various operating cost categories. This was followed by operating cost data collection campaign.

The relevant federal and city administration institutions were consulted in the process of evaluating the environment for investing in transport and the mechanisms for sustainable financing. In this context, an evaluation of the planning of urban transportation including public transportation on a city wide comprehensive basis was made. The availability of resources and the technical capability for programmatic planning was also appraised.

The performances of conventional bus, the min-bus and the conventional taxi were also examined on the basis of perceptions of riders as part of an assessment of urban travel patterns and data from secondary and primary sources.

Motor vehicle accident data was collected from both the federal and Addis Ababa Traffic Police. It was necessary to establish trend in fatalities and accidents as a ratio of vehicle population. In this context, high-risk locations ("black spots") were visited and observations recorded. Meetings were held with the Addis Ababa Traffic Police, the Road Transport Authority and the Road Fund Administration concerning road safety education and publicity programs, safety consideration in the design of road improvements, pedestrian facilities, uniformity and consistency of enforcement of traffic regulations.

Primary data collection was also undertaken. The transport surveys were conducted on the basis of sample riders at places of employment, bus stops and other locations. The surveys provided data concerning vehicle operations, transport expenditure and modal split. The data gathered and the discussions held with the management of Anbessa City Bus Enterprise and taxi owners as well as findings from previous studies were used to establish urban travel patterns in Addis Ababa.

9.2 AN OVERVIEW OF TRANSPORT IN ETHIOPIA

The Ethiopian transport system is not complex comprising the following:

- A road network of about 30,000 km of classified roads (about .03 kilometers of road per square kilometer of area)
- A 781 km long single-gauge railway line running from Addis Ababa to Djibouti, and rolling stock consisting of 7 steam locomotives 17 diesel - electric locomotives, 27 passenger cars, 430 freight cars and 5 auto rails.
- Two international and 32 domestic airports.
- A total motor vehicle fleet of 117,972, of which 43879 (37 percent) are private cars, 41681 (35 percent) are commercial vehicles and 16.094 (14 percent) are government vehicles. The remaining are taxis (9 percent), and vehicles owned by diplomatic organizations and mass organizations.

9.3 TRANSPORT IN ADDIS ABABA

9.3.1 An overview of city transport

Public Transport The motor vehicle fleet in Addis Ababa shows that automobile ownership is significantly low; one automobile for 66.6 persons. Table A1 shows the registered and inspected passenger motor vehicle fleet in Addis Ababa for the period 1992/93 to 2000/01.

Table A1. Motor vehicle fleet in Addis Ababa (1992/93 to 2000/2001)

Year	Automobile		Station Wagon	Double Purpose	Seats				
	5 seat	6 seat			9-12	13-29	30-44	> 45	Total
1992/93	29505	68	5313	2302	4047	586	301	339	42461
1993/94	29300	20	5712	2405	5085	359	226	371	43478
1994/95	32917	11	5580	3211	5618	701	624	580	49242
1995/96	32237		6696	3189	5632	880	584	1021	50249
1996/97	34040		6922	3786	5321	554	361	1168	52152
1997/98	36919		4389	5677	7172	636	687	886	56366
1998/99	36471		4428	5183	6395	268	102	492	53339
1999/00	38639		5014	5615	7060	247	105	491	57207
2000/01	39034		5556	5399	7997	237	106	567	58896

Source: Road Transport Authority

In addition to the passenger motor vehicles, there were about 16,000 registered vehicles for the movement of freight.

Public transport in Addis Ababa consists of conventional bus services provided by the publicly owned Anbessa City Bus Enterprise, mini buses operated by the private sector, conventional taxis, and buses exclusively for employees of large organizations. A total of about 620 motorcycles also provide services to a limited number of people, while the role of bicycles in urban transport is insignificant.

Increase in Demand and the Role of Public Transit Services. The demand for public transport services in Addis Ababa has been growing at a rapid rate due to the expansion of the city and a rise in population. As car ownership has not gone up corresponding to the population growth rate, public transport operations have a dominant role in urban mobility. This is consistent with the following finding from data for 150 cities in developing countries.

For every additional 1,000 people in developing world cities, an extra 350 - 400 public transport trips per day will be generated.[1,2,] Similarly, for every additional square km of city growth, an extra 500 public transport trips per day will be generated. With both effects taking place

simultaneously, passenger- km are rising at a faster rate than the number of individual passengers carried.

Considering the level of poverty in Addis Ababa and on a high level of generality, it would not be possible to state that transport demand has increased in relation to the additional square km of the city's growth and population increase. It should be noted that the difficulties encountered in providing enough jobs for those able and willing to work, and the resulting inadequate aggregate demand is an important factor in faster increase in trips. According to the Report on the 1998 Welfare Monitoring Survey, more than 97 percent of sample number of households walked to reach facilities such as food market, health center and other basic facilities and services. This general pattern is also applicable for Addis Ababa (which was also included in the survey), as the findings confirm no major differences between urban and rural areas.[3] Evidence from a study that goes back to the 1980's indicated that more than 90 percent of Addis Ababa's home-to-work mobility was by the walking mode.[4] In light of this, the issue of poverty is an important ingredient in introducing solutions to the urban mobility problem in Addis Ababa.

One of the characteristics of the urban public transport sector in Addis Ababa is that mini-buses have been playing a greater role, partly because they achieve higher frequency due to their adaptability to difficult operating conditions of congestion as compared to the conventional buses of Anbessa which require larger road space.

The Anbessa City Bus Enterprise provides subsidized scheduled services with fixed stopping points and established routes to a large number of passengers, about 10.5 million in 1988/89, dropping to 8.5 million in 1993/94, increasing to 13 million in 1997/98 and 18.9 million in 2000/2001. The fleet size of Anbessa has increased from 171 in 1992/93 to 255 in 1997/98, 355 in 1998/99, reaching 415 buses in 2001/2002. The Enterprise serves a total of 85 routes and currently one bus is available for 6193 people. While the Anbessa bus service enjoyed monopoly prior to 1987, a ban on import of private vehicles enforced by the government and as the continuing rapid growing demand for transport could not be met by one large operator, mini-buses were encouraged to provide services.

The removal of restriction on entry to passenger transport business in Addis Ababa led to a sharp rise in the number of mini-buses. In 1992/93, there were only a total of 4025 taxis registered in Addis Ababa. The fleet of taxis (predominantly mini-buses) increased to 5471 in 1995/96 and then to 8847 in 2000/2001. According to information obtained from the Road Transport Authority, more than 60 percent of the taxi fleet in Addis Ababa each have capacity greater than five and less than twelve.

The Anbessa City Bus Enterprise provides scheduled services along the 85 routes, and for each route 2 to 10 buses are assigned depending on traffic density. The mini-buses generally operate on regular routes, but are relatively demand-responsive in terms of frequency of services. According to the results of the public transport vehicle operation survey carried out as part of the urban mobility scoping study, the frequency by a mini-bus during peak travel periods (6:30 to

9:00 a.m. in the mornings and 3:30 to 7:00 p.m. the evenings) could be as high as five to eight times the frequency in the off-peak periods. There are more than 30 major mini-bus stations in the city, which are the primary centers of origin and destination. Information obtained from the operations department of Anbessa City Bus Enterprise indicates that each bus, on average operates 170 km per day, which is relatively low as compared to a standard of 200 km per day in the world. [5] This is primarily attributable to the inadequacies of roadway features (narrow width, absence of separate bus lanes, lack of connecting links) and overlap in the route network. Anbessa has four major terminals. Under normal operating conditions, Anbessa City Bus Enterprise runs at the same frequency throughout the day under two shifts (morning and afternoon shifts).

The Addis Ababa population is also served by conventional taxis and service buses. The conventional taxis, generally operate from 'hubs' located at major hotels, the airport and along high density routes in business centers. The service buses (convent9nal and mini-buses) are operated by major organizations as part of conditions in employment contracts. The conventional taxis have become an exclusive - ride service, contributing to a form of demand- responsive service.

The passenger utilization of Anbessa is generally high. While the design capacity of each bus is 100 passengers, the actual utilization has reacted 150 passengers. According to the Annual Report (Amharic version) of the Anbessa City Bus Enterprise, in 2000/2001,out of 366 buses assigned for regular services, the number of buses that were operational for 1 to 12 hours were 32 (9 percent), from 13 to 21 hours 58 buses (16 percent), from 22 to 30 hours 276 buses (82 percent). There are significant variations in the level of utilization of the old Mercedes buses and the new Daf buses.

The average utilization of the mini-buses is low during off-peak hours. Generally, the mini-buses have low utilization from 10 to 11:30 in the mornings and from 2:00 to 4:00 in the afternoons. In the evenings, the time between 7:30 to 9:00 is also characterized by relatively low demand. The market segment for mini-buses includes office employees in government and private sector institutions with an income level generally exceeding about 800 Birr per month and individuals with income level higher than the average (300 to 350 Birr) who go out shopping and social visits as well as students who belong to middle income families. The average occupancy of each mini-bus during off-peak hours is roughly 60 percent.

The headways of Anbessa bus services differ by route from 7 to 30 minutes. On the contrary, the headway of mini-buses is low, about 5 to 8 minutes during peak hours depending on variations in traffic density and at off peak hours about 10 minutes. The urban Transport and Road Network Report issued by the office for the Revision of Addis Ababa Master Plan (ORAAMP), reveals that the average waiting time for the services of Anbessa City Bus Enterprise is half an hour, but could reach 90 or more minutes depending on the particular route and time of day[6]. The same report pointed out that the results of user surveys conducted at different bus stops and stations indicated that more than 60 percent of users traveled distances exceeding 5 km to

work. Out of these riders, about 11 percent had to travel more than 15 km. It added that most government employees, students and self-employed persons either in the informal sector or engaged in small businesses rely on the services of Anbessa at about the same time during the day and as a result there are shortages of buses at the conventional rush hours. A visit to the Bus Enterprise and observations made at the nodal points of Merkato, Piassa, Sidist Kilo and Megenagna indicated failure in meeting the schedule of buses, primarily due to difficulties in matching demand more closely to supply and hence constraining objective of improving reliability. In the same way, it was confirmed that there are shortcomings in analyzing data to determine where supply falls far short of demand, or in some cases where additional capacity is needed. It should be stressed, however, that any action to be adopted by Anbessa would involve changes in achieving specific goals at a broader level, covering aspects such as attempt to alter travel demand patterns as part of the revision of the Addis Ababa Master Plan particularly relating to zoning regulations pertinent to residential, commercial and manufacturing development for more effective service by public transit systems, procedures for operation (government regulations regarding speed limits, licensing requirements, and service standards) as well as the costs borne by operation and/or users, which are not only influenced by the management of the transit system, but also directly governed by regulations of the city administration and subsidies. The most important policies and regulations that are related to system performance and ultimately system costs and effects will be examined briefly in different sections of this report. As the stakeholders involved in decision making that influence transportation supply are quite large (elected representatives of the city administration, government appointees such as heads of transport and communications bureau, the board for Anbessa city bus enterprise, law enforcement officials and implementers such as the engineers in Addis Ababa City Road Authority responsible for planning designing, and constructing the roads and traffic management facilities as well as the professionals in the master plan revision office), systems complexity requires many interactions.

Mini-bus services are mostly rendered by individual operators, who are either organized in associations or are independent of such associations. Anbessa is managed by a board under the City Administration. The city administration receives direction from the newly established Ministry of Federal Affairs. The conventional taxis are privately owned, operated by large number of individuals.

Unlike the mini-buses and conventional taxis, Anbessa has a political and social obligation, irrespective of low fare. Although, the urban private transport industry has been partially deregulated, innovative competition could not be promoted due to restrictive regulation in setting fares. However, in these days of concern for the transportation disadvantaged due to low income and poverty, low transit fares are unavoidable. On the other hand, the goals of public transport in Addis Ababa should aim at providing a higher degree of mobility to stimulate economic growth and development, and a more efficient land use, while at the same time meeting the needs of the transportation disadvantaged.

Transportation and the Poor On a high level of generality it could be stated that poverty in Ethiopia has become a set of conditions that renders a very high percentage of the population (more than 50 percent) incapable of participating in the activities of the society. Various economic and social indicators combined could be used in generating an index for assessing the level of poverty. An article in the proceedings of the Annual conference on the Ethiopian Economy stressed that one of the factors inducing increased demand for resources and by implication the level of poverty is the average annual rate of population, which was only 0.2 percent at the beginning of the century rose to 2.92 percent at the end of the same century.[7] The paper quoted that 'Ethiopia entered the 20th century with about 11 million and left it with about 62.6 million'. This is aggravated by the burden of creating productive employment. The same article pointed out that the increase in the urban labor force could be attributed to, among other things, the rural-urban migration. It was also indicated that limited job opportunities in the formal sector and the increasing urban labor force have given rise to and expansion of the informal sector employment in urban areas. According to the urban informal sector survey conducted by the Central Statistical Authority (CSA) in 1996, a total of about 731,000 persons were employed in the urban informal sector.[8] The survey revealed that the informal sector has engaged 51 percent of the economically active population in Addis Ababa. Additionally, the rate of unemployment in the urban areas was 2.8 percent in 1984 and it became 22 percent in 1994. It should be noted that Addis Ababa has the highest share of the urban population of Ethiopia, which is about 27 percent. According to the 1992 Government and World Bank estimate, sixty-three percent of the urban population can finance only fifty percent of its minimum consumption needs.[9] The situation has probably deteriorated due to the increase in recent years of the number of poor and vulnerable groups partly as a result of impact of structural adjustment programs implemented since 1992.

The difficulties of absorbing a rapidly growing labor force in Addis Ababa primarily due to lack of growth in the different sectors of the economy has implications on aggregate demand. In urban Ethiopia, reflecting the situation in Addis Ababa, household expenditure continues to exceed income up to the income group 3400 to 4199 Birr.[10] Households save about 9.5 percent of total earnings. Further, 40.9 percent of the total income of households goes to food and only 4.8 percent to transport and communications.

According to the study by the international livestock center in 1995/96, about 50 percent of the population of Addis Ababa has monthly income up to 200 Birr[13]. Additionally, about 40 percent of the city's population has a monthly income of 201 to 500 Birr. Another study carried out by the Addis Ababa and Gothenburg universities (Sweden) revealed that about 46.4 percent of the population of Addis Ababa earns a monthly income of Birr 300, and about 61 percent receives monthly income of less than 450 Birr.[13]

Basically, one of the effects of low income and failure of the economy to provide enough jobs for those able and willing to work is inadequate access to food, health services, educational services, etc. Turning to urban mobility in Addis Ababa, it is important to take into consideration

the relationship between the level of poverty and access to facilities and services for those who are working but have low income and those households that are outside the labor force. It is estimated that the medium income for working individuals in Addis Ababa is about 300 Birr. In this context, it should be noted that about 70 percent of Addis Ababa's home-to-work mobility is by walking, largely a reflection of the level of unemployment and inadequate income for those working. In this connection, a World Bank document on country strategy for Ethiopia revealed that amongst 24 other Sub-Saharan African countries, for which 1992 data were available, none showed the characteristics of high proportion of the population below the poverty line as prevailing in Ethiopia.[14]

The poor without access to an automobile and public transport are being forced to carry a heavy burden, which affects mobility and growth. There is adequate evidence from the results of the survey carried out as part of the study that much longer walking distances (up to 15 km) are accepted in Addis Ababa. The findings show that individuals with an average monthly income of less than 70 Birr a week walk from their origins to place of work. The average walking distance for low-income working families can be attributed to inability to finance the cost of public transit. Under the circumstances in Addis Ababa, it would be difficult to determine the 'tolerable' walking distance for the transport - disadvantaged as prices of conventional bus and mini-bus services have become unaffordable. Given the variety of objectives to be considered by the city administration and the federal government, a policy to address urban mobility issues to the poor should take a long term view and should rely more heavily on transit services which operate at higher speeds and capacity than city bus service can provide at relatively lower unit cost and hence lower fares. Several studies have determined threshold values that are desired and minimum as criteria for rapid transit in the framework of a long-range transportation plan. The criteria includes size of central city population, passenger flow per corridor (persons per hour), urban area population, Central Business District (CBD) floor space, CBD destination, peak hour movement based on cordon count and daily CBD destination within the corridor. "This could be an optimum intervention considering that more than half of the population of Addis Ababa lives below the absolute poverty line, according to various studies.

An estimate of the peak hour passenger loads on major axes of the Addis Ababa Transport system was made based on the 1982 data provided by the Cessen-Ansaldo study, as shown in Table A2.

Table A2. Estimated peak hour passenger loads on major axes of the Addis Ababa transport system (passenger/hour)

Corridor	1982	1999 (estimated)
East to West	8300	15,687
West to East	6500	12,285
North - East to Center	3200	6048
North - West to Center	7400	13,986
Center to North-West	6900	13,041
South to Center	3200	6048
Center to South	3800	7182

Source: CESSEN - ANSALDO/FINMECCANICA Group, 1986, Biomass Energy Resources. Main Report and Technical Report 1, National Energy Committee, Ministry of Mines and Energy, Addis Ababa.

There is no doubt that further studies would be required on four aspects of travel in Addis Ababa to address the transport needs of the poor; household travel behavior survey, origin-Destination survey, inventory of the physical characteristics of the land use and transportation system as well as highway and transit counts. Special data could also be required to determine the travel behavior of the poor (both working and unemployed) as well as the handicapped. The Addis Ababa City Roads Authority has already taken the initiative in organizing a database for the road network in Addis Ababa as part of the Pavement Management System Study being carried out by SURECA Consultants of Australia. The Office for the Revision of the Addis Ababa Master Plan (ORAAMP), has come up with the following:

- A *Structure Plan*, comprising a spatial and legal framework for infrastructure and investment.
- A *strategic Framework*, defining policy and flexible and administrative tools to facilitate implementation.
- *Pilot Projects*, which are thought to be practical applications to further assist the realization of plans into actions.
- *Institutional set-up* and capacity Building; aiming at the restructuring of the existing organizational set up of the municipality to enable it facilitate urban management in a sustainable manner.

An analysis of alternatives should seek to clarify key issues in the area of transport and the poor. This is a challenging responsibility as a study of urban travel patterns involving characteristics of a wide range of needs in a broader context would be required to define trip purposes, temporal distribution of trip making, spatial distribution of trip making, and the costs involved so as to establish indications of feasibility for different modes meeting various market segments which also include the poor.

As walking is actually the most vital means of transport for the poor in Addis Ababa, and as goals and objectives of pedestrian system development are lacking, it is considered as a major constraint in urban mobility. It should be stressed that there is no clear understanding of the primary pedestrian transportation characteristics in Addis Ababa, which include speed, walking distance and traffic capacity. Several studies have pointed out that pedestrian system development not only requires a basic understanding of pedestrian traffic flow characteristics similar to that developed for vehicle flow, but also a greater understanding of human behavioral factors. As walking is considered to be, 'a versatile linkage between transportation modes' impossible to duplicate, and as the pedestrians (primarily the poor) have been forced to share the road way with vehicles, it should be given priority in the improvement of urban mobility in Addis Ababa. The situation is exacerbated due to lack of parking provision for vehicles and hence contributing to city inefficiency.

9.3.2 Safety and security

General.. Safety in terms of accident prevention is becoming a great concern in Ethiopia. As riding the conventional bus and mini-buses together with walking are dominant in terms of urban way of life; safety and security are particularly relevant to the poor. Narrow side walks or their complete absence contributes to high motor vehicle accidents. As average individual area occupancies required to attain normal walking speed and to avoid conflicts with others are significantly low, particularly during peak hours, there are problems of safety and security in dense pedestrian traffic flow areas such as Merkato (the major market), Piassa, Arat Kilo etc. In this context, deficiencies in the provision of convenient transfer connections is a factor in safety and security.

Country level. The fatality rate per 100,000 inhabitants is only 1.92, while the fatality rate per 10,000 vehicles is 140.2. Ethiopia has one of the highest fatality rates in relation to its vehicle population. As shown in Table A3 ratios of accidents, causalities, fatalities and serious injuries to 1000 operational vehicles indicate an erratic pattern. It is estimated that road accidents cost the Ethiopian economy in the order of 340 to 450 million Birr per annum, representing about 1 percent of annual GDP.[12]

Table A3. Trend in motor vehicle accidents in Ethiopia

Year	Operational Vehicles	Accidents	Casualties	Fatalities	Serious Injuries	Accident/ 1000 vehicle	Casualties/ 1000 vehicles	Fatalities/ 1000 vehicles	Serious injures/ 1000 vehicles
1996/97	96,502	11,524	8675	1715	2829	119.4	89.9	17.8	29.3
1997/98	103,080	13,302	9128	1693	2159	129.0	88.6	16.4	20.9
1998/99	105,850	11,658	5165	1274	1771	110.1	48.8	12.0	16.7
1999/00	111,519	11,450	5092	1558	1756	102.5	45.7	14.0	15.7
2000/01	121,000	11,776	7957	1261	1697	97.3	65.8	10.4	14.0

Source: Monitoring Report, Road Sector Development Program, 1997/98 to 2000/01, Addis Ababa

There is no specific government policy concerning road safety. Organizations involved in road safety at the country level include the Ethiopian Roads Authority, the Road Transport Authority/Road Transport Communication Bureaus and the Traffic Police. The Ethiopian Roads Authority (ERA) is responsible for setting the geometrical standards of federal roads as well as signs and markings on such roads. The Road Transport Authority (RTA) sets road safety standards and directives to be implemented by the Road Transport and communications Bureaus (RTCBs) of the Regional States. Addis Ababa has its own RTCB under the city council. RTA has a driver training and testing center. Traffic police under each regional state police commission are responsible for enforcement of traffic regulations and for providing data on accidents. The Road Fund Secretariat is mandated for the financing of road safety improvement measures. A Road Safety Program has been formulated by the Road Safety Study, which cover road safety engineering, accident data system, traffic law enforcement, driver training and testing, vehicle testing, traffic safety education and road safety publicity, emergency medical services and vehicle insurance. There are inadequacies in the enforcement of traffic regulations, and in vehicle inspection. Ethiopia has not yet introduced mandatory third party motor vehicle insurance, which has led to legal issues in the compensations to accident victims.

The Transport Amendment Regulation No. 279/1963 constitutes the Ethiopian Road Code, which was based on the English Road code, with the exception of introducing the right side of driving instead of the left side driving. The code covers use of roads, speeds, traffic rules, priority, parking, transport of passengers, transport of merchandise, towing play vehicles, motor cycles and bicycles, animals, pedestrian movement, road signs, lights and safety (driving downhill, repairs and refueling) as well as accidents and miscellaneous aspects.

Addis Ababa. Significant economic and social changes have taken place in Addis Ababa with the introduction of motorized means of transport. However, it is important to note that these changes are not without problems. There are many factors that should be considered in the process of determining the city administration's goals for public transportation. Two of the key issues facing the city administration and other stakeholders and the public in general are safety and security. Motor vehicle accidents in Addis Ababa have become serious concern.

One of the duties of the Addis Ababa Traffic police is to record motor vehicle accidents. The city's Traffic police has developed standard forms for accident reporting. The form covers details related to general reference (time, day, date, collision type, general environment), information on the vehicles and drivers involved. Location details, weather condition, surface of the road, lighting condition, type of accident, class of pedestrians involved in accidents, movement of the vehicles involved in the accidents, severity of casualties, condition of pedestrians involved, the movement of pedestrians (where and how), and the causes of the accidents are also included.

The general location of accidents is presented in a simple hand drawing (locations sketch) by the investigating traffic policemen. Although it was not possible to examine a typical drawing. It should be stressed that without a scaled drawing of the important physical conditions, par-

ticularly at high-accident frequency locations, together with collision diagram, it would be too difficult to interpret patterns. Purely subjective reporting of motor vehicle accidents primarily for prosecution is a major constraint in reporting.

The Addis Ababa Traffic Police faces problems in road accident data analysis. Manual aggregation of data is in-place, although there are two old microcomputers, mainly engaged in recording data for follow-up of status of prosecution. Lack of expertise in motor vehicle accident data analysis, limitations of data collected for engineering use and unavailability of microcomputer -based accident analysis package has prevented establishing common features of patterns. In fact, absence of a comprehensive system of data collection, data entry to a computer and in-depth accident analysis is a major obstacle in traffic management in Addis Ababa.

Surprisingly, the Addis Ababa Traffic Police has managed to compile motor vehicle accident data on weekly, monthly and yearly basis. Unfortunately, limitations in computerization have not allowed detailed data entry, and fast and reliable retrieval, and as a result absence of sufficient analysis.

The number of registered and inspected vehicles in Addis Ababa has increased gradually over the period 1996/97 to 2000/2001. In 1996/97 the total fleet of registered and inspected vehicles was 69248, which rose to 74383 in 2000/2001, by about 7.4 percent (roughly an annual growth rate of 1.5 percent). Table A4 shows the number of registered and inspected vehicles in Addis Ababa for the period 1996/97 to 2000/2001. It should be noted that except automobiles, double purpose vehicles, taxis & mini-buses (9 to 12 and 13 to 29), most of the other vehicle classes operate outside Addis Ababa with their dominant origins and destinations from and to the city respectively. In any case, the registered and inspected vehicles are applicable for determining ratios for accident analysis, with qualifying remarks.

The number of motor vehicle accidents in Addis Ababa has gone up from 6852 in 1996/97 to 7203 in 2000/2001, by about 1.5 percent over a five-year period. The total number of accidents has continued to decline after a sharp rise in 1997/98. The pattern is similar for the different types (severity) of casualties as shown in Table A5. On the whole ratios of accidents to 10,000 registered vehicles, fatalities to 10,000 registered vehicles, serious injuries to 10,000 registered vehicles show a stable increase, except for 2000/2001 in which case a decline was recorded. The trend for each of these indicators is shown as follows:

Accidents to 10,000 Registered vehicles

Year		**Ratio**
1996/97	-	989.4
1997/98	-	1175.6
1998/99	-	1083.2
1999/'00	-	1015.5
2000/'01	-	968.4

Accidents to 10,000 people in 2000/2001

289.4

Fatalities to 10,000 vehicles

Year	Ratio	
1996/97	-	38.1
1997/98	-	38.8
1998/99	-	41.3
1999/'00	-	41.8
2000/'01	-	36.0

Serious injuries to 10,000 vehicles

Year	Ratio	
1996/97	-	49.1
1997/98	-	66.7
1998/99	-	69.3
1999/'00	-	71.7
2000/'01	-	67.1

Regarding accidents by type of vehicles involved, three vehicle classes (automobiles, taxis and trucks with capacity of 4.1 to 10 tons) combined accounted for about 62 percent of the total motor vehicle accidents in Addis Ababa. Automobiles accounted for about 29 percent of the total motor vehicle accidents, while taxis accounted for about 23 percent; Table A6 shows the statistics on motor vehicle accidents by vehicle class.

As for fatality rates by class of vehicles involved in motor vehicle accidents, four vehicle classes (automobile, taxi pick-up with 1 to 4 ton capacity and passenger vehicle with 13 to 45 seats) combined accounted for about 47 percent of the fatalities over the period 1996/97 to 2000/2001. The number of fatalities in motor vehicle accidents by type of vehicle involved is shown in Table A7. The same vehicle classes have been involved in the highest percentage of casualties resulting in serious injury. The number of serious injuries in motor vehicle accidents in Addis Ababa by type of vehicle involved is presented in Table A8. Table A9 shows the number of motor vehicle accidents by type. From the table it is evident that the number of pedestrians involved accounted for about 26 percent of the motor vehicle accidents in 2000/2001 followed by side-by-side collision of vehicles (22percent). Collision characterized by front and back involvement of vehicles accounted for about 20 percent of the total number of accidents. Table A10 shows numbers of general environment conditions in which motor vehicle accidents had taken place. The frequency of accidents is much higher at office areas, market places and entertainment locations.

The number of motor vehicle accidents is significant where there are no junctions (about 66 percent of the total number of accidents in 2000/2001). About 17 percent of total motor vehicle accidents in the same year were at T-junctions, and about 14 percent at cross-junctions (+). Table A11 depicts the number of motor vehicle accidents by location for the period 1996/97 to 2000/2001.

Table A4. Registered and inspected vehicles (Addis Ababa), 1996/97 - 2000/01

Year	Automobile	Station wagon	Double Purpose	Public Transport				Sub total 5	Cargo vehicles (1.5 to18 tone)	Trailer	Road Trailer	Semi Trailer	Sub Total	Total
				9-12	13-29	30-44	>=45							
1996/97	34040	6922	3786	5321	554	361	1168	52152	13181	2819	915	181	17096	69248
1997/98	36919	4389	5677	7172	636	687	886	56366	13402	2131	770	326	16629	72995
1998/99	38471	4428	5183	6395	268	102	492	53339	11366	1996	679	428	14469	67808
1999/'00	38639	5014	5651	7060	247	105	491	57207	11522	1996	677	416	14611	71818
2000/'01	39034	5556	5399	7997	237	106	567	58896	12553	1841	673	420	15487	74383

Source: Road Transport Authority

Table A5 Motor vehicle accidents in Addis Ababa

Year	Fatal	Serious Injure	Light injury	Property Damage	Total No of Accidents	Estimate of Property Damage in '000 Birr
1996/97	264	340	1261	4987	6852	12,311.1
1997/98	283	487	1527	6284	8581	11,685.2
1998/99	280	470	1409	5186	7345	12,019.0
1999/'00	300	515	1358	5120	7293	11,765.4
2000/'01	268	499	1347	5089	7203	14,948.7

Source: Addis Ababa Traffic Police

Table A6. Motor vehicle accidents in Addis Ababa by type of vehicle (1996/97 to 2000/01)

Year	Cycle	Motor cycle	Auto	Station wagon	Pickup up to 1 ton	Goods vehicles			Fuel tanker	Taxi	Passenger vehicles			Special vehs.	Horse carts	Special trailer	Train	Others	Unknown	Total
						1.1 - 4 tone	4.1 - 10 tone	Truck trailer			Up to 12	13 - 45	Buses over 45							
1996 - 1997	32	25	1857	784	475	289	718	135	60	1783	86	168	366	29	3	-	1	2	39	6852
1997 - 1998	39	45	2355	881	666	344	898	176	67	2136	123	209	542	18	6	3	4	-	72	8584
1998 - 1999	47	40	2476	825	310	310	747	156	63	1570	110	169	492	16	-	2	4	-	53	7345
1999 - 2000	43	42	2151	948	629	279	675	152	60	1466	102	167	501	24	3	-	3	-	48	7293
2000 - 2001	42	43	2068	957	601	347	732	153	30	1485	108	122	438	27	4	-	3	-	43	7203

Table A7. Fatality numbers in motor vehicle accidents in Addis Ababa by type of vehicle involved (1996/97 to 2000/01)

Year	Cycle	Motor cycle	Auto	Station wagon	Pickup up to 1 ton	Goods vehicles			Fuel tanker	Taxi	Passenger vehicles			Special vehs.	Horse carts	Special trailer	Train	Others	Unknown	Total
						1.1 - 4 tone	4.1 - 10 tone	Truck trailer			Up to 12	13 - 45	Buses over 45							
1996 - 1997	2	-	44	22	18	18	42	9	6	52	2	18	17	3	-	-	-	-	16	264
1997 - 1998	-	-	54	28	15	19	42	10	2	44	4	156	24	-	1	1	3	-	21	283
1998 - 1999	3	-	37	19	17	12	51	14	3	58	7	11	17	3	-	-	2	-	26	280
1999 - 2000	6	-	46	28	18	12	37	11	6	67	5	12	28	4	1	-	1	-	18	300
2000 - 2001	2	1	34	25	13	15	57	13	1	52	10	8	17	1	-	-	-	-	15	268

Table A8. Serious injuries in motor vehicle accidents in Addis Ababa by type of vehicle involved (1996/97 to 2000/01)

Year	Cycle	Motor cycle	Auto	Station wagon	Pickup up to 1 ton	Goods vehicles			Fuel tanker	Taxi	Passenger vehicles			Special vehs.	Horse carts	Spe-cial. trailer	Train	Others	Un-known	Total
						1.1 - 4 ton	4.1 - 10 ton	Truck trailer			Up to 12	13 - 45	Buses over 45							
1996 - 1997	4	1	92	37	25	13	24	2	5	97	11	4	14	1	-	-	1	-	9	40
1997 - 1998	8	6	150	34	35	26	29	8	6	109	6	9	33	1	3	-	1	-	23	487
1998 - 1999	3	5	147	55	29	24	31	6	1	112	4	14	23	2	-	-	2	-	12	470
1999 - 2000	5	6	155	66	32	14	31	9	2	130	12	7	32	2	-	-	2	-	10	515
2000 - 2001	7	6	133	61	39	26	32	12	3	116	15	5	29	2	2	-	1	-	10	499

Table A9 Number of major types of motor vehicle accidents (Addis Ababa), 1996/97 to 2000/01

Types of Accidents	Year				
	1996/97	1997/98	1998/99	1999/00	2000/01
Head on collision	231	323	207	240	212
Vehicles - front & back	1401	1699	1411	1325	1260
Vehicles - front & side (combination.)	1622	1711	1386	1272	1458
Vehicles - Side by side	1171	1887	1518	1692	1578
Vehicle over turn	70	63	85	79	76
Pedestrian victims	1688	2098	1970	1961	1882
Animal Victims	5	4			2
Passengers Jumping off (from vehicles)	18	27	42	25	43
Collision with parked vehicle	410	401	421	364	429
Collision with static objects	229	350	311	330	255
Collision with traffic	3	9	1	5	5
Others	4	9	9		2
Unknown			2		1
Total	**6852**	**8581**	**7363**	**7293**	**7203**

Source: Addis Ababa Traffic Police

Table A10 Number of General Environment Conditions

General Environment	Year				
	1996/97	1997/98	1998/99	1999/200	2000/2001
Rural (Sub-urban)		1	1	1	
Schools	170	235	225	230	300
Factories	35	47	39	35	45
Places of workshop	205	336	322	308	326
Market places	778	1335	1044	1023	1082
Entertainment Places	1032	1226	895	787	860
Medical Centers	61	80	64	56	79
Offices	3611	4134	3958	4101	3842
Residential	960	1187	795	749	662
Others			2		7
Total	6852	8581	7345	7290	7203

Source: Addis Ababa Traffic Police

Table A11 Number of motor vehicle accidents by location (Addis Ababa), 1996/97 - 2000/01

Location Designation	Year				
	1996/97	1997/98	1998/99	1999/00	2000/01
1. No Junction	5202	5825	4870	4955	4755
2. Y Junction	47	110	25	32	56
3. T Junction	725	1293	1233	1134	1223
4. Round About	150	172	169	159	138
5. Cross Intersection (+)	720	1151	1027	929	1014
6. Multiple Intersection (*)	8	29	21	23	17
7. Rail Crossing	-	1	-	-	-
8. Others	-	-	-	1	-
Total	**6852**	**8581**	**7345**	**7233**	**7203**

Source: Addis Ababa Traffic Police

A cause analysis in motor vehicle accidents requires not only accident reporting but also supplementary data collection, technical data preparation and professional reconstruction. The first level of accident investigation in Addis Ababa is the duty of the Traffic Police, which as was stated earlier on is directed toward pre-crash circumstances, crash circumstances and to a lesser degree post-crash circumstances, or a combination al all these. Unfortunately, road and vehicle examination and tests as part of technical data preparation are not carried out satisfactorily, as there are shortcomings in skill availability and equipment-supported techniques. It should be noted that accident reconstruction involving inferences about speeds, position on the road, observation of traffic control devices could only be carried out in the future with the assistance of, for example, professional associations or universities.

In the motor vehicle accident statistics supplied by the Addis Ababa Traffic Police, causes have been determined, based on reporting of each accident by the investigating traffic policeman rather than evaluating accident patterns, number of accidents having common characteristics. The most important causes of accidents, as stated by the Addis Ababa Traffic Police for the period 1992/93 to 1997/98 are the following:

- 98.3 percent due to poor driver behavior
- 0.8 percent due to inadequately maintained vehicles
- percent due to poor condition of the roads
- 0.75 percent due to absence of adequate traffic management and control facilities.

The Traffic Police Report for 2000/2001 stated that the following are the primary causes of motor vehicle accidents in Addis Ababa.

- 22.7 percent, due to not giving priority to pedestrians
- 17.4 percent, due to lack of maintaining adequate gap with vehicle ahead
- 17.1 percent, due to exceeding speed limit.
- 15 percent, due to not giving priority to vehicles by considering direction of travel, and yield signs, warning signal, etc..
- 8.5 percent, due to instant movement after parking or stopping without any sign.
- 8.4 percent, due to improper overtaking.

In principle, a detailed study of motor vehicle accidents would be required for cause analysis. Unfortunately, this is lacking in Addis Ababa.

Traffic management in Addis Ababa is constrained by a number of factors, which include the following:

- Insufficient traffic police force (only 52 motor cycle supported and 307 without motor cycles)
- Lack of effective mobile radio communication for the traffic police
- Only one old ambulance available for emergency services, without first aid.
- Weakness in applying standards by about 40 government institutions in issuing driving licenses
- An old highway code that has served for about 30 years that requires re-visiting and updating
- Absence of instruments for vehicle inspection
- Lack of alcohol test equipment in the enforcement of traffic regulations
- No organized public awareness campaign as part of road user education
- Educational curriculums do not give priority to road safety education
- Overemphasis on routine motor vehicle investigation entirely for persecution purposes
- Lack of capacity in placing traffic control devices, including traffic signs, signs, and pavement markings
- Weaknesses in institutional capacity for traffic planning, including traffic data management, traffic projection and assignment, types of routes, and locations
- Short durability of road way markings
- Slow pace in the improvement of street lighting, including luminary selection and location
- There are only 26 traffic signals in Addis Ababa (about 2 per 100 km of roads), extremely low particularly in relation to the city's population (1 traffic control signal for 9885 persons.)

The institutional aspect, which will be covered later on this report, is critical for traffic engineering administration. From the point of view of organizational arrangement, the Addis Ababa Road Transport and Communications Bureau has overall responsibility for developing rules, standards, and practices, which should aim at facilitating safe traffic movement. But, traffic control work is related to traffic police activity and the functions of the Addis Ababa City

Road Authority (AACRA). As the traffic management function is related to parking, pedestrian movements, transit operations, terminal facilities, rush-hour traffic controls, etc, the importance of sound traffic planning and operations could not be over emphasized. There is also a need for establishing working relationship between the concerned institutions. Currently, there is a Traffic Safety Committee that is responsible for resolving problems related to traffic signs, signals, parking, and black spots. The committee investigates requests and complaints from organizations and individuals over specific problems. It holds scheduled meetings and comes up with recommended solutions for facilitating the orderly flow of traffic. Unfortunately, the committee lacks the involvement of professionals in traffic engineering and a manual of instructions for its guidance.

The Addis Ababa City Roads Authority's Engineering Department is responsible for introducing traffic signals as part of the construction of new roads. In principle, 'the principal function of traffic control signals is to permit streams of traffic to share the same intersection by means of time separation. Thus, the major criterion of signal control is the volume of traffic entering the intersection. Although the poorly staffed safety unit of AACRA has carried out traffic counts at selected intersections, there is no sufficient data for determining traffic characteristics. There has not been any form of origin - destination survey over the last decade or more to obtain information on existing travel practices so that efficient public transportation could be planned and provided. In more specific terms, the installation of traffic signals requires traffic flow data and speed, among other aspects. It is expected that the on-going study by SURECA Consultants of Australia for the development and implementation of a Pavement Management System for Addis Ababa would provide a database for the planning and design of signals and the improvement of roads, side walks, and parking space. Table A12 provides a description of existing intersections at Addis Ababa. Traffic flow data for selected junction as supplied by the Traffic Safety unit of AACRA is shown in Annex 1.

One of the factors that has contributed to difficulties in promoting road safety in Addis Ababa has been absence of city design controls and criterion for the road network. Without good geometric design, it would not be possible to provide a safe, efficient and convenient system of road, consistent with the volumes, speeds and characteristics of the vehicles, and drivers that use them. In the same way, a road classification system is also required to establish a 'logical, integrated system' and to relate to geometric traffic control and other design standards. The requirements for side walks, under passes and overpasses as well as facilities at bus stops as well as criteria for parking provision should be included in design guides. SURECA Consultants are also engaged for the preparation of Road Design Manual and Standard Specifications for Addis Ababa. It is hoped that the Consultants would furnish basic criteria and values for different types of roads by considering the range of conditions prevailing or are likely to develop in Addis Ababa. The principal operational differences in the amount of interference particularly by pedestrians is an important element in the planning and design of roads in Addis Ababa.

The provision of adequate parking is an essential element in any city. As the number of legal parking spaces in Addis Ababa has been decreased due to 'congestion', on-street parking is con-

tributing to inefficiency of mobility. Unfortunately, there is lack of parking policy. Additionally, there is no data on existing parking supply, parking demand, characteristics of current parking usage. There are no parking modules for design purposes that are applicable to Addis Ababa's needs relating to parking generators, influencing facility location. As locating parking facilities has a safety element, it should be considered as an integral part of traffic management in Addis Ababa.

It was stated earlier in this section of the report that there are capacity limitations in the analysis of motor vehicle accidents. This is particularly relevant in determining high-accident frequency locations ("black spots"), along with the location's traffic volume to serve as a guide for the detailed study of engineering alternatives. In the absence of standardized special markings on the road network (e.g. km posts) and/or road log books or strip maps for identifying locations, analyzing accidents at specific locations becomes difficult. In any case, the Addis Ababa Traffic Police has identified a number of Black Spots in the city shown in Table A13.

Table A12 Existing intersections in Addis Ababa

Type of Intersection	Quantity
A. At grade intersections without light point	
. T intersection	21
. Cross Intersection	58
. Multiple Intersection	3
Total	**82**
B. At grade intersections signalized and channeled	
. T intersection	5
. Cross Intersection	16
. Multiple Intersection	nav
Total	**21**
C. Round about Intersection	

Nav - Not available

Source: Addis Ababa City Roads Authority

Table A13 Road sections /Black Spots in Addis Ababa

Road Sections /Black Spots	Origin From	Destination To
1. Debre Zait road	Gottera	Kalitti Control Spot
2. Tessema Aba Kemaw Road	Tekle Haimanot	Goma Kuteba
3. Ras Mekonnen Road	Meskel Square	Mexico
4. Ras Desta Damtwe Road	Ghion Hotel	Harambie Hotel
5. Jima Road	Head Quarters of Ground Army	Zenebe Work bridge
6. Ras Biru Road	4th Ground Army Headquarter	Gottera
6. Messalmiya	Messalmya	Ammanuel Total
7. Patriots Road	Yohannes Church	Wingate School
7. Africa Road	Meskel Square	Bole (Airport)
8. Churchill Road	Banco Di Roma Traffic light	Legehar Traffic light
9. Megenagna	Megenagna	CMC
10. Fekre Mariam Aba Techan Road	Kokebe Tsebah Sec. School	Megenagna
11. Megenagna	Megenagna along AMCE	MOENCO
12. Habte Giorgis Bridge	Habte Giorgis Bridge	Ammanuel Messalemiya
13. Kazanches	Kazanches	Kazanches

Source: Addis Ababa Traffic Police

9.3.3 The Role of the Authorities

General. Various legal dispositions govern the roles of authorities in Addis Ababa. In accordance with the constitution of the Federal Democratic Republic of Ethiopia (FDRE), an elected council heads the city's overall administration. The city's high-level political administrative authority reports to the Federal Government, according to the recent restructuring, to the Ministry of Federal Affairs.

The City Council. The Addis Ababa City Council enacts laws, issues directives, designs broad policies and strategies, reviews and approves plans and programs and monitors their implementation. These powers of the city council also apply to urban mobility. The duties of the city council are in line with the provisions of the constitution of the FDRE regarding devolution of power.

Federal Government Institutions in Transport Sector: Road Transport Authority (RTA). According to Article 7 of Proclamation No. 14/1992, the powers and duties of the Road Transport Authority are limited to issuing and supervising the implementation of directives relating to registration and control of vehicles, licensing of persons driving vehicles, licensing of persons and enterprises engaged in motor vehicle operation, certification of technical competence of garages engaged in the repair and maintenance of vehicles, conditions of carriage for passenger, mail and goods by commercial road transport vehicles, activities of transport associations and

provision of motor vehicle insurance coverage (goods and passengers by public commercial road transport vehicles), RTA has also the duty to issue and enforce standard specifications for terminals and trip schedules of road transport vehicles. It also has the duty to approve trip schedules prepared by associations for public commercial road transport vehicles linking two or more regional states. There are six classes of vehicle driving licenses issued as per the directives established by proclamation, as follows:

- Class I Motor cycles and motorcycle combinations, minimum age 18
- Class II Saloon cars, dual - purpose vehicles of up to twelve seats other than taxis, minimum age 18
- Freight vehicles with a capacity up to ten quintals (1 ton), All three - wheel vehicles.
- Class III Any vehicle in Class II, minimum age 21
- Any freight vehicle with GVW up to 7500 kg
- Class IV Any vehicle in class II or III, minimum age 21
- Any sized freight vehicle
- Class V Any vehicle in Class II, III or IV, minimum age 21
- Any truck trailer, tractor - Trailer or special mobile equipment subject to Endorsement (not applicable)
- Class VI Any vehicle in class II or class III, minimum age 21
- Any passenger vehicle

It should be noted that class V licensed shall only be valid for any truck-trailer, tractor trailer or types of special mobile equipment if so endorsed. Endorsement will only take place after the driver has passed a test on that type of vehicle (e.g. a driver licensed to drive a truck-trailer is not allowed to drive a tractor-trailer until after passing a test on tractor-trailer). It is also necessary that experience for twelve months without having an accident is required before qualifying for the next higher driving license class.

One of the issues regarding the role of RTA is the practical application of the supervision of the implementation of directives (for instance by the Addis Ababa Road Transport and Communications Bureau), as modes of operations have not been clearly defined.

Road Fund Administration. The Road Fund was established by proclamation No. 66/1997 to finance the maintenance of roads and road safety measures. Addis Ababa is a beneficiary from the allocations of the Road Fund, along with the other institutions, the Federal Ethiopian Roads Authority (ERA), the Regional Road Authorities and a number of municipalities. The Fund's sources of revenue include the following:

- budget allocated by the government
- road maintenance fuel levy
- annual vehicle license renewal fee
- overloading fines
- any other road tariff levied as may be necessary

One of the issues regarding road fund allocations is the criterion to be employed for rural and urban financing as well as the level and structures of the different sources of revenue.

City Government Institutions in Urban Mobility: The Road Transport and Communications Bureau. According to the Definition of Powers and Duties of the Central and Regional Executive organs - Regional Transport Bureau's (Article 45 of Proclamation No. 41/1993), the following are the duties of the Addis Ababa City Road Transport and Communications Bureau:

- Develop Road Transport Services in the region
- Ensure the application of Road Transport laws and regulation
- Together with other institutions, stimulate infrastructure and commercial development
- Facilitate integrated transport in the city
- Register vehicles, conduct technical inspections and issue driving licenses
- Issue licenses for commercial purposes, register commercial associations, and approve trip schedules
- Issue licenses for garages and driving schools
- Establish and operate public road terminals
- Collect, compile and transfer data and information to those concerned

The Addis Ababa City Road Transport and communications Bureau has two Departments, Vehicles and Drivers Affairs Department and Transport Systems Department as well as service giving entities such as planning and programming.

The functions of the vehicles and Drivers Affairs are related to vehicle registration, licensing and inspection as well as issuing and renewal of driver licenses.

The Transport Systems Department is a new one, which has a Traffic Safety Section, a Terminals Section, a Prosecution Section and Vehicle Inspection Section.

The Bureau has a total of 428 permanent employees, of whom eleven have degrees and about 70 diplomas from technical and vocational schools. Most of those with diplomas are engaged in the inspection of vehicles. The Planning and Programming Office has a total of about 10 employees, none of them with training in transportation.

The Bureau receives revenue from road user charges (vehicle registration, licensing and inspection plus from issue and renewal of driving licenses, etc). In 1999/2000, the total revenue generated from road user charges was about 72 million Birr, which declined to sum of 60.5 million Birr in 2000/2001. Charges for vehicle inspection account for about 65 percent of total user revenue collected by the bureau. The bureau transfers the funds to the city finance bureau, which only releases funds on the basis of approval of annual budget by the Addis Ababa City Council. Unless there are dedicated funds for the bureau's activities, it would not be possible to improve the urban mobility situation in the city.

The Addis Ababa Traffic Police The Addis Ababa Police Commission directs the activities of the Addis Ababa Traffic Police. The Addis Ababa City Government has issued its own Road Traffic Safety Regulations (No 15/1998). The regulations provide for the following:

- determination of offences and penalties
- six categories of offences and the amount of fine to be imposed for each category
- petition lodging
- keeping of records, etc.

There are differences in levels of fines imposed in Addis Ababa and other Regions following the Road Traffic Safety Regulation issued by the Addis Ababa City Government.

The most relevant aspects regarding the roles of the Authorities in Addis Ababa are related to the provision of public transport services. Anbessa City Bus Enterprise is a parastatal administered by a Board, but under the authority of the Addis Ababa City council. Thus, there is a failure in mixing the roles of the city government and that of a transit organization. The Road Transport and Communications Bureau is directly involved in setting fares for the mini-buses, conventional taxis and any other public transport services. The Bureau has also a role of approving schedules. The city council also approves purchases of buses, routes and other matters of strategic significance to Anbessa. Of particular importance is that the city council determines the structures of fares applied by the Anbessa City Bus Enterprise and grants subsidy on a year-by-year basis depending on the anticipated 'financial position'.

There are two major issues concerning the role of the authorities in Addis Ababa's urban mobility scene and these are:

The difficulty of meeting the challenge of providing transport services to the public at 'reasonable' fare levels while at the same time achieving greater efficiency. This is related to the definition of the city government's objectives in general. This is relevant to both public and private transit organizations.

Problems of ensuring that the assets of the Anbessa City Bus Enterprise obtain a reasonable financial return so that its operation would be sustainable. In this connection, one of the constraints is that there is no clear definition of the role of the city government and that of the public transport parastatal. This dilemma has its root causes in the regulatory framework.

Another view of the role of the Authorities in Addis Ababa is concerned with planning responsibilities.

Coordination of Land-use and Urban Transport Plan. The Addis Ababa Master Plan Revision Project (ORAAMP) was launched in 1999, with the mission to update the master plan made official in 1986. The revision process is currently under way. A detailed knowledge of the characteristics of urban travel patterns is required in planning for mobility in Addis Ababa, as a component of the revision of the city's Master Plan. The Master Plan Revision Office has made

an effort to deal with 'Urban Transport and Road Network'. However, there seem to be limitations in forecasting the 'urban activity system' in relation to forecasting the future demand for transportation. Additionally, the enhancement of the performance of transportation systems (present and anticipated) could require policies and programs which might have to be designed to alter urban activity patterns. It is this context that the urban planning transportation process has to undergo considerable change. The Addis Ababa City Road Transport and Communications Bureau is concentrating on vehicle licensing registration and inspection as well as on issuing driving licenses. Instead, the Bureau's role should focus on responding to a wide range of urban mobility issues. The goal of the Bureau should aim at a more efficient use of transport system, which requires drawing together the 'fragmented components' of traffic engineering, transit operations and overall transportation system management. The development of an urban mobility Information system has to be an integral part of the Addis Ababa City Road Transport and Communications Bureau's activities. It would be necessary to formulate practical objectives for urban mobility so that transit planning could be carried out effectively. A market-oriented public transport agency (an urban transport Agency) would be required to carryout the following foundations:

- To coordinate with city authorities in the arrangement or re-arrangement of land use based on the requirements for transport system infrastructure which includes the rights - of - way over which vehicles pass, the signal system, terminal and other facilities that would be needed.
- To carryout studies related to the characteristics of urban travel in Addis Ababa and organize a database for forecasting demand.
- Evaluate alternative public transportation system and recommend for decision-making the most appropriate taking into consideration demand, cost of construction and operation, financing and affordability as well as social and environmental impacts.
- Set standards for vehicles, operational performance, safety and environmental aspects.
- Monitor the performance of public transit and introduce improvement measurers.
- Promote the role of the private sector in the improvement of public transport, for example in turnkey contracting for mass transit services.

9.4 PROFILE OF ADDIS ABABA

9.4.1 History

Addis Ababa, the federal capital of Ethiopia was founded by Emperor Menelik II around 1891. It was initially established as a garrison town (formality on the slopes of mount Wuchacha - west of the present capital, moved to the Entoto mountains which overlooks Addis Ababa from the north). At Entoto, the capital had a population of not less than 50,000 from the start. It was later on that was realized by the Emperor that Entoto was not suitable for a capital as its topography was rugged to accommodate a growing population and meet its service demands.

After a visit to what is commonly called Filwoha (natural hot spring), a new settlement began in 1887. The Queen named the new settlement Addis Ababa, literally new flower. According to historical records, the first stone buildings were erected in 1891, a few months after the coronation of the Emperor. Addis Ababa has since proved to be good for a modern capital as it is centrally positioned with sufficient water supply, abundant timber and invigorating climate. The altitude of the city is in the range of 2300 to 2500 meters about sea level.

9.4.2 Area

The area of Addis Ababa is 530.14 square km. It is anticipated that the city's area would expand to reach 830 square km in the medium term. Initially, the awarding of large land grants to Emperor Menelik's war chiefs and men of state at several hilltops had contributed to the city's distinct historic pattern of development. The nationalization of urban land and extra houses by the Mengistu regime had significant ramifications on the city's growth, positive and negative.

9.4.3 Administrative set-up

Addis Ababa is divided into six zones. There are 28 weredas under the six zones. The weredas are further divided into about 300 'kebeles' or local neighborhood associations. Representatives from each hierarchy are elected, which ultimately constitutes the Addis Ababa City council. The area of each of the six zones is given as follows:

Zone 1	-	4 weredas (3,4,5 and 6) (7.95 sq. km)
Zone 2	-	5 weredas (20, 21, 22, 23, 24) (90.4 sq. km)
Zone 3	-	4 weredas (17, 18, 19, 28) (222.18 sq. km)
Zone 4	-	7 weredas (1,9,11,12,13,15,16) (3.28 sq. km)
Zone 5	-	6 weredas (2,7,8,10, 14, 25) 42.5 sq. km)
Zone 6	-	2 weredas (26 and 27) (113.83 sq. km)

9.4.4 Population

In 1982, Addis Ababa had a population of 1.3 million, representing 4 percent of the population of the country and nearly a third of all urban dwellers. The current population of Addis Ababa is about 2.57 million, about 3.9 percent of the population of Ethiopia. It also represents about 26 percent of the urban population of Ethiopia (estimated to be 9.89 million in 2000/2001). It is the largest city in eastern half of Africa between Cairo and Johannesburg.

Addis Ababa has an aggregate population density of 4847.8 persons per square km.

The population of Addis Ababa is forecasted to reach 5.1 million in 2030 as follows:

Year		Numbers
2005	-	2,887,000
2010	-	3,328,000

2015	-	3,792,000
2020	-	4,246,000
2025	-	4,664,000
2030	-	5,087,000

The population density per square kilometer of the six zones of Addis Ababa is given as follows:

Zone 1	-	48,776.5 persons
Zone 2	-	5826.4 ''
Zone 3	-	2011.9 ''
Zone 4	-	10,675.3 "
Zone 5	-	12,608.2 "
Zone 6	-	912.7 "

At the wereda level, the highest population density is that of wereda 5 of zone 1 (64,818.5 persons per square km) and the lowest is that of wereda 26 of zone 6 (571.6 persons per square km). The variations in population densities have implications in the temporal distribution of trip making. In the same way, as transit travel (conventional and mini bus) are more spatially "concentrated" in terms of density, and as walking is expected to be dominant in areas of higher population density, such inter-relationships become an important element of urban mobility in Addis Ababa. It is therefore necessary to evaluate both the temporal (time) and spatial (space) distribution of travel in relation to population densities in Addis Ababa. This along with socio-economic characteristics would be necessary in establishing a set of goals and objectives to guide planners in their analysis and evaluation of urban mobility improvement proposals for Addis Ababa.

9.4.5 Unemployment

One of the sources of poverty in Addis Ababa is the low demand for labor. According to a report presented by a representative of the Addis Ababa city administration concerning the social dimensions of poverty, the unemployment rate has reached 34.7 percent, as the capital accounts for about 46.9 percent of the number of migrants.[15] The unemployment issue is critical as without a policy of raising demand for labor, interventions for remedying poverty by piecemeal means will not be effective. Essentially, there exists a link between the level of unemployment and urban mobility.

It should be noted that the unemployment rate can only be brought down to a more 'appropriate' level by more effective structure of remedial measures are in place in the broader macro economic context.

9.4.6 Poverty

Unemployment is not the only major cause of poverty in Addis Ababa. The inability of individuals to earn an income level above the poverty line is another dimension of poverty. This aspect is related to inadequate marginal productivity and hence the price that employers are willing to pay for labor services. Undoubtedly, limited employment opportunities together with inability to acquire skills is a significant factor contributing to incomes falling short of the poverty line.

The household income and expenditure survey conducted by CSA reveals that 41.5 percent of the households in Addis Ababa can earn less than Birr 4100 per year (about 342 per month). 19.6 percent falls in the range of Birr 4200 to 6,599 per year (350 to 550 Birr per month).[10] It is estimated that about 50 percent of the city's population lives under the poverty line. On the other hand, it is estimated that the capital contributes about 25 percent to national Gross Domestic Product (GDP).[15] Yet, some of the manifestations of urban poverty in Addis Ababa are aggravated by fast growing population of street children, homelessness, beggary, overcrowding and congested living conditions as clearly apparent from observations. It is estimated that there are about 40,000 street children in Addis Ababa.[13] An appraisal of the level of poverty in Addis Ababa, with particular emphasis on estimating income deficiency of the large percentage of the population, is essential in providing solutions to urban mobility problems. The high percentage of walking in urban mobility in Addis Ababa is, however, a symptom of the level of poverty. The prospects for improved mobility in the city would be influenced by an increase in the demand for travel, which can only be achieved by raising the incomes of the poor to an "acceptable" level. According to the Report on Household Income, Consumption and Expenditure Survey by the CSA, for urban households, household expenditure continues to exceed income up to the income group 3400 to 4199 Birr per year.

The severity of the poverty situation in Addis Ababa is also vividly reflected in the provision of shelter, inadequacies of water supply (69 percent of the demand), low level of sewer infrastructure (about 98.7 percent of the city's population is not connected to modern system), insufficient solid waste collection (only 65 percent capacity), limited public transport services, overcrowding in schools, low health coverage and chronic malnutrition. According to the 1996 welfare Monitoring Survey, about 5.1 percent of children were classified as wasted, 21 percent under weight and 49 percent stunted.[3] The Addis Ababa municipality regularly reports that the city suffers from human excreta, overflowing of latrines, stagnant water, industrial and commercial wastes. Flooding is also a major problem in Addis Ababa, constraining mobility during the rainy season for those who particularly rely on walking. According to the city administration, in 1993/94 and 1995/96, 20 died, 9032 become homeless due to flooding. Although there is no information available for the study, there is no doubt that vehicle exhaust is an important pollutant. As there are no controls of engine pollutant emissions, restrictions have to be introduced before they reach unhealthful proportions.

9.4.7 Schools

In Addis Ababa, there are a total of about 265 schools, of which about 60 percent are government schools. There is an important linkage between student mobility and the city's transportation system. The peaking of travel by students between residential areas and schools each week day morning, and again from 4 to 6 p.m., which also correspond to hours for work trips is an important characteristic in the city's urban travel pattern. From an urban planning mobility study perspective, an analysis of travel by students is important because it can be used to deduce demand patterns particularly during peak hours. It should be noted that the Anbessa City Bus Enterprise provides discount fares for students. According to the Report on the 1998 welfare monitoring survey by CSA, about 61.2 percent of urban households did not use the nearest primary school. Additionally, close to 90 percent of the households did not use the nearest secondary school. This is an important element regarding the spatial location of origin and destinations by students.

9.4.8 Health services

There are a total of 17 hospitals, 18 health stations 11 clinics and 21 health posts in Addis Ababa administered by government. There are also 5 hospitals and about 160 clinics run by the private sector. The results of the poverty monitoring survey indicated that about 91 percent of members of households in urban areas relied on walking as a means of transport to reach to the nearest health services irrespective of where they were residing. About 5.7 percent used public transpiration and about 1.9 percent used pack animals and horse-drawn carts.

9.4.9 Expansion of Addis Ababa

Addis Ababa's radius has widened, particularly to the east and south. An understanding of the relationships between the expansion of the city, travel facility, and trip making characteristics is essential for urban mobility planning. At present, the pattern of urbanization is that as the city expands, peripheral areas have become part of the metropolis. Consequently bus/taxi routes lengthen and running times increase. This is a primary input to future transportation planning as spatial distribution of people and activities change as the city expands.

9.5 A Summary of Transport Characteristics

The following box summarizes the key features of transport in Addis Ababa.

Box 1. Addis Ababa

City Statistics				Income/hour	$ 100 per year U.S. $
Population	2.57 (growth rate 3.1%	Area	530.14 km^2		
Extent and use of public Transport					
Share of Public Transport (%)					
PT	26	Car	4	Car Own	66 veh./1000 population
Public Transport Mode Split (%)					
Bus	26.9%	mini bus	72.7%	Taxi	1.4%

In 1986, it was estimated (based on survey) that about 70% of the city population depended on the walking mode. In 1988 it was estimated that about 55.9% of the population, used walking for mobility. According to current indications, the 1986 estimate is still applicable, as confirmed by the survey carried out by the Addis Ababa Master Plan Revision Office.

Public Transport Market

The Anbessa Bus Enterprise, a parastatal under the city council, moves around 27 percent of all public transport passengers. It operates a fleet of 415 conventional buses (102 old and 363 new), with an average age of 6 years, and provides scheduled services along 85 routes as well as non-stop rapid services (express service). About 10 routes are provided with additional express services. The Enterprise is reporting a small surplus of 1.1 million Birr in 1998/99 (1 U.S$ =8.79 Ethiopian Birr) after experiencing heavy losses for several years. Although there is a system of flat fares, there is a range varying with distance, 25 Ethiopia cents for up to 9 kilometers), 35 Ethiopian cents up to 9.9 kilometers, 50 Ethiopian cents for 9.9 kilometers up to 14.2 kilometers, and so on. The highest fare is 2.25 Birr for a distance of about 44 kilometers) extending to the peripheral areas to the west and south of the capital. Additional 10 Ethiopian cents per trip are charged for express services. A new fare of 250 Birr has been introduced for use by government employees for unlimited number of trips over a three-month period.

The remaining 73 percent of public transport passengers move by private operators, which have about 500 taxis and 7997 mini-buses in urban and sub-urban area of Addis Ababa.

Institutional and Regulatory Framework

The road transport industry was deregulated in 1992 as part of the liberalization of the economy. The city Administration is directly involved in setting fares for the Anbessa City Enterprise as it also has the power to allow subsidies for its operation. The city Administration, through the Road Transport and Communications Bureau reviews and approves the schedules and fares of mini-buses. The conventional taxis that provide exclusive services have the flexibility to set fares depending on demand. Factors of politics relating to the poor have become the real impetus for the city administration in subsidizing passenger fares of Anbessa (by 21 cents per trip). It could be stated that there are conflicts between financial sustainability in urban transport and broad objectives of reducing the cost burden on the poor.

Government intends to privatize the Anbessa City Bus Enterprise, but it will take time as the economic and social dimensions of poverty are of serious political concern.

Financing

There are no alternative source of financing outside the commercial banking system. There are difficulties in meeting short and long term requirements for funds. The capital market, either subscription to a public issue or through stock exchange is yet to be developed. The private urban transport sector has not been able to attract the interests of the commercial banking system. The Anbessa City Bus Enterprise has, however, been able to have access to the credit facilities of the commercial banking system and soft loan arrangements and grants from external sources. The Government has provided guarantees for loan financing for the procurement of buses from bilateral agencies. In general, there are difficulties in meeting the financial sustainability of public transit partly due to low fares and partly due to lack of access to equity capital. There are also no provisions for parking and terminal facilities. The Anbessa City Bus Enterprise was subsided a sum of 15 million Birr in 2000/2001.

Effects of regime

Developments since the mid-1990's indicate a trend towards a mismatch between demand and supply in public transport. There are problems of vehicle and driver utilization during peak and off-peak hours. For Anbessa, the ratio between the number of buses operated during the rush hour compared to the number during the base period. This is primarily due to nature of the market segment (the low-income earners and students) that it serves. However, the mini-buses and the exclusive rider conventional taxis are facing declining productivity as a result of particularly mid day gap extending from around 10:30 a.m. to 2:30 - 3:30 p.m. The problem is exacerbated by congestion during peak hours that affect running speeds and stopping. Low levels of utilization (reduced frequencies) and fares will contribute to inadequate financial returns and ultimately end up with an old fleet of mini-buses.

Road Safety

In general, the rates of motor vehicle accidents, fatalities and serious injuries as a ratio of the vehicle fleet in the city are high. Although, a decline in the ratios was recorded in 2000/2001, the overall trend prior to that pointed out vividly that the situation had been worsening. An assessment of motor vehicle accident data management, cause analysis, traffic policing and public awareness as well as vehicle inspection indicate weaknesses towards improvement of road safety. Additionally, traffic code that meets the requirements of current and evolving situations is lacking. There are only 359 traffic policemen (only 52 supported by motor cycles), one ambulance for emergency situation and old mobile radios that are ineffective for communication. The application of computers for accident data management has been constrained by lack of skilled personnel, hard ware and software. There is problem in coordination between the Road Transport and communications Bureau, the Traffic police and the Addis Ababa City Roads Authority

9.6 COMPARATIVE OPERATING COST IN PUBLIC TRANSPORT

The Addis Ababa City Administration reviews and approves the fare level and structure of the Anbessa Bus Enterprise. If also indirectly 'regulates' the schedules and fares of the mini-buses. The conventional taxis have greater freedom of operation, as they are characterized by exclusive ridership and more demand-responsive.

The following are the major characteristics of the operations of the Anbessa City Bus Enterprise that influence its unit costs:

- The competitive position of Anbessa and its monopoly of urban transit services have declined since deregulation was introduced, primarily following the removal of restrictions to entry by mini-buses.
- There are a total of 415 conventional buses operated by Anbessa along 85 routes. There are also express services along selected dense routes.
- There are two shifts for a day's operation. Each shift has a crew of one driver and a conductor ("fare collector"). Mechanics and inspectors are assigned for groups of routes.
- Bus headway policy is between 7 to 30 minutes. However, delays are encountered (from 30 minutes to 1 hours).
- The peak - to -base ratio is 1, showing no difference in supply during peak and off-peak hours.
- On average each bus covers about 170 km a day, in about 18 trips.
- The design capacity of each conventional bus is 100 persons while actual performance has reached 150 persons. A load factor of 90 percent is applicable, combining peak and off-peak periods.
- The fare structure of the Enterprise varies with distance (from 25 Ethiopian cents for up to 9 km to 2.25 Birr for distances of 44 km). Each trip has a subsidy element of 21 cents, and students pay a discounted fare of 15 cents.
- The enterprise employs about 2300 personnel of whom about 4 percent are professional, 16 percent skilled and the remaining 80 percent are semi-skilled and unskilled.

The financial statements of the Anbessa City Bus Enterprise show that provision for depreciation accounts for about 33 percent of its annual cost. Fuel accounts for about 22.3 percent, salaries and related for about 20 percent and maintenance for about 11.3 percent. A breakdown of the total cost of the Enterprise in 2000/2001 is presented in Table A14.

Table A14 Breakdown of annual cost of the Anbessa Bus Enterprise (2000/2001)

Item	Million Birr
1. Salaries and Related	23.9
2. Fuel	26.6
3. Lubricants	2.6
4. Tires & Tubes	5.6
5. Maintenance	13.4
6. Insurance	1.7
7. Depreciation	39.0
8. Office Supplies & printing	3.0
9. Miscellaneous administrative	3.8
Total	**119.6**

The cost of overhead of the Enterprise is estimated to reach about 25 to 30 percent. In general, labour-related expenses in the form of wages to crew, technicians and transport supervisors constitutes a relatively low component of total cost.

The management of Anbessa has not been in a position to focus on carefully defined objective (share of the market, return on investment, return on sales, etc...). In fact, marketing has not become a matter of major importance as here is no flexibility in scheduling and fare setting due to the control exercised by the city administration. There has not been any need to research into the market and determine demand together with a mix of prices and services that could appeal to different, segments of the market. The 'patronage' of the riders is directly linked to policy of low fare serving political and social obligations of government. There are also critical problems of capacity limitations. According to the management of the Anbessa City Bus Enterprise, a total of about 1000 buses would be needed to serve anticipated demand over the coming three to five years. An additional 150 buses are to be delivered in 2004, partly for replacement of old fleet and to expand its services.

The following are the general operating characteristics of mini-buses:

- There are a total 7997 mini-buses registered and licensed to operate in Addis Ababa. About 85 percent of the fleet is operational every day.
- The primary market segment for mini-buses include office employees, students from middle income families individuals engaged in small businesses (both formal and informal) and those with average income of about 800 Birr per month who go out shopping and social visits.
- Fares of mini-buses are 'indirectly' regulated. Fares vary by distance traveled; 55 Ethiopian cents, 95 Ethiopian cents, and one Birr and sixty-five cents per trip.
- On average, each mini bus operates for 8 hours a day after deducting time for meals, rest and mid-day gap.
- Each mini-bus operates 28 days in a month.
- The frequency of service (considering medium distance for which fare of 95 Ethiopian cents per trip applies) is 25 trips per day. Mini - buses have an advantage of headways, running times, and short turns as compared to the conventional buses of Anbessa.
- Daily km covered by a mini-bus is, on average 150 km per day.
- A load factor of 70 percent is assumed as an aggregated average of peak and off peak hours.
- Unlike the Anbessa City Bus Enterprise, mini-buses do not receive direct capital or operating subsidies.
- More than 90 percent of mini-buses enter the market as second hand vehicles. The average age of the fleet could go as high as 8 to 10 years.

In an assessment of comparative economics between two types of transit services, it is necessary to establish a common base for the various cost categories. However, there are differences in initial capital cost as Anbessa has the advantage of access to financial sources (domestic and

external), while taxi operators generally rely on their own funds. There are also differences in standing cost items in which are included garaging, insurance, supervision, accounting and management. The operations of the two transit systems also differ in terms of their operations, Anbessa for higher capacity, fixed route and scheduled services while mini-buses have each seat capacity of up to 12. Anbessa has freedom of operation (over loading) while mini-buses are controlled. Anbessa's services are subsidized, while mini-buses are self-financing. As a result, the average cost and average revenue per bus and per mini-bus vary. In fact, even in each system, there are differences in cost and revenue due to variations in traffic density and other factors such as route characteristics. Although Anbessa City Bus is burdened with high overhead cost, it has a relatively lower operating cost per seat kilometer as it has greater capacity with an excess loading pattern. The employees of the Anbessa City Bus Enterprise are organized under a trade union, which has influence on collective bargaining process and hence working conditions. Drivers and assistants of mini-buses are generally temporary employees.

The following estimates provide a general and aggregated level of operating costs for Anbessa and mini-buses intended to serve in making rough comparisons. The application of the figures in detailed studies requires caution, as a great deal of diversity is concealed.

9.6.1 One conventional bus - Anbessa

Operating Cost

Cost of fuel per km	-	1.40 Birr
Cost of lubricant per km	-	0.14 Birr
Cost of tires & tubes/km	-	0.30Birr
Maint. labor cost/km	-	0.19 Birr
Crew cost/km	-	0.29 Birr
Maint. parts/km	-	0.71 Birr
Insurance/km	-	0.09 Birr

Operating Revenue. Based on actual revenue collected in 2000/2001, and average kilometrage per bus, operating revenue per bus per km is estimated to be 6.52 Birr.

A comparison of operating cost and revenue per bus per km shows that there is a surplus of 3.20 Birr. However, the operating surplus has to meet additional cost items such as allowance for depreciation (estimated to be 2.70 Birr per km) reducing the amount to 1.13 Birr. Therefore, the contribution made by the system to overhead per km is estimated to be only 1.13 Birr per km. According to rough estimated cost of overhead per km (apportioned on basis of actual cost in recent years and performance in km traveled), which is about 1.38 Birr per km, the deficit per km per bus is estimated to be 25 Ethiopian cents. This clearly shows that the Anbessa City Bus Enterprise's operation is not financially sustainable and would therefore not be able to expand its services to match anticipated increases in urban mobility.

9.6.2 Mini-bus

Operating Cost

Cost of fuel per km	-	.53 Birr
Cost of lubricants per km	-	.03 Birr
Cost of tires & tubes	-	.04 Birr
Cost of crew	-	.26 Birr
Maint. labor cost/km	-	.04 Birr
Maintanance parts	-	.12 Birr

It should be noted that all mini-bus operators rely on private workshops for servicing and maintenance of vehicles. Generally, their maintenance standards are low, as they prefer to avoid increase in cost and advance interests to raise vehicle utilization. Additionally, as there is no third party compulsory insurance, there is no cost involved for this specific item.

Operating Revenue

Average Daily income	-	300 Birr
Daily km covered	-	150
Operating revenue/km	-	2 Birr

The dominant cost items in the operations of mini-buses are vehicle based and km based costs. Considering an average overhead cost of 0.48 Birr per km (the supervision by the owner), there is only a surplus contribution of 0.50 Birr per km for replacement and to cover government taxes and fees. Assuming that about 20 percent goes to taxes and fees, an amount of 20,160 Birr per year could be considered as contribution for replacement and profit. Taking a 20 percent provision of profit, a sum of Birr 16,128 would be appropriated for vehicle replacement. The average purchase cost of a second hand mini-bus is about 100,000 Birr. It would therefore require 6.2 years to operate to replace a mini-bus. However, major maintenance would be required 3 to 4 years after purchasing a second hand mini-bus, which could cost about 10,000 to 15,000 Birr. Additionally, the risk of road accident is very high as the streets of Addis Ababa are congested, which indicates the possibility for extra cost burden. According to current operational management of mini-buses in Addis Ababa, it would not be possible to cover capital costs (cost of vehicle replacement) over a reasonable period of 6 to 8 years. Eventually, there will be old fleet of mini-buses operating in Addis Ababa.

9.7 ROAD NETWORK OF ADDIS ABABA

The Addis Ababa City Roads Authority (AACRA), under the city council is primarily responsible for the construction, rehabilitation and maintenance of bitumen - surfaced roads. There are a total of about 40 km of bitumen-surfaced and about 1000 km gravel -surfaced roads, as reported by AACRA. The network reported by AACRA does not include roads built and maintained by various communities and non-governmental organizations.

The total budget for roads under AACRA's program for the 2001/2002 fiscal year is 254 million Birr, of which 150 million Birr is for the ring road. A sum of 56 million Birr, out of the total annual budget is for road maintenance and rehabilitation. Out of the total financial resources generated by the Road Fund, 10 percent is allocated for urban centers, out of which Addis Ababa receives 50 percent. The city administration finances the cost of almost all roads in Addis Ababa. As the city's budget deficit has reached close to 810 million Birr a year, sustainability is a critical issue.

The main features of the bitumen - surfaced roads in Addis Ababa is shown in Table A15.

The existing drainage facilities are open earth ditch, open paved ditch, concrete pipes and 1/2 concrete pipes.

In general, the road network in Addis Ababa is inadequate in terms of coverage and geometric features. It was reported that the width of 70 percent of the network is insufficient (less than 9 meters). Presently, 1 km of any type of road serves 38 sq. km and 1 km of bitumen - surfaced road is for 1.33 sq. km.

A systematic Road Functional Classification System is not yet introduced in Addis Ababa. Given a functional classification, design criteria can be applied to the use of roads as intended. The on-going study by an Australian consultant could result in classifying the highway network for a more effective planning. It is also expected that the roads will be numbered within a given system.

One of the deficiencies of the Addis Ababa road network is the lack of interconnecting links and parallel routes. According to the office for the Revision of the Addis Ababa Master Plan, the road coverage of the city is not more than 5 to 7 percent of the urbanized area as compared to about 15 to 20 percent considered to be acceptable on the basis of general norm. Another shortcoming is the lack of legal parking space. The extent to which the parking demand exceeds the parking supply of spaces is particularly evident during the peak hours of the day. On street parking is dominant, as off-street spaces are either limited or are occupied by vehicles of employees or customers of business entities or government organizations and not available to the general public. The situation is exacerbated by lack of off-street truck loading facilities. Additionally, there is significant interference with street traffic flow, both vehicle and pedestrian.

Table A15 Main features of roads in Addis Ababa

Category	Roadway	Existing road width range in (m)	Length in km	Future proposed length	capacity (lane)	Side walk provided
Main Roads	- Ring Road	38 - 50	33.00	13	8 pcs	✓
	- Urban Principal Arterial	27 - 37	1.83	-	6 pcs	✓
	- Minor Arterial	21 -26	39.92	-	4 pcs	✓
Secondary Roads	- Local Arterial Sec.	15 -20	53.92	-	4 pcs	✓
	- Local Sec.	9 -14	90.55	-	2 pcs	X
	- Kebele Roads	6 - 8	160.77	-	2 pcs	X
	- Trails	3 - 5	15.3	-	1 pcs	X
Total			**395.25**	**13**		

Source: Addis Ababa City Roads Authority

9.8 TRANSPORT SURVEYS OF URBAN TRANSPORT IN ADDIS ABABA

9.8.1 General

Transport surveys were carried out as an integral part of the urban mobility scoping study. A total of three sample surveys were conducted comprising a sample survey on vehicle operations, a sample survey on transport expenditure and a sample survey on modal split. The sample survey on vehicle operations has the purpose of finding out level and structure of fare and tariff levels, typical levels of vehicle utilization and some information on operating costs. The purpose of the sample survey on transport expenditure is to assess the level of transport expenditure in the total household expenditure and as a component of total income. The third sample survey aims at describing urban travel patterns in relation to modal choice behavior.

In general, the information from the three surveys has the primary objective of providing background for the evaluation of urban mobility characteristics in Addis Ababa.

9.8.2 Surveying strategy

The Surveying Strategy (sampling method and sample size) has intended to make as reliable as possible, inferences about the general characteristics of urban mobility to serve the purposes of the study. One of the limitations of the surveying strategy is that it is not based on a statisti-

cally significant sample to make inferences about the characteristics of the population of Addis Ababa. The following sampling methods were employed for the surveys:

Household travel behavior. Data was primarily acquired from interviews at work places, bus stops/taxi stops and market places. This provided most complete information, as higher response rates were possible though personal interaction. Simple random sampling was used at bus and taxi stops, as each of the respondents had a chance of being drawn. This was supplemented by stratified random sampling at work places, grouping according to differences in income and car ownership. As a result, low income, medium income and higher income respondents were included in the sample. The household travel behavior survey provided timely data on socio-economic characteristics and modal choice as well as trip distances. The stratified sampling technique enabled the inclusion of the different market segments of urban transport.

Transit operators interviews. Simple random sampling was used in interviewing drivers/owners of mini-buses at different locations of the city. They were asked questions to provide information on kilometers covered, utilization, revenue earned, load factor and operation costs, etc.

Secondary data was obtained from the Anbessa City Bus Enterprise. By applying structured interviewing technique, it has been possible to get data on operations, costs and revenues.

Generally, a total of 193 respondents were covered by the sample surveys. The sample classified by gender comprised 114 male and 79 female individuals. In terms of age distribution, 2 were below 15 years, 38 were between 15 and 25 years, 101 were between 25 and 45 years, 46 were aged between 40 and 60, while 6 were more than 60 years. From the viewpoint of income, 11 individuals responded that they had no income, 89 were classified as low-income earners, 76 as middle-income earners and 17 as high-income earners. Table A16 shows personal data of the respondents.

The questionnaires were designed in such a way that they would generate information about trip purpose, travel mode (motorized and non-motorized), trip frequency, transport expenditure ...etc.

Trip purpose - aggregated. Individual trips were classified by purpose of trip; work trips (trips to places of employment, school trips (trips made by students to institutions of learning), market trips (shopping trips) and trips to health care facilities.

Table A16 Personal Data of the Respondents

			Total
Distinction by gender	M		114
	F		79
Distinction by age	- 15		2
	15-25		38
	25-40		101
	40-60		46
	>60		6
Distinction by income level	no income	-	11
	low income	-200	29
		201-500	60
	middle Income	501-1000	46
		1001-2000	30
	high income	2001-4000	9
		4001-6000	6
		>6000	2

Out of the total 193 respondents, about 74 percent (142 individuals) expressed that their trips were work related. Out of these total respondents, 81 were in the range of 25 to 40, 37 between 40 and 60, 22 in the range of 15 to 25, and the remaining 2 were elderly. 8 percent of the total number of respondents (16 individuals, of whom 5 were female and 11 were male) were making school trips. Of those making school trips, 14 were in the 15 to 25 age group, one was below 15 and another one between 25 and 40 years. 15 percent of the total number of respondents (28 individuals of whom 15 were female and 13 male), were making shopping trips. Of those that made trips to market /shopping trips, 16 were between the ages of 25 and 40, 7 were in the 40 to 60 age group, 2 in the age group of 15 to 25 years and the remaining 1 individual was less than 15 years old. 7 respondents were making trips to health care facilities of which 4 were female and 3 male. The age spectra of those making trips to health care facilities showed that 3 were between 25 to 40 years old. 2 were between 40 to 60 and another 2 were more than 60 years old.

9.8.3 Motorized transport

Trip purpose. Out of the total 131 individuals who used motorized means of transport (about 68 percent of the total sample size), 76 individuals (58 percent) used mini-buses as their main choice for travel. Of the 76 individuals, 64 were making work trips, 9 shopping market trips, and 3 school trips. 26 individuals (26 percent) used conventional bus for traveling, of whom 23 were making work trips, and the remaining 3 school trips. 27 respondents (21 percent owning private automobiles), used their cars for traveling. Out of the 27 automobile owners, 23 were making work trips and 4 shopping trips. The remaining 2 (about 1 percent) used vehicles assigned for employees by organizations for making work trips.

Income Level. Out of the 76 respondents who used mini-buses (taxis) as a means of transport, 49 (64 percent) are in the middle-income group, 20 (26 percent) are in the low group, 5 (7 percent) in the high-income group and 2 (3 percent) stated that they had no income. Similarly, out of the 26 individuals who used conventional bus, 20 (78 percent) are in the low-income group, 3 (11 percent) are in the middle-income group and the other 3 (11 percent) have no income. Also, from the 27 respondents who used their private cars, 15 (56 percent) are in the middle-income group, while 12 (44 percent) are in the high-income group. The remaining 2 individuals who use transport services arranged by their organizations belong to the middle-income group.

9.8.4 Non - motorized means of transport (walking)

The survey results show that 33 percent of the total number of respondents (62) were pedestrians, who depended on walking as a means of transport. This varies with the proportion of trips by the walking mode revealed by previous studies estimated to be 70 percent. The factor that contributed to such a variation is that the size of the sample could not provide equal chance for pedestrians whose proportion is very high.

From the viewpoint of trip purpose, out of the 62 pedestrians, 30 were walking to work, 15 to market, 7 to health facility and the other 10 to school.

In terms of income, 49 individuals (79 percent) are in the low-income category, 7 (11 percent) were in the middle-income category and the other 6 (10 percent) have no income.

9.8.5 Trip frequency

The survey results show the trip frequencies are related to trip purposes. 91 percent (176 respondents) asserted that they travel very frequently, 158 daily, 9 travel 5 days in a week and again 9 travel 4 days in a week. The remaining 17 (9 percent) travel less frequently (10 travel less than 1 day per week and 7 travel less than 2 days per week). From the viewpoint of trip purpose of those who travel very frequently, the majority (81 percent) travel to work. The remaining 16 (9 percent) make trips to school, while 18 (10 percent) made market trips. On the other hand, those who travel less frequently predominantly (59 percent) make shopping trips. The remaining 49 make trips to health facility.

9.8.6 Income level and expenditure

Household transport expenditure is estimated for those households who use public transport and private automobile owners. For users of public transport it is the direct expenditure incurred in the form of fares, while for private automobile owners and riders it is expressed in terms of vehicle operating costs. As the level of income was grouped in the form of range, the mean is estimated to compare total household income (represented by the responding indi-

viduals) and transport expenditure. Table A17 shows the mean income of the different income categories.

Table A17 Mean income of income groupings (Birr/Month)

Income Groups	Mean Average Income
No income	--
< 200	150
201 - 500	350
501 -1000	750
1001 - 2000	1500
2001 - 4000	3000
4001 - 6000	5000
6000+	6000

Prior to analyzing the level and pattern of income and expenditure on transport, automobile riders and pedestrians had to be excluded. The sample size was accordingly reduced to 104 individuals.

Out of the 104 individuals, the no income group (5 in number) spend on average 67 Birr/month on transport, 10 individuals who earn on average 150 Birr per month spend 57 Birr/month or 38 percent of their income on transport. The transport expenditure of the 30 respondents whose income is 350 Birr per month on average is 67 Birr per month or 19 percent of their monthly income. Of the 35 respondents whose income is 750 Birr per person per month, their transport expenditure is 95 Birr/month (each) or 13 percent of their income. 19 individuals each receive an average monthly income of 1500 Birr, and spend about 104 Birr month on transport (7 percent of their income). The remaining 5 earn 3000 Birr/month each, and they spend 78 Birr/month or 3 percent of their income on transport.

Out of the 27 respondents, who own private automobiles, 5 earn an average 750 Birr/month and each spend around 247 Birr/month for operating their vehicles (about 33 percent of their income). Another 10 individuals, who earn a monthly income of 1500 Birr/month, each spend 700 Birr/month for vehicle operation or 47 percent of their income. Those 4 respondents who earn 3000 Birr/month each on average spend an amount of 590 Birr per month or 29 percent of their incomes for vehicle operating costs. The six individuals who earn 5000 Birr/month each on average, spend 1217 Birr/month each (24 percent of their incomes) on vehicle operating costs. The remaining two individuals whose monthly income is 6000 Birr each spend 1200 Birr per month (20 percent of their income) each for operating their vehicles.

9.8.7 Average distance and time to destination

The findings clearly illustrate the significance of the spatial distribution of travel. The pattern of average distance and time from origin to destination by mode is summarized as follows:

- Conventional bus riders travel longer distances (17 km) and takes them on average about 50 minutes, reflecting headways, bigger road space and travel situations relating to the characteristics of the transit network.
- Mini bus riders (generally classified as taxi riders in the questionnaire) travel about 7 km to their destinations within 30 minutes, on average. The minibuses generally operate along shorter trip lengths as compared to the conventional buses and have more frequency of services due higher speed and shorter turns.
- Automobile riders travel around 6 km in 26 minutes.
- Pedestrians walk 5 km on average which takes them 60 minutes.

9.8.8 Total travel distance per week

The total distance covered by the total number of respondents is around 16,410 km per week. The time taken for the total distance is 1,842 hours per week. The aggregated average travel speed is about 9 km/h. The travel pattern for each class of respondents is described as follows:

- Work trips run over a distance of 90 km per week.
- School trips cover a distance of around 120 km per week (This is on the high side as one respondent travels 100 km in one trip/day over five days a week). If this is disregarded, the distance traveled per week comes to approximately 65 km as the average declines.
- For shopping, the average distance traveled per week is approximately 50 km.
- Health facility trips take up on average a distance of about 10 km per week.

From the level of income point of view, travel distances have the following pattern:

- The no income group (predominantly students) travel about 70 km per week, after deducting the abnormal case of the respondent who travels 100 km in a single trips.
- The low-income group travel about 75 km per week.
- The middle - income group travel a distance of about 65 km per week.
- The high - income category travels a distance of 60 km per week.

In terms of the age groups of respondents in relation to travel distance, the following general characteristics are derived:

- Two respondents below the age of 15 years travel a distance of around 40 km per week.
- The age group between 25 and 40 years travel approximately 60 km per week.
- Those respondents between the ages of 40 and 60 cover a distance of 74 km per week.
- The individuals 60 years and above whose trips are predominantly market or health facility trips travel about 30 km per week.

9.8.9 Motor vehicle accidents

The perception of the respondents about the risk involved in traveling in Addis Ababa is summarized as follows:

- 77 percent (149 individuals) feel their trips are not safe.
- 83 respondents out of 149 stated that they are aware of involvement of accidents in their families or in their community, while the remaining 63 expressed that they have not witnessed any accident.
- 23 percent of the total number of respondents (44 individuals) pointed out that their trips are safe.
- 14 out of the 44 individuals (23 percent of the total number of respondents) stated that they were informed of motor vehicle accidents in their community, while the remaining 30 expressed that they were not aware of any accident.

The black spots identified by the respondents include Meskel Square, Piassa, 22 Mazoria (traffic signal along Haile Geber Selassie street), the main market (Merkato), Gotterea ("confusion square"), Arat Kilo (near Ministry of education) and Senga Tera (close to the Head office of the Ethiopian Roads Authority).

Cars. Out of the 27 car riders, 17 have not responded to some of the questions. As a result, the sample size has been reduced to 10. The respondents stated that on average their vehicle age is around 18 years. As for operating speed, they drive about 41 km/hour during working hours, and their average speed goes up to 44 km/hour during off-hours.

9.9 PUBLIC TRANSPORT OPERATING CHARACTERISTICS

A total of 24 individuals responded to questions asked regarding vehicle mode, passengers carried, vehicle age, average distance traveled, earrings per week, salaries of crew, cost of vehicle repair, current value of vehicle contributions made to associations and financial source for purchase of vehicle.

Out of the total number of respondents, 15 were hired drivers and 9 were owner-drivers. Regarding type of transit operated, 17 were mini buses, 3 conventional taxis and 4 were conventional buses (Anbessa buses). Out of the total number of mini-buses, 16 were Japanese made Toyota mini-buses and 2 were French manufactured "Weyeyets" (similar to the "*Matatus*" of Kenya). The four conventional buses were Dutch manufactured DAF vehicles.

- As to the capacity of the vehicles, all 24 carry in total 427 to 477 passengers at a time of which the mini-buses moved 176 passengers, the 4 conventional buses about 210 to 240 passengers and the 3 conventional taxis 12 passengers.

- The average age of the conventional buses is 6.3 years, that of the mini-buses about 12.9 years and the conventional taxis about 25 years.
- The average distance (per driver per day) for conventional buses is 278.3 km that of mini-buses about 135 km. While the conventional taxis covered 90 km.
- The average weekly earnings varied from 793 Birr for one mini-bus to 5250 Birr for one conventional bus and 257.50 Birr for the conventional taxi.
- Monthly salaries of a mini bus driver and conductor combined is 378.60 Birr per month and that of the driver of a conventional bus and conductor is 750 Birr per month.
- The average current value of a mini-bus is 61,250 Birr, and that of a conventional bus about 1.73 million Birr. The current value of a conventional taxi is about 30,330 Birr.
- There was no sufficient response to question asked about contribution to associations (only 3 responded) which varied from 1 Birr to 20 Birr per month).
- The primary source of finance for vehicle purchases is family loan (12 out of 23 respondents). 4 others stated that associations were their sources of finance, while another 4 expressed that they used their own money. The source of capital for the conventional bus is government, according to the responses.

9.10 RECOMMENDATIONS

On the basis of the findings of the study, the following recommendation have been drawn:

- An urban transport policy should be formulated in coordination with the city's activity Plan (the land use plan) to guide investment by public and private sectors, as well as planners in their analysis and evaluation of transportation proposals. The goals and objectives must be clear, concise, unambiguous, and understandable to all stakeholders.
- Transport sector planning capacity be improved as part of the city administrations decision - making process. An effective urban transportation planning would require the development of a data collection and management plan. The Road Transport and communications Bureau could be the most appropriate institution for the most central active planning role.
- Establish a suitable institutions for the city's transit services. An urban Transport Authority would be necessary to provide an enabling environment for studies, planning, financing and monitoring of public transport in Addis Ababa. The Authority would also have a role in determining the requirements for roads, signals, parking, terminals and other facilities needed for improving mobility in the city.
- The mechanisms for transit financing be evaluated so that sustainability of the public transport industry would be ensured. In this connection, alternative sources of financing should be considered and that operations become self-supporting. The Anbessa City Bus Enterprise should have autonomy to set fares and rationalize its operations. Additionally, instruments for cost recovery from transport users should be developed so that financial needs for infrastructure would be met. Relatedly, current user charges be reassessed so that they reflect real resource costs.

- Transport for the poor should receive priority in urban transportation planning and management. This would require providing mass transit services.
- Establish a regulatory framework for public transport that ensures that the alternative means deliver efficient services. The actual deregulation of fare setting is an essential element in improving the regulatory environment.
- Introduce new traffic regulations and traffic safety procedures. This would require re-visiting of existing regulations, accident data management, and accident cause analysis and upgrading the capacity of the Addis Ababa Traffic Police.
- Improve vehicle inspection and driving skills as well as road safety public awareness campaigns. Road safety should be included in the curriculum of all the schools.
- As walking is the most vital means of transportation in the city, it should be an important element in urban transportation planning. The separation of the pedestrian from the vehicle by providing adequate side walks is critical in enhancing security, safety and convenience. To that effect, the development of a pedestrian system would require an understanding of pedestrian flow characteristics which also involves behavioral factors.

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10 APPENDIX B - DAR ES SALAAM

10.1 DEVELOPMENT TRENDS

Dar es Salaam is the largest city in Tanzania and is the principal center of commerce and industry. It is also an important transportation terminal with the port of Dar es Salaam as one of the busiest East African ports. The city also has the international Tanzania-Zambia Railway Authority (TAZARA) northern terminal and the main Tanzania National Railway terminal. Dar es Salaam has the busiest international airport in the country and is the center of road transport as the nation's main trunk roads start from here. Although officially no longer the seat of government, it nevertheless is still the country's principal center of administration, social and economic activities.

The city is on the Tanzanian coastal plain between the Indian Ocean on the eastern side and the Pugu Hills to the west. Several streams and rivers, the most important of which are the Msimbazi River and Mzinga River, traverse the plain on which the city lies. The main city development has been mainly on the north-south direction along the Indian Ocean coast and also along the west trunk (Morogoro) road corridor.

The commercial activity of the Dar es Salaam port and the geographical characteristic of the urban area have resulted in a radial road network. There are four major roads emanating from the city center:

- Nyerere Road
- Morogoro Road
- Ali Hassan Mwinyi Road and
- Kilwa Road

Only two arterial ring roads exists, the Nelson Mandela Road, which interlinks Ali Hassan Mwinyi Road (through Sam Nujoma Road), Morogoro Road, Nyerere Road, Kilwa Road and the harbour. The other main arterial ring road is Kawawa Road which interlinks Ali Hassan Mwinyi Road, Morogoro road, Nyerere Road and Kilwa Road (through Chang'ombe Road). The pavement condition of the arterial roads has improved over the last few years although they still lack some safety features notably signs and markings.

The city is divided into three municipalities, Kinondoni, Ilala and Temeke. The municipalities have the same names as the political administrative districts although the district boundaries extend beyond the municipal boundaries.

10.2 POPULATIONS AND EMPLOYMENT

The population of Dar es Salaam was 356,286 in 1967, 842,090 in 1978, and 1,360,850 in 1988 and indicates that the growth rate of Dar es Salaam decreased from 7.8% during 1967 to 1978 to 4.8% during 1978 to 1988. The establishment of the Dar es Salaam Master Plan and the introduction of industrial decentralization brought about the decline in growth rate. However this growth rate is still the highest of any urban center in Tanzania and the estimated population by 1999 was 2.5 million.

The total employment in Dar es Salaam increased from 87,000 in 1976 to approximately 186,000 in 1984 with an annual growth rate of 10%. The employment/population ratio is steady at 18, which lead to an estimate of 240,000 in 1988 and approximately 460,000 in year 2000. However, with the recent and ongoing economic reforms the manufacturing sector has shrunk considerably. With the sale and privatization of the parastatal sector, as well as the restructuring of the civil service employment opportunities have been lost in the public services and utilities sector. This means that the employment situation in 2002 is much lower than estimated from past trends. There has been a sharp rise in employment in the informal private sector mainly petty trading and small-scale industries.

10.3 LAND USE PATTERN

The land-use pattern of Dar es Salaam consists of one city center predominantly with a radial road network and the central area serving as the focal point. The current land use plan show an extension of planned residential area in the north-west along Ali Hassan Mwinyi road, in the south along Kilwa road and in the Tabata area.

The plan also shows an extension of unplanned residential area in the west along Morogoro road, in the Southwest corridor along Nyerere road and in the south corridor along Kilwa road. There is also an extension of industrial areas north along Ali Hassan Mwinyi road, along Nyerere road and part of Mikocheni area.

10.4 TRANSPORTATION SYSTEMS

The transport infrastructure of Dar es Salaam consist of the Dar es Salaam International Airport; the Dar es Salaam Port which comprises of a container, deep-sea general cargo, deep-sea oil products berths and other coastal facilities. There are two main railway terminals serving the Tanzania Railways Corporation (TRC) and TAZARA (both for passenger and freight traffic to and from the city). There is one large terminal for long distance buses and a number of small terminals serving the city public transport buses. The port and transport are the major em-

ployment generators. Road is the most dominant mode of transport to and from the city center. The city has an extensive classified road network of approximately 1200-km.

10.4.1 Road system

The existing road network in the city is approximately 1,150 km categorized by surface type as shown in Table B1.

Table B1. Road network in Dar es Salaam

Area	Surface Type	Length (km)
Urban	Bitumen	400
	Gravel	200
Suburban	Bitumen	50
	Gravel	245
	Earth	245
Total		1,150

The existing roadway system is predominantly radial, with the central area serving as the focal point where most public and government institutions are concentrated. The radial structure developed during a time when travel needs were strongly oriented towards activities contained in the Central Area. Non-radial travel has since become a major factor in the total travel picture, contrary to the radial emphasis of the road network. The current road development plan has provision for ring roads and two are already completed namely Nelson Mandela Expressway and Kawawa road. The two ring roads have contributed significantly to the efficient operations of passenger travel by public transport from the northern suburbs to the Southwest industrial area and suburbs.

Arterial roads comprise about 13% of classified roads and carry most of the urban passenger bus traffic. Collector roads covers about 6% of the total and collect and distribute traffic with the residential, industrial and central business districts (CBD) of the city. Access roads comprise most of the city road network at 81% of the total and distribute traffic within smaller areas. They also provide access to individual buildings and land within the local area.

Responsibility for maintenance, improvement and construction of roads varies according to the functional classification of the facility. TANROADS, the executive agency of the Ministry of Works is responsible for the maintenance of key arterial roads, especially those that form part of the trunk road network. The Dar es Salaam city council is responsible for the maintaining the remainder of the arterial roads. The municipalities are responsible for the maintenance of all urban collectors and local roads in their jurisdiction. Maintenance funding is provided by the road fund through its disbursement to TANROADS and the city council.

The pavement surface condition of most arterial roads is in reasonably good condition. This is due to the Japanese grant, which was used to rehabilitate and upgrade most of the arterial net-

work through the nineties. The availability of funds from the road fund has made it possible to maintain the recently rehabilitated network. However, the condition of the network in suburban areas is in very poor state to such an extent that some are not passable in the wet season. The alignment of the roads in Dar es Salaam is generally good, road width is consistent with the functional classification and sight distances are available on most sections.. However, along most roadways the effective travel width, especially the space reserved for non-motorised transport has been encroached by other developments or roadside business. The reduction in effective road width has been as much as 30 per cent.

10.4.2 Traffic conditions

The traffic volumes were extracted from the JICA Feasibility Study Report on Road Improvement and Maintenance. These figures are compared to the 12-hour counts conducted during this study.

Table B2. 12-hour traffic volume counts 1990

Road Name	Lanes	Cars	Light Goods	Medium Goods	Heavy Goods	Bus	Total
Nyerere	4	13,722	8,993	1,579	318	2,184	26,796
Kawawa	2	5,049	1,479	648	85	467	7,728
A Mwinyi	2	9,424	4,146	454	314	280	14,618
Morogoro	2	5,599	2,469	122	15	260	8,465
Mandela	4	3,455	3,296	1,618	466	698	9,533
Kilwa	2	1,228	1,109	854	159	471	3,821
Ocean	2	7,009	2,379	118	89	246	9,841

Table B3. 8-hour traffic volume counts 2002

Road Name	Cars, Vans Taxis	Public Bus (c<18)	Public Bus (c>18)	Staff school Bus	Goods Vehicles	MC & Tricycles	Pedaled goods veh
Morogoro	8,406	6,805	1,872	90	466	442	63
Nyerere	17,816	3,179	734	217	1,361	895	10
Kilwa	5,909	2,067	820	122	466	378	9

The volumes above indicate clearly that there has been an increase in the total number of buses using the roads. This increase is due to the use of the 16-seat minibus as the main vehicle for public transport services in the city. This situation is different from 1990 when most public transport vehicles were standard buses or midi-buses. Since 1990, the main arterial roads (A. Mwinyi, Morogoro, Kawawa) have been upgraded from 2-lanes to 4-lanes. This has reduced the congestion levels and at the moment Kilwa road is the one experiencing high congestion levels during the peak period.

10.4.3 Road traffic accidents

The number and type of accidents in Dar es Salaam are indicated in Tables 4 and 5.

Table B4. Accident severity 1995 -1998

Severity	1995	1996	1997	1998	Total
Fatal	271	252	180	130	833
Hospitalized	814	756	633	486	2,690
Not Hospitalized	531	560	387	325	1,803
Damage	2,537	2,646	1,786	1,143	8,113
Total	4,153	4,214	2,986	2,084	13,439

Table B5. All accidents by vehicle type 1995 -1998

	1995	1996	1997*	1998*	Total
Cycle	155	159	140	78	532
M/cycle	177	143	125	106	551
Car	2,808	2,812	1,995	1,335	8,959
LGV	358	354	217	155	1,084
Pick-Up	1,028	1,028	731	478	3,265
HGV	130	174	96	64	464
MGV	329	297	172	121	919
Mini-Bus	1,057	1,481	1,147	789	4,474
Bus	359	223	123	65	771
Tractor	8	6	7	1	22
Animal Cart	2	0	0	0	2
Push Cart	18	12	8	8	46
Other	69	36	35	57	197
Total	6,498	6,725	4,800	3,261	21,286

*1997, 1998 Data are not complete

There has been an increasing trend in accidents in Dar es Salaam over the last 5 years. The table above shows the number of fatalities recorded since 1995; the figures indicate a generally high risk of accidents. Buses and minibuses are involved in 25% of all accidents occurring.

10.4.4 Public transport services

The demand for public transport in Dar es Salaam has been growing faster than the resources available to satisfy it. The two factors contributing to this growth are the rapid growth in city population as well as the growth in city size due to uncontrolled development. The average mobility of most city residents is very low due to the fact that most cannot afford the public transport where available and there are no facilities for cycling or walking where this is feasible.

Bus services in Dar es Salaam are now provided by a state owned operator, Shirika la Usafiri Dar es Salaam (UDA) and by private operators, collectively known as *dala-dalas*. Besides buses operating on public bus services, many private companies, schools, parastatals companies and government departments operate buses to provide transport to and from work for their personnel. The system operates with minimum regulation as regards to market entry, level of service and safety.

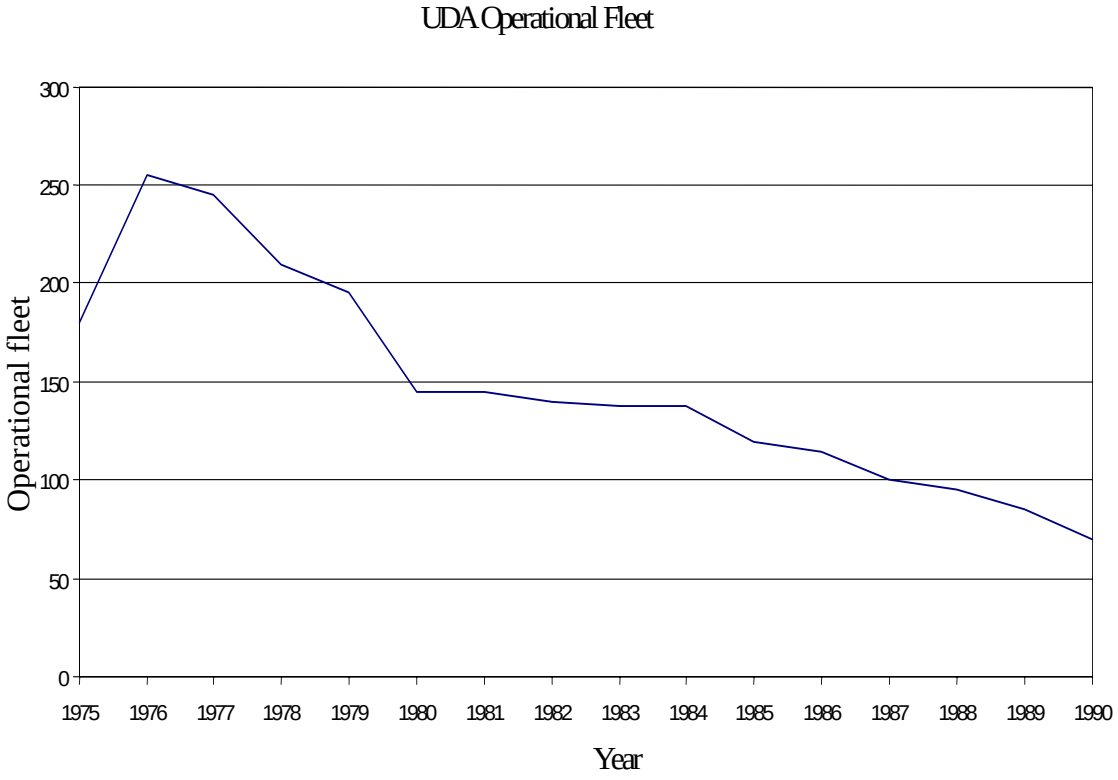
Usafiri Dar es Salaam (UDA). Bus service provision in Dar es Salaam was nationalized in 1970 and put under the joint ownership of the Dar es Salaam City Council (51%) and the National Transport Corporation (49%). As a parastatal, UDA received assistance for both procurement of buses, spare parts, tools, and for management and training, as well as maintenance programs/ This assistance came directly from central government as well as from a number of bilateral donors. However, city residents continued to suffer from inadequate services provided by UDA due to:

- Lack of adequate foreign exchange to purchase spare parts. For instance, during 1980/81 UDA had enough local cash to purchase spares worth Tsh. 19.7 million (current prices) but was allocated foreign exchange worth Tsh. 6.5 million (current prices).
- Lack of qualified personnel to carry out maintenance and scheduling of vehicles more effectively and efficiently leading frequent break-downs due to mechanical failures (1977/78 Budget speech)
- Buses failed to adhere to scheduled timetables due to increased congestion especially on narrow roads in the CBD.
- Aged and obsolete fleet.
- Unrealistic fares that was uneconomical and did not reflect changes in the price of inputs.
- High fleet replacement costs
- High vehicle-staff ratio implying that UDA was operating with relatively overheads.

The role of UDA as the sole operator of public transport in Dar es Salaam came to an end in 1983, when private operators were allowed to provide services under the co-ordination of UDA. This came about because UDA lacked the capacity, due to a continuing decline in its operational fleet. UDA's service decline was a result of the conflicting pressure of operation without direct subsidy and charging controlled, uneconomic tariffs. Figure 1 shows the decline in the UDA fleet from 1976.

During this decline in services, the staffing levels did not decline at the same rate as fleet size. The staff to operating bus ratio grew from 11:1 in 1984 to 18:1 in 1990. The company had also a high level of investment in buildings and physical infrastructure. This type of investment created high overheads, which had to be supported by a dwindling number of revenue earning buses. As a result UDA role as public transport provider has greatly diminished, currently it has about 30 buses operating mostly on out of town routes. The company is up for privatization and the process is underway.

Private operations (dala dala). Registered private bus operations began in 1983. Since then the *dala-dalas* vehicle fleet has been very diverse in both type and capacity with most of the vehicles imported as reconditioned or bought second hand from Japan and the Middle East. Currently the majority of vehicle types comprise Toyota Hiace, Toyota Coasters, Isuzu Deluxe, Mazdas etc, with a passenger capacity ranging from 18 to 35. Toyota Hiaces with a capacity of 18 passengers dominates on most routes. The routes operated range from 3 km to long routes of approximately 30 km, the latter being peri-urban routes. Services are not timetabled and vehicles only leave a rank when they are full.



Driver remuneration is not fixed but is paid on commission based on revenue collected. Other operators stipulate revenue targets to be achieved by their drivers. Both methods of remunerating the *dala-dala* drivers have encouraged speeding, excessive overtaking, poor parking and frequent vehicle stoppage to pick up or drop passengers

The majority of *dala-dala* operators do not have proper maintenance facilities or programs. Vehicle maintenance for minor repairs is carried out at the backyard after a persistence outcry of the driver on the vehicle fault. Major repairs are undertaken at external workshops the majority of which belong to friends. It is currently estimated that over 7000 vehicles are in operation owned by about 6000 operators, which leads to an average of one vehicle per operator. The operators have an association that looks after their interests.

Most of the drivers employed in the *dala-dala* industry are very young. There are no laid down procedures for driver recruitment or training. For instance, a driver discharged by one operator can be re-engaged by another operator in a matter of hours without even ascertaining the reasons for dismissal. Consequently, driver turnover is very high. There are no drivers training programs for the majority of the drivers.

When necessary, more particulars may be required to be submitted before a license is issued to the operator.

10.4.5 Public transport performance

No study has been carried out recently to estimate the performance of public Transport in Dar es Salaam. It is however possible to make an estimate of the potential passenger trips capacity of the existing bus fleet. Past studies have estimated the potential daily passenger trip capacity of the Dar es Salaam bus fleet as follow:

- Standard Bus 2,000 passengers per day
- Midi-bus 900 passengers per day
- Minibus 450 passenger per day

The survey conducted on selected arterial roads in the course of this study reveal that about 80% of the existing fleet is minibuses while the rest are midi-buses. The total fleet size of buses is 8,500 (7000 registered and 1500 unregistered), that is 6800 minibuses and 1700 midi-buses. Based on these volumes the daily passenger trip capacity can be worked out as 4,590,000 passenger trips per day. This represents the maximum number of passenger trips that could be made if all available buses entered public service daily. However in Dar es Salaam bus availability and utilization is low due to vehicle defects and breakdown. In addition some *dala-dala* operators remove their vehicles from service when they feel that the revenue collected does not justify the cost of operation. The total loss or under-used passenger capacity resulting from these factors can be estimated at 30%.

Allowing for this unused capacity, the effective available daily passenger carrying capacity of Dar es Salaam bus fleet in 2002 is estimated to be 3,213,000 passenger trips per day. This capacity is approximately 325,000 passenger trips (10%) below the estimated demand for bus trips in 2000 of 3,539,876. This clearly indicates that there is already a shortfall on some of the areas of Dar es Salaam.

Other performance indicators revealed by the survey interviews of passengers include lack of comfort, as most of the minibuses have no standard seats and their tendency to overload. Most passengers also perceive the minibuses as inherently unsafe due to their frequent involvement in accidents and the general lack of discipline of the drivers.

The total bus fleet of 8500 midi and minibuses is equivalent to 2160 standard buses. This means that if the current fleet were to be replaced by standard buses there would be over 6000 fewer

vehicles. This would go a long way towards the alleviation of congestion and air pollution, as well as reduction in road accidents.

10.4.6 Previous transportation studies

There have been a number of urban transportation studies in Dar es Salaam over the last 20 years. With the exception of the JICA studies, no attempt was made to implement the main recommendations of these studies. The following are the studies completed:

- Cowiconsult Study in 1984: Dar es Salaam Urban Passenger Transport Study
- TRL Study in 1987: Public Transport Provision in Dar es Salaam
- Wilbur Smith Associate Study in 1990: Dar es Salaam Urban Passenger Transport Study
- JICA Studies: 1990 The Feasibility Study on Road Improvement and Maintenance in Dar es Salaam
- 1993 The Study on Dar es Salaam Road Development Plan
- 1995 Basic Design Study on Dar es Salaam Road Development Project
- IHE Delft and UDSM Study: Urban Mobility and Non-Motorized Transport

The main recommendations of the first three studies were on the improvement of the public transport infrastructure including bus maintenance facilities of UDA. The other recommendation concerned increased fleet size of UDA and other private operators. Finally there were recommendations on the improvement of the regulatory regime and the institutional ability to plan and co-ordinate urban transport services.

The JICA studies were primarily concerned with road rehabilitation and upgrading. In order to tackle the problem in a systematic manner a comprehensive transport study was carried out to assess transport demand and other obstacles to mobility. The main recommendations were a list of road links to be rehabilitated or upgraded. The recommendations have been carried out or are programmed to be implemented in the near future.

10.5 URBAN TRAVEL BEHAVIOR

A household survey carried out by the study on Urban Mobility and Non-motorized transport revealed that motorized transport was providing for less than 50% of all the trips made at the household level. The study also found out that the average mobility of middle and low-income households is estimated at 1.96 trips per person per day. It was also found that it was not possible to increase the modal share of motorized transport due to serious resource constraints among which are capital, land availability and unaffordability of motorized vehicles by the majority of residents. On the other hand, it is very important that the level of mobility of the majority of residents be increased so that they can participate in wide ranging economic activities.

10.5.1 Modal split

The modal split in Dar es Salaam, identified from various studies is shown in Table B6.

Mode	1983 COWI	1987 TRL	1994 IHE/UDSM
Public Bus	47	48	43
Walk	31	25	43
Staff Bus/Priv.Car	21	25	
Private Car			6
M/cycle/Bicycle			
Bicycle			3
Taxi	1	2	

The table shows that the public bus has a modal share slightly lower than 50% in all studies carried out so far. The next important mode as shown by all the studies is Walking. The 1994 study was the only one that based on household interviews and the modal split figures are based on the most important trip of the day.

The table below shows the results of interviews carried out at marketplaces as well as at work-places. The modal share for trips to the marketplace show that walking is the predominant mode while for the workplace the bus is the most important followed by the private car.

Table B7 Travel characteristics of individual modes

Mode use	Markets places		Working places		Average trans-port cost as % of income
	Average travel distance (km)	Average travel time (min.)	Average travel distance (km)	Average travel time (min.)	
Car	7.5	25	12.2	33	19.7
Dala dala	7	30	12	58	17.2
Bicycle	2.5	15	1	15	2.3
Walking	2.2	34	1.5	21	6.3

10.5.2 Mobility constraints

Unaffordability of transport costs. The household survey study results that the average mobility of middle and low-income residents of Dar es Salaam is 1.96 trips per person per day. This value is very low and indicates that many people are immobilized around their homes. Those going to work at fixed work places were found to make only one round trip per day and a large number walked to their destination. For the most important trip of the day 45% of respondents walked all the way while 44% used the bus. Considering trip length, it was found that 57% of

all trips were less than 3km showing the limited range of the pedestrian trip. One of the major reason for this low mobility is that a large number of residents of Dar es Salaam cannot afford the bus fare of about 150/= per single trip. Most residents cannot afford a bicycle, which on the average costs about four times the monthly minimum wage.

Traffic conditions. The existing traffic conditions in Dar es Salaam have an overall negative effect on mobility. Fear of road accidents has made it difficult for one to use the bicycle on a trip downtown. This can be attributed partly to the high speed of motorized traffic and partly to poor driving behavior of *dala-dala* drivers. The same reason has curtailed walking along the major corridors especially because of difficulties associated with crossing the road between intersections. Safety is the most important reason not to cycle on the main corridors or to consider cycling as a potential mode for such a trip.

Lack of infrastructure. The assessment of the users as to the quality of the route infrastructure indicate that most consider the condition of the road surface a hindrance to either walking or cycling. More serious in this regard is the absence of continuous direct route for cycling or walking in many areas of Dar es Salaam. Another serious obstacle to walking or cycling is the obstruction of the few existing pedestrian and cycle lanes by parked cars or kiosks. The infrastructure for motorized traffic has improved greatly over the last few years.

The design of most old roads does not match with rapid increases in traffic volume. Other road related problems include inadequate parking spaces; illegal parking at the curbside and parking spaces not marked, lack of maintenance and room for future expansion; lack of modern bus terminals.

The inadequate physical planning and poor implementation of master plans when coupled with lack of enforcement of urban bylaws have a negative impact on mobility and accessibility. This is true in most parts of the urban areas, especially in unplanned urban settlements. Some residential areas are inaccessible due to inadequate and poorly maintained infrastructure.

10.6 Regulatory Framework of Urban Transport Activities

A number of government agencies are directly involved in the regulation and control of urban transport activities. These agencies are discussed below.

10.6.1 Ministry of Communication and Transport

The ministry of communications and transport has the responsibility for policy, sector development and operational standards. The MCT has a draft National Transport Policy that spells out the strategy to be adopted in planning urban transport services. It also has the responsibility for Commercial vehicle licensing.

10.6.2 Presidents Office, Regional Administration and Local Government (RALG)

Through the District, City, Municipal and Town councils RALG is politically responsible for the development and maintenance of district, urban and unclassified roads. The district and urban councils are responsible for the provision of transport services and the regional administration is responsible for the Regional transport licensing board.

10.6.3 Dar es Salaam City Council

Dar es Salaam city council is the municipal authority responsible for urban transport services. The city council owns 51% of the parastatal bus operator, UDA. Urban transport policy formation and urban transport infrastructure development at the city level are the responsibility of the city council through its transport committee. There is also supposed to be a department or technical secretariat responsible for urban transportation issues. The lack of these two units has caused a major gap in transport planning and control.

10.6.4 Ministry of Home Affairs

The Ministry of Home Affairs, through the National Traffic Police, is responsible for all enforcement of traffic laws, traffic and parking regulations, and all aspects of vehicle safety and operational licensing enforcement.

10.6.5 Dar es Salaam Regional Licensing Authority

This unit is supposed to handle the licensing of vehicles operating in the region as part of the trade office of the region. In Dar es Salaam DRTLA handles the licensing of all the buses operating in the region and is in assigning routes for the same.

10.7 ENVIRONMENTAL ISSUES

Before 1983 the key legislations pertaining to the road sector and the environment in Tanzania were (a) Highway Ordinance Cap 167 of 1959 with amendment in Act no. 40 of 1969, which provided for some element of public participation essential for an EIA process and (b) Traffic Ordinance Cap 168 of 1957 with amendment in Act no. 30 of 1973, which focus only on traffic control and road safety and there is nothing about environmental pollution caused by traffic. In 1983 the National Environment Management Council (NEMC) was established following the adoption of National Environment Management Act no. 19. This was later transformed into the National conservation Strategy for Sustainable Development (NCSSD) in 1992. It was through the NCSSD that a unit in the Ministry of Tourism and later on the Ministry of Tourism and Natural Resources and Environment was formed. Consequently the policy of environment was enacted. However, of recent the Ministry for environment is in the Vice President's Office.

The National Environmental Policy (NEP, Dec. 1997), Chapter (iii) section (51) on the cross sectoral policies focuses on three main environmental objectives namely:

- Improvement in mass transport systems to reduce fuel consumption, traffic congestion and pollution
- Control and minimization of transport emission gases, noises, dust and particulates and
- Disasters/ spill presentation and response plans and standards shall be formulated for transport of hazardous / dangerous materials.

In 1997 the NEMC was empowered to oversee the enforcement and compliance (and technical arbitration) of environment standards, before then the NEMC played advisory role to the government only. However, to date there exists draft standards for air quality and wastewater. The Council has already developed Environment Impact Assessment (EIA) guidelines, which awaits government approval. Also, institutional framework for environment management which prescribes who should do what waits for government approval. It is envisaged that once all these documents are approved then the legal framework will follow for government approval.

Besides these initiatives there are very little studies on air pollution problems in Tanzania as impacts are expected in major urban centers like Dar es Salaam with a high number of vehicles and industries. According to Mato (1999) studies on automobile air pollution for the city of DSM indicated a high potential of air pollution from traffic emissions especially during peak hours.

On the other hand, noise levels for some areas in the city are on the higher side as evidenced by the unpublished report by the Center for Energy, Environment, Science and Technology (CEEST) in 1996. Table B8 below presents noise levels as reported by the CEEST in 1996.

Table B8: Noise levels for some areas in DSM city

Sampling point	Noise levels dB(A)	
	Lamax.	LEQ60sec.
Ubungo (Samu Nujoma/ Morogoro Road Junction)	87.4	78.7
Kariakoo (Msimbazi street, near police station)	80.2	74.8
Oysterbay (Haile Selase/ Ghuba Junction)	75.0	69.4
Dar es Salaam International Airport (DIA) new terminal (behind main building, facing the runway)	80.3	78.7
Samora Avenue/ Morogoro Road Junction	77.3	75.0

In addition, there are problems of

- Lack of regular environmental audits, and
- Lack of environmental database.

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11 APPENDIX C - NAIROBI

11.1 HISTORICAL DEVELOPMENT

Nairobi is the capital city of Kenya, and serves as the seat of the Government. It houses all the government ministries and diplomatic offices. Kenya's average Gross Domestic Product (GDP) has been declining. Between 1965 and 1980 it was 6.8%, in the next decade it was 4.2%, and in the 1990's it was 2.5%, and 1.4% in 2000 [Kenya Human Development Report 1999, Republic of Kenya 2000]. Since the 1990's, the GDP is below the rate of growth of population.

Nairobi has served as one of Africa's most important centers for commerce, industry, and tourism for many years. It has a long history as the regional trade, communications, and administrative center for Eastern Africa. The city is an internationally known tourist destination, supporting numerous wildlife parks and scenic areas in the region. The city hosts many international agencies, serving the eastern African Region, and several United Nations bodies.

Nairobi's transport and communications network was developed to link the city to the nearby countries. Inter-continental and international air links were established through Nairobi's airport and coupled with regional road and rail routes to create the region's most important transport center for all modes.

Nairobi is situated along the Great North Road that links the landlocked Uganda, and other countries to the port of Mombasa. Uganda, in particular, relies heavily on this transport corridor for her international trade. This road link passes right through the Central Business District of Nairobi.

11.2 URBAN GROWTH

The city has grown significantly in recent years both in terms of population and developed land area. In 1963, the population was about 350,000 inhabitants, but was 828,000, 1,325,000, and 2,137,000 in 1979, 1989, and 1999 respectively [Kenya Population Census, CBS].

Table C1: Population of Kenya, Nairobi, and other nearby districts

	1979	1989	1999				
			Male	Female	Total	Area (km^2)	Density (per/km^2)
Kenya			14,205,589	14,481,018	28,686,607	581,677	49
Nairobi District	828,000	1,325,000	1,153,828	989,426	2,143,254	696	3,079
Thika District			323,479	322,234	645,713	1,960	329
Kiambu District			369,101	374,909	744,010	1,324	562
Muranga			164,670	183,634	348,304	930	375
Kajiado			206,353	199,701	406,054	21,903	19
Machakos			442,891	463,753	906,644	6,281	144

The inter-censal growth rates of Nairobi have been 4.7% and 4.8% for the 1979/89 and 1989/99 periods. In the past, the growth was mainly due to rural-urban migration, but natural growth is now the most important factor.

Nairobi's population in the day is much higher than in the night. In the day, it serves the neighboring districts of Thika, Kiambu, Muranga, Kajiado, and Machakos. Many people from these districts come to Nairobi on a daily basis to work, school, for business, trading, and so on. Apart from high populations (see Table C1), there is rapid growth in these districts which have a direct impact on the city. Some of the impacts include: heavy traffic flows during peak hours; supply of services cannot meet daytime demands; traffic management demands outstrip the resources; inadequate infrastructure and sanitation facilities; etc.

Since 1989, the rate of employment growth has slowed in Nairobi. In the early part of the decade, this was largely driven by a stagnating economy. By the mid-1990's, relative economic recovery pushed employment growth up, producing a 2.5% average annual growth rate between 1989 and 1997 [Post Buckley Int. 1999]. Employment rate has been higher in the outlying areas (neighboring districts).

11.3 Land Use and Population Distribution

Much of the development growth that took place since the 1990's in Nairobi is unplanned. Urban physical planning Master Plan exists, but development is largely uncontrolled. The building of single-storey residential areas within the city boundaries has created the problem of "urban sprawl", making trip distances longer and transport costs much higher.

Nairobi's population is segregated by income, but with no clear zone boundaries. High and low income areas are sometimes only a few meters apart. Pockets of low-income settlements, of varying size, are widely distributed with many of the newly arrived immigrants in lower-density areas surrounding the city. Different terms – 'unplanned', 'low-income', 'slum' and 'non-slum', 'informal', etc. – are used to describe the land generally occupied by the poorest.

Not all occupants of informal settlements are poor – the majority is in terms of income, assets, access to resources and environmental conditions - and not all the poor live in formally acknowledged settlements. Others are scattered throughout the more wealthy areas as house servants, watchmen, messengers, etc. Notwithstanding this the most visible symbols of poor communities remain the informal settlements, which are the focus of much of the efforts to address urban poverty. In 1993 there were about 110 informal settlements with a population of approximately 0.75 million. They occupied 5.84% of the land area used for residential purposes, but housed 55% of the city's population [Alder 1995].

11.4 INSTITUTIONS INVOLVED IN URBAN TRANSPORT

11.4.1 Local government institutions

The management of urban transportation planning and management is the responsibility of the Local Authorities, through the various City, or Municipal, or Town Councils. The councils have also been responsible for carrying out transportation infrastructure maintenance (from taxes and rates collected by the Councils). Lastly, they are in charge of planning for, and managing the growth in traffic within their cities and towns.

These roles require that the Councils should not only have the necessary human and financial resources, but also strong political support. Almost all local authorities in Kenya, regardless of their size, have limited human resource capacities in place at senior and middle levels. About 73% of the staff are junior level non-established staff employed by the local authorities. The result is a large number of junior staff who lack clear direction, instruction, reporting systems, and motivation [Opiyo and Koster 2000]. Further, there is a weak state of city/town finances, which is clearly a major constraint on any immediate improvement of services by the councils. Moreover, their freedom to initiate innovative attempts to involve the private sector are strongly inhibited by central government controls and the natural structural problems found in many Sub-Saharan Africa [Howe with Brycesson 2000]. Political support from the central Government is weak, especially in Nairobi.

The tasks are therefore clearly not matched with the resources required to undertake them effectively. By and large therefore, the important role played by the urban centers (particularly Nairobi) in the overall national development cannot be realized.

11.4.2 Central government institutions

There are many institutions that are/have been involved with urban transport infrastructure and services in Kenya. The Ministry of Local Government (MoLG), under which all local authorities belong, is involved mainly in urban planning and infrastructure development. Over the past 5 years, the Ministry has been involved in major urban road maintenance under the

Kenya Urban Transport Infrastructure Project (KUTIP)[11] and the Road Maintenance Levy Fund (RMLF)[12] projects.

However, the management of the RMLF is now entrusted to the newly formed Kenya Roads Board[13] (KRB) in the Ministry of Roads and Public Works (MoR&PW). Under the new arrangement, the KRB will channel funds to the local authorities through the MoLG. This arrangement may frustrate road maintenance efforts by local authorities in case the disbursements are not made promptly by the MoLG. Local authorities will be financed from the 40% of the Road Maintenance Levy Fund (RMLF) to be given to the districts (KRB Supplement, 2002).

The Ministry of Information, Transport and Communications (MoITC) is in charge of formulation of national transport policies (planning, design and management), vehicle licensing, and transport service regulations. In practice, however, the MoITC has had relatively little involvement in the roads sector, their duty being limited mainly to vehicle registration and licensing. Commercial vehicle operation licensing is carried through the Transport Licensing Board (TLB). New registration and subsequent road licensing is by the Registrar of Motor Vehicles. The lack of active involvement of the MoITC in roads sector policy formulation can be traced back to 1984 when the Roads Department was moved from the then Ministry of Transport and Communications (MoTC) to the then Ministry of Public Works (MoPW). Since then, the Roads department has been responsible for planning, designing, constructing, managing, and maintaining of the classified rural road network. Financing of road infrastructure has been through the Roads Department, with funding from the Ministry of Finance.

The KRB was formed by an Act of Parliament, and is entrusted with the planning, construction, and management of all public roads in Kenya, including those in urban areas. However, all public land (including roads and their reserves) is in the custody of the Ministry of Lands and Settlement. The KRB (in the MoR&PW) is supposed to build and manage roads, while the MoITC is to formulate road transport policies, registration of vehicles, licensing of all vehicles, and allocation of routes for all commercial vehicles.

Although officials of the MoITC are members of the KRB, the harmonization of policy and road infrastructure development issues may be a problem in the future. Better co-ordination between the MoR&PW and the MoITC in transport policy formulation and implementation is crucial, as the tasks entrusted to the Local Government Councils are not matched with enough political clout, and resources. This can be achieved through the KRB, which currently seems to have both strong political and financial support.

[11] KUTIP was jointly funded by the World Bank and the Kenya Government, and covered road maintenance projects in 26 urban areas.

[12] The RMLF was formed through the RMLF Act of 1993. The objective of the levy fund was to establish a source of fund that would be exclusively used on road maintenance.

[13] The KRB was formed by an Act of Parliament in December 1999. The Minister for Roads and Public Works appointed members to the Board in July 2000, and the KRB became operational on that date.

Another Central Government institution is the Office of the President (OP), through Kenya Police Department, is dealing with law enforcement, traffic control, and road traffic accidents. The OP has in the past dealt with transport infrastructure emergency maintenance. The Judiciary, through the Attorney General's Office is in charge of dealing with traffic compliance issues.

11.5 TRANSPORTATION STUDIES

There has been much transport planning, but little implementation. Past plans are thus of interest primarily from the perspectives adopted and the extent to which these addressed the needs of the urban majority.

The first study, the Nairobi Metropolitan Growth Strategy, was done in 1973, and bus ways were proposed. Several other studies, notably, the Transurb Consult study of 1987 and 1990, study of urban transport needs in Nairobi Stage I in 1986, and Stage II in 1990, by the World Bank, and the Nairobi Long-Term Transport Study in 1998.

These studies have tended to focus on improving the increasingly unsatisfactory conditions for the journey to and from work, as manifest in main road and junction congestion, slow journey times, high fares, etc. While most of the studies acknowledged the dominance of trips by walking and public transport, recommendations have tended to favor the latter, and by implication other motor vehicles. The issue of the affordability of public transport, its management in an increasingly decontrolled operating environment, and, as a consequence, the extension of services to the more remote communities, received little serious attention until the study in 1998. Similarly, improved facilities for walking and the restoration of an environment that would reinstate cycling also received little attention until the 1998 report.

Few of the recommendations of these studies have yet been implemented, even those in the latest one of 1998. Lack of financial resources has been the main reason, but the failure of the Nairobi City Council as both a political and administrative organization is also an obstacle. The result has been a steady deterioration in almost all transport infrastructures, and worsening congestion. Growth in population, economic activity and traffic have thus been superimposed on an infrastructure and transport service that receives little investment. Consequently much has deteriorated and continues to deteriorate.

11.6 URBAN TRAVEL BEHAVIOR

This section of the paper presents the urban travel behavior of poor and low-income earners in Eastern Nairobi[14]. The information presented is based on the Sub-Saharan Africa Transport Policy Program (SSATP) study on Non-Motorized Transport (NMT) and Urban Mobility study carried out between 1993 and 1999.

The observations from the case studies which might provide the most insight into travel behavior are the mobility levels and their main determinants; modal choices and travel distances; and vehicle ownership.

11.6.1 Mobility levels

In the SSATP Nairobi study area (eastern parts), the average number of weekday (excluding Sunday) trips[15] made by the adult (15+) population was 2.5 [SSATP 1994b]. Adults from low-income households (<$60/month) made slightly fewer trips (2.4) than higher income (>$60/month) households (2.8 trips). Children made an average of 2.0 trips per day.

The average adult figure in Nairobi is significantly *higher* than that used in previous studies (1.8) due to their omission of many walking trips [Nairobi Urban Study Group 1972, Ministry of Local Government 1992]. However, it is not easy to decide whether this level of mobility adequately meets the needs of the population. Higher levels can be observed in other cities of a comparable wealth, especially those with a significant share of two-wheeled traffic (bicycle or moped). For example, studies in metropolitan Ouagadougou (Burkina Faso) gave mobility levels of 3.1 trips/person/day for people walking, and 4.1 trips for people cycling. For the moped and car the respective figures were 4.3 and 4.5 trips /person/day [INRETS 1993]. Other studies in metropolitan Bamako (Mali) and Ouagadougou gave the following variations in mobility levels, respectively: housewives (2.0 and 2.6); young jobless women (2.4 and 3.4); heads of households (3.2 and 3.6); girl pupils (3.2 and 3.8); young men with a job (3.8 and 4.1); and boy pupils (3.9 and 4.6) [Diaz Olvera, et. al. 1998]

The evidence on mobility levels is thus not straightforward. The variations in rates may simply be due to differences *inter alia* in income levels, the availability of a personal means of transport, the age and gender of the respondent, cultural norms in the local society, or the precise way that a trip was defined.

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[14] The area covered 40-45 km^2 in the eastern parts of Nairobi, and houses many poor, low- and medium-income households. In the 1994 survey, 302 households were covered, with 1903 members.

[15] One-way movements from the home, including short trips to collect water or purchase items nearby unless the activity at the destination took more than 10 minutes in which case two trips were recorded. There is some evidence that this definition may not have been consistently applied and that in the case of Nairobi trips less than 15 minutes were excluded. This would lead to an under estimate of mobility levels and bias against neighbourhood, especially subsistence-related trips.

11.6.2 Modal split[16]

The weekday adult modal split was 47% of the trips made on foot, 1% by bicycles, 42% by public transport, 7% by private car, and 3% by private company cars. Since a trip by public transport often starts and ends with a substantial walk, then the modal share for walking was much higher than stated.

By considering the vehicle counts the private car dominates, while when occupancies are used, walking and public transport have the highest modal splits (see Table C3). From the viewpoint of ease of trip making for the urban population at large the provisions for walking and public transport are evidently of paramount importance.

Bicycles made a relatively insignificant contribution to modal split. This is in marked contrast to the situation prevailing 2-3 decades ago. Bicycle use was common and significant in many African cities. But they have become insignificant in the largest cities due to the increasingly hostile and unsafe environment created by motor vehicles and the absence of dedicated infrastructure at critical locations.

There was a difference in modal split depending on income. For those with incomes less than $60 per month, 57% and 68% of the first and second trips respectively, were made on foot. Walking was even more dominant, with public transport use declining after the first and most important (work) trip (from 42% to 29%). Car and bicycle use among this group were insignificant. Higher income reduced the importance of walking and greatly increased car use (from 57% to 24%)[SSATP 1994b].

11.6.3 Shifts between modes

The surveys in Nairobi showed that two thirds of the survey area population had no alternative but the mode they presently used, and only 16% actually used different modes for the same trip [SSATP 1994b]. Modal shift possibilities related almost entirely to walking and public transport, with an equal directional tendency for the shorter distance trips. Respondents who were not using a bicycle at that time did not consider cycling as an alternative. The main reason was the unsafe road conditions. Under the circumstances prevailing there was evidently a high modal captivity among the poor: to walking and public transport.

11.6.4 Trip purposes and patterns

The main trip purposes of households in the Nairobi study area were work (main industrial areas and the CBDs) and school. Out of an average of 2.4 trips made by an adult respondent in a

[16] The figures quoted are household averages. For specific *destinations* there may be significant variations. Thus, for trips from Eastlands (Nairobi) to the CBD, walking was 47% of trips as a household average; to the Industrial Area it comprised 65%; and locally 70%.

day, 1.7 (70%) were work-related. These trip purposes were followed in importance by shopping and visits to friends. This pattern closely agrees with other past studies.

Majority of the trips was to the main industrial areas and to the Central Business Districts. This trend is likely to be changing. In general, formal sector employment is declining relative to informal sector activities in most developing countries in African cities. The rising importance of the informal sector activities in the livelihoods of the majority of the poor population imposes more complex patterns of movement in time and space. The peak travel demands are still evident. However, the movements are increasingly less directional as most movements are made hawking, trading, and searching for work, with often very different characteristics exhibited by men and women. These types of movement may seem to require flexible transport systems than the radial movements provided by the existing public transport systems.

11.7 BICYCLE OWNERSHIP

The bicycle is the only practical alternative to walking or use of public transport, as a personal means of travel. In Eastern Nairobi, only 11% of the households owned one or two bicycles. This apparently high ownership level is in marked contrast to the trip shares (1 - 3% of all trips made). Further analysis indicates that there are those households who own bicycles mainly for children's recreation, and those that own them as basic means of personal transport, and for carrying goods. The low apparent utilization for the most important trips reflects the fear people have about using bicycles.

Overall it can be concluded that mobility problems (particularly of the poor) in the small cities are substantially less than in the metropolitan areas. Trip distances are shorter, taking less time and requiring lower expenditures. The increased use of walking and cycling support this conclusion.

11.8 TRAVEL PROBLEMS AND NEEDS OF THE URBAN POOR

This section summarizes the travel problems of the poor households in urban areas, based on the travel data presented in the previous section. It presents the poor households access targets and the extent to which the transport system has frustrated their achievement. Problems associated with the goods transport by and for low-income groups, using handcarts, are also presented.

11.8.1 Walking

The expense of public transport and lack of safe alternatives (e.g. cycling) determines that walking is the only personal travel option for much of the poor population. For a growing proportion walking trips are becoming longer as the cities expand, and formal (and informal) em-

ployment opportunities and the most important services remain centralized in the CBD and the industrial areas. Many peripheral settlements are in unattractive locations so income generating activities and services are difficult to establish in their vicinity. The result is that some of the most poor are completely stranded in remote slum settlements.

The most fundamental problem confronting the pedestrian is that many roads are only designed for motor vehicles. Sidewalks for pedestrians are non-existent or comprise the bare earth. Walking routes are often obstructed - by waste, parked vehicles, or informal businesses – generally unsafe and uncomfortable. There are few constructed footways and those that exist are generally filthy and in very poor condition, since they frequently are used as dumping grounds for solid waste or serve as drainage channels. [Omwenga et.al. 1993, Nguma et.al. 1993].

Some pedestrian routes are greatly extended by detours. These may be due to the lack of footbridges across rivers and swamps, obstructing buildings, or access prohibitions across government or private land.

There is general lack of properly designed and recognized pedestrian road crossings. This is a major cause of accidents and discourages people from walking because it is too dangerous. Accident figures bear testimony to this statement. Along Jogoo road, for example, out of the 25 fatalities in 2000, 17 of them were pedestrians [KUTIP Nairobi NMT Works 2001] [Opiyo and de Langen 1998].

Lack of social security is another concern for the poor. Women are especially concerned with the security aspect of walking and the risk of attack. It is alleged that harassment comes from thugs, council officials and the police [Ambwere 1993]. To those who have to undertake long journeys to and from work, this is critical in the hours close to dark and at night. Lack of effective street lighting has frustrated walking at night, as there are dangers from traffic and a risk of violence. As result some women and children are forced to incur the expense of public transport, even for short distances, or take long detours. For most women and girls mobility is severely restricted by insecurity, especially in and around the informal settlements

11.8.2 Cycling

The perceived danger of cycling is the main reason why more use is not made of a mode of transport which is otherwise appealing [SSATP 1994f]. The aggressive and uncaring behavior of motorists is undoubtedly the single most important problem confronting cyclists. The poor condition of many routes, the lack of secure facilities to park bicycles, and, in some areas fear of robbery, are also perceived as significant problems. The undisciplined behavior of cyclists themselves also contributes significantly to the very real danger of using a bicycle. They lack training in the safe use of roads.

11.8.3 Handcarts

Despite being licensed by the Nairobi City Council for a fee that entitles them to use the roads, handcart operators are not provided with any facilities in the form of parking space, or special rights of way. As with cyclists, they are constantly harassment by motorists, council officials and the police, albeit to, a lesser degree.

Other problems experienced by handcart operators are conflicts with motorists for road space, and the poor condition of the roads themselves. Travel through the main junctions is a particular difficulty because they lack positive traffic controls, such as signals, which creates a dangerous free for all.

11.9 ROAD NETWORK

11.9.1 Nairobi road system

The initial layout of Nairobi's main road system was reasonably well planned and spacious, but its development has not been able to keep up with the explosive growth of population and road traffic. The orientation remains largely radial focusing on the CBD, with the arterial system dominated by the main Mombasa to Uganda road traversing the city from south-east to north-west, and a north-east fork that serves the important population centers and agricultural areas around Mount Kenya. There are few bypasses or circular routes by which long distance traffic can avoid the center of the city. However, they currently do not serve as such, since land development has turned them into local access roads.

A full inventory of the road system was made in 1992 with a partial survey of the most heavily trafficked routes in 1998 [Ministry of Local Government 1992, Post Buckley Int. 1999]. There are around 300 km of main[17] and 850 km of access roads, including unpaved earth tracks, much in a deteriorated condition.[18] The total length of roads in Nairobi is a small percentage (1.8%) of the national road network given in Table C2. The 1992 survey found only 39% of the network surfaces to be in a good or adequate condition, the remainder being poor or very poor requiring resurfacing or reconstruction. However, drainage conditions were worse with 56% poor (under-designed) or very poor (non-functional) and 17% having no roadside drains or culverts.

[17] Paved roads were 964km, Gravel surfaced 40km, and Earth roads 149km. Main roads was defined to include national trunk highways, primary arterials, secondary arterials, and collectors. The survey covered an area of approximately 10km radius from the city centre.

[18] The condition of most roads in the city is now better, thanks to the Kenya Urban Transport Infrastructure Project (KUTIP), and the Road Maintenance Levy Fund (RMLF) that have been used to rehabilitate roads in Nairobi and other urban areas.

Under the KUTIP many improvements have been made on the condition of the road network. The improvements have relieved congestion along some major roads, due to the building of additional capacity, and general surface condition improvements. Under the same project, a draft Urban Roads Design Manual was produced, but has not been finalized. Lack of an Urban Roads Design Manual (and a functional road classification system) is one of the main causes to problems of access control and provision of transportation infrastructure.

The 1998 surveys focused on 300 km of main roads that were in reasonable condition, but suffered from a high level of side friction reducing their operational efficiency. The side friction was in the form of encroachment onto the carriageway, or excessive provisions for local access. The lack of access control was cited as one of the major causes of traffic congestion in Nairobi.

Table C2 National Road Lengths by road class are shown below

Km of roads as at 1st July 1994 - 1999

Category	1994		1995		1996		1997		1998		1999	
	Bitumen	Earth/gravel	Bitumen	Earth/gravel	Bitumen	Earth/gravel	Bitumen	Earth/gravel	Bitumen	Earth/gravel	Bitumen	Earth/gravel
A	2,697.2	957.9	2,653.0	957.9	2,653.0	957.9	2,653.0	957.9	2,653.0	957.9	2,653.0	957.9
B	1,403.3	1,344.8	1,304.4	1,366.5	1,304.4	1,366.5	1,304.4	1,366.5	1,304.4	1,366.5	1,304.4	1,366.5
C	2,590.0	5,568.4	2,561.7	5,468.9	2,561.7	5,468.9	2,561.7	5,468.9	2,561.7	5,468.9	2,561.7	5,468.9
D	1,187.0	10,905.6	1,183.8	10,155.0	1,183.8	10,155.0	1,183.8	10,155.0	1,183.8	10,155.0	1,183.8	10,155.0
E	712.7	25,993.6	749.3	26,321.5	749.4	26,321.5	749.5	26,321.5	749.6	26,321.5	749.7	26,321.5
F	213.5	10,905.2	219.5	11,000.4	219.5	11,000.4	219.5	11,000.4	219.5	11,000.4	219.5	11,000.4
TOTAL	**8,803.7**	**55,675.5**	**8,671.7**	**55,270.2**	**8,671.7**	**55,270.2**	**8,671.7**	**55,270.2**	**8,671.7**	**55,270.2**	**8,671.7**	**55,270.2**

Source: Central Bureau of Statistics, Kenya Government

Category A: International Trunk Roads

B: National Trunk Roads

C: Primary Roads

D: Secondary Roads

E: Minor Roads

F: Special Purpose Roads (government access, settlement, rural access, sugar, tea and wheat roads.

11.9.2 Traffic volumes and composition

Data collected along some 6 major entries/exits from the Nairobi's CBD, in May 2002, are shown in Table C3.

Table C3: Modal Splits by vehicle types and persons transported during peak hours

Road	Modal split by:	Modal Split						Total peak volume	
		Private cars	Small *Matatus*	Minibuses	Buses	Goods vehicles	NMT	MT	NMT
Muranga	Vehicles	57	32	7	1	3	-	23,492	-
	Persons	11	53	23	6	-	7		12,531
Landhies	Vehicles	64	19	9	3	6	-	16,164	-
	Persons	16	36	26	30	-	5		15,176
Uhuru h/way -	Vehicles	74	14	3	6	3	-	28,748	-
north	Persons	15	28	10	45	-	2		2,008
Kenyatta -	Vehicles	60	27	6	5	2	-	14,681	-
west	Persons	10	39	14	31	-	6		9,772
Haile Selassie -	Vehicles	58	31	6	2	3	-	11,133	-
west	Persons	11	48	17	15	-	9		8,545
Uhuru h/way -	Vehicles	69	15	7	2	7	-	39,842	-
south	Persons	17	32	27	23	-	2		3,652

Source: *TRL Nairobi Field Surveys, May 2002*.
Note: Vehicle occupancies used are: 2 (1.5): 20 (15): 40 (30): 110 (80) for Cars: Small *Matatus*: Minibuses: Buses. Figures in brackets are for flows on lanes opposite to peak flow direction.

On average, private cars constitute about 61% of all MT traffic on the roads, while they transport only 12% of all persons. Based on persons transported, the bus is the most efficient, followed by the minibus, then the small *Matatus* and private cars. At the average of 5% of all persons transported, the contribution of NMT should not be ignored.

On average, the motor transport peak traffic flow varied between 8 and 21 vehicles per lane per minute. For some roads, the minimum flow rate recorded was 2veh/min/lane. These figures show that congestion levels are quite high in Nairobi during the peak hours.

NMT volumes are high in Nairobi, as most trips are made on foot. Pedestrian crossing volumes are also very high. Data collected in 1999 is shown below.

Table C4: Crossing pedestrian volumes and motorized vehicle volumes

Road	12 hours		Peak Hour	
	Vehicles	Crossing pedestrians	Vehicles	Crossing pedestrians
Juja road	3,207	3,121	449	414
Outer Ring (1)	10,325	6,438	1,526	1,208
Outer Ring (2)	9,983	8,114	838	1,620
Outer Ring (3)	13,901	3,126	1,960	502
Jogoo (1)	23,291	5,092	2,869	1,243
Jogoo (2)	32,585	10,723	3,299	1,393
Landhies	39,366	19,359	5,140	1,294
Uhuru Highway	31,678	13,728	2,743	1,740
Ngong	14,468	9,956	1,470	955
Mombasa	36,724	15,113	3,911	4,041
Langata	12,359	8,157	1,921	2,144

Source: Post Buckley International, 1999.

In the 1998 PBI study, the most common forms of encroachment, causing congestion, were:

(i) by Non-Motorized Transport, either parallel with traffic or crossing the road in large numbers. This is due to lack of NMT facilities.

(ii) public transport vehicles stopping in the carriageway to take on or discharge passengers, or waiting to fill up with passengers, mainly by the *Matatus*, and;

(iii) on-street parking by private cars in central areas of the CBD.

All these combine to block the smooth flow of traffic.

11.9.3 Vehicle population

Vehicle registration in Kenya is centralized with the headquarters in Nairobi. The data is not kept in a way that allows for easy determination of the number of vehicles in any region. Estimation of the number of vehicles operating in Nairobi is complicated by the presence of vehicles from the neighboring districts/towns (as far as 150 km), which normally operate in the city during the day. Some national and city data is presented below.

Table C5: New registrations 1993 - 1999

Category	1993	1994	1995	1996	1997	1998	1999*
Motor cars	6,370	9,730	9,779	12,694	13,254	16,301	16,037
Utilities, panels, Vans, pick-ups, etc.	2,510	3,880	5,778	7,711	7,544	7,295	8,121
Lorries and trucks, Heavy vans	750	1,315	1,778	2,222	2,732	2,578	2,705
Buses and minibuses	814	817	1,556	1,834	1,858	1,761	1,958
Motor and auto cycles	1,133	1,488	1,778	2,328	2,415	1,980	1,708
Other motor vehicles	552	657	1,111	1,201	1,410	1,258	1,482
Trailers	291	541	444	674	680	539	52
TOTAL	12,420	18,428	22,224	28,934	29,893	31,712	32,063

Increment		**6,008**	**3796**	**6710**	**959**	**1819**	**351**
Annual Growth rate (%)		**48.4**	**20.6**	**30.2**	**3.3**	**6.1**	**1.1**
Increase in annual vehicles registered							**158%**

Source: Central Bureau of Statistics, Kenya Government; and own calculations.

* The 1999 data were provisional.

Table C6 All Vehicles with current licenses 1993 -1999

Category	1993	1994	1995	1996	1997	1998	1999
Motor cars	171,506	171,569	172,770	202,716	211,916	225,078	241,824
Utilities, panels, Vans, pick-ups, etc.	100,141	100,178	100,947	116,470	121,685	148,832	162,843
Lorries, trucks, Heavy vans	32,402	32,413	32,570	37,493	39,475	54,172	55,805
Buses and minibuses	29,669	29,681	29,753	33,725	34,909	46,367	37,912
Motor and auto cycles	32,303	32,317	32,479	37,761	39,421	42,475	43,021
Other motor vehicles	21,467	21,475	21,512	24,257	25,182	29,842	32,511
Trailers	10,568	10,571	10,486	12,125	12,563	13,147	13,708
TOTAL	**398,056**	**398,204**	**400,517**	**464,547**	**485,151**	**559,913**	**587,624**
Increment		**148**	**2,313**	**64,030**	**20,604**	**74,762**	**27,711**
Annual Growth rate (%)		**0.0**	**0.6**	**16.0**	**4.4**	**15.4**	**4.9**
Total growth (Average annual growth rate = 5.3%)							**47.6%**

Source: Central Bureau of Statistics, Kenya Government and own calculations. Includes new registrations and renewals.

Table C7 summarizes details on the number of licenses issued for freight and passenger transport services.

Table C7 Licenses issued to freight and passenger transport vehicles (1995-1999)

Category	1995	1996	1997	1998	1999
PSV - *Matatu*	22,820	24,470	21,662	24,334	28,805
PSV - Buses and tourist vehicles	2,185	2,042	1,996	1,952	3,359
Freight Transport vehicles	7,752	6,517	9,031	7,157	7,706
TOTAL	**32,757**	**33,029**	**32,689**	**33,443**	**39,870**

- 1999 data are provisional; - PSV: passenger service vehicle.
- Source: Economic Survey, 2000, Republic of Kenya.

Vehicle populations in Nairobi were estimated by Post Buckley International in 1998 as 230,478 in 1989, 274,820 in1994, and 320,072 in 1996. These figures are about 70% of all vehicles in Kenya that had current licenses. A percentage between 30 - 35% of the national vehicle population may be used for estimation purposes.

11.10 PUBLIC TRANSPORT SYSTEM

Rapid and continuing population growth has been accompanied by an equally rapid increase in the demand for public transport. This is not only because of the increase in the number of (potential) users, but also the increasing commuting distances resulting from physical expansion of the cities. This makes other modes (walking, cycling) less attractive; also transport by private car remains the prerogative of the wealthy minority - less than 10% of household trips.

The Nairobi public transport system, apart from some limited commuter rail operations, consists entirely of road-based services, which are fully private. In addition, the system operates in a largely deregulated environment: there is little or no government control of, or even influence on, such crucial elements as route structure, operational practices, timetables or fares. The system consists mainly of two entirely different sub-systems, which compete on the same routes.

The system has traditionally consisted of two entirely different sub-systems (KBS and *Matatus*), which compete on the same routes, but since 2002, there are new entrants (privately owned large buses) into the market. The privately owned buses are estimated to be 60 in number. Buses and *Matatus* share the regularly congested carriageway with other road users: dedicated infrastructure such as bus lanes, is absent, as is e.g. preferential treatment at controlled intersections.

Due to a rapid increase in the number of private cars and the lack of traffic management measures, congestion has increased over the years and operating speeds have declined. Traffic management measures are now urgently required, including specific measures such as bus lanes. Such measures might result in lower travel times, increased frequencies, increased patronage, lower fares, or a combination of these.[19] Lower fares would also be beneficial to those who currently cannot afford public transport, as well as to the operators who would see increased patronage.

For much of the urban population the main problem with public transport is simply its cost. For the low-income in Nairobi Eastlands this was estimated, at between 10-30%[20] of the personal monthly income depending on trip length [SSATP NMT Study 1994c]. Many low-income users state that they can only afford public transport during the initial weeks of a month, afterwards they walk.

[19] Studies into the effects of a possible bus lane on Jogoo Road, one of the major corridors in Nairobi through the middle of the study area, suggest a benefit/cost ratio in the order of 3, mainly as the result of time gains for both bus/matatu operators and users, and other road users [Hop et al. 2000].

[20] The survey carried out for this study gives an estimate of 10-15% of the traveller's income.

11.10.1 Kenya Bus Services (KBS)

KBS is a private company that had some 277 large buses (110 passengers) on fixed routes and schedules in 1998. Most routes they operate on are radial, passing through the city center. This reduces the need for passenger transfers and provides a competitive advantage over the *Matatus*, which are permitted to enter the city center, but only along some specific peripheral roads.

According to a study carried out by KBS in August-September 2000, the KBS market share stood at some 17% for all routes, and 29% on KBS operated routes in the city. At that time KBS had about 240 buses operating daily, competing against 9,894 *Matatus* and 15 country buses [KBS Competition Survey, Aug./Sept., 2000]. This share has declined continuously. In 1994, KBS had 36% of the market. The small *Matatus* were estimated to grow at about 31% per year in 2000. KBS transported some 300,000 passengers per day in 1990, while the number of passengers transported per bus per day has been steadily declining over the past years: from a high of 1,500 passengers/bus/day in the mid-80's to less than 1,000 in 1997. The network has been gradually reduced over time, as routes have been abandoned and taken over by *Matatus* [Post Buckley International 1998].

The ownership of the KBS Company has changed hands many times. The latest change was in 1998, when Stagecoach sold the company to a group of Kenyan investors, who changed the company's name back to Kenya Bus Services. KBS split the companies into two: KBS and Bus Track. KBS now offers two services: Express service (new buses) which is for inter city transport, mainly to Western Kenya; and the Metro Shuttle minibus that serves the high/medium income areas in Nairobi. The Bus Track Company offers city transport, and is now the main competitor with the *Matatus*.

There are 30 Metro Shuttle minibuses, each with a capacity of carrying 33-seated passengers. They were bought new, are well maintained, clean, do not carry standing passengers, and operate on timetables. However, they are about 50% more expensive than the *matatu*. Their market niche is the middle- and high-income urban residents who value their comfort, safety, and time, and ready to pay the high fares. KBS hopes to increase the fleet, as initial indications are that they can make better profits in this service than in the Bus Track service.

Bus Track vehicles are refurbished old buses that have been plying city routes. Approximately 240 buses ply the city routes daily. The Bus Track service is operated by former employees (former KBS supervisors) in some sort of lease from the company since 2001. The buses are operated on a profit sharing basis between the company and the individual operators. Each operator manages about 10 buses [Opiyo 2002][21]. The leasing out the buses and the licensing of pri-

[21] A paper is to be presented at the 12th Steering Committee Meeting of SSATP in July 2002 on this subject.

vate bus operators also affected the *matatu* operators who had dominated some of the routes previously not served by KBS due to poor road conditions.

11.10.2 Matatus

Matatus mostly operate on the same routes as Kenya Bus Service, but without timetables. They are of two main types: the 18- and the 25-seater vehicles. On some routes they compete amongst themselves without the KBS. According to data collected for this study[22], about 63% of the small *Matatus* (18-seater capacity) are over 10 years old, while about 70% of the minibuses are less than 10 years old. About 95% of all *Matatus* are owned by individuals, and 53% of them were purchased through family savings. The vehicle values are generally less than Ksh. 1 million (<US$ 12,500). About 47% of the small *matatu* owners owned only one vehicle, 34% owned two, and 19% owned more than 2 vehicles. For the small *matatu* owners, their main reason for choosing the vehicle was for financial (38%) and economical (31%) reasons. For the minibus owners, it was mainly economical (36%) and informal route regulations (24%) by the operators.

Matatu fares depend on the time of the day and the weather conditions. The fares are higher during peak hours, late at night, and during bad weather. In the off-peak periods, fares can drop by 30 - 50% or more, as a way of ensuring they get enough people on-board. Under "normal" operations, the fares are fixed by the particular route operators/associations. Fares due to internal *matatu*/*matatu* competition only apply for approximately 20% of the time. The normal fares are about Ksh. 2, 1.9, and 1.3 for the small *matatu*, minibus, and bus respectively.

In August/September 2000, Kenya Bus Services estimated the number of *Matatus* operating in Nairobi at 9,894 units, out of which 2,946 units are 25-seaters and 6,948 units are 18-seaters [KBS Competition Survey, Aug./Sept., 2000]. *Matatus* largely ignore official bus stops and, especially in peak hours. They depart from the termini only when fully occupied, and generally drive non-stop to the final destination. In off-peak periods, drivers try to pick-up as many passengers as possible on the way, which leads to erratic driving and stopping behavior. During congested periods, traffic rules are often ignored (e.g. they use the road shoulders, or lanes for opposing traffic to by-pass traffic jams).

Although formal route associations were banned some years ago for political reasons, they did exist informally until in 2000 when the *Matatu* Welfare Association (MWA) was registered. About 80% of all *matatu* operators belong to some association, mainly to get permission to operate, and welfare reasons. The MWA's main role has been to address issue that affect their members like cost of vehicle insurance, parking spaces within the urban area, discipline at the termini, and any other matter that affect their membership.

[22] Some 150 operators were interviewed in Nairobi during May 2002.

Matatu owners reportedly do not pay income taxes, whereas Kenya Bus Service does. However, since late 1999 they have been paying the so-called Transport Licensing Board (TLB). The TLB is a license allowing the *Matatus* to operate along some designated routes, and operators should be taxed. Before the issuance of the TLB license, the operator must show a valid annual vehicle inspection report, and an insurance cover.

According to the May 2002 study, the small *matatu* operators collect about Ksh. 8,000 daily from which they spend about Ksh. 3,500 on fuels, drivers, conductors, and other costs. The data was not very reliable as most them admitted they do not keep accounts. However, it was calculated that they can make about Ksh. 750,000 per year, equivalent to the price of a second hand small *matatu*. The minibus operator can make about Ksh. 1.3 million per year. These figures may be supported by the fact that about 60% of the operators said they would not leave the business even if the government controlled fares. However, they were divided on the reason for not leaving: 50% because it is profitable; and 50% because there would be no other better business.

The main problems, encountered in the market, cited by the operators were in the following order:

1. Extortion by the police and local government officials;
2. Poor infrastructure;
3. Traffic safety on the roads they operate;
4. Financial;
5. Insecurity in Nairobi; and,
6. Competition in the market.

It is surprising that the operators rank financial problems and competition on the market low.

11.10.3 Traveler interview survey

As part of the study, a survey was carried out to get some information on how travelers view their modes of travel and the general traffic safety within city. Some 136 respondents, from their places of work (offices and markets) were interviewed. Some 98 of them used public transport, 22 used private cars, 13 walked and 3 cycled. About 94% of them used the mode daily. On average, those who used the private car traveled 19 km, those in *Matatus* 14 km, and those in the buses 12 km. Those who walked traveled about 4 km on average.

About 71% preferred the mode they used, mainly because the mode was convenient to use for the trip (74% of the respondents). Traffic safety of the mode was cited as the main reason for preference by 19%, and only 7% had no alternative, other than the mode they used. Some 68% of the respondents stated that the modes they used were not safe, mainly due to traffic safety (40% of the 68%). It may be concluded that convenience seemed to influence the choice of mode more than safety and other reasons. About 35% of those who used the *matatu* did not

prefer it to the other available modes. This may be pointing to the problems normally encountered in the use of the *matatu*.

On route safety, 93% stated that they were not safe, and 63% (of the 93%) said traffic safety was the main problem. About 38% of the respondents knew of some victims of road traffic accidents in their neighborhoods, of which 25% of the cases were fatalities.

The main problems cited by the respondents that needed to be addressed to improve transport in Nairobi, were in the following order:

1. Good infrastructure;
2. Effective enforcement of traffic rules and education of users;
3. Improvement in traffic safety; and,
4. Improvement in insecurity.

11.11 ROAD TRAFFIC ACCIDENTS

Nationally, between 1991 and 2001 (Table C8), the total number of accident casualties increased from 21,720 (2,216 fatalities; 6,958 serious; and 12,546 slight) to 29,408 (2,790 fatalities; 10,504 serious; and 16,114 slight). This is an increase of 35% in the number of casualties. Over the same period, fatalities increased by 26%, serious injuries by 51%, and slight injuries by 28%. From the data of 1996 and 1997, nationally, pedestrians account for about 42% of all fatalities, while about 60% of all serious injuries involve passengers.

Table C8: National Traffic Accident Data

Accident type	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Fatal	1544	1716	1743	1835	2113	2186	2189	2220	2292	2184	2134
Serious	3041	3498	3447	3830	4905	5265	4394	4199	4229	4227	4409
Slight	6525	7521	7165	6120	5942	6439	8526	7923	7670	7527	6864
Total Accidents	**11,100**	**12,735**	**12,355**	**11,785**	**12,960**	**13,890**	**14,849**	**14,342**	**14,291**	**13,938**	**13,407**
Victims											
Persons killed	2216	2673	2516	2424	2617	3000	3022	2972	2823	2819	2790
Seriously injured	6958	8495	7734	7652	8661	9313	9618	9632	10160	9659	10504
Slightly injured	12546	14959	14150	12884	14332	15431	16133	15896	17038	16539	16114
Total Casualties	**21720**	**26127**	**24400**	**22960**	**25610**	**27744**	**28773**	**28500**	**30021**	**29017**	**29408**

In Nairobi, between 1990 and 2000, the total number of accident casualties increased from 4,890 (375 fatalities; 1,003 serious; and 3,512 slight) to 6,463 (531 fatalities; 739 serious; and 5,193 slight). This is an increase of 32.2% in the number of casualties. Over the same period, fatalities increased by 3%, serious injuries by -2.9%, and slight injuries by 5.6%.

Table C9 Accident Data for Nairobi Area

Accident type	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Fatal					459	461	497	471	466	474	472
Serious					640	390	593	626	619	807	854
Slight					3292	3925	4134	4240	4109	3777	3164
Accidents		**4,227**	**4,483**	**4,252**	**4,391**	**4,776**	**5,224**	**5,337**	**5,194**	**4,959**	**4,490**
Victims											
Persons killed		433	391	470	481	487	530	503	493	501	521
Seriously injured		639	690	789	727	773	736	723	707	858	1114
Slightly injured		4374	4603	4044	4243	4674	5318	5347	5473	4994	4825
Casualties		**5446**	**5684**	**5303**	**5451**	**5934**	**6584**	**6573**	**6673**	**6353**	**6460**

Source: Traffic Police Headquarters, Nairobi, Kenya, 2002.

Table C10 Classes of persons killed and injured in Nairobi area

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Drivers										
Killed	44	34	39	38	49	43	32	38	44	37
Seriously injured	77	105	98	118	75	93	82	88	117	129
Slight injuries	530	598	497	532	655	606	593	607	636	607
Motor cyclists										
Killed	4	4	1	2	3	4	3	4	3	2
Seriously injured	14	12	8	14	20	13	12	27	22	19
Slight injuries	114	102	73	85	105	119	142	118	146	172
Pedal cyclists										
Killed	13	13	16	22	24	24	22	32	25	17
Seriously injured	25	46	33	34	35	28	39	39	50	58
Slight injuries	289	281	241	222	259	277	275	350	255	296
Passengers										
Killed	98	80	125	108	84	92	81	69	81	90
Seriously injured	214	172	253	216	243	232	203	176	220	400
Slight injuries	1495	1572	1282	1427	1375	1797	1827	1724	1707	1902
Pedestrians										
Killed	271	260	289	311	318	367	365	350	348	375
Seriously injured	309	355	397	345	400	360	387	377	449	508
Slight injuries	1946	2050	1951	1977	2280	2519	2510	2604	2250	1848

Source: Traffic Police Headquarters, Nairobi, Kenya, 2002.

In Nairobi, pedestrians account for about 68% of all fatalities, about 50% of all serious, and 48% of all slight injuries.

Table C11 Age groups of persons killed and injured in Nairobi area

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Persons over 16 years										
Killed	361	338	399	420	406	479	449	453	443	473
Seriously injured	529	547	662	628	669	644	634	619	746	985
Slight injuries	3593	3835	3552	3739	4055	4788	4596	4818	4425	4249
Persons up to 16 years										
Killed	72	53	71	61	72	51	54	40	58	48
Seriously injured	110	143	127	99	104	82	89	94	112	129
Slight injuries	781	768	492	504	619	530	751	655	569	576

Source: Traffic Police Headquarters, Nairobi, Kenya, 2002.

From Table C11, about 12% of all fatalities involve persons under the age of 16 years (school going age). This is considered a high accident rate given that the children are most of the time in school or at their homes. Data available at the City education department indicate that about 250,000 (11.7% of the city population) children under the age of 14 attend primary schools in Nairobi. They are confronted with poor safety conditions of the roads, especially those that come from poor families. Children from medium and high-income households are either transported to school by parents in private cars or by school buses. There is no data on the growth in the number of school transport buses and vans. However, their growth over the years can be attributed to the failure of the public transport system, in terms of safety and comfort, and the disparity in the quality of education in the city.

Data on the time the accidents occurred shows that 45% of all accidents occurred during the night. This percentage of occurrence is high taking into account that there are fewer vehicles on the road at night. Possible explanations are the poor road infrastructure, lack of street lighting (also contributing to insecurity), and drunk drivers on the roads.

Table C12 Vehicles or others primarily responsible - Nairobi area

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Cars and Utilities	1644	1661	1292	1503	1586	1593	1876	1397	1501	1238
Lorries	299	266	267	319	188	240	156	152	142	71
Trailers	6	0	0	2	22	10	25	30	31	29
Tankers	2	0	0	1	9	2	46	25	22	29
Tractors	4	1	2	6	3	1	5	0	0	0
Urban buses	393	291	195	270	297	274	334	576	571	649

Country buses	97	80	66	64	76	48	117	65	51	45
Taxis	94	97	76	105	95	39	137	112	88	163
Matatus	701	534	314	367	476	601	892	929	1085	936
Motor cycles	132	105	75	99	92	92	123	174	158	163
Hand carts	32	30	32	26	19	4	25	23	33	19
Pedal cyclists	201	187	148	164	129	137	210	292	247	270
Animals	0	2	1	23	2	1	1	2	0	2
Persons	541	969	1382	1061	1396	1638	1054	1087	685	585
Unknown	81	260	402	381	376	544	336	330	344	291
	6219	6476	6246	6386	6762	7221	7335	7193	6958	6491

Source: Traffic Police Headquarters, Nairobi, Kenya, 2002.

Vehicles mainly responsible for accidents are private cars (23%), *Matatus* (10%), and urban buses (6%). Persons are also responsible for a substantial amount of accidents (15%).

11.11.1 Main causes of traffic accidents

High rates of traffic accidents are caused by a number of factors. The main ones are discussed below.

Inadequate road designs and poor infrastructure. Most roads have been designed with no clear road functions. Layouts of most urban roads allow for various uses, which are often conflicting. The apparent governments' bias against NMT has lead to poor or no infrastructure for the majority of the urban population, that is, those who walk, and could cycle. The state of transport infrastructure is generally bad for both the motor vehicle traffic and NMT. However, it is worse for pedestrians and cyclists, particularly in the central urban areas, where the amount of street space left for walking does not reflect the high NMT demand. NMT facilities either do not exist, or are in very poor condition.

The existing road network is also congested, and traffic movements are chaotic and unpredictable. The passenger loading and off-loading behavior of the *Matatus* (privately owned public transport vehicles) is an important ingredient of this chaos.

NMT users are left with no option but to use (mix with fast MT modes) the congested roads with the consequence of being injured and killed by motorized traffic. Further, convenient, direct and comfortable routes are hardly available, and certainly not over longer distances.

Poor Enforcement of Traffic Laws and Regulations. There is general lack of enforcement of traffic laws and regulations by the Police departments and the local authorities. Drivers often flout traffic laws and regulations, especially the public transport vehicles because they know they can "buy" their freedom through the payment of a small fee. This has contributed to poor driver behavior, and those who are completely ignorant of traffic laws. The lack of training of

NMT users in correct behavior in traffic is another contributor to high accident rates. Efforts are made by the Traffic Police to educate children in schools on road safety, but these efforts are often frustrated by lack of human and financial resources.

The local councils and the police also lack the necessary resources (human and financial) to effectively manage and control traffic within the central areas. Lack of urban transport policies, with regard to parking and environmental conditions, has made the problems to continue unabated.

11.11.2 Some ways to reduce accidents

In the short-term, (Opiyo, 2002):

1. Development and use of appropriate urban road design guidelines, through demonstration projects, using the findings from projects carried out in the region, and elsewhere,
2. NMT training and education on proper road use,
3. Vehicle inspections, and,
4. Proper budgets and availability of funding for policing.

In the medium- to long-term:

1. Addressing the conditions in the PT micro-enterprises market (very stiff competition), and,
2. Development and use of appropriate urban road design standards, and proper traffic management institutions and structures, and sustainable financing of urban transportation.
3. Policies that encourage the NMT modes of transport.

Improvements by engineering measures. Engineering improvements should mainly involve road network re-design, construction of NMT route networks, and traffic calming measures. Combinations of these measures often give the best results. For these measures to work, it is important to ensure that they are, as much as possible, "self-enforcing". They should not necessarily require the Police or traffic signs to be effective.

Policy actions for road safety improvements. Government policies should be enacted to ensure that transport infrastructure designs are safe before they are constructed. Road Safety Audits, by independent professionals should be part of the design process[23]. Similarly, urban transport service designs should go through Urban Transport Audits before implementation. These audits will not only be useful in planning and design of transportation projects, but also in their operations, and impacts to the community.

[23] The professionals should not be related to the implementing government agency or the design consultant.

Finally, the urban transport problems vary from one city to the other; however, most cities only need better traffic management capabilities. A concerted effort is needed to build up capabilities for transport research and policy development at the country level. Currently too many institutions are involved in urban transport decisions making none directly involved in the formulation of clear transport policies, especially in urban areas.

11.12 Environmental Pollution

In 1999, Parliament passed the Environmental Management and Co-ordination Act, which came into force in January 2000. The Act provides an appropriate and legal and institutional framework for the management of the environment and sustainable use of natural resources.

As a first step in the reduction of vehicular pollution, the Ministry of Energy, in liaison with the Kenya Bureau of Standards, effected a new standard on unleaded gasoline in 1999. By end of July 2002, there will be a specification on unleaded gasoline. However, unleaded fuel is already available at some outlets in Nairobi.

No comprehensive study has been done in Nairobi to get the pollutant levels, but indications (congestion, poor roads, old vehicle fleet, etc) are that vehicular emissions are high. There are no legal requirements that all vehicles are inspected for pollutant emissions before renewal of road licenses.

11.13 Summary

The modes used by the urban poor have been largely ignored, through lack of investment in their facilities. On a daily basis, the poor either have to expose themselves to very dangerous traveling conditions in search of basic needs, or be stranded in the slums. The options are: travel and be killed (fatalities among the pedestrian population stands at approximately 70%), or stay hungry in the cold without clothing.

The key transport issues are:

1. Traffic road accidents, mainly for the NMT users
2. Traffic management to reduce congestion and pollution in the central areas of the city
3. Regulation and control of the private operators (*Matatus*)
4. Development of a system of functional classification of roads within urban areas that would assist in facility designs, in terms of access control, facilities to provide for each class, maintenance strategies, etc.
5. Institutional arrangements that would ensure delivery of services, transportation included

6. There is need for financial and human resource capacity building at the Nairobi City Council
7. There is need for an urban transport policy that would guide the city council to achieving efficient and sustainable transport system that would create economic development

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12 APPENDIX D – ADDIS ABABA ACCIDENT BLACKSPOTS

The main blackspots reported by the Addis Ababa Traffic Police are listed below, and were normally mentioned as sections of road rather than precise spots. The order of listing is arbitrary as accident data for each site were not available during the visit.

1. Tessema Damtew Road at Ghandi Memorial Hospital

This road leads north-west from the main Meskal Square and is dual carriageway width with a 1.5m median. There is a surfaced 2-3m wide raised footpath on both sides of the road, which is in relatively good condition. A number of junctions lie along this stretch of road that have accident problems. Owing to vegetation in the median, visibility is very restricted for drivers making a left-turn from lane 2 into one of the side road T-junctions. Also, approach speeds along the dual carriageway are relatively high.

2. Africa Road – from Maskal Square to International Airport

This is again a dual carriageway with a wider median of ~4m which is heavily vegetated. There is a raised curb and footway on both sides of the road but this is not paved in many places, being frequently dusty and potholed. One of the worst locations is a T-junction where there is considerable pedestrian movement and turning into or out of the minor road is extremely difficult due to restricted visibility (due to vegetation) and fast approach speeds.

Debre Zeit Road – Gottera to Kaliti Control Spot

This blackspot link is about 4km in length, which is again dual carriageway width with pedestrian activity, bus stops and industrial outlets. Perhaps the worst spot is on the edge of the city where a dual carriageway section becomes 2-way (at the Kalita Control Spot – right-hand photograph). There is also a fork junction, garage, minibus stop and horse & cart stop at this point with considerable pedestrian activity. Vehicles travelling towards the city tend to approach at high speed.

Ras Biru Road – Gottera to 4th Ground Army Division HQ

This area comprises a rail crossing located on the brow of a hill, and about 50m from this there is a T-junction linking to the main Bole Road. A bus lay-by (used by mini buses) is located immediately after this junction. Ras Biru Road is of dual carriageway width (approx. 6.5m in each direction) and there is a 2.5m width footway with much pedestrian activity across the road.

Ras Mekonnen Road – connecting Meskal Square to Mexico Square

This is a very wide major road (~25m total width) and has a 2 m raised footway. There is a minor T-junction located on gradient and emerging manoeuvres from this minor road are obviously difficult (see left-hand photograph). There is also a considerable amount of pedestrian activity. Further along the road there is an interurban bus depot (right-hand photograph) with a junction located closed to it. Also, the main customs warehouse is located 100m from the bus depot, which may also be an area where accidents are clustered.

Tessema Aba Kemaw Road – connecting Tekle Haimanot to Goma Kuteba

This site is another dual carriageway separated by a 1m median. It has a market area located in a dip with associated pedestrian movements and parking problems. Gaps in the median allowing U-turns are also a likely source of vehicle conflicts.

Habte Georgis bridge – to Amanuel Messalemiya

This bridge is just before a T-junction, which is arranged in a road layout forming a square. There is a garage and shops located around this square and relatively fast approach speeds along the major road. Further along the major road is a T-junction where many buses and taxis make turning manoeuvres which is also thought to be an a point where accident cluster.

Messalemiya to Ammanual Total

This road is only about 6.5m wide and is a major trading area with shops or stalls on both sides and very heavy pedestrian usage. However no footway is provided and the gravel shoulder has been encroached by traders, leaving a width of about 1.5 m which is inadequate to cope with the volume of pedestrians.

Megenagna – near AMCE factory

This relatively narrow road (~6.5m) is the location of a very large wayuyit terminal at the edge of the city, and thus again has high volumes of pedestrians.

Section connecting Megenagna to Kikebe Tsebah Secondary School

This straight section of road has wide gravel shoulders. A large school generates considerable peak hour pedestrian movement.

13 APPENDIX E – DAR ES SALAAM ACCIDENT BLACKSPOTS

The ten worst blackspots identified using Dar es Salaam Traffic Police computerized accident data are listed and described below. Using a sample of data from 1997 to 1999, the list is in order of total numbers of recorded accidents.

Jangwani – Morogoro Road

This is a long (~2km) straight dual carriageway section which had 52 recorded accidents in the ~2½ years most recent accident data. These included 7 pedestrian fatalities and 4 seriously injured. The other main accident group was rear-end collisions of which there were 21. It has a good quality footway/cycleway of over 2m wide, a 2m wide central median, and a bus bay which enables *Dala dalas* to pull off the main carriageway, (which they were observed to do – see right-hand photograph). It is thought that high speed is a feature in these accidents with vehicles possibly following too closely and being unable to stop when the vehicle head does so. A number of pedestrians were observed to cross in this vicinity, which is obviously hazardous with the high vehicle speeds, and no special crossing facilities have been provided.

Manzese - Morogoro Road

The second worst blackspot is this extremely busy section of the Morogoro Road. There are market stalls on both sides of the dual carriageway with housing behind those. There is a wide ~6m central median and a service road has been provided for a length of about ½km. A pedestrian bridge has also been installed. However, 49 accidents have been recorded in the 2½-year period with the majority (35) being pedestrians, including 5 fatalities. The pedestrian bridge has relatively steep fights of steps and is open with no shade protection from the sun. It appears that the bridge is thus little used with the majority of pedestrians crossing at-grade, as there are no central barriers to discourage this choice.

Mwembechai Bus Stop - Morogoro Road

This is again an area of busy pedestrian activity, and short bus bays have been provided for the *Dala dalas*. Unfortunately, these bays do not always allow adequate space for the dala dala demand, and some double parking occurs. A service road in front of the shop stalls has again been provided. A clear, signed zebra crossing has also been provided and appears to be well used despite very few drivers on the dual carriageway being observed to stop for pedestrians. The most common type of accident again involves pedestrians (15 out of 37). Also there appears to be a greater rate of pedestrian accidents occurring during the hours of darkness: and the site is not lit. There are also a number of accidents classed as head-on and rear-end, which may be linked with vehicles performing U-turns through the gaps provided in the median.

Magomeni traffic lights

This is a busy, wide signalized junction with wide footways (3m) and zebra crossings at all the junction arms. However, again the most common accident type is that involving pedestrians (13 out of 32), and many pedestrians were observed to cross without using the crossings. There were a number of sideswipes and head-on collisions (total 10) which is most likely due to a driver running a red light. There were no obvious times of day when accidents had occurred more frequently. The traffic police frequently direct traffic at this junction overruling the signals, which are left operating. This can be particularly confusing for pedestrians.

Uhuru Lumumba

This is an uncontrolled junction where 31 accidents have occurred during the recent 2½-year data period, and in this case the majority of collisions were side impacts. There are no clear priority markings, and indeed, the 'minor' road is in fact wider than the priority road and even has a narrow median. Possibly because of this lack of clear priority road marking or even signs, drivers also do not appear to know which stream should give way and, as well as resulting in side impacts, the junction frequently locks with traffic trying to make right turns (see photographs).

Tazara - Nyerere/Nelson Mandela Road

Nyerere Road, which is dualised, has a 2 to 3m central median at this point and links the city center to the airport. This junction is where it intersects with the outer ring road (Nelson Mandela Road), which is also dualised and separated with a median. There are splitter islands separating the left turners. There were three pedestrian fatalities at this site, though the majority of collisions were either head-on or side impact. Some drivers were observed to brake rather abruptly, and some seemed to be reluctant to observe the red signal. This may be partly due to the fact that the signal set overhangs lane 2 and is not clearly noticeable to drivers on the nearside.

Morogoro/United Nations Rd


This signalized junction had 25 recorded accidents in the 2½-year period and most of these were side impacts. The junction is located on the brow of a hill and vehicle approach speed up the gradual incline appears to be quite high. Several drivers observed appeared to be reluctant to stop or braked sharply when the signal changed to red.

Kamata - Nyerere/Msimbazi Road


Nyerere Road is dualised with a 1.5m central median at this point and links the city center to the industrial area, and eventually to the airport. This crossroad junction with the inner ring road is signalized and the majority of collisions are either head-on, side impact or rear-end However, the only fatality was a pedestrian. There were obvious indications of collisions with most signal masts and fairly long queues were observed to build up on the single carriageway, Msimbazi Road. This may encourage drivers to run the red on this approach. Drivers appear to filter left during the right turn filter green, but several were observed to do so even when their signal arm had changed to red.

Kenyata/Kinondoni Rd

This signalized crossroad is on the main road to Bagamoyo to the north and is uphill with fast approaching traffic along this dual carriageway. There was only 1 pedestrian accident here: the main collision types again being head-on, side impact and rear end. The Traffic Police appear to direct traffic frequently at this junction, again overruling the signals. The minor road arms have both a right filter and straight on arrow filters. Again fast approaches on the dual carriageway and a reluctance to stop when the signal turns red is possibly a contributory factor to many of these accidents

Nyerere / Kiwalami

This is a minor staggered crossroad with the fast dual carriageway, Nyerere Road. One of the minor arms is unsealed and the right turn out of it is forbidden (no break in the median). The opposite arm is sealed and leads to a residential area, which is well trafficked. The majority of collisions has been classed as side impact or head-on and these accidents appear to occur around the mid-part of the day. There have also been 4 pedestrians killed in the 2½-year accident period. It is thought that the high-speed approaches are making turning movements at this uncontrolled junction very difficult and driver errors are probably common.

14 APPENDIX F – NAIROBI ACCIDENT BLACKSPOTS

Ten of the worst blackspots reported by the Nairobi Traffic Police are listed below. However, the order of listing is arbitrary as accident data for each site were not available during the visit.

Site 4. Valley Road – opposite Nairobi Pentecostal church

Valley Road is approximately 12 m wide on a relatively steep incline. It is thus wide enough to accommodate 2-lane of traffic in each direction but does not have a median or even solid center line marking. There is a minor road junction on each side of Valley Road the road on the left in the above photographs is one-way, turning off the main road only (however, some drivers ignore the no entry sign and do make the right turn out of this road - see right-hand photograph). There is a 1.8m raised and sealed footway and bus stops opposite each other (though without bus bays) and many pedestrians cross the wide Valley Road at this point.

Site 9. Thika Road – at Utalii drift

This is a very fast and busy separated dual carriageway leading north-west out of the city. There is a relatively sharp bend, followed by a dip down to the stream crossing (drift). There were apparently guardrails along this section but they have all been broken away and not replaced. On the north side of the road there is a relatively steep side slope and even a slope into the drainage ditch in the grass median.

Site 11. Thika Road - at Survey of Kenya (opposite Standard Chartered Bank).

A pedestrian footbridge has been constructed at this site on the main arterial, Thika Road, where many pedestrians cross between bus stops and the Nairobi Youth Service and Survey of Kenya office on one side to the bank and training college on the other. However, very few use the footbridge (two flights of steps) and misjudgment of fast approach vehicles may well be a cause of many accidents. The road has a sealed hard shoulder bordered by a curb and earth footway, and a right-turning lane has been provided for U-turners.

Sites12,13 Juja Rd – between airforce, Kinigori bar and Chief's Camp.

This road is one of the most heavily trafficked by public transport vehicles in Nairobi. It links the poorer housing areas to the city center. It is narrow (~7m) and the surface is currently poor. The shoulders are earth, at least 3m wide and, although very rough, are used by pedestrians in preference to the smoother carriageway. There is considerable pedestrian activity and there are stalls along this road with slum dwellings extending on either side.

Site 14. Jogoo Rd – opposite Burma supermarket

A 2-stage ramp footbridge has been constructed at this site, which is thought to be more amenable for pedestrians. However, unfortunately the bridge is sited about 150m east of the apparent pedestrians' preferred crossing place, and thus many continue to cross at-grade. There are bus stops, hawker stalls and housing on one side of this extremely busy dual carriageway with factories and commercial outlets on the opposite side: generating much pedestrian crossing movement.

Site 15. Jogoo Rd – Near Uchumi supermarket.

This site is very similar to the previous one with an identical footbridge construction and pedestrians choosing to cross at street level rather than use the bridge. However, many schoolchildren do use the bridge. Although there is no separate sealed shoulder, a relatively wide 6 to 8m earth shoulder exists, and pedestrians tend to walk this shoulder.

Site 16. Jogoo Rd – Makongeni Gate

This is another location where many pedestrians choose to cross often in the U-turn gap in the median. However, in this case, no facilities have been provided for pedestrians. Approach speeds on the dual carriageway tend to be particularly high at this point.

Site 17. Outer Ring Rd – at Umoja railway halt

The road surface at this point is currently extremely rough and there are speed humps just before the narrow road junction (see right-hand photograph); thus at present vehicle speeds are generally very low. There is again a great deal of pedestrian activity around this small T-junction off the Outer Ring Road, and it is thought there may be a number of night-time accidents here, possibly involving turning vehicles.

Site 18. Outer Ring Rd – at Nairobi River Bridge


The road narrows slightly to cross a river bridge at this point, and there is a raised footway across the relatively short bridge on one side of the road only. There are guardrails on the approach and across the bridge but heavy vehicles approach at relatively high speeds and there is very restricted width for two lorries to pass (see right-hand photograph).

Site 19. Outer Ring Rd – at junction with Kamunde Rd


The road has relatively wide earth shoulders which pedestrians use, and the road is narrow (~6.5m) at this point with a very poor surface at present. The T-junction is located just beyond a hillcrest. There is no street lighting and nighttime accidents are thought to be common here.