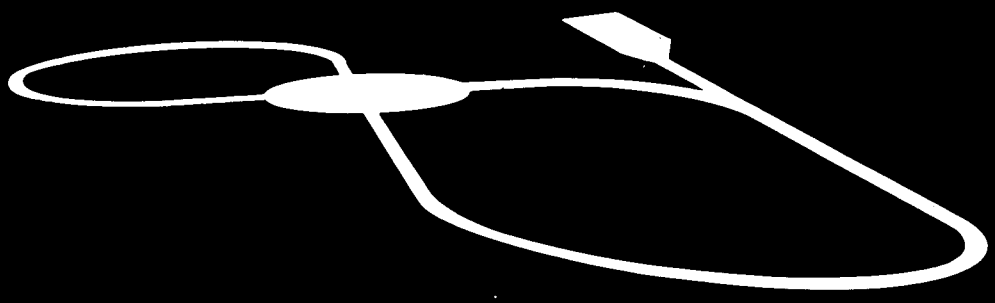
TRRL Research Report 294

Transport and Road Research Laboratory



Department of Transport

The impact of bus regulatory policy in five African cities

by D A C Maunder

TRANSPORT AND ROAD RESEARCH LABORATORY
Department of Transport

RESEARCH REPORT 294

THE IMPACT OF BUS REGULATORY POLICY IN FIVE AFRICAN CITIES

by D A C Maunder

The work described in this report forms part of the programme carried out for the Overseas Development Administration, but the views expressed are not necessarily those of the Administration

Overseas Unit
Transport and Road Research Laboratory
Crowthorne, Berkshire, RG11 6AU
1990

ISSN 0266-5247

CONTENTS

	Page
Abstract	1
1 Introduction	1
2 The cities and their public transport	3
2.1 City characteristics	3
2.2 Public transport supply	5
2.3 Public transport performance	6
2.3.1 Bus services	6
2.3.2 Shared taxi services	6
2.4 Service quality	6
2.4.1 Journey speeds and waiting times	6
2.4.2 Load factors	6
2.4.3 Accessibility	6
3 Comparative analysis	7
3.1 Vehicle size	8
3.2 Private or public?	9
3.2.1 Comparison within modes within a city	9
3.2.2 Comparison within modes between cities	9
3.3 Effects of regulation	10
3.3.1 Mode performance	10
3.3.2 Public transport development	11
4 Conclusions	12
5 Acknowledgements	12
6 References	13
Appendix A: Travel characteristics	14
Appendix B: Bus performance and costs	15
Appendix C: Shared taxi performance and costs	17
Appendix D: Cost comparison	19

TRRL

Transport and Road Research Laboratory
Old Wokingham Road
Crowthorne Berkshire RG11 6AU
Telephone 0344 773131
Fax 0344 770356 Telex 848272

Digest of Research Report 294 **1990**

THE IMPACT OF BUS REGULATORY POLICY IN FIVE AFRICAN CITIES

by

D A C Maunder

The regulation and control of the bus industry is a long debated topic. Proponents of free competition seek complete relaxation of controls on the grounds that market forces will generate an efficient and effective service. Others seek varying levels of control and government involvement because of perceived imperfections in market forces, and loss in social welfare. This report examines the extent to which variation in the level of regulation affects public transport performance and any resulting effect on travel patterns. The case-study material comes from five African cities, in the population range 0.4–1.5 million, whose public transport demonstrates a range of regulatory controls and development options.

Table 1 sets out the main attributes of public transport and in which of the selected cities these attributes are found. The comparative analyses which have been made are discussed below.

TABLE 1

Attributes of public transport in the selected cities

	Large vehicles fixed routes		Small vehicles fixed routes		Small vehicles flexible routes	
Control	Private	Public	Private	Public	Private	Public
Strong	Harare Dar es Salaam	Yaounde Douala Dar es Salaam	Harare Dar es Salaam	—	Yaounde Douala	—
Limited	—	—	Jos	—	Jos	—

(1) The comparison between modes within a city throws light on the vehicle size issue, providing that the comparison is made of vehicles performing the same role, and that the operators are similarly organised and regulated. Thus in Dar es Salaam the private operators use a variety of vehicle size, and in Harare the big buses and shared taxis operating on fixed routes are similarly compared, though the comparison is less perfect because the operators are dissimilar in organisation.

(2) The comparison within modes within a city provides evidence on the 'public versus private' issue. Here the comparison is between operators of different organisational form using the same vehicles in essentially the same role. The only example in this study is from Dar es Salaam where both the private and public sector operate large buses on similar stage carriage services.

(3) The comparison within modes and between cities provides further evidence on the private-public issue as well as the question of regulatory control. In the latter case, the comparison attempts to show whether there are any major differences in performance of a particular mode operated under different regulatory regimes, given that they are similarly organised and perform the same basic role. Here the best comparison is between the small vehicles of Jos, Harare and Dar es Salaam. Comparisons are also made between the shared taxis in the Cameroonian cities (Douala and Yaounde) and in Jos.

Department of Transport

(4) Comparing similar operations between cities by differently organised operators facing similar regulatory control, provides evidence on the private-public issue. The comparison here is the performance of large buses under these conditions in Harare, Dar es Salaam and the Cameroonian cities.

(5) The last comparison compares the total public transport performance of the systems in each city, and largely provides evidence of a general nature on the effects that various levels of regulation have had on public transport development.

The study had the objective of assessing the relative merits of alternative approaches to public transport in a number of African cities. In particular the aim was to examine the relative performance of public transport under varying levels of Government involvement in both the regulation and operation of the sector. The main conclusions are as follows:

— the lack of regulation probably encourages the use of small capacity vehicles (as in Jos) though city size is also likely to be a significant explanatory factor, smaller cities requiring smaller vehicles.

— regulation is never totally enforced (with significant numbers of 'illegal' vehicles operating in most cities) while the absence of government control is often compensated by self regulation by the industry (as in Jos).

— there is some evidence from the bus sector that the absence of strong regulation (in particular market entrance) has allowed more competition and a better level of service to the user. The evidence is not conclusive, however, and indeed the shared taxi market presents a conflicting picture.

— vehicles in the public sector are less cost efficient and less productive than their private sector counterparts; however, they tend to operate with lower load factors and generally provide a better quality of service.

— in general the higher the content of fixed route services, the lower is the unit cost of public transport, and the higher is the energy effectiveness.

— leading on from the previous conclusion, households in cities where shared taxis are the dominant public transport mode spend a higher percentage of the household budget on transport (all modes) compared with households in cities where shared taxis are either not provided, or play a minor role.

Overall, one may conclude that the absence of strict government regulation has not strongly influenced the performance of individual modes of public transport. The impact has probably been on the development of the public transport sector, with more fixed routes and larger vehicles in highly restricted environments. Operational costs tend to be lower in these circumstances. Where government also controls the bus company operations, unit costs of operation are likely to be higher than in the private sector and user benefits are only marginally better than in a less regulated system.

The work described in this Digest forms part of the programme carried out by the Overseas Unit (Unit Head: Mr J S Yerrell) of TRRL for the Overseas Development Administration, but the views expressed are not necessarily those of the Administration.

If this information is insufficient for your needs a copy of the full Research Report RR294 may be obtained, free of charge, (pre-paid by the Overseas Development Administration) on written request to the Technical Information and Library Services, Transport and Road Research Laboratory, Old Wokingham Road, Crowthorne, Berkshire, United Kingdom.

THE IMPACT OF BUS REGULATORY POLICY IN FIVE AFRICAN CITIES

ABSTRACT

The regulation and control of the bus industry is a long debated topic. Proponents of free competition seek complete relaxation of controls on the grounds that market forces will generate an efficient and effective service. Others seek varying levels of control and government involvement because of perceived imperfections in market forces, and loss in social welfare. This report examines the extent to which variation in the level of regulation affects public transport performance, and any resulting effect on travel patterns. The case-study material comes from five African cities, in the population range 0.4–1.5 million, whose public transport demonstrates a range of regulatory controls and development options.

1 INTRODUCTION

There is a continuing debate about the role of Government in the bus industry, both in respect of ownership and regulation. The UK urban bus sector has recently gone through a profound change as a result of the 1985 Transport Act, which abolished quantity control of bus services in Great Britain (outside London) and allowed subsidy to be paid for bus services only after competitive tendering. At the same time the largest public operator (the National Bus Company) was reorganised and sold to the private sector, and the Passenger Transport Executives and Municipal bus companies were made into separate operating companies, some of which have been privatised.

There was much debate prior to the enactment (for example, Gwilliam et al, 1985, Beesley and Glaister, 1985). Proponents looked to more efficiency, cost savings and a more effective service for users, resulting from the development of a competitive market. Those opposed to the changes forecast no development of a contestable market, and hence few of the benefits which could be expected from a competitive environment.

In practice there seems to have been a mixed outcome, with substantial reductions in the costs of all operators (Gwilliam, 1989), but an unexpectedly high decline in bus patronage, despite increased service levels (White, 1989).

The debate about ownership and control has also been replayed in the context of the developing world (for example, Walters, 1981, White, 1981). Indeed, the World Bank has long adopted a policy of support and encouragement towards private operators within a less regulated structure (World Bank, 1986). Even so, many Third World bus operators are still in public hands, and control is still fairly rigid. The latter is the case even where private enterprise dominates the bus industry. In a recent survey of transport policy in a number of major Third World cities, only one out of 21 had complete deregulation (ie no government imposed control on market entry, route specification or fare levels) though some 16 of the cities had private operators providing some or all of the conventional bus services (Thomson et al, 1989).

The purpose of this current research has been to examine the operations of public transport in five medium size African cities to see what effect differences in regulation and ownership have had on performance and development. This supplements earlier work in medium sized Indian cities (Fouracre and Maunder, (a) 1986, (b) 1987) which investigated how performance and costs varied between strong and weak government involvement in both ownership and control. In this case the city having the strong involvement of government had decidely cheaper public transport, giving more access for the lower income community.

Public transport in African cities differs from that of Indian cities in that the latter still have large numbers of traditional modes (rickshaws) and their modern variants (auto-rickshaws). African cities, by-and-large, have a limited range of public transport modes: conventional stage-carriage buses, minibuses, shared taxis and conventional meter-taxis.

The selection of cities was on the basis of city size and the level of Government involvement in ownership and regulation, reflecting as far as possible the range of options. It was important to constrain city size within a fairly narrow range, as size is likely to influence the character and state of development of public transport (Fouracre, Maunder and Banjo, 1988). The cities were selected from those in the range 0.4–1.5 million. There are many cities within the African continent which fall within this range and thus provide a large choice. Below this size public transport is unlikely to have a significant role, and above this size there are few examples. Figure 1 presents a chart of the position of the selected cities in a two dimensional map of ownership and control. (For reference, the Indian cities covered in the earlier work, referred to above, are also included). There are other dimensions to this chart such as the

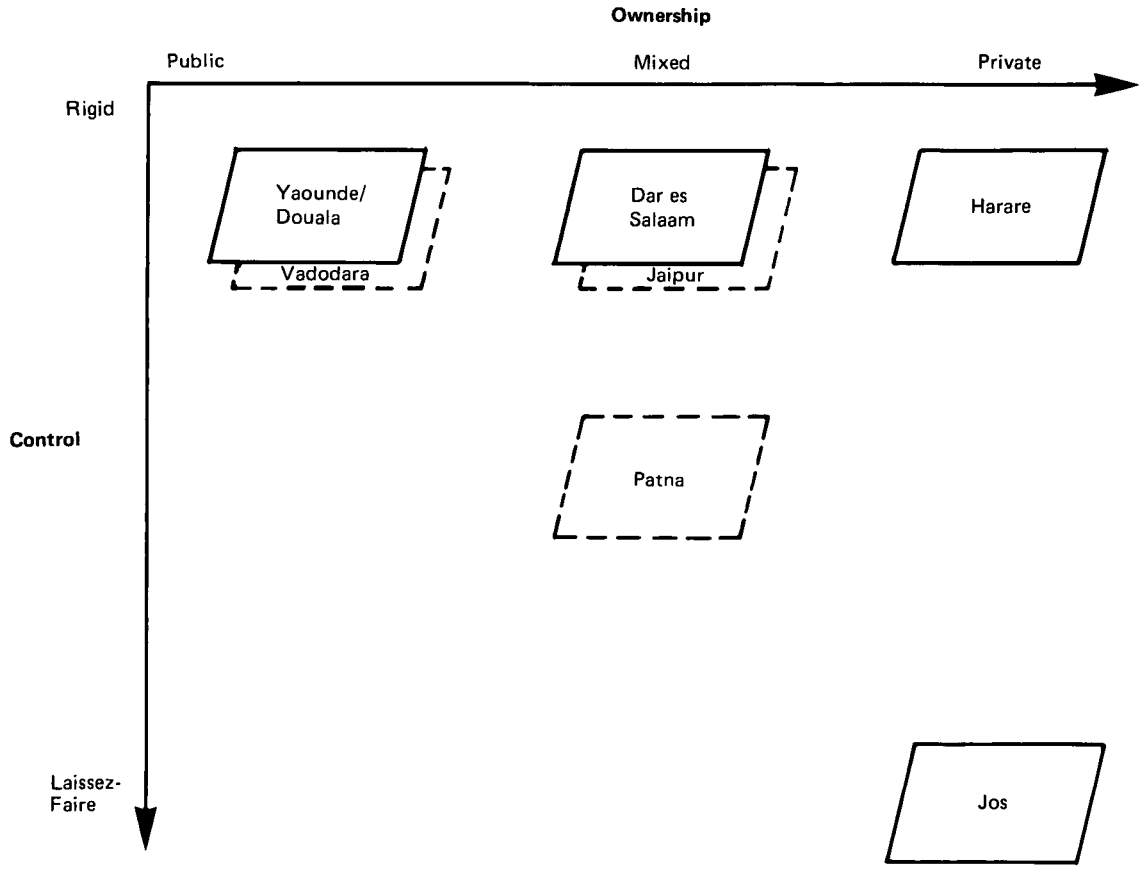


Fig. 1 Ownership and control in the selected cities

type of private enterprise (corporate or individual owner-driver) and the related issue of vehicle size. (As a generalisation, but not a rule, smaller vehicles tend to be used by individual owner-drivers or small-fleet operators). Within a small sample it is obviously impossible to cover all possible differences in attributes; the five cities were chosen to reflect the main options.

As indicated above, a considerable debate has been generated from the basic question of what type of public transport system should be encouraged in a city. The debate involves many interdependent issues such as:—

- the extent to which the public sector should be involved in the provision of a public transport system given that it is often less cost-efficient than the private sector, though may be more effective in its service coverage.
- the effects of regulation (and control) on service provision.
- the technical and economic benefits of different types of vehicle, including energy considerations.

To compare performance under different regulatory regimes is difficult because there is the danger of comparing dissimilar entities. Policy (towards public transport) may strongly influence the type of vehicle and/or operating enterprise: de-regulation may encourage use of smaller vehicles by individual entrepreneurs, who may be much more efficient at running vehicles (because they can be completely flexible) even by comparison to the private corporate enterprises. However, individual entrepreneurs may not thrive in a more controlled environment. But in order to gauge the true effects of regulation, one would ideally like to compare the performance of individual entrepreneurs (or any other enterprise type) operating the same vehicle type under the alternative regulatory regimes, ie holding constant as many as possible of the contributory factors to performance, and varying the one of interest (regulation).

Similarly, to compare the performance of operators in the public and private sectors, one would like to hold constant the influence of vehicle size and regulatory policy

The cross-sectional nature of this study enables these comparisons to be made and conclusions drawn on the effects of regulation, government involvement in ownership and the relative merits of alternative vehicle size.

The comparisons are made on the basis of various measures of vehicle output and productivity, costs and indicators of service level. Cost comparisons can be made within cities but may be unreliable between cities of different countries because of the problem of artificial exchange rates and different taxation rates on labour and materials. To overcome the problem of artificial exchange rates the cost figures are compared by normalising them with respect to the countries dollar per capita income. Differences in taxation rates were not thought to be significant.

Inevitably there is no single measure of performance. The analysis can demonstrate only the strength of these measures without necessarily showing that one set of performance figures is better or worse than another set.

The material for this report was collected over the period 1986/88. Surveys were undertaken of the public transport system, and some small-scale household surveys were also completed. The methodology and detailed findings of these surveys are recorded elsewhere in a series of unpublished working papers.

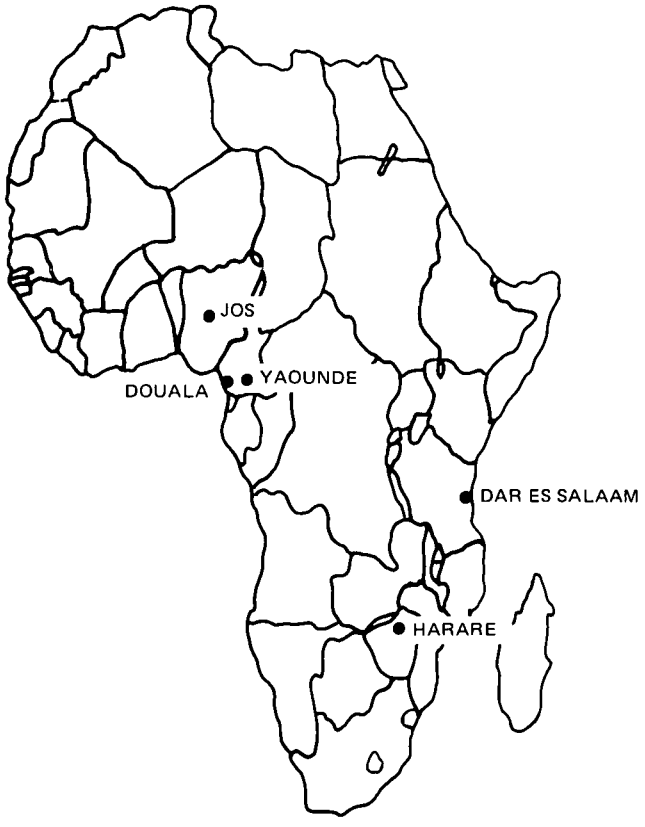


Fig. 2 The location of the study cities

2 THE CITIES AND THEIR PUBLIC TRANSPORT

2.1 CITY CHARACTERISTICS

Harare and Yaounde are the capitals, administrative centres and seats of government of Zimbabwe and Cameroon respectively. Douala and Dar es Salaam are the largest populated cities and major commercial centres of Cameroon and Tanzania respectively. In addition, Douala and Dar es Salaam are their country's busiest ports. Jos is a local administrative city in central Nigeria. The location of the five cities is shown in Figure 2. Table 1 outlines recent population estimates as well as national income and vehicle ownership data.

All five cities are characterised by very high population growth. The countries in which they are located have low per capita incomes, and low car ownership levels. Urban centres have higher car ownership levels than the national figures given in Table 1; the limited household surveys implemented by TRRL in the five cities suggest that they range between 25–30 per 1000 population in Dar es Salaam and Jos to between 60–80 per 1000 population in Douala, Harare and Yaounde.

TABLE 1

City characteristics

	Population (millions)	Av. annual pop. growth % pa	GNP per Capita ($ per annum)	Vehicle ownership per 1000 pop.
Jos	0.4	7	640	4
Yaounde	0.8	9	910	18
Douala	1.1	9	910	18
Harare	1.3	5	620	39
Dar es Salaam	1.5	7	240	5

Sources: various, including World Bank Atlas 1987, and International Road Federation World Bank Statistics 1986 and 1987. Income and vehicle ownership figures are for the country.

TABLE 2

Public transport inventory

	Vehicle type and service	No vehicles per 1000 pop*	Daily seat km per 1000 pop	Ownership	Regulation
Jos	Shared taxis Mini-buses on fixed routes	4.60 0.60	2 960 1 280	All vehicles privately owned in small fleets or owner-driven	Little control of routes and vehicle numbers. Fares regulated by State Govt. Owners union regulates operations
Douala/Yaounde	Shared taxis Stage-carriage buses	4.70 0.17	2 480 2 890	Privately owned Public enterprise	Central Govt controls vehicle numbers and fares and routes
Harare	'Emergency' taxis Stage-carriage buses	0.56 0.44	860 10 500	Privately owned Private fleet operator	Central Govt controls routes, fares and vehicles licensed to operate. Stage carriage services operated under franchise agreement
Dar es Salaam	Stage-carriage buses	0.26	2 480	State fleet operator and privately owned vehicles in small fleets or owner-driven	Vehicle numbers regulated by Central Govt and State bus company. Route control by State bus company. Fares controlled by Central Govt.

* Includes estimates of illegal operators where appropriate.

2.2 PUBLIC TRANSPORT SUPPLY

Table 2 summarises the provision of public transport services in the five cities, as well as the form of ownership and regulatory controls.

It is apparent from Table 2 that all cities, apart from Dar es Salaam, had a mix of bus services and shared taxis (known as emergency taxis in Harare). In Jos the buses were small 8–15 seat vehicles, whereas in the other cities the more conventional single-deck vehicles were in use. In Dar es Salaam there was a mix of small and large buses. All the shared taxis were privately operated whereas some of the buses were in private and others in the public sector: Jos and Dar es Salaam had privately operated buses run in small fleets or by owner-drivers; Harare had a large private fleet operator (the Harare United Omnibus Company—HUOC) with a monopoly of stage-carriage services; Douala and Yaounde had a parastatal operator (Societe de Transport Urbain Cameroonien—SOTUC) with the monopoly of stage-carriage services; Dar es Salaam also had a parastatal operator (Shirika La Usafiri Dar es Salaam Ltd—UDA) which provided competitive bus services with the private operators (known collectively as Dala-Dala).

By and large the respective State or Central Governments kept a fairly tight control on fare levels, vehicle numbers and route allocation. Regulation was less restrictive in Jos where only fares were prescribed. However, it was evident that the Minibus Owners Union in Jos plays a major role in self regulating operations. In Dar es Salaam the privately operated Dala Dala were controlled by the state run UDA, the latter determining (in conjunction with the Ministry of Communications and Works) the number of authorised vehicles and route allocations. In Harare HUOC operated under a franchise agreement with the Municipality of Harare. This gave HUOC exclusive operating rights within a specified radius around the city centre. Despite the controls on vehicle numbers, most cities had 'illegal' operators.

The importance of public transport in the five cities may be gauged from the modal split figures given in Table 3. It is clear that public transport (both bus and shared taxis) was the most important mode of transport in all cities except Harare, where walking was exceptionally important.

Estimates of the use of public transport in each city are shown in Table 4. Perhaps surprisingly, the smaller cities (Jos, Yaounde and Douala) have the highest trip rates on public transport. Taking account of trip length (see Appendix A), there is little difference between the cities in demand (passenger km per capita) for public transport. What is evident is that with increasing city size the relative use of shared taxis declines.

TABLE 3

Modal split for all trips undertaken daily by household members

% of trips by:	Jos	Yaounde	Douala	Harare	Dar es Salaam
Walk	23.0	23.0	25.0	42.0	30.0
Public transport	45.0	40.0	42.0	25.5	35.0
Personal motorised vehicles	25.0	30.0	28.0	30.0	20.0
Cycle	2.0	0.5	1.0	1.5	2.0
Others*	5.0	6.5	4.0	1.0	13.0

Source: TRRL Surveys
* Includes meter taxis, parastatal, school and company buses

TABLE 4

Use made of public transport

	Jos	Yaounde	Douala	Harare	Dar es Salaam
Public transport trips per capita per day	0.81	0.94	0.75	0.37	0.49
% per bus	15	22	29	73	100
Public transport kms per capita per day	2.9	4.3	4.0	4.3	4.0
% by bus	19	22	32	79	100

Source: Study estimates

2.3 PUBLIC TRANSPORT PERFORMANCE

2.3.1 Bus services

Some key indicators of operator performance are given in Table 5 (Note: A detailed schedule of performance for each operator is given in Appendix B). Operators have been grouped into public and private enterprises.

TABLE 5

Bus operator performance indicators (ranges)

	Public	Private
Average fleet availability (%)	47–85	80–89
Passengers per bus daily	1200–2200	200–2900
Passengers per km operated	7.6–10.1	1.2–12.1
Daily km per bus operated	160–220	170–240
Staff per bus operated	5.8–13.5	1.0–3.7
Load factor	0.3–0.6	0.6–0.9
Profitability (revenue: cost)	0.6–1.2	0.9–3.6

Sources: see Appendix B

The examination and explanation of some of these ranges is the subject of the analysis in Chapter 3. However, it is worth noting at this stage that private operators on average tend to have more of their fleet available, operate with fewer staff per vehicle, and are likely to be profitable. Private vehicles are also operated at higher load factors than public sector vehicles.

2.3.2 Shared taxi services

Table 6 contains key indicators of the shared taxi services in the four cities where they are used. In Douala, Yaounde and Jos the majority of taxis were operated in completely flexible fashion: the first person boarding the vehicle determined the destination, and other passengers were picked up and dropped along the route. In Jos, however, some taxis were operated on fixed routes, whereas in Harare the emergency taxis were being operated on fixed routes, akin to bus services.

TABLE 6

Shared taxi performance indicators (ranges)

Average fleet availability (%)	80–97
Passengers per taxi daily	130–270
Passengers per km operated	0.6–1.1
Daily km per taxi operated	160–250
Load factor	0.5–1.2
Profitability (revenue: cost)	1.2–1.8

Source: see Appendix C

Shared taxis by their nature of limited size and flexible operations tend to carry far fewer passengers than buses; it is notable that the Harare fixed-route vehicles carry the highest number of passengers. Vehicle availability is high and profitability is good.

2.4 SERVICE QUALITY

2.4.1 Journey speeds and waiting times

Table 7 presents journey speed information: the range of overall speeds (based on user assessments of the times and distances incurred on their trip making, including walking and waiting times) is shown separately for buses and shared taxis.

TABLE 7

Journey speeds and wait times (ranges)

	Bus services	Shared taxis
Journey speeds (kmph)	11–24	13–24
Waiting times (min)	1–36	3–7

In general journey times by bus were longer than by shared taxi. Only in Jos were buses able to provide as fast a service as taxis; here the very high frequency of operation of buses on a limited number of routes helped to keep waiting times to as low as 1 minute on average. However, waiting times for buses in the other cities were generally much higher than for shared taxis, as is also shown in Table 7.

2.4.2 Load factors

The measure of average vehicle loading is taken as a proxy for comfort. Load factors were measured for all vehicles providing public transport services. The typical range of values for buses and shared taxis are shown in Tables 5 and 6 respectively. Each value expresses the ratio of passenger km to seat km (ie passenger use to vehicle capacity) over a typical operational day. Load factors were generally quite acceptable; only that monitored for the emergency taxis in Harare exceeded 1.0, indicating a high level of over-crowding throughout the day. Many of the bus services seemed to be operating with remarkably low average load factors, which has undoubtedly had an impact on the poor profitability of stage buses.

2.4.3 Accessibility

Table 8 contains some measures of the accessibility of public transport to the user. These include fare levels, hours of available service and service coverage.

TABLE 8

Accessibility measures (ranges)

Bus fare level (as % of daily per capita income)	4–12
Index of shared taxi/bus fare*	1.3–2.0
Hours of bus operation/day	12–24
Hours of shared taxi operation/day	11–19
Bus routes per million population	5–48
Buses per route	7–125

* Most bus and taxi fares were flat. Some premium bus services were operated at a higher fare, usually equivalent to the shared taxi fare. In Harare the bus company had a graduated fare. Here the index of shared taxi/bus fare ranged from 1.0 to 2.5, depending on distance travelled.

Bus fare levels were mostly between 4–5 per cent of daily per capita income, with only Jos having an exceptionally high level of 12 per cent. Shared taxi fares were typically twice the ordinary bus fare, except in Jos where the differential was only one third. The HUOC in Harare had a graduated fare scale which made short journeys cheaper than emergency taxis, and longer journeys about the same. Overall, it was estimated that household expenditure on transport as a percentage of household income ranged from about 8 per cent in Harare to 16 per cent in Dar es Salaam and the Cameroonian cities.

Buses were generally scheduled to operate for longer hours than shared taxis, many of the bus services beginning at 4 or 5 in the morning and finishing at mid-night. (In Harare there was a 24 hour service on some routes). This does not mean that a full service was available for all this time; buses were brought into service gradually, building up to the peak. (Only the HUOC had adopted significant split shift working whereby many buses were not in use during off-peak periods).

Earlier it has been shown the amount of shared taxi and bus service varies in the cities (Table 2). This variation partly explains the differences in route coverage (routes per million population). This was highest in Harare, which also had the highest provision of bus seat km per 1000 population. At the other end of the scale Jos only had two bus routes. Conversely Jos had a very high ratio of buses per route, because its large number of minibuses were deployed on just two routes. More typically the cities with conventional buses had about 7–14 buses per route, on average. This difference in buses per route between Jos and the other cities is reflected in the much lower waiting times experienced in Jos (Table 7).

3 COMPARATIVE ANALYSIS

Table 9 sets out the main attributes of public transport and in which city these attributes are found. The comparisons which are made between particular modes in particular cities are discussed below.

(1) The comparison between modes within a city throws light on the vehicle size issue, providing that the comparison is made of vehicles performing the same role, and that the operators are similarly organised and regulated. Thus in Dar es Salaam the private operators use a variety of vehicle size, and in Harare the big buses and shared taxis operating on fixed routes are similarly compared, though the comparison is less perfect because the operators are dissimilar in organisation. (see 3.1)

(2) The comparison within modes within a city provides evidence on the 'public versus private' issue. Here the comparison is between operators of different organisational form using the same vehicles in essentially the same role. The only example in this study is from Dar es Salaam where both the private and public sector operate large buses on similar stage carriage services. (see 3.2.1)

TABLE 9

Attributes of public transport in the selected cities

	Large vehicles fixed routes		Small vehicles fixed routes		Small vehicles flexible routes	
Control	Private	Public	Private	Public	Private	Public
Strong	Harare Dar es Salaam	Yaounde Douala Dar es Salaam	Harare Dar es Salaam	—	Yaounde Douala	—
Limited	—	—	Jos	—	Jos	—

(3) The comparison within modes and between cities provide further evidence on the private-public issue as well as the question of regulatory control. In the latter case, the comparison attempts to show whether there are any major differences in performance of a particular mode operated under different regulatory regimes, given that they are similarly organised and perform the same basic role. Here the best comparison is between the small vehicles of Jos, Harare and Dar es Salaam. Comparisons are also made between the shared taxis in the Cameroonian cities (Douala and Yaounde) and in Jos. (see 3.3.1)

(4) Comparing similar operations between cities by differently organised operators facing similar regulatory control, provides evidence on the private-public issue. The comparison here is the performance of large buses under these conditions in Harare, Dar es Salaam and the Cameroonian cities. (see 3.2.2)

(5) The last comparison compares the total public transport performance of the systems in each city, and largely provides evidence of a general nature on the effects that various levels of regulation have had on public transport development. (see 3.3.2)

3.1 VEHICLE SIZE

In Dar es Salaam the private operators use a variety of vehicles ranging from the minibus to 90 passenger capacity single-deck vehicles. The operators are similarly controlled and organised, and provide similar services, thus enabling effective comparisons to be made between large and small vehicles. In Harare, both conventional buses and shared taxis are provided by the private sector. The comparison between the two is less effective, however, because of some differences in organisation and the service provided.

Table 10 compares the performance of large and small vehicles in these two cities, using the ratio of large: small vehicle for each performance indicator. For the most part these indicators show close agreement in the two cities. However the capacity differential of vehicles in Harare is much greater than in Dar es Salaam, and the profitability of large vehicles in Harare is only half that of the small vehicles; the latter are operated with higher traffic (very often with passenger loads above the legal limit) which offers much of the explanation for this difference in profitability.

Despite the higher capacity of the large buses in both cities, passenger loadings (actual numbers and passenger kms) are only two to three times higher than on the small vehicles, ie there is less than a 1:1 correspondence between differences in vehicle size and in passenger loadings. This is seen in the lower load factors on big buses in both cities.

There is little to differentiate the quality of service between the two vehicle types: most passengers will select the first arriving bus which they can board, be it small or large. The lower average load factors on big buses imply more comfort and a greater probability of being able to board the bus, but this may well be compensated for by the higher frequency (and hence reduced wait times) of operating the small vehicle.

Cost per passenger km of the large buses were typically 70 to 80 per cent of the small vehicle, and the large vehicle was similarly more energy efficient.

TABLE 10

Comparative performance of small and large vehicles operated on fixed routes

	Ratio of large: small vehicle	
	Dar es Salaam	Harare
Vehicle capacity	3.6	14.4
Daily vehicle output:		
availability	1.0	1.1
km operated	1.4	0.9
passengers carried	2.1	2.2
passenger km	2.0	3.4
Costs per pass km	0.7	0.8
Energy cost per pass km	0.6	0.4
Profitability (revenue/cost)	1.4	0.5
Load Factor	0.8	0.5

3.2 PRIVATE OR PUBLIC?

3.2.1 Comparison within modes within a city

In Dar es Salaam both the private and public sector (UDA) operate large buses on the same route network enabling evidence for the 'public versus private' debate to be found. Table 11 presents ratios of performance of the public to private sector for a number of performance indicators.

Although the availability of vehicles in the private sector was much higher, the actual output of vehicles in use was not too dissimiliar to the public sector. Staff productivity was very much higher in the private sector, which probably accounts for the 30 per cent higher costs of operation in the public sector. This and the fact that the private sector could also charge higher fares is reflected in the higher profitability of the private buses.

As before, there is little to choose between service quality. Load factors on the public buses were marginally lower, but not significantly so. Fares were higher on the Dala Dala, but this did not seem to deter most travellers, who chose the first arriving bus.

3.2.2 Comparison within modes and between cities

A comparison within modes and between cities also provides further evidence for the 'public versus private' debate. In this case the performance of large conventional buses operated in Harare, Dar Es Salaam and the two Cameroonian cities was compared. Each city has similar regulatory controls, but the conventional buses are operated under different forms of ownership. Table 12 presents comparative performance ranges for a series of indicators for the two groups.

As before, the availability of vehicles in the private sector was consistently higher than in the public sector. The ranges also indicate a much higher level of daily vehicle kilometrage, though there is little to choose between actual passenger demand satisfied by the two sets of operators.

Staff productivity was generally higher in the private sector, though some of the better public operators could almost match the poorer private operators. This is equally true of profitability.

Indicators of service quality show the public sector in a somewhat better light than the private sector; load factors were lower (more comfort), as were wait times.

The range values for the private sector reflect the difference between a corporate operator and the alternative individual owner-driver enterprise. By and large the higher output, better staff productivity and higher profitability were returned by the owner-driver enterprises.

TABLE 11

Comparative performance of conventional sized vehicles operated by private and public sector in Dar es Salaam

	Ratio of public: private vehicles
Daily vehicle output:	
availability	0.6
km operated	0.9
passengers carried	0.8
passenger km	1.1
Staff productivity:	
Staff per bus	4.5
Staff per 1000 passenger km	4.3
Costs:	
per passenger km	1.3
energy per passenger km	0.9
profitability (revenue/cost)	0.3
Load factor	0.9

TABLE 12

Comparative performance of conventional sized vehicles operated under similar regulatory controls in different cities (ranges)

	Public operators	Private operators
Daily vehicle output:		
availability (%)	47–85	80–87
km operated	160–220	230–240
passengers carried	1 200–2 200	600–2 900
passenger km	6 500–12 600	7 700–11 900
Staff productivity:		
staff per bus	5.8–13.5	3.0–3.7
staff per 1 000 passenger km	0.5–1.1	0.3–0.4
Profitability (revenue/cost)	0.6–1.2	0.9–3.6
Service quality:		
load factor	0.3–0.6	0.6–0.8
wait times (min)	7–14	14–36
hours of operation/day (hr)	16–20	19–24

TABLE 13

Comparative performance for small capacity vehicles on fixed routes operating under different regulatory controls

	Regulatory control	
	Weak	Strong
Daily vehicle output:		
availability (%)	89	80
kms operated	170	175–250
passengers carried	200	270–1 400
passenger km	1 400	2 200–5 700
Staff productivity:		
staff per bus	1.0	1.0–3.7
staff per 1 000 pass km	0.7	0.4–0.5
Profitability (revenue/cost)	1.1	1.8–2.5
Service quality:		
Load factor	0.7	0.9–1.2
Wait time (min)	1.0	14.0
Hours of operation	12	12–19

3.3 EFFECTS OF REGULATION

3.3.1 Mode performance

The comparison within modes and between cities provides evidence as to the impact of different regulatory systems on public transport performance. The minibuses operated in Jos and Dar es Salaam were compared where the level of control ranges from minimal in the former to effective in the latter. In addition, the shared taxis of Harare which are strongly regulated and operated akin to buses on fixed routes, are also used for comparative purposes. Table 13 presents comparative performance data for these privately

operated vehicles performing the same role under different regulatory systems.

The data indicate that the effect of regulation could have been to reduce competition; load factors are lower, profitability is lower and the kilometrage operated by each vehicle is lower than in the more regulated sector. These differences can be partly explained if the absence of barriers to market entry in the less-regulated system have encouraged an excessive number of operators to compete.

There is contrary evidence for this effect when comparing the shared taxis operated in the tightly regulated Cameroonian cities with those of the less regulated city of Jos. Table 14 makes comparisons of their performance.

In this example, the weak control in Jos was reflected in higher load factors and waiting times, as well as higher profitability, by comparison with the more rigidly controlled shared taxis in Douala and Yaounde.

3.3.2 Public transport development

It has already been noted (Table 4) that over the range of population size covered by the small sample of five cities, the relative use of shared taxis declined with increasing city size. This, not surprisingly, ties in with a decreasing proportion of shared taxi seat capacity with increasing city size.

The variation in shared taxi provision could also be interpreted (though perhaps with less evidence) in terms of the level of regulation: the higher the level of regulation, the less the provision of shared taxis. The fact that saloon cars are less expensive than small buses to purchase by individuals would explain why shared taxis might proliferate in a situation of easy access to the market. Furthermore, public transport capacity may not be so crucial in a small city compared with a large one. (Walking and cycling are acceptable alternatives in small cities where journey distances are short). As cities increase in size so public transport capacity becomes increasingly important as does the importance of the bus sector.

In Table 15 the overall level of supply and performance of public transport under regulated and less regulated frameworks is compared.

The performance of the public transport sector in the single example of a less regulated environment lay well within the range values of performance of those cities which had more control, in respect of level and cost of provision. Only the absolute levels of use of public transport were lower, simply reflecting the smaller size of the city concerned. The trip rate (by public transport) in the less regulated city was one of the highest.

For all the cities, the lower operational costs per passenger km were generally associated with systems having a high component of fixed route operations. The same was true for energy costs.

TABLE 14

Comparative performance of shared taxis operating under different regulatory controls

	Regulatory control	
	Weak	Strong
Daily vehicle output:		
availability (%)	97	85
kms operated	160	220–250
passengers carried	150	130–140
passenger kms	510	640–660
Profitability (revenue/cost)	1.2	1.3–1.4
Service quality:		
Load factor	0.8	0.5–0.6
Wait time (min)	7	3–5
Hours of operation	12	19

TABLE 15

Comparison of public transport operating under different levels of regulation

	Regulatory control	
	Weak	Strong
Public transport provision:		
Daily seat kms per 1 000 population	4 240	2 480–11 360
Proportion of shared taxis (%)	70	0–46
Daily demand for public transport:		
passengers (000)	330	490–850
passenger kms (000)	1 290	3 330–5 590
trip rate (per capita per day)	0.8	0.4–0.9
Cost per capita (index)	2.0	1.0–4.5
Cost per passenger km (index)	1.2	0.7–2.0
Energy cost per passenger km (index)	1.5	0.7–1.9

4 CONCLUSIONS

The study had the objective of assessing the relative merits of alternative approaches to public transport in a number of African cities. In particular the aim was to examine the relative performance of public transport under varying levels of Government involvement in both the regulation and operation of the sector. The main conclusions are as follows:

- the lack of regulation probably encourages the use of small capacity vehicles (as in Jos), though city size is also likely to be a significant explanatory factor, smaller cities requiring smaller vehicles.
- regulation is never totally enforced (with significant numbers of 'illegal' vehicles operating in most cities) while the absence of government control is often compensated by self regulation by the industry (as in Jos).
- there is some evidence from the bus sector that the absence of strong regulation (in particular market entrance) has allowed more competition and a better level of service to the user (Table 13). The evidence is not conclusive, however, and the shared taxi market presents a conflicting picture (Table 14).
- vehicles in the public sector are less cost efficient and less productive than their private sector counterparts. However, they tend to operate with lower load factors and generally provide a better quality of service (Tables 11 and 12).
- in general the higher the content of fixed route services, the lower is the unit cost of public transport, and the higher is the energy effectiveness.
- leading on from the previous conclusion, households in cities where shared taxis are the dominant public transport mode spend a higher percentage of the household budget on transport (all modes) compared with households where shared taxis are either not provided, or play a minor role.

Overall, one may conclude that the absence of strict government regulation has not strongly influenced the performance of individual modes of public transport. The impact has probably been on the development of the sector, with more fixed routes and larger vehicles in highly regulated environments.

Operational costs tend to be lower in these circumstances. Where Government also controls the bus company operations, unit costs of operation are likely to be higher than in the private sector and user benefits are only marginally better than in a less regulated system.

5 ACKNOWLEDGEMENTS

The observations recorded in this report are the outcome of a research programme by the Overseas Unit (Unit Head: Mr J S Yerrell) of the Transport and Road Research Laboratory and undertaken with the collaboration of the University

of Lagos (Dr G Banjo, Department of Civil Engineering), the University of Dar es Salaam (Prof Saxena, Department of Civil Engineering), the National Institute of Transport, Tanzania (Director: Prof Chijumba) and the Ministry of Communications and Works in Tanzania (Commissioner: Mr R Minja); the Ministry of Transport, Cameroon (Director of Road Transport: Mr B Sindeu); the Ministry of Local Government, Urban and Rural Planning, Zimbabwe (Director of Department of Physical Planning: Mr Zamchya) and the Zimbabwe United Passenger Company Ltd: SOTUC in Cameroon (Director General: Mr. M. Yonda) and Shirika La Usafiri Dar es Salaam (General Manager: Mr P Kushoka).

6 REFERENCES

BEESLEY M E and S GLAISTER (1985). 'Deregulating the bus industry in Britain—(C) A response'. Transport Reviews Vol 5, 113–142.

FOURACRE P R and D A C MAUNDER (1986). 'A comparison of public transport in three medium sized cities of India'. *Department of Transport TRRL* RR82: Transport and Road Research Laboratory, Crowthorne.

FOURACRE P R and D A C MAUNDER (1987). 'Travel demand characteristics in three medium sized Indian cities'. *Department of Transport TRRL* RR121: Transport and Road Research Laboratory, Crowthorne.

FOURACRE P R, D A C MAUNDER and G A BANJO (1988). 'Urban public transport in Nigeria'. Paper presented at CODATU IV in Jakarta, June 1988.

GWILLIAM K M, C A NASH and P J MACKIE (1985). 'Deregulating the bus industry in Britain—(B) the case against'. Transport Reviews, Vol 5, 105–132.

GWILLIAM K M (1989). 'Setting the market free'. Journal of Transport Economics and Policy. Vol XXIII, 29–43.

INTERNATIONAL ROAD FEDERATION (1987). 'World road statistics 1982–1986'. Geneva.

JACOBS, G D, D A C MAUNDER and P R FOURACRE (1986). 'Characteristics of conventional public transport services in Third World cities'. Traffic Engineering and Control. Vol 27 No 1.

THOMSON J M, R J ALLPORT and P R FOURACRE (1990). Rail mass transit in developing cities—the TRRL Study. In: Institution of Civil Engineers. Proc. of Conference on Rail mass transit for developing countries, London, 9–10 October, 1989. London: Thomas Telford, 21–40.

WALTERS, A A (1979). 'The benefits of minibuses. The case of Kuala Lumpur'. Journal of Transport Economics and Policy, September 1979, 320–334.

WHITE, P R (1981). 'The benefits of minibuses. A comment'. Journal of Transport Economics and Policy, Jan 1981, 77–79.

WHITE, P R (1989). 'Bus deregulation: the overall view.' Local Transport Today, 15.11.89.

WORLD BANK (1986). 'Urban transport: a World Bank policy study'. World Bank, Washington, DC.

WORLD BANK (1988). 'The 1988 update of the 1987 World Bank Atlas'. World Bank, Washington, DC.

APPENDIX A:

TRAVEL CHARACTERISTICS

TABLE 16

Average travel distance by mode (km)

	Jos	Yaounde	Douala	Harare	Dar es Salaam
Walk	1.2	1.7	1.2	1.6	1.7
Cycle	3.1	3.2	5.6	5.5	3.1
Personal motorised	4.9	5.1	6.0	10.9	6.6
Stage bus	4.7	4.6	5.8	12.7	8.1
Shared taxi	3.4	4.6	5.2	8.3	N/A
All modes	3.0	3.9	5.6	7.5	6.5
All modes average speed (kmph)	10.5	11.0	15.0	18.0	17.0

Source: TRRL Household Surveys. Trip distances from origin to destination and speeds on public transport include walking and waiting times

TABLE 17

Average daily travel time and distance for all trip purposes

	Jos	Yaounde	Douala	Harare	Dar es Salaam
Per household:					
distance (km)	33	60	62	69	41
travel time (mins)	190	325	246	230	141
Per capita:					
distance (km)	5.4	9.4	10.8	11.0	9.5
travel time (mins)	31	51	43	37	33

Source: TRRL Household surveys

APPENDIX B:

BUS PERFORMANCE AND COSTS

TABLE 18

Performance and productivity

	Public operator			Private operator		
	Douala	Yaounde	Dar es Salaam	Harare	Dar es ** Salaam	Jos **
Average fleet availability (%)	85	70	47	87	80	89
Ratio of trips operated to schedule	89	81	86	77	N/A	N/A
Total passengers daily	248 000	170 000	220 800	350 000*	504 000	50 000
Passengers per bus operated daily	1 198	1 429	2 208	603	2 100	200
Passengers per km operated	7.6	8.1	10.1	2.6	10.3	1.2
Kilometres per bus operated daily	158	176	219	223	204	170
No of breakdowns per 10 000 kms	10.8	6.0	15	3.0	–	–
No of accidents per 100 000 kms	5.3	5.6	4	1.0	–	–
Staff per bus operated	5.8	10.8	13.5	3.7	3.0	1.0
Average passenger lead** (kms)	4.6	5.8	5.7	12.7	4.1	7.0
Average load factor**	0.3	0.4	0.6	0.6	0.8	0.7

Note: *Estimated from ticket sales
**Based on TRRL surveys
Sources: SOTUC Annual Statistical Review for 1986/87
HUOC Annual Statistical Review for 1987/88
UDA Annual Statistical Review for 1985/86

TABLE 19

Cost structures (percentages)

	Public operator			Private operator		
Factor	Douala	Yaounde	Dar es Salaam	Harare	Dar es *** Salaam	Jos***
Staff/personnel	40.0	26.8	29.3	23.0	11.0	6.5
Fuel/lubricants	13.5	11.6	19.4	22.5	31.7	31.5
Tyres tubes & spares & maintenance	15.0	14.8	16.3	40.8*	23.9	18.5
Depreciation/interest	20.2	24.1	9.0	5.8	28.8**	42.5**
Taxes/licence/insurance	4.3	3.0	1.2	0.7	4.6	1.0
Miscellaneous	7.0	19.7	24.8	7.2	–	–
Total	100	100	100	100	100	100

Note: *Includes wages of maintenance staff
**Depreciation based on a capital recovery factor of 15 per cent for 5 years
***Based on TRRL surveys
Sources: SOTUC Annual Statistical Review for 1986/87
HUOC Annual Statistical Review for 1987/88
UDA Annual Statistical Review for 1985/86

TABLE 20

Costs and revenues

	Public operator			Private operator		
	Douala	Yaounde	Dar es Salaam	Harare*	Dar es* Salaam	Jos*
Total daily revenue (£)	29 610	22 666	8 044	35 878	29 460	3 250
Revenue per kilometre operated (Pence)	90	107	37	26	57	7.6
Revenue per passenger (Pence)	12	13	3.6	10	5.6	6.5
Revenue per bus operated daily (£)	143	190	80	61	122	13
Total daily costs (£)	37 510	38 072	6 466	39 406	9 450	3 000
Costs per kilometre operated (Pence)	114	181	29.5	29	19	7
Costs per passenger (Pence)	15	22	3	11	1.8	6
Costs per bus operated daily (£)	181	320	65	67	39	12
Daily profitability (£)	−7 900	−15 406	+1 578	−3 528	+20 010	+250
Profit per kilometre operated (Pence)	−24	−74	+7.5	−3	+38	+0.6
Profit per passenger (Pence)	−3	−9	+0.6	−1	+3.8	+0.5
Profit per bus operated daily (£)	−38	−130	+15	−6	+83	+1
Revenue: cost ratio	0.79	0.59	1.24	0.91	3.00	1.08

Note: *Based on TRRL surveys.
Sources: SOTUC Annual Statistical Review for 1986/87
HUOC Annual Statistical Review for 1987/88
UDA Annual Statistical Review for 1985/86
Exchange rates used: £1 = Tanzanian sh80 (1987), 450 Cameroonian CFA (1987)
Zambian Z3.1 (1988), 5 Nigerian Naire (1986)

APPENDIX C:

SHARED TAXI PERFORMANCE AND COSTS

TABLE 21

Performance and productivity

	Fixed routes	Flexible routes		Mainly flexible routes
	Harare	Douala	Yaounde	Jos
Total fleet	631	5 500	500	1 900
Average fleet availability (%)	80	85	85	97
Total passenger daily	136 500	588 000	590 000	277 000
Passengers per taxi operated daily	270	126	139	150
Kilometres per taxi operated daily	250	220	250	160
Passengers per kilometre operated	1.1	0.57	0.56	0.9
Average passengers lead (kms)	8.3	5.2	4.6	3.4
Average load factor	1.2	0.5	0.6	0.8

Source: TRRL surveys

TABLE 22

Cost structure (percentage)

	Fixed routes	Flexible routes		Mainly flexible routes
Factor	Harare	Douala	Yaounde	Jos
Labour/personnel	14.0	11.0	11.0	9.6
Fuel/lubricants	51.3	33.0	29.5	29.6
Tyres spares and maintenance	26.7	15.0	19.5	17.8
Depreciation and interest	12.0*	22.0*	19.0*	41.4*
Taxes, licence, insurance	1.4	17.5	17.0	1.2
Miscellaneous	4.6	1.5	4.0	0.3
Total	100	100	100	100

Note: *Depreciation based on a capital recovery factor of 15 per cent for 5 years.
Sources: TRRL surveys

TABLE 23

Costs and revenues

	Fixed routes	Flexible routes		Mainly flexible
	Harare	Douala	Yaounde	Jos
Daily revenue per taxi (£)	43.54	26.66	28.89	12.40
Revenue per kilometre (pence)	17.4	12.1	11.6	7.8
Revenue per passenger (pence)	16.1	21.2	20.8	8.3
Daily costs per taxi (£)	23.87*	19.75	22.67	10.20
Cost per kilometre (pence)	9.5*	9.0	9.1	6.4
Costs per passenger (pence)	8.8*	15.7	16.3	6.8
Daily profitability per taxi (£)	19.67*	6.91	6.22	2.20
Annual profit (£)	5 740*	2 140	1 930	770
Profit per kilometre (pence)	7.9*	3.1	2.5	1.4
Profit per passenger	7.3*	5.5	4.5	1.5
Revenue: cost ratio	1.82	1.35	1.27	1.21

Note: *Excludes commission to driver
Source: TRRL surveys
Exchange rates used—see Table 19

APPENDIX D:

COST COMPARISONS

TABLE 24

Adjustment to cost data based on national wealth index

	Jos	Yaounde	Douala	Harare	Dar es Salaam
National GNP per capita:					
US $	640	910	910	620	240
Index	2.7	3.8	3.8	2.6	1.0
Total public transport cost per passenger km: pence	1.7	3.8	2.8	0.9	0.5
index	3.4	7.6	5.6	1.8	1.0
Public transport energy cost per passenger km: pence	0.5	0.9	0.8	0.2	0.1
index	5.0	9.0	8.0	2.0	1.0
Index of costs per pass. km adjusted by wealth index:					
Total cost	1.2	2.0	1.5	0.7	1.0
Energy cost	1.5	1.9	1.7	0.7	1.0

Note: All index numbers relative to Dar Es Salaam (= 1.0)

TABLE 25

Total public transport output ('000)

		Jos	%	Yaounde	%	Douala	%	Harare	%	Dar es Salaam	%
Bus Services	Passengers/day	50	15	170	22	248	30	351	72	725	100
	Passenger kms/day	350	27	782	22	1 438	32	4 458	80	3 326	100
Shared Taxi Services	Passengers/day	277	85	590	78	588	70		28	–	–
	Passenger kms/day	941	73	2 714	78	3 058	68	1 133	20	–	–
Total System	Passengers/day	327	100	760	100	836	100	487.5	100	725	100
	Passenger kms/day	1 291	100	3 496	100	4 496	100	5 591	100	3 326	100

Source: TRRL surveys

TABLE 26

Total public transport costs

		Jos	Yaounde	Douala	Harare	Dar es Salaam*
Bus Services	Daily cost (£)	3 000	38 100	37 500	39 400	15 900
	Cost per capita (pence)	0.7	5	3	3	1
	Cost per passenger (pence)	6	22	15	11	2
	Cost per passenger kilometre (pence)	0.84	4.8	2.6	0.88	0.47
Shared taxi services	Daily cost (£)	18 900	96 400	91 100	12 100	–
	Cost per capita (pence)	4.7	12	8	0.9	–
	Cost per passenger (pence)	6.8	16.3	15.7	8.8	–
	Cost per passenger kilometre (pence)	2.0	3.5	2.9	1.0	–
Total system	Total daily cost (£)	21 900	134 500	128 600	128 600	15 900
	Cost per capita (pence)	5.4	17	11	11	1.0
	Cost per passenger (pence)	6.6	17.7	15.3	15.3	2
	Cost per passenger kilometre (pence)	1.7	3.8	2.8	2.8	0.5
	Energy costs per passenger kilometre (pence)	0.50	0.90	0.79	0.79	0.12

Note: *Includes UDA and Dala Dala
Source: TRRL surveys. See Table 19 for exchange rates used

Printed in the United Kingdom for HMSO
Dd8222792 8/90 C5 G476 10170