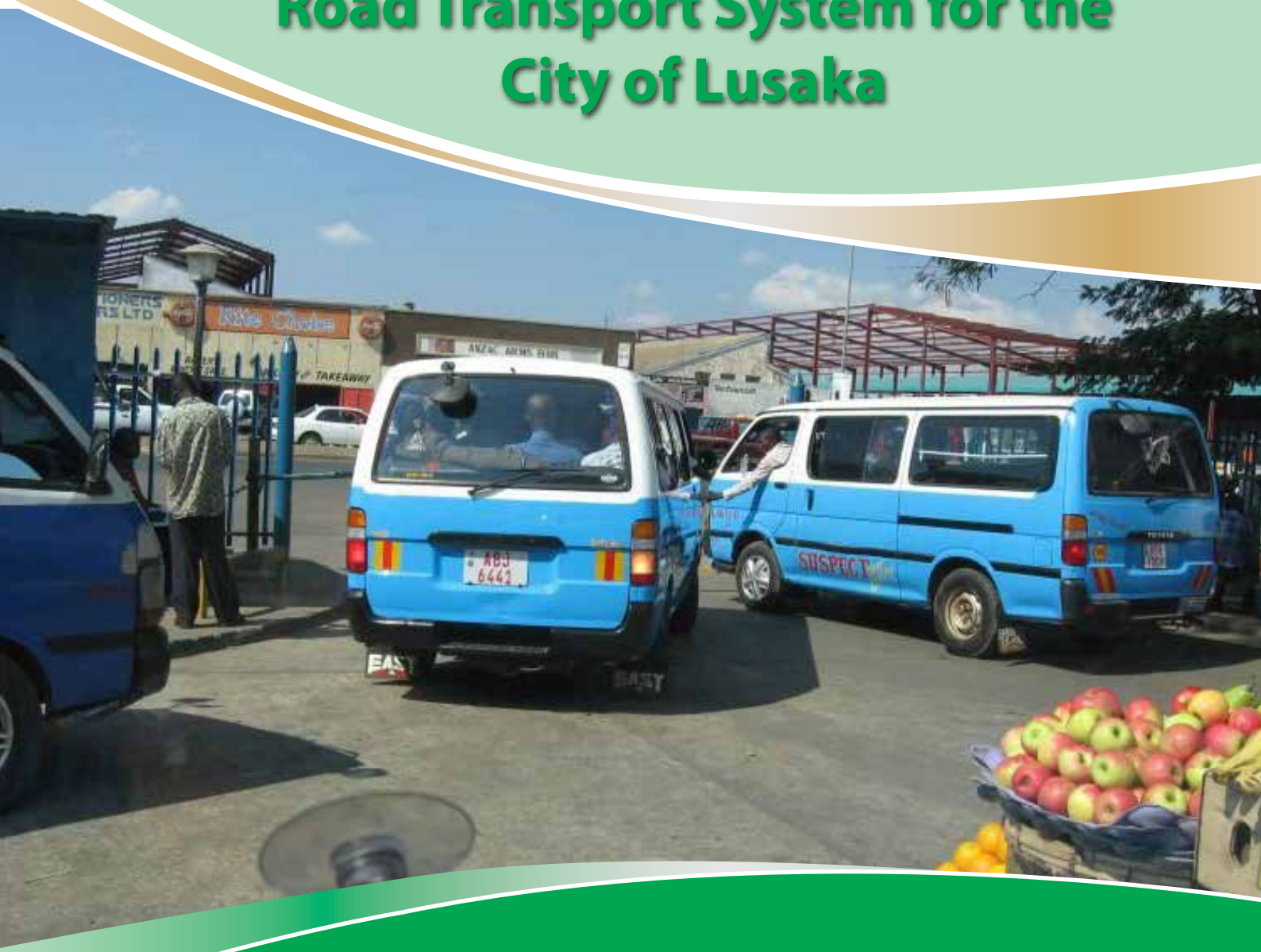
ZIPAR
Zambia Institute for Policy Analysis & Research

Trip Modeling and Cost Analysis for Public Road Transport System for the City of Lusaka



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The reported research was undertaken by ROM Transportation Engineering Ltd for and on behalf of the Zambia Institute for Policy Analysis (ZIPAR). The research was commissioned by ZIPAR under the mandate of the Road Sector Programme Support 2 of the Danish International Development Agency (DANIDA). In commissioning this research, ZIPAR partnered with the Ministry of Finance and the Ministry of Transport, Works, Supply and Communications (MTWSC).

Executive Summary and Recommendations

The increase in the use of private motor vehicles for routine travel within the City of Lusaka suggests weakness in the Public Transport (PT) system. Regrettably, the majority of the intra-city travelers have to accept an ineffective and inefficient PT system or resort to walking/cycling whereas those who can afford turn to private motoring. . It is evident that the less privileged travelers of the City are the most affected by the weaknesses of the current PT system. The current PT fares are unsustainably high and service levels undesirable. This is largely owes to the minimal regulation approach to public transport operations in Zambia.

The commitment by Government to invest in transport infrastructure such as ring roads, filter lanes and traffic light is backed by the realization that intra-city travel is becoming more and more problematic and that the situation would become unsustainable in future if it were to be left unaddressed. These measures will substantially tackle a lot of the emerging local travel problems, but the need to examine the current travel demand management and its effectiveness in promotion of public transport usage is equally important. Additional measures will be required to enhance PT services provision, making it more efficient, effective and affordable. Enhanced PT services are expected to engender a reduction in dependency on private motoring and the associated traffic congestion concerns on one hand and an increase PT usage on the other.

In this research we investigated some of the key features of the PT system in the City of Lusaka, model its trips and analyses its costs. Our analysis is based on a survey of bus services, covering approximately 50 bus routes and over 1,700 passengers. GPS data was also gathered for purposes of modelling trips and charting bus routes. In our analysis we considered aspects of service specifications, current level of service, fuel consumption, revenue, average trip costs, driver expenses, operator expenses and bus revenue allocation. Most of these aspects were found to be far off from the international best practice and international benchmarking. Our research concluded that the PT system for Lusaka fails to sufficiently meet the routine travel requirements of the majority.

Finally, we recommend some measure that could be considered to address the issues arising and to better manage the travel demand of the City's population. These measures are first highlighted in isolation because they can be implemented as such. However, we recommend combining all the measures into a single set of actions which can be implemented in stages in order to harness the synergies of a joint implementation which could yield up to as much as 48 percent PT fare reduction. The proposed measures are as follows;

i. **Supply and Service Management,**
   This measure requires assignment of each vehicle to a specific route to match supply to demand as well as setting up and enforcing operational plan with clear Service Level Agreements.

ii. **Introduction of High Occupancy Buses (i.e. 12m Long, 60-Seater Urban Transit Buses),**
   The measure involves engaging the private operator to operate large buses on designated routes through Public Service Contract and phasing-out of the small buses.

iii. **Introduction of a Common Ticketing System,**

This measure requires introduction of a common ticketing system to facilitate free transfers within a given time between any two trips for passengers who do not terminate their trips in the city center. This will help small to medium income passenger to save money on routine travel and increase the mobility of the city's population.

iv. **Reducing the Daily Cost of PT Vehicle Leasing, and**

This measure entails limiting the bus leasing costs to prescribed lower level than the current. This could be achieved through a State Owned Enterprise or NGO leasing out buses to drivers at a reasonable cost in return for drivers charging lower fares. This may lead to fluctuations in market prices until they stabilize at lower fares.

v. **Subsidized Fuel Costs and or Driver Salaries**

The measure would require Government to facilitate provision of subsidized fuel to PT operators, reduce levies and taxes, or other fiscal mechanisms that will translate into subsidize fares for the marginalized populations.

Acknowledgement

We would like to acknowledge the invaluable support of the following Institutions to this study; Ministry of Finance (MoF), Ministry of Transport, Works, Supply and Communications (MTWSC), Ministry of Local Government and Housing (MLGH), Lusaka City Council (LCC), Road Development Agency, National Road Fund Agency (NRFA), Road Traffic and Safety Agency (RTSA) and Flash Bus Company.

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1. Introduction

1.1. Background

Public Transport (PT) operation in Zambia is in private hands. The liberalization of PT brought about a rise in the number of bus operators as well as buses of all kinds. Following the liberalization of the transport sector, bus services were entirely deregulated. This meant that anyone could bring a public transport vehicle, have it licensed and then operate any route of choice. This is particularly so for intra-urban public transport. It was envisioned that once public transport services had become less dependent on government support and greater competition between operators had been attained, operations would become more efficient and effective. Liberalization facilitated the needed closure of the supply - demand gap created in the time state owned and controlled bus operations, through market responsive importation public transport vehicle; the relatively cheaper to import 12-16 seater buses begun to dominate the market.

The increase in the number of Public Transport operator increased the number of passenger seats available while the quality of service continued to decline. The public institutions responsible for public transport regulations appeared to be inappropriately structured to contain the rapid changes in system. Public transport management in Zambia is a function of the Ministry of Local Government and Housing. Local authorities are still the bearers of the mandate to run bus stations, to designate routes and to develop the associated PT infrastructure along the routes. Another government institution, the Road Traffic and Safety Agency (RTSA) legislated in 2003 has the mandated to carry out the transport control and regulatory functions. It is RTSA that is in charge of vehicle testing, collection of road license fees, issuing of cross border-permits, collection of road user fees, and enforcement/fines. The regulatory functions of public transport are therefore wrapped up in the functions of Local Authorities and RTSA.

1.2. Public Transport in Lusaka City

Public transportation in Lusaka is provided primarily by small 16-seater buses. There are a few medium sized 24-seater buses. Large buses are only operated for intercity transport. Buses are registered, and stop at designated bus stops to pick up and drop off passengers. However, a small presence of informal operators is also evident within the system.

Current transportation fares in Lusaka range between 4.20 and 5.20 ZMW for a single intra-urban trip (0.80-1.00 USD). Although Lusaka has the lowest poverty levels in Zambia, public transport fares at such high levels are unsustainable. Urban households largely depend on public transport in almost all their activities. They transit to and from workplaces, schools, market places and social gatherings. High public transport fares have a serious income redistribution effects, increase the cost of doing business for the public and contributes to increased marginalization of the poor. Impacts of high public transport fares are traceable to both individual households and the national economy.

1.3. Aim

The aim of this research is to provide policy alternatives for the improvement of the PT system in the City of Lusaka. This includes recommendation of solutions that will offer significant reductions in PT fare.

1.4. Objectives

The objectives of the research ware to evaluate the effectiveness of existing travel demand management system for the public road transport system in Lusaka City, to model and analyze its routine trips and costs.

1.5. Scope of work

This study included a review of all urban bus service, including official service that departs from within stations and informal services that do not enter stations. However, the study does not include long distance bus services, rail transport services or taxi services. The study covered 49 bus routes that operate within the district of Lusaka and presents a snapshot of PT services during the time period of September through November of 2013. The study also refers to recent studies to understand context.

Based on a complete understanding and analysis of PT operations and financial structure the study developed scenarios and strategies for reducing public transport fares in Lusaka. The scenarios were appraised and then developed into a single concrete action plan which could readily be implemented. The proposed solution will offer the opportunity to reduce PT fares.

1. Methodology and Work Plan

The methodology employed for this study included undertaking the following activities:

- Mobilization of team for survey work,
- Secondary data collection from multiple sources,
- Document reviews,
- Stakeholder meetings to gather views on transportation services and transportation needs in Lusaka,
- Refine methodology based on uncovered needs, and
- Survey execution

The main output of the above listed activities was an inception report. The scope of work would continue as follows:

- Survey quality analysis and control,
- Analysis of PT service provision and cause of high fares,
- Preliminary observation and definition of 2-3 scenarios for fare reduction, and
- Development of a trip cost model for the Lusaka PT system

The resulting technical working paper for the study would be reviewed by a six (6) person Transport and Infrastructure Development Technical Committee. Based on the comments and recommendations of the Technical Committee, appropriate adjustments to the trip cost model and scenario analysis would be made. Forthwith, the development of a comprehensive study report to be presented to a key stakeholder workshop for validation would draw its legitimacy from the recommendations of the Technical Committee. The final report for this study would thus be founded on the recommendations of the technical committee and the validation workshop for key stakeholders.

The work plan for the execution of the study is provided in Appendix 1.

2.1. Background Studies Reviewed and Primary Data Collection

Table 1 below provides a list of both primary and secondary data collected in the development of this research. The Table comprises document name, document author, the date the report was published and the data specifications.

Table 1: Data and Sources

Document	Author	Published	Data
Fare Table	RTSA	2013	Trip fares for major routes in Lusaka
Study on Comprehensive Urban Development	JICA	2009	Traffic zones, traffic volumes across screen line, traffic volumes across cordon line, other travel habits
Route Scheme	Primary data collection	2013	Origin, destination, length of Lusaka urban bus routes
Zambia Census of Population and Housing	Republic of Zambia Central Statistical Office	2000	Demographic data on population and households for Lusaka by ward
Subsidy and Operation Tax / Payments	Primary data collection	2013	Preliminary findings of added PT costs
Route Departures by Station	Bus Stations Managers - the 4 main bus stations	20.10.2013	Partial and not always consistent vehicle / departures by line
Vehicle Registration	RTSA	28.10.2013	Partial vehicle registration (only long-term)

2.3. Surveys Executed and Field Work

1.3.1. General Survey Plan

The scope of the survey was designed to be representative to fit the study requirements. In order to attain that, the sample size was calculated with reference to the City's most current demographic data from the Zambia Census of Population and Housing. Table 2 below provides a summary of the survey plan developed for collection of data for this study. It includes survey name, purpose, methodology, quantity of collected data and the time of day the survey was completed.

Table 2: Summary of Survey Plan

Survey Name	Purpose	Methodology	Quantity	Time of day
Passenger survey	Identify pattern of trips related to socio-economic characteristics.	Performance of questionnaire in stages.	1,750 questionnaire	Entire day.
Driver survey	Identify drivers revenues.	Deploy surveyors in all stages throughout Lusaka City Centre.	Over 800 drivers were sampled at more than 30 routes in Lusaka.	Entire day.
On-Board Passenger Count	1. Compute an accurate demand by time of day and by route. 2. Identify the total revenues intervals.	Deploy surveyors in the 4 main stages throughout Lusaka city.	150 round trips at 70% of the routes.	AM peak, PM peak
Fuel survey	Compute an accurate fuel consumption rate	Deploy supervisor in the 4 main stages throughout Lusaka city.	10 vehicles	For all day.
GPS survey	Identify routes, speed and definition time	On Board surveyor with GPS tracker	All routes	Once per route

2.2.2. Logistics and Administration

The complexity of the survey questionnaires and the necessity for an accurate database built on survey results required placement of that the quality control aspects of the surveys in the critical path of the research. At the beginning of the survey process, all research assistants were required to undergo and complete a three (3) days of training regime conducted by the survey manager. The training regime included simulations, pilot surveys and case studies of inappropriate survey results recorded during the pilots. After training, only fifteen (15) surveyors who met the required standards for administering a survey were recruited to the research.

All bus station managers were adequately consulted and sensitized regarding the research. Further consultations with bus station managers were made prior to deployment of the research assistants. In the field, surveyors were deployed in small groups headed by a supervisor. All surveyors were given an identity tag and a manual defining their task. Survey managers were also assigned to monitor at least one supervisor per stage.

The surveys were checked for quality assurance and quality control in four stages. The first stage was real-time quality control by supervisors on-site. The supervisors periodically checked all surveys for possible errors and performed on-site data cleaning. The second stager took place upon receipt of the questionnaire by the quality assurance manager. The quality assurance manager went through the survey to ensure consistency. The third stage involved an embedded logic check that ran in the background of a computer system during the data coding and entry process. This was designed to ensure that out of outlying responses could not be entered into the database. Such responses would be flagged at data entry to warn of problematic data analysis. Finally, an off-site dedicated expert would review and approve or disapprove each record based on responses. The off-site data expert then also simulated and reviewed the aggregated statistics to ensure reliability.



2.2.3. Passenger Survey

Surveys were conducted by surveyors approaching public transport passengers at bus stations during the wait time in order to ask them questions regarding their routine trips and their satisfaction with regards to service and fares. These surveys provided critical information regarding the travel habits of PT services users, their reported household incomes, their overall spending on bus transportation, and their other expenses.

A total of 1,700 unique passengers were surveyed in from all the 4 main bus stations servicing the intra-city PT. The passenger survey was conducted during day-time including the three peak periods of the day.

This survey found that on average, household spending on public transport is 70% higher than spending on education. The majority (68.8%) of the passengers earn less than ZMW 2,000 per month, with a median income of ZMW 1,500 per month, as shown in Table 3.

Table 3: Summary Statistics of the Passenger Survey

Household Monthly Income				Household Spend Transport per Week				Household Spend on Education per Year			
From	To	#	%	From	To	#	%	From	To	#	%
1	500	206	14.2%	1	50	550	34.7%	1	500	136	12.2%
501	1000	380	26.2%	51	100	598	37.8%	501	1000	280	25.2%
1001	2000	413	28.4%	101	200	312	19.7%	1001	2000	319	28.7%
2001	3000	225	15.5%	201	300	102	6.4%	2001	3000	176	15.8%
3001	5000	229	15.8%	301	400	22	1.4%	3001	5000	201	18.1%
5001	8000	97	6.7%	401	1000	37	2.3%	5001	8000	97	8.7%
	Total	1453	100%			1584	100%			1112	100%
Average			2862.77				104.35				3442.16
Med.			1500				70				1800

Further, the survey finds that about 39% of trips are made with transfers. A high transfer rate is attributed to the radial layout of the PT scheme and the lack of direct lines between origins and destinations. This is phenomenon that would though only partly be resolved through the on-going ring-roads Programme. About 40% of the City's passengers pay twice to reach their final destination. In addition, cycling park & rides and drop-offs hardly exist as feeder modes for public transport, adding to the need for transfers.

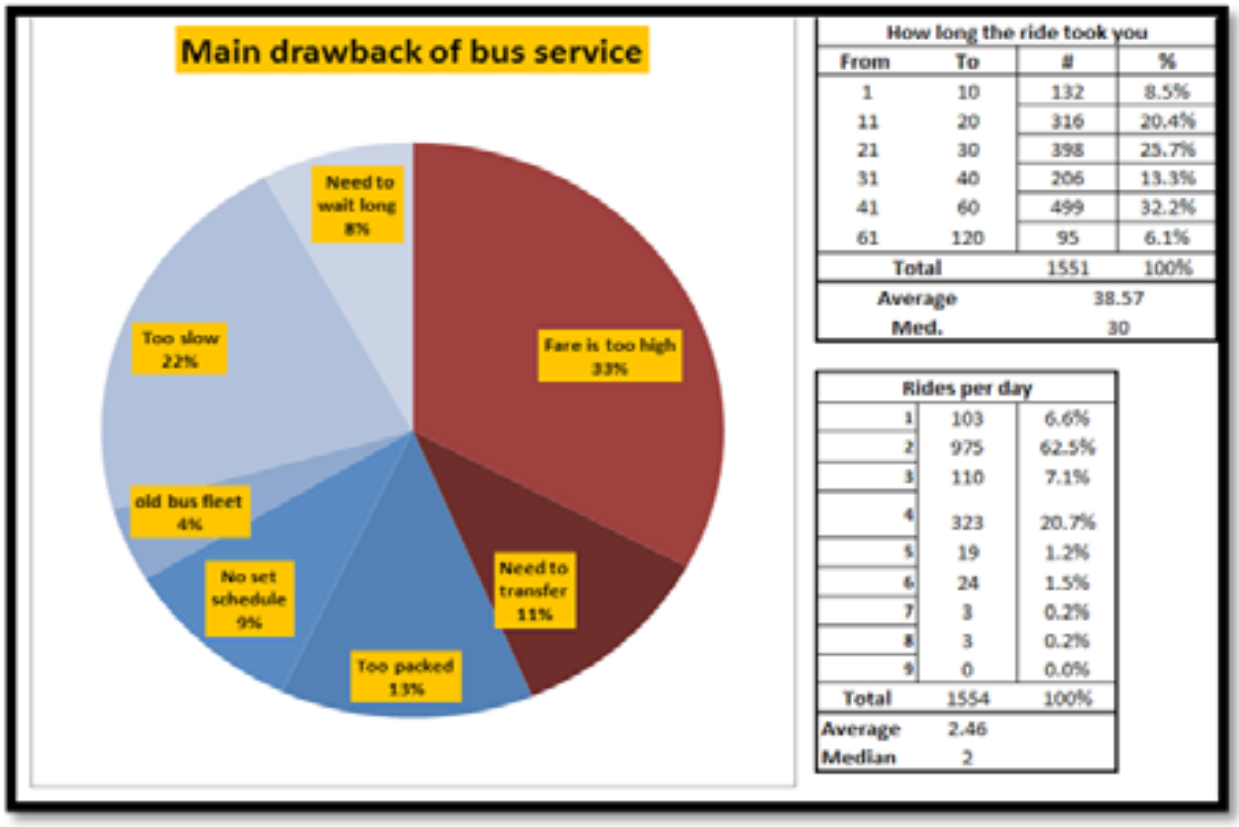
Table 4: Summary Statistics of Trip Transfers

	Mode of Reaching the Main Bus Station		Mode of Leaving the Main Bus Station		Number of Buses Rides to Reach Final Destination		
Transport Mode	**Freq.**	**Relative Freq.**	**Freq.**	**Relative Freq.**	**Bus Rides**	**Freq.**	**Relative Freq.**
1) Bus	1516	91.7%	5	0.3%	1	994	61.0%
2) Walking	98	5.9%	1007	60.9%	2	586	36.0%
3) Offical Taxi	7	0.4%	7	0.4%	3	30	1.8%
4) Car	23	1.4%	13	0.8%	4	19	1.2%
5) Another bus	0	0.0%	618	37.4%	> 4	0	0.0%
6) Unofficial Taxi	9	0.5%	3	0.2%	**Valid**	**1629**	**100%**
7) Other	0	0.0%	1	0.1%	**Average**	**1.48**	
Valid	**1653**	**100%**	**1654**	**100%**	**Median**	**1**	

2.2.4. Service Quality Assessment

Regarding the quality of the service offered, the study found that 44% of passengers complained of high fares, while 30% complained of service speed.

Figure 1: Passenger Satisfaction Survey



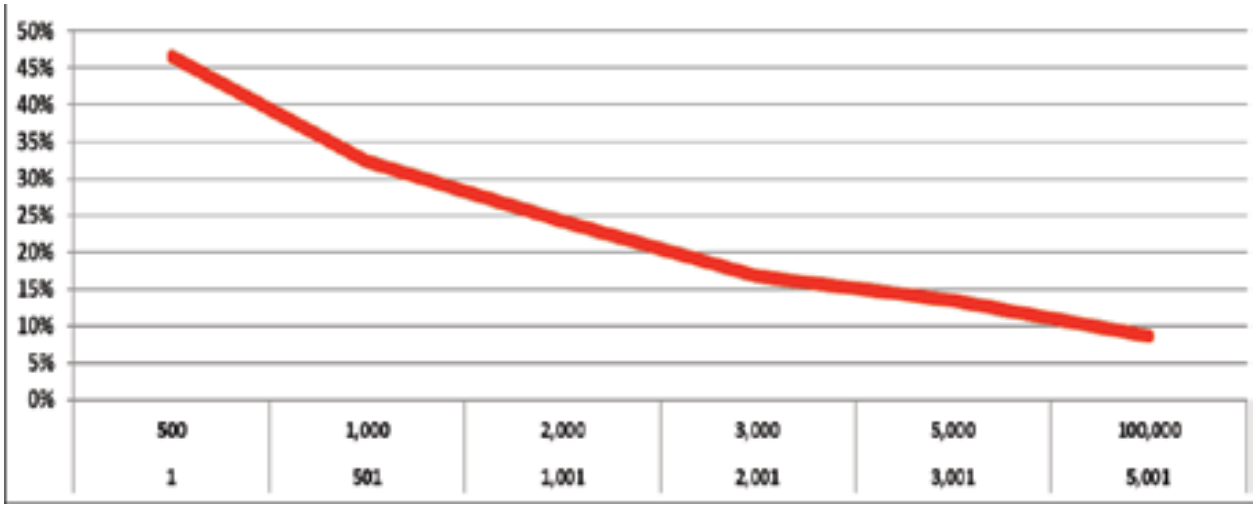
How long the ride took you			
From	To	#	%
1	10	132	8.5%
11	20	316	20.4%
21	30	398	25.7%
31	40	206	13.3%
41	60	499	32.2%
61	120	95	6.1%
Total		1551	100%
Average		38.57	
Med.		30	

Rides per day		
1	103	6.6%
2	975	62.5%
3	110	7.1%
4	323	20.7%
5	19	1.2%
6	24	1.5%
7	3	0.2%
8	3	0.2%
9	0	0.0%
Total	1554	100%
Average	2.46	
Median	2	

2.3.5. Expenditure on PT Services

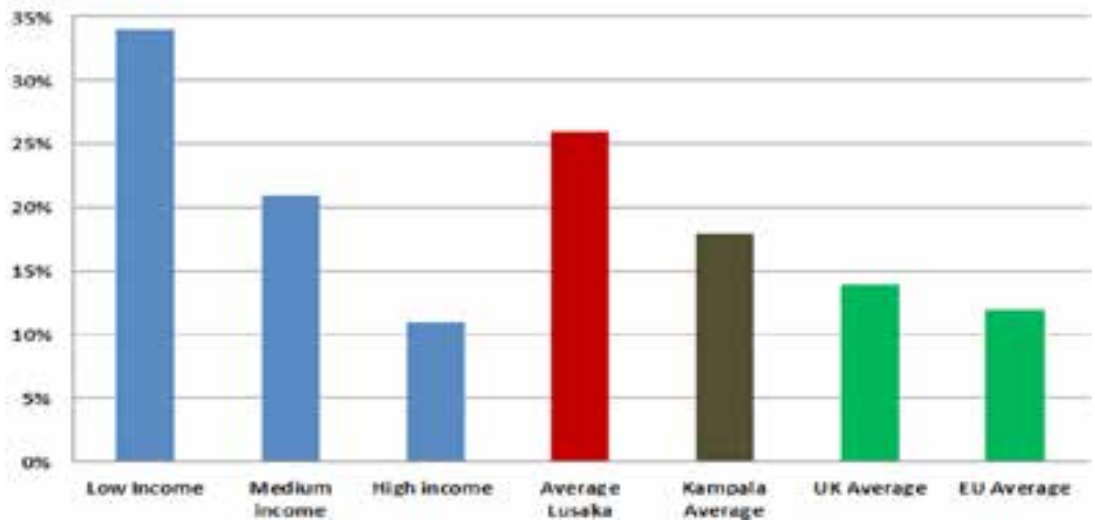
The study revealed some important occurrences concerning household spending on PT services. On average, spending on PT services accounted for 26% of all household expenses. Low income households spend up to 40% of their income while high income households spend less than 10% on transport on average.

Figure 2: Share of PT Expense by Income Group



Monthly spending for PT users is 450 ZMW per month on average, which is nearly a third of the median household salary. This means that 5 trips per day are taken by households on average, which may mean too many transfers or more than one user per family. Figure 3 below shows the share of PT expense by income group for Zambia's low, medium and high income groups of PT passengers as well as the overall average for Lusaka and Kampala, Uganda. In addition the UK and EU averages are also shown in the same graph.

Figure 3: Expanded Comparison of Income Share of PT Expenses



2.3.6. Driver Survey

The driver survey involved collection of quantitative information regarding operations, costs and revenue. This was accomplished by administering a structured questionnaire. This survey provided information regarding operating costs and daily revenue collected by drivers.

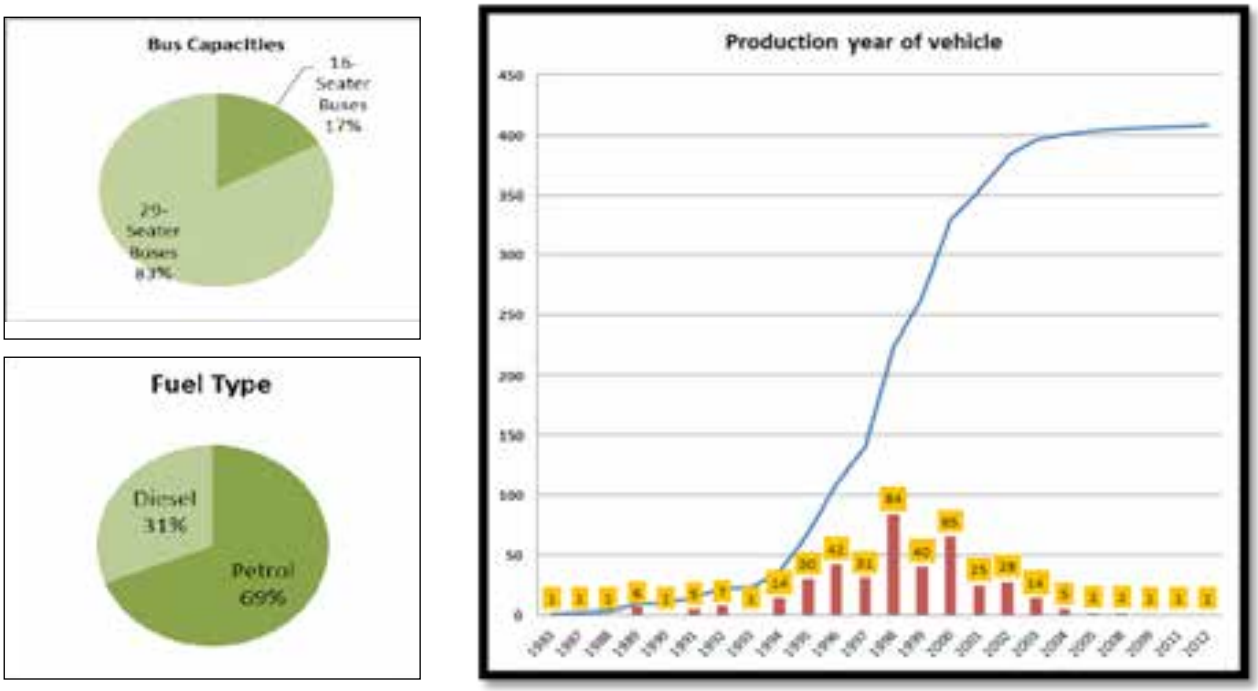
A total of 450 drivers were interviewed. The data from this survey provided esoteric information for understanding the intricacies of driver incomes and expenses. However, some data inconsistencies were observed and this due under-reporting especially with regard to revenue and over-reporting with regard to fuel expenditures.

To resolve the data inconsistencies observed in the driver survey, a triangulation method was devised. This involved an on-board driver observation survey to capture all expenses and revenue generated. This method provided sufficient information and data to validate the data captured in bus driver survey.

2.3.7. PT Vehicle Characterization

From the driver survey, it was observed that most of the PT vehicles are 16-seaters buses, running on petrol. The average age of vehicles is 15 years. A relationship between PT vehicle age and fuel consumption was also established. Older PT vehicles were observed to use up more fuel on average than the newer ones. Figure 4 below is dashboard showing that the dominance of the 16-seater minibuses, gasoline fuel as well as older vehicles.

Figure 4: PT Vehicle Characteristics

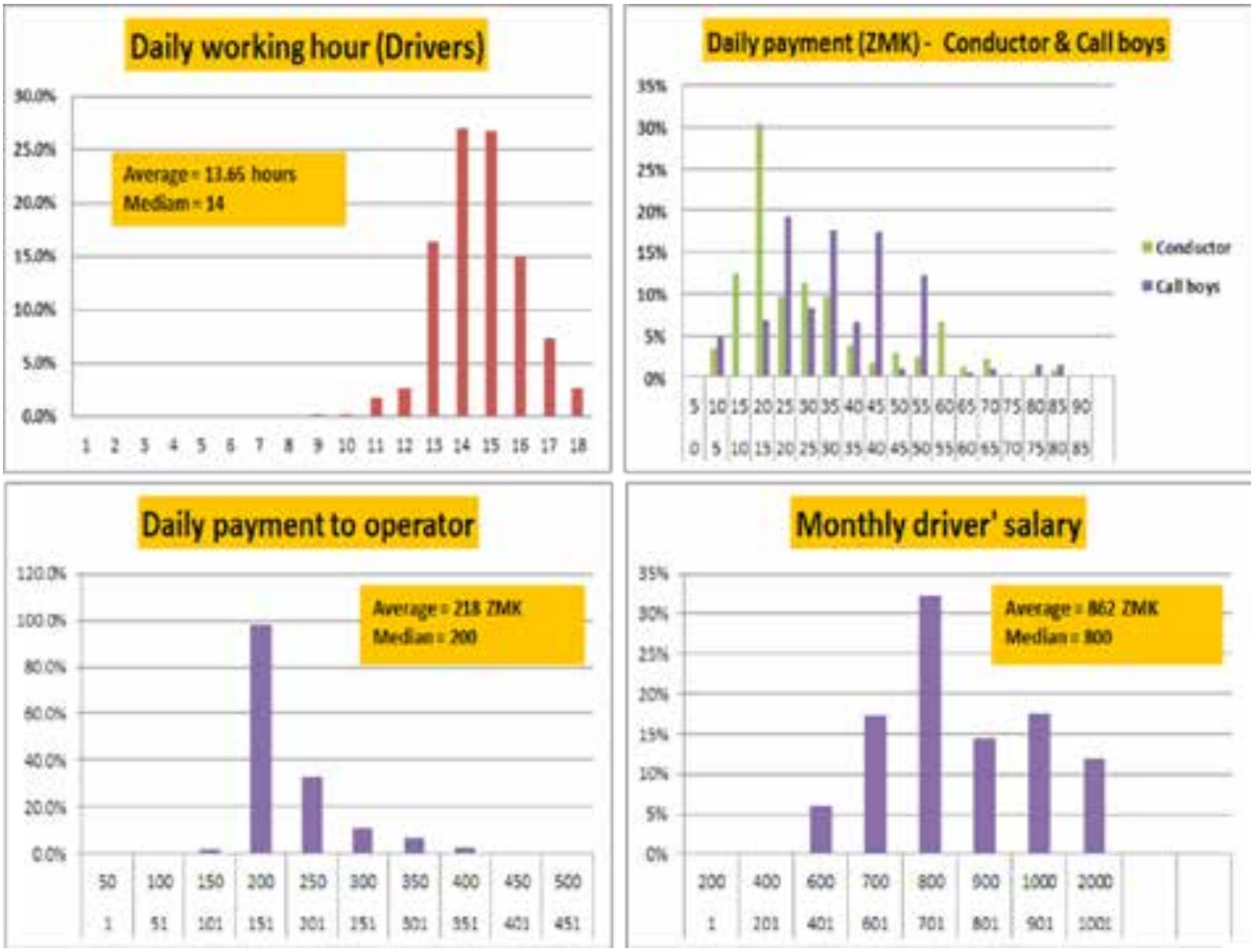


1.3.8. Driver Working Conditions

The research unveiled many important factors regarding the operation of PT transport. Operators issue out their buses to the drivers in some casual form of operating lease and expect a fixed daily rent payment in return. The departure of this form of lease from the formal operating lease is that the driver still gets a salary from the operator. Drivers pay operators an average of ZMW 218 per day and earn a median monthly salary of ZMW 800 per month.

The research further shows that most of the drivers are on-duty for over 14 hours per day. This is in spite of the fact that most of them complete only 4 round trips per day. Figure below summarizes the elements in the drivers' working conditions.

Figure 5: Key Elements in Drivers Working Conditions



2.3.9. On-board Passenger Count

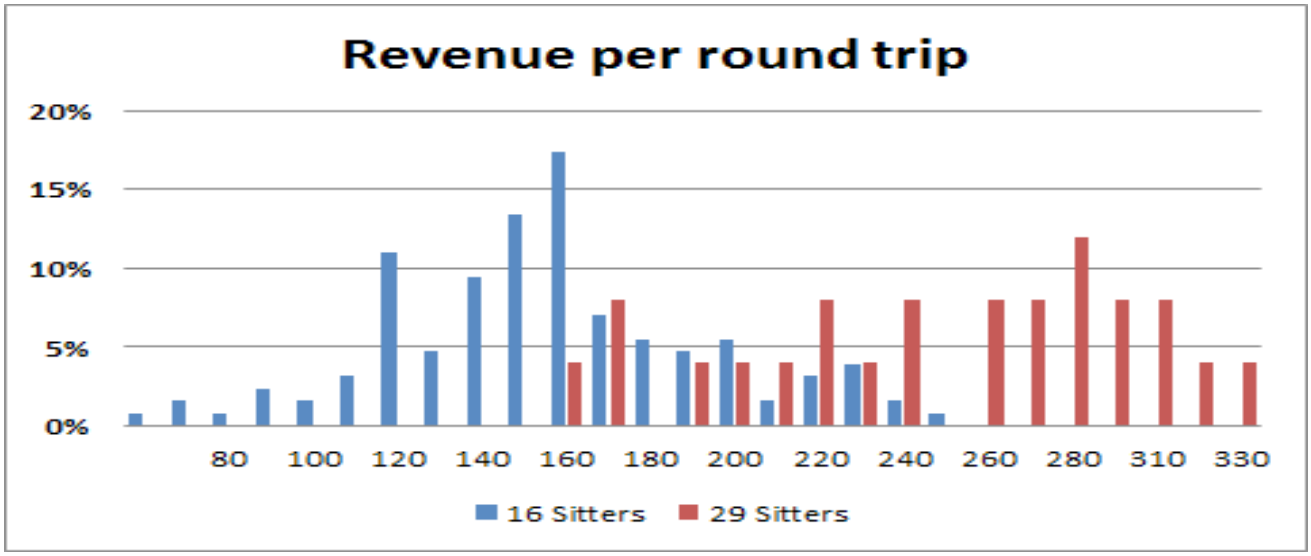
In order to complement the data provided in the driver survey and terminal document reviews, on-board passenger counts were conducted. Surveyors on-board the buses, counted the number of passengers boarding and alighting the bus on each route. This survey strategy sought to:

- Establish the actual number of vehicle departures and their intervals for each route by stage,
- Establish the actual number of passenger boarding for each route by stage,
- Establish the actual number of vehicles operating on each route by stage, and
- Establish the actual daily revenue per route

The data gathered in this survey was used in the total passenger and revenue estimation for each route. Table 5 below summarizes the essential results of the survey.**Error! Not a valid link.**

The survey results also show that larger capacity buses generate more revenue per round trip than the smaller capacity ones. Figure 6 below show how the bus revenues are distributed between the typical bus capacities on the City routes.

Figure 6: Revenue Distribution per Round Trip



2.3.10. GPS Survey

Considering that there are no official route designations in the City and to capture some the data that could not be collected using the recall methods and document reviews a GPS Survey was deployed. This involved placement of GPS data Loggers on sampled buses to collect bus coordinates on 3 seconds intervals.

The GPS survey gathered the critical data regarding the alignment of all bus routes in the City; transit and stoppage times as well as operations speed along all routes. The data gathered was used to generate an integrated route system map for PT in the City using route maps software.

3. Summary of all data collected

3.1. Bus System Data

There are four bus terminals in Lusaka's City Centre shown in Map 1; City Market, Lumumba Station, Kulima Tower and Millennium Station. The consultant mapped the 48 urban bus routes departing from all four bus stations. The purpose of mapping the bus routes was to collect real operational info about the routes, such as length, duration, speed and official stops, among other data.

The consultant mapped all urban routes exiting from all bus terminals and validated them using on-board GPS tracking devices. Map 1 for instances shows one the bus route alignments generated.

Map 1: Alignment of Bus Routes Origination from Kulima Tower

3.1.1. Route Fares

Public transportation fares on all routes were found to range between ZMW 4.10 and ZMW 5.00 per single trip. Cheaper fares are offered for short trips, but these are not officially defined and standardized. It was further observed that fares are not typically well matched with trip distances and transfer options are not available. Passengers pay for every transfer as though it was an individual trip. Even though fares have been recently raised, but there remains constant political pressure from drivers and operators to permit further raises.

3.1.2. Fleet Enumeration and Service Delivery

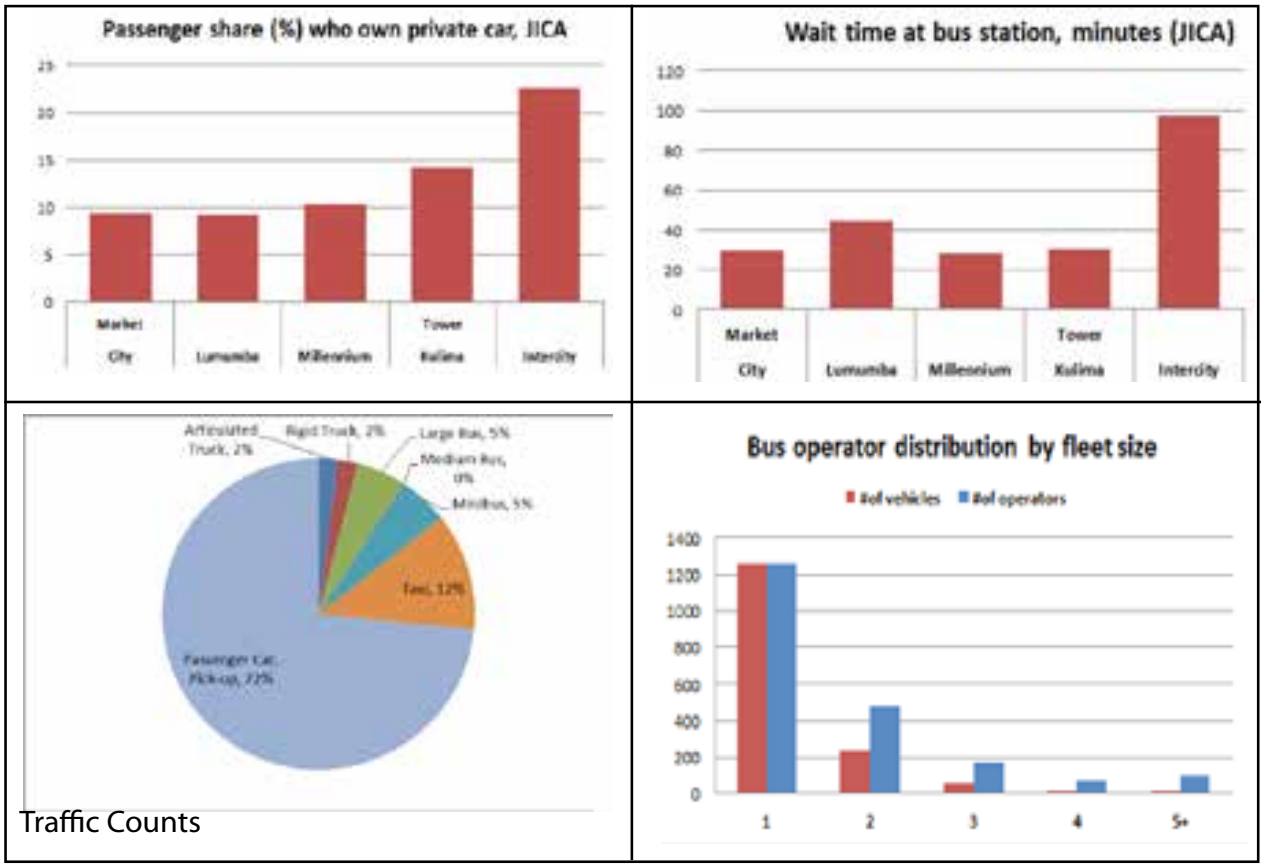
Bus registration and departure data per route were collected from each of the four terminal managers in the City Centre. While the data was not always consistent, we can estimate that approximately 1,900 vehicles and 6,400 departures per day were reported for all four stations. It is important to note that this data excluded vehicles operating from outside the station. The GPS based route alignment revealed that, some routes were not reported by bus station managers.

Other studies and reports were considered to provide data to complement our research. The 2009 JICA study showed that a very small portion of passengers own a private car. That number is higher (22%) on intercity bus routes, but is less than 15 percent from all bus terminals and more than 10% from only one bus terminal (Kulima Tower). The JICA study also showed that passenger cars made up the vast majority of traffic (72%).

Further, the JICA study reveals that passengers wait long periods of time for their bus service to leave the station. On average, passengers leaving all stations waited more than 20 minutes at their bus station. Figure 7 below shows multiple summaries of the JICA data considered in the research being reported on.

Figure 7: Composition of the JICA Data Considered

In October 2013, RTSA reported that there were 2,017 registered public transport vehicles owned by



Traffic Counts

1,772 individual owners. This list includes only annual registrations and excludes short term (3 month) registrations. Based on the JICA traffic counts, the bus station data, the survey data and the RTSA report, an estimate of 2,600 public transport vehicles operating daily in Lusaka was arrived at.

3.2. Bus Info Tables

In order to proceed with the analysis of the PT system, all the bus routes and their attributes were compiled into a single numeric data framework called the bus information table. Various sources were used to compile accurate operational, ridership, fleet, spatial and economic data for each route. While there is no official definition of what constitutes a route in Lusaka, and there are many variations for some routes, the research using GPS route maps defined the routes by listing all major destinations from all four of the intra-city bus terminals. The data also included unofficial 16-seaters that operate outside of bus stations on designated routes. Approximately 17% of the 16-seater buses don't operate from the station and are therefore considered "unofficial."

The bus information table was used to build a complete analysis of the City's bus services. The analysis estimated a total daily revenue of ZMW 1.8 million, or ZMW 546 million (USD 105 million) per annum. It is therefore observed that the urban PT system in Lusaka constitutes a huge market with many employment opportunities. Overall, there are 2,600 PT vehicles covering a daily distance of 184,000 km, or only 72 km per PT vehicle. This is significantly lower than the international benchmark, which is 200-300 km per PT vehicle. The public transport system in Zambia capital city provides less than half a million daily trips. Given that most users make a one way trip twice per day, and the transfer rate is 1.3 boardings per trip, we justify our estimate that the system serves less than 200,000 individual passengers per day, or 10% of the entire City's population. The legitimate question to ask is, 'what form of transportation do the rest of the population without access to private transport use then?' The bus information table developed is shown in Appendix 2.

4. Preliminary Overview of Lusaka's Current PT Structure & International Comparison

There are usually ten (10) different features considered in the evaluation of PT service. These include:

i. Trip cost and fare structure
ii. Time table and service hours
iii. Route structure and coverage
iv. Number of vehicles and vehicle capacity
v. Vehicle fuel type and On-Board ITS
vi. Owner and driver characteristics
vii. Institutional and Public Service Contract issues and arrangements
viii. Planning issues and passenger satisfaction
ix. Subsidy and operations taxes and payments
x. Infrastructure for passengers (stops, stations, information)

These characteristics are elaborated upon and discussed below.

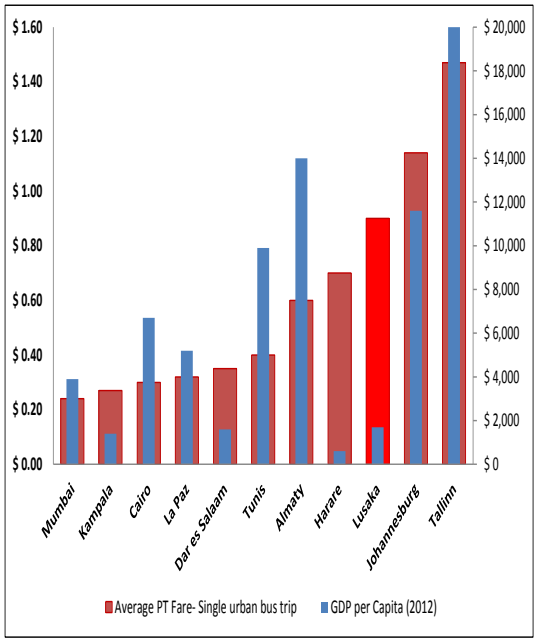
4.1. Trip Cost and Fare Structure

Current Situation

Currently, public transportation fares in Lusaka range from ZMW 4.10 to ZMW 5.00 ZMW per single trip. This is equivalent to USD 0.80 to USD 1.00. Whereas fares have been raised recently, and fares have been raised by nearly 500% over the past 8 years at an annual rate of approximately 22%, drivers and owners continue to apply constant pressure to the government to authorize further raises. Table 6 below shows the changes in the intra-city bus fares since 2005. **Error! Not a valid link.**The PT system has no fare structure is in place for the facilitation of transfers. Sometimes, driver to driver arrangements are brokered to allow passengers to board free of charge on transferring from a previous bus route. This however occurs when there is a change of bus route from the originally intended. Fares are collected by conductors and fares are uniform, with no discounts for the disabled, the old, pupils and students. Payment rate is high, with little to no fraud.

All of this makes Lusaka to be among the cities with the most expensive public transport systems worldwide. The annual household expenses on bus fare to GDP per capita ratio, which is a good measure of ability to purchase a transport fare, is 0.5, which is three times the ratio in Kampala and 10 times the ratio for Mumbai. Figure 8 below shows an international comparison of PT fares to GDP in various countries.

Figure 8: International Comparison of Bus Fare to GDP Ratio



City	Fare to GDP ratio ('000)
Harare	1.17
Lusaka	0.53
Dar-E-Salam	0.22
Kampala	0.18
J-Bourg	0.1
Mumbai-La-Paz, Tallinn	0.06
Almaty, Tunis, Cairo	0.04

CITY PT FARE TO	GDP RATIO
Harare	1.17
Lusaka	0.53
Dar-es-Salaam	0.22
Kampala	0.18
Johannesburg	0.1
Mumbai, La Paz, Tallinn	0.06
Almaty, Tunis, Cairo	0.04

International Best Practices

International best practices in fare collection make public transport more affordable for regular users by offering discounted monthly passes. Public transport can also be made more affordable for disadvantaged populations by offering discounts for pupils, students, elderly and disabled. In addition, free transfers can be provided within a specified period of time from the first boarding, for instance within an hour of the first boarding using a dispensed ticket.

PT operators can contrive improvements to the current situation in collaboration with the regulator considering real distance-based fare structures to cover real costs and possibly revenue guarantees for sustainable operation.

The current situation must be fixed, because it leads to a vicious cycle that excludes the poor from the enjoyment of public transport services and keeps public transport in poor condition. A large portion of Lusaka's population can't afford paying the high cost of public transport services, and those who use the services, do so to the detriment of other important necessities, such as quality education, healthcare and food. An inefficient PT system hurts the low to medium income households and retards national development.

4.2. Time Table and Service Hours

Current Situation

Public transport operates on an on-demand basis, meaning that transport services only leave the origin when there are a sufficient number of passengers on board the vehicle. Therefore, buses only leave the terminal station once they are full, which leads to long wait times at the terminal stations. At some terminals, the buses do leave the terminal partially empty, but will stop at specified locations in order to ensure that the buses are filled up before they reach their destination.

Service is very frequent but slow moving during the day, due to high demand, but there is practically no service after 20:00 due to the inability of drivers to fill their vehicles to capacity. This means that the populations that patronize attend evening activities are generally limited to the use private transport. This is counterproductive to the road safety campaigns to reduce drunken driving.

International Best Practices

International best practice prescribes that transit service should run from 05:00 to 24:00 to promote evening activity within the City. Some cities offer limited overnight service during off-hours as well.

Service should follow a strict timetable for departures and arrival times. Reliable travel times are essential in order to more PT usage. While frequency is most often based on demand, a policy of minimum headways should be introduced and maintained so that buses continue to serve locations at a minimum of twice per hour for all city routes.

4.3. Route Structure and Coverage

Current Situation

Approximately 50 routes depart from the four main bus terminals located less than 1 km apart, heading mostly to the same set of destinations. The route structure for Lusaka is radial, where all bus routes start at multiple points, but all end in the City Centre. This type of system creates a need for a high number of transfers. Drivers regularly do not run their complete route, and often they divert from their routes or turn back before reaching their final terminal thus engendering more transfers. Some drivers shun the bus terminal in order to avoid terminal fee and attempt to collect passengers en-route instead. However, in most cases and within the City Centre, drivers obey the law and pick up and drop off passengers at official stops.

International Best Practices

Internationally, routes tend to be more diverse and connect different origins and destinations. Transfer hubs are located at the edge of the City (or sometime at the edge of the City Centre) to improve connectivity to suburbs and long distance travel. Hierarchical route structure with high occupancy vehicles on major corridors are the solution to the radial structure. The traditional central bus station concept, located in the City Centre has become less useful, while the development of multiple hubs for different corridors has become more common. Cities similar in size to Lusaka tend to have an average of 100 to 120 bus routes, compared to Lusaka's less than 50 bus routes. A hierarchical network provides options to optimize capacity to actual demand patterns by increasing vehicle capacity and frequency. High volume corridors (such as Chelstone) should be served at a high frequency with large buses while others (for instance Los Angeles Street) can be served with smaller minibuses.

4.4. Number of Vehicles and Vehicle Capacity

Current Situation

Approximately 2,600 PT vehicles are officially registered at RTSA and pay annual and 3 month passenger service vehicle license fees. Most PT vehicles have 16 seats which, in practice, hold 18 passengers while others have 29-seats. PT Vehicles are permitted to be added to service based on willingness to supply service, with no limits. This leads to over-capacity, which lowers the number of trips per driver and vehicle to an average of only 4 runs per day.

International Best Practices

International best practices show that the number of vehicles per route should be predetermined and must correspond to ridership. A city the size of Lusaka should have a minimum capacity of 100,000 seats to meet the AM peak demand. A variety of vehicle sizes, such as regular large buses, articulated buses, midi-buses and minibuses, should be used to fit demand on different routes and save on operation and maintenance costs. Figure 9 below compares Lusaka with other cities with similar population sizes with respect to the number of buses and bus seats and buses.

4.5. Vehicle and Fuel Type and On-Board ITS

Current Situation

Most buses in Lusaka use unleaded petrol and diesel fuel and fuelling is done at regular fuelling stations at market price. Vehicles are old, mostly built prior to 2000, leading to high pollution outputs. Vehicles lack air-conditioning and afford little space for comfort and maneuvering. The vehicles are inaccessible to the disabled people. Vehicles lack signage to communicate to passengers the vehicle's destination. Instead, vehicle destinations are communicated by the conductor shouting the destination.

International Best Practices

Today, there are multiple energy alternatives available for bussing, including benzene, compressed natural gas (CNG), electricity, and fuel electricity hybrids.

Each city provides buses by identifying an appropriate mix of energy sources that are most economically and environmentally friendly for its purposes. Buses today tend to have air-conditioning and heating for passenger comfort, an on-board real-time passenger information system to communicate destinations and next stops to passengers, and payment systems that automates the payment process. Buses today are most often accessible to the disabled and elderly via low floors, ramp and easy boarding and spaces for wheelchairs.

4.6. Owners and Drivers

Current Situation

PT vehicles are oes2wned by private companies and individuals, who typically own 1-3 vehicles, although a few operators own more vehicles. Drivers have some form informal lease agreements with operators, which defines how much should be paid to the operator on a daily basis for use of the vehicle and the salary for the driver. Drivers are organized in some form of associations along the routes, which serves as an informal social network. New drivers are typically permitted to provide service along any route without any capping of service.

International Best Practices

Today internationally, most buses are owned by private operators. Most EU cities have only a few bus operators within a city, typically ranging between one and five operators per region. Operators are not permitted to compete with one another, and rather operate on different routes that feed each other to service the market. A driver's role is typically limited to driving, while revenue collection and information is provided automatically through ITS systems. Drivers work in shifts, with at least 2 drivers per bus, regulated

by the operator. Drivers' compensation is not sensitive to ridership, as the driver tends to work for a salary paid by the operator. This encourages provision of service even during lower demand time periods in order to encourage PT usage at all times.

4.7. Institutional and Public Service Contract

Current Situation

The current PT system in Lusaka is largely unregulated. Authorities keep some vehicle records regarding vehicle registration and operating fees, but operations and Level of Services (LoS) are heavily dependent on the whims of drivers who drive where and when they wish, with limited restriction and enforcement to restrict transit vehicles on some streets, such as Cairo Road. There is no sufficiently demonstrated capacity for planning and managing of transport services.

International Best Practices

Today, across many countries, regulatory bodies, called Public Transport Authority (PTA) have been established. These regulatory bodies set principles of PT operation and manage public transport service contracts with PT operators. PT operation principles typically define rights and obligations for both the transport authority and the transport operator. A sample of Public Service Contract (PSC) with defined rights and obligations is shown in Appendix 5.

4.8. Planning and Passenger Satisfaction

Current Situation

The current public transport authorities and regulators, that is the Lusaka City Council and RTSA have to this point not demonstrated sufficient capacity for planning and managing the bus system properly. For instance routes are not planned and passenger concerns are not being sufficiently addressed. Rather, these Institutions continue to follow their traditional alignments or are demand-driven, resulting in low levels of service outside the most popular routes during peak hours. RTSA does not collect data regarding the volume of passengers and their levels of satisfaction to services offered. The lack of information and leverage provides little prospect for RTSA to improve the current level of service of the PT system in Lusaka.

International Best Practices

Internationally, the practice has been to institute a dedicated Public Transport Authority (PTA) to regulate the entire public transport system and analyze the bus system performance periodically in order to consider and implement improvements. The PTA collects daily operational data on each vehicle and ridership data for compensation analysis. In addition to utilizing modeling tools, the regulator conducts periodic satisfaction surveys to identify where there is room for improvement in the provision of services to passengers.

4.9. Subsidy and Operation Taxes and Payments

Current Situation

In Lusaka, operators and drivers pay regular fees to the authorities. The annual payments are approximated to sum up to ZMW 2,100. There is no subsidy of any kind available, even for the provision of services to the underprivileged populations.

International Best Practices

While some popular routes may be profitable, cities and states worldwide tend to heavily subsidize public transport operations in order to ensure a high level of service for all citizens, especially during off-peak periods in order to increase the hours of operation and route coverage. Subsidies are disbursed based on operation and service provision, such as kilometers per hour driven. The PTA tends to provide designated subsidies for disadvantaged populations in order to improve the service provided to them, and therefore improve regional mobility for disabled and less capacitated populations.

4.10. Passenger Infrastructure

Current Situation

Lusaka has four intra-city bus terminal stations. All are in poor condition and two (Millennium and Lumumba) are managed by private companies. Signage in all the bus terminals is poor, although regular passengers tend to know the platforms for the buses of their destination. Buses have absolutely no route signage markings and passengers rely on the voice calls of the conductors and call-boys. While bus stops do exists, few are marked and even fewer provide any type of shelter. There is no information provided on buses aside from a posted fare list. There is no consideration to accessibility for disable and aged individuals.

International Best Practices

Worldwide best systems offer high quality and protective bus stops with maps, time schedule and electronic information system. Bus stations, which are indoors or covered, are typically located at the City's entrances and provide convenient transfers. Intercity public transport is integrated with the local transport at easy transfer points. Accessibility for disabled passengers is provided with care for their needs.

5.11. Summary of Public Transport Service in Lusaka

Public transport service in Lusaka is fully de-regulated and doesn't meet adequate level of service standards. Fares are very high, resulting in low mobility for underprivileged populations. Due to low quality and expensive service, residents avoid using buses. Those who can afford the fares, instead choose to buy private cars or pay for taxis. Overall, less than 10% of the population that own private motor vehicles use public transport. Others use unofficial taxi services, which are more popular because they offer better service than the official public transport service for the same or cheaper prices. Many people however, have to either pay the high price or choose not to travel. Some people choose to walk long distances, few cycle, while others choose to stay at home and not travel at all. In recent years, due to declining bus level of service, congestion has become an increasing problem bringing the City's road network to the verge of collapse.

A business-as-usual approach to the PT issues in Lusaka will have a tremendous negative impact on the City's economic and social wellbeing. For this reason, it is strongly recommended that the City Authorities define a Master Plan specifically for public transport and implement its recommendations immediately in order to mitigate congestion and increase mobility for all citizens, while reviving the vibrancy of the City streets. Several preliminary ideas were developed for improving and recovering the level of service for public transport in Lusaka.

i. Introduce high occupancy vehicles
ii. Re-organize the bus route network to connect all parts of the City,
iii. Manage operations (time tables, Level of Service, departures, capacity)Introduce a common ticketing scheme,
iv. Develop adequate passenger facilities,
v. Introduce bus-only lanes to prioritize public transport,
vi. Improve passenger facilities,
vii. Make institutional changes to define who is in charge of the system,
viii. Then develop capacity building and planning abilities,
ix. Regulate services and define a set PSC between the regulator and the owners to guarantee a set level of service

A separate study should be implemented to deal with all the issues of the Lusaka public transport system and offer an action plan to mitigate them. The proposed transport department within the City Council is a good start in providing the capacity to undertake this study.

5. Fare Model Development

5.1. Fare Model Targets

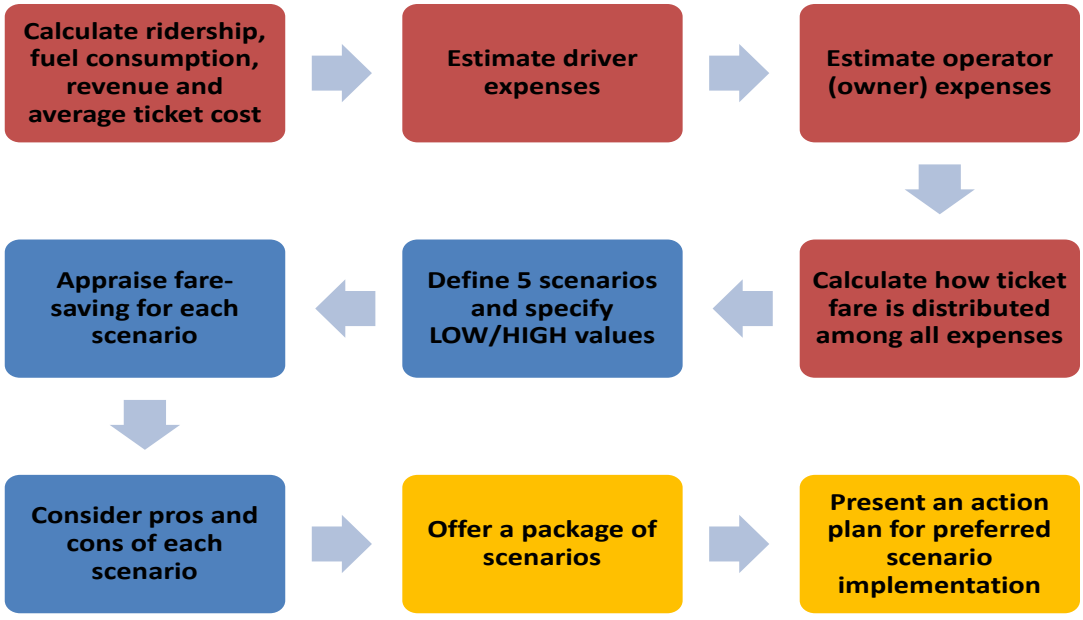
Based on our preliminary investigation of existing public transport operations in Lusaka, and based on international comparisons, we propose targeting significant reductions in public transport fares, which can be achieved if all or most of the recommended measures are undertaken to influence more efficient public transport operation. The recommended changes can be implemented within a few years, given the commitment of relevant stakeholders to the target and the ability of agencies to work together towards its achievement. **Measures of efficiency have the ability to sustainably reduce fares up to 50% from their present levels**. In order to meet this target, preliminary actions should be undertaken within before new dynamics emerge besides those discussed in this report.

In addition, it is strongly recommended that a more comprehensive **Public Transport Master Plan for the City of Lusaka** be developed, so that all proposed steps are further explored in the light of intermodal and intercity travel activities. The tasks of this plan should include, but are not limited to, institutional reform and capacity building, comprehensive route re-organization, improvement of public transport facilities, introduction of a common ticketing system, and regulatory changes toward standard PSC.

5.2. Fare Model Development Methodology

The methodology for the development of the fare model is a mix of international best practice for fare setting along with processes specifically developed for the calculation of a fare model for Lusaka. The project methodology is summarized in Figure 10. The red boxes define data collection and analysis; the blue boxes define the steps involved in developing a set of scenarios to be considered and the analysis of

Figure 10: Stratified Methodology for Defining a Fare Model



those scenarios. Finally, the orange boxes define the development of an implementation plan for reducing fares.

5.3. General Benchmarks

In order to analyze transportation fares in Lusaka, a set of benchmarks for the current service were collected to understand the effect of fares on transportation services and revenues. Table 7 below shows a summary of the established benchmarks.

Table 7: Benchmarking of PT Services

Characteristic	Benchmark
Average daily passengers per vehicle	176
Average daily round trip journeys per vehicle	4.02
Average daily revenue per vehicle	705 ZMW
Average daily revenue kilometres per vehicle	72 km
Average passengers per round trip	45
Total daily passenger trips	453,000
Total daily vehicle trips	10,000
% of vehicles operating inside the bus station	83%

Reduced fares are likely to increase public transport ridership. A common benchmark for ridership increase is elasticity in the range of 0.3 to 0.5. In other words, every 10% fare reduction produces an increase in ridership of 3% - 5%. However, for the purpose of this study we remain conservative in our projections and therefore assume no additional ridership following the fare increase. In practice we assume a 12% to 20% increase in transit ridership after implementation of the combined scenario. Therefore, our projections are slightly biased towards the current scenario, and that is considered in the review of the outcomes.

5.4. Fuel Cost Per Ticket Benchmarks

Table 8 provides benchmarks with regards to fuel costs. International benchmarks show that energy costs are approximately 15% of the overall operational expense of a bus. The Lusaka figure is particularly high, because the fleet is small and engines are not highly efficient.

Table 8: Fuel Cost Benchmarks

Characteristic	Benchmark
Petrol price per litre (ZMW)	9.91
Diesel price per litre (ZMW)	9.20
Petrol consumption (kilometres per litre)	4.41
Diesel consumption (kilometres per litre)	2.80
Average fuel cost per kilometre (ZMW)	2.30
Total annual system fuel cost (ZMW, 000,000,000)	129
Total annual system revenue (ZMW, 000,000,000)	546
Fuel cost as a share of revenue (%)	23.6
Fuel cost per ticket (ZMW)	0.94

7.5. Driver Expense Benchmarks

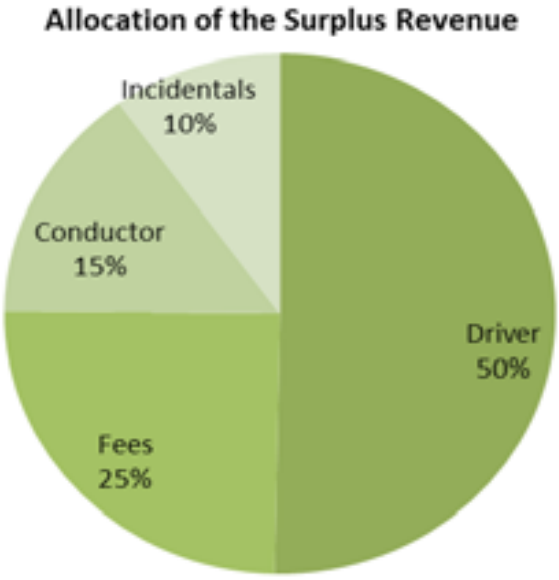
Driver expenses are a large part of the expense of running a public transport operation. Table 9 shows the benchmarks with regard to driver expense.

Table 9: Driver Expense Benchmarks

Characteristic	Benchmark	% of Revenues
Average daily wash & park expense per driver (ZMW)	18	2.5
Average daily bus station cost per driver (ZMW)	17	2.4
Operator charges (minus driver salary) (ZMW)	187	25.1
Call boys average daily fee (ZMW)	17	2.4
Average daily driver expenses (including fuel) (ZMW)	428	60.6

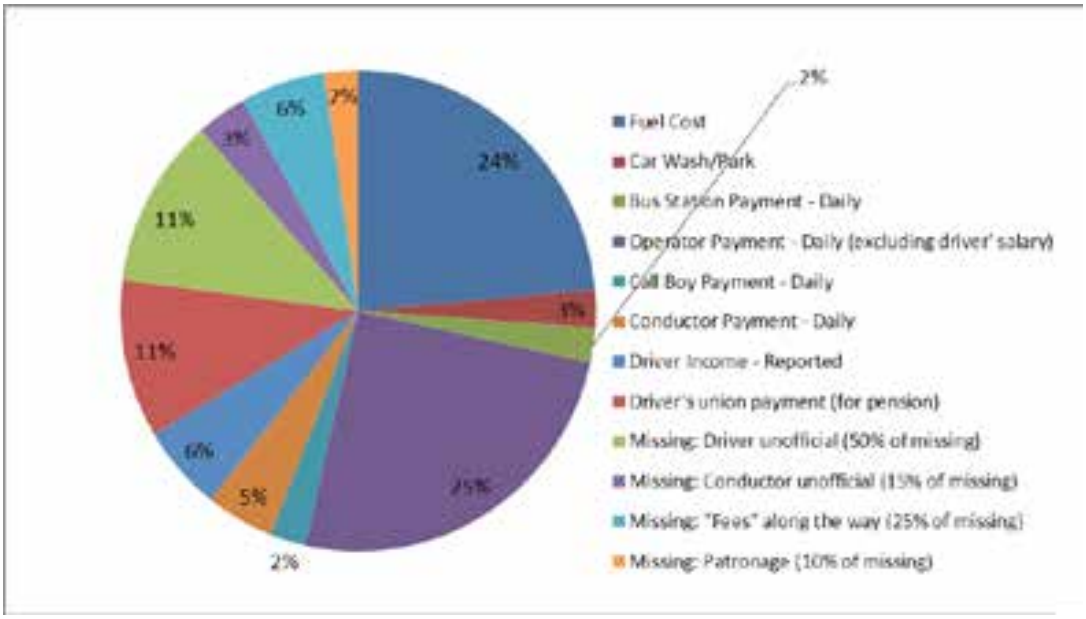
Drivers report a daily income of only ZMW 41 on average, or ZMW 862 monthly. The driver income reflects 8.8% of revenue. Approximately 80% of drivers pay the union ZMW 100 daily for social benefits such as pensions, injury coverage and others. This reflects 10.6% of revenue. There is an addition surplus of ZMW 162 daily, which is 22.9% of revenue. Based on discussion with stakeholders we proposed to allocate it as shown in Figure 11.

Figure 11: Allocation of the Surplus Revenue



The entire picture of the administration on the bus revenues is illustrated in Figure 12 below.

Figure 12: Allocation of the Bus Revenue



5.6. Operator's Cash Flow

The overall daily tax payment is estimated at ZMW 16.4 while operational expenses paid by owners add up to 60 ZMW daily. Total expenses before returns to investment are calculated are only 64 ZMW daily, assuming a 4 ZMW daily fine expense. A 15% depreciation and 16% interest cost will add an additional expense of 31 ZMW daily, leaving a daily net margin of 82 ZMW as shown in Graph 20. Table 10 below gives a summary of operators' costs while Figure 13 shows a breakdown of the operator's daily bus rentals received.

Figure 13: Share of Operator's Daily Cash Receipts

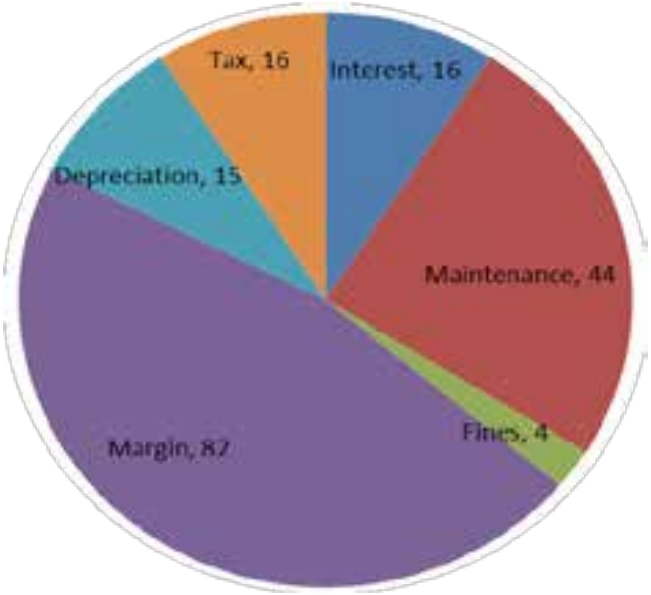


Table 10: Summary of Operator Costs

Fixed payments	Payment	Time frame	Daily	Who pays	To whom	Fine	Remarks
Clearing and Forwarding (mini b	60,000	One time payment	14.90	Operator			Based on 10% depreciation on 45,00
Interest rate	16%	Annually	15.89	Operator			Based on 16% interest on 60,000
First Aid Box	310	One time payment	0.10	Operator			
Fire Exguisher	60	One time payment	0.02	Operator			
Fitness	120	Annually	0.40	Operator	RTSA		
ZRA	3.60	Daily	3.60	Operator	ZRA		
Identity Fee	287	Annually	0.95	Operator	RTSA		
Road Tax	312	Annually	1.03	Operator	RTSA		
Upholstering	2,000	Annually	6.62	Operator	RTSA		
Vehicle license - Mini Bus - 16 s	375	Annually	1.24	Operator		270	
Vehicle license - Bus - 28 seats	450	Annually		Operator		270	
Insurance	732	Annually	2.42	Operator			
Daily average		**Daily**	**47.2**				
Daily average Excluding vehicle cost			**16.4**				

Payment Type	Payment	Time frame	Daily	Who pays	To whom	Fine	Remarks
Engine_Oil	120	Every Month	4.8	Operator			
Transmission_Oil	230	Every Month	9.1	Operator			
Oil_Filter	45	Every Month	1.8	Operator			
Spark_Plugs	60	Every Month	2.4	Operator			
Petrol_Filter	50	Every Month	2.0	Operator			
Break_pads	70	Every Month	2.8	Operator			
Break_Shoes	140	Every Month	5.6	Operator			
Labour	100	Every Month	4.0	Operator			
Tires_Replacement	283	Every Month	11.2	Operator			
Total Monthly Payment	**1,098**	**Every Month**	**43.6**				

Fine and other payment	**100**	**Every Month**	**4.0**				
TOTAL Operator cost			**94.79**				excluding driver salary
Total OPEX no financing			**78.89**				excluding driver salary
Profit			**82.39**				
annual share of cost			**41%**				

6. Scenario Definition

6.1. Scenario Definition Model

An initial set of scenarios for PT fare reduction was developed based on several forms of data employed. Figure 14 below depicts the model used for the development of the various PT Scenarios.

Figure 14: PT Scenario Development Model

Five initial scenarios were developed in order to reduce bus fare levels, and the scenarios were presented to stakeholders at a workshop. Stakeholders provided insightful comments on the proposed fare reduction scenarios. Based on these comments, the scenarios were updated and rearranged to form the final set of five scenarios presented in this report. The rest of this chapter presents each of the scenarios.

6.2. Scenario 1: Manage Supply / Manage Service

The first scenario involves managing the supply of transit vehicles. This is based on the finding that the City routes generally had too many buses offering PT services due to because there were no limitations to the number of vehicles serving an individual route. This led to excessive in-route competition and in the end, inefficiencies in the utilization of PT vehicles.

Description

Therefore, the first scenario is to assign each vehicle to a specific route to match supply to demand, manage service and set an operational plan. Under this plan, we strongly propose to increase the number of departures to about 6 to 8 departures per day per vehicle.

Pros

This type of system will lead to more efficient use of resources by means of regulation. Drivers will have greater daily revenue due to a decrease in competition over the route and the increased numbers of daily trips. Operational cost savings will be realized due to the reduced number of drivers on each route to match demand and reduce extraneous trips. This scenario will enjoy support from passengers because it will increase reliability and frequency of service due to the increased number of trips per vehicle.

Cons

However, this scenario will limit the number of employment opportunities, as the need for additional vehicles will be reduced. A strong enforcement mechanism will need to be put in place to ensure that drivers stay on their own routes, do not add competition to other routes, and ensure that unauthorized services do not attempt to compete. In addition, the regulator must ensure that supply of transportation remains high during peak hours, which will require an optimal utilization of the authorized fleet.

Implementation

The implementation of this scenario is defined at two levels. That is, low and high implementation levels. At low implementation level, the regulator will limit informal public transport operation and increase the number of daily trips by 25% to 5 round-trips per PT vehicle. At the high level of implementation, the regulator will ban all informal public transport operation and manage the supply of services to increase the daily number of trips by 50% to between 6 and 8 round-trips per transit vehicle.

The implementation would require that the regulator (RTSA/City council) issue a specific license, based on demand analysis, with a clear Service Level Agreement (SLA), and limit the number of licenses per route. Enforcement would be managed at bus stations and along the corridor to ensure only authorized vehicles are in operation.

Impact on Fares

The implementation of this scenario will have a direct impact on fares, managed by the authority along with the supply. Supply and service management can cut fares by up to 25%, down from ZMW 5.0 today to about ZMW 3.7 per single trip. The saving per ticket will be realized across all measures except fuel cost. Overall, there will be more daily passengers per vehicle (45% for the high implementation scenario). The driver's income could still be reduced slightly to ZMW 187 daily from 197 ZMW. Table 11 provides a breakdown of costs under both low and high scenarios.

Table 11: Breakdown of Fares under Scenario 1

INDICATOR	Ticket Price Breakdown (ZMW)	Ticket Price Proportion (%)	Daily Revenue (ZMW	SCENARIO 1: MANAGE SUPPLY AND SERVICE			
				LOW: Limit only illegal (5 daily trips)		LOW: limit all illegal + manage (6 daily trips)	
				Per ticket		Daily	
				LOW	HIGH	LOW	HIGH
Fuel Cost	0.94	24%	167	0.94	0.94	208	250
WASH/PARK	0.10	3%	18	0.08	0.07	18	18
Bus Station Payment Daily	0.09	2%	17	0.08	0.06	17	17
Operator Payment Daily (excluding driver' salary)	1.00	25%	177	0.80	0.67	177	177
Call Boys Payment Daily	0.10	2%	17	0.03	0.03	7	9
Conductor Payment Daily	0.18	5%	33	0.17	0.17	37	44
Driver Income reported	0.23	6%	41	0.21	0.19	46	51
Driver's union payment (for pension)	0.42	11%	75	0.34	0.34	75	75
Missing: Driver unofficial (50% of missing)	0.46	11%	81	0.23	0.23	51	61
Missing: Conductor unofficial (15% of missing)	0.14	3%	24	0.07	0.07	0.09	0.10
Missing: "Fees" along the way (25% of missing)	0.23	6%	40	0.11	0.11	30	30
Missing: Patronage (10% of missing)	0.09	2%	16	0.09	0.09	20	24
TOTAL	3.97	100%	706	3.14	2.96	686	756
# of passengers						219	255
Change				-21%	-25%		
Revised fare for current ZMW 4.5/trip	4.5			3.60	3.40		
Revised fare for current ZMW 5.0/trip	5			3.90	3.70		

6.3. Scenario 2: Reduce Daily Cost of PT Vehicle Leasing

The second scenario involves reducing the daily cost of PT vehicle leasing. The current cost to drivers for use of the vehicles is high and leaves the drivers with minimal income and to be reliant upon the paid salaries. Reducing the cost of leasing the vehicle provides the driver with additional incentive to provide good service to bring in more passengers.

There is no clear and convincing reason for the bus leasing prices at today's high level, except that drivers can pay it. Owner profits therefore remain high at the expense of passengers. A new 16 seat vehicle costs approximately 60,000 ZMW to put into operation. The owners currently collect 65,000 ZMW annually per vehicle and spend 36,000 on driver salary, taxes, depreciation and maintenance. Financing costs of at least 16% (interest rate) add an additional 6,000 ZMW annually for the first 7 years of operation. This leaves a mean profit of 26,000 ZMW per vehicle. That translates into a rate of return of 34% over expenses. This is a high per vehicle profit in the PT services business in the present day.

Description

Therefore, the second scenario is to set a maximum value for vehicle leasing at a lower cost than is paid currently. The transport authorities would also need to inspect agreements between owners and drivers in order to enforce the lower vehicle leasing costs.

Pros

This type of system will lead to a fairer distribution of revenue between owners, drivers, conductors, bus station management and passengers without much impact on service.

Cons

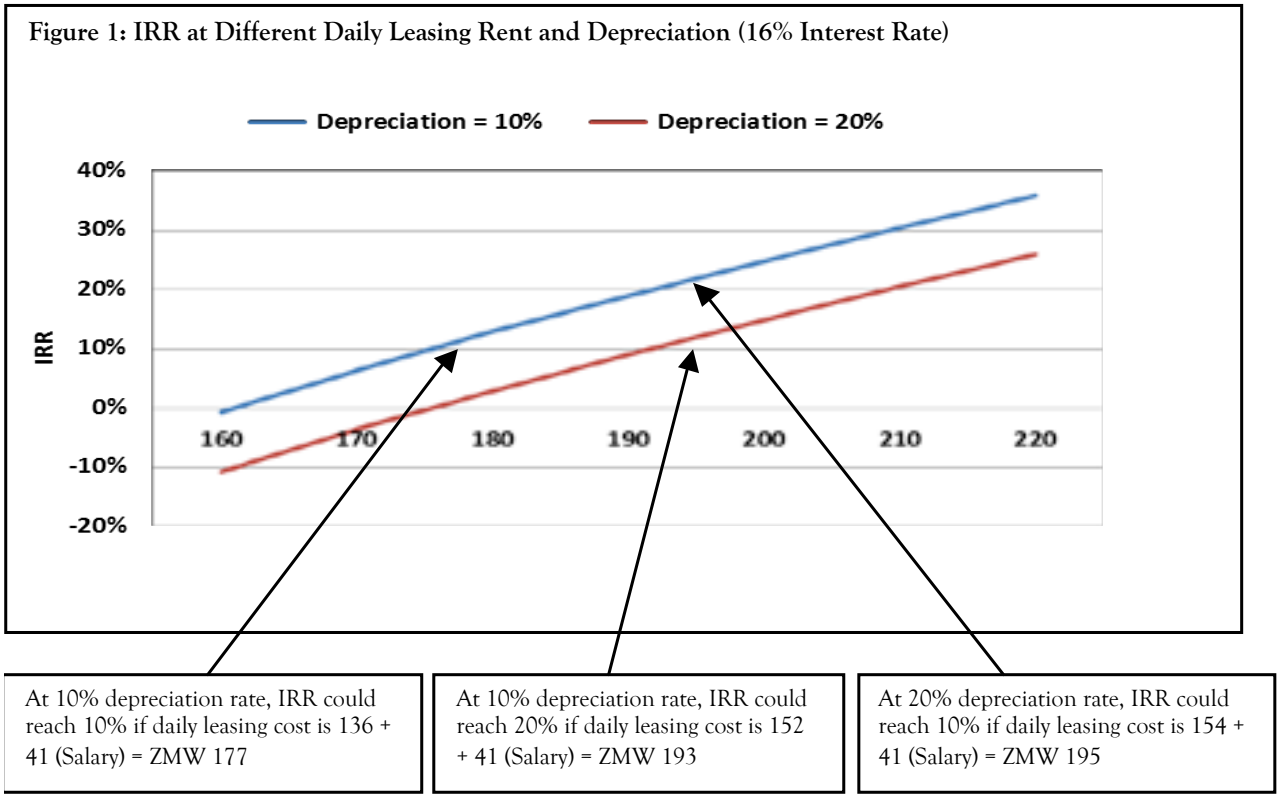
However, this scenario presents a greater challenge with regards to enforcement, as the authorities will need to review contracts to ensure enforcement. In addition, owners will earn less, leading some of them to attempt to search for more profitable markets or leave the business altogether.

Implementation

The implementation of this scenario is also defined at two levels. That is, low and high implementation levels. At a low implementation level, the regulator sets an internal rate of return (IRR) for their investment of 20% and ensures that operator adhere to the regulation. At the high implementation level, the regulator sets an internal rate of return (IRR) for their investment of 10% and ensures that operator adhere to the regulation. This is on top of the 16% interest, 10% depreciation costs and operation and maintenance costs that the operator must recover.

The implementation could be initiated as a pilot where a private preferably not-for-profit organization or a state owned company leases vehicles at a reasonable rent to the drivers in return for drivers charging lower fares while at the same time, maintaining the current status of operations. This may lead to fluctuations in market prices until they stabilize at lower fares. Figure 15 below shows the IRR estimates for different daily leasing rent payments and depreciation rates.

Figure 16: IRR at Different Daily Leasing Rent and Depreciation (16% Interest Rate)



Impact on Fares

The implementation of this scenario will have a direct impact on fares. The operator lease cost will be lower and in return drivers will be induced to demand lower bus fares. The lower implementation scenario proposes a reduction in operators' profits by 30% (from 82 ZMW daily to 57 ZMW), which will reduce the overall cost by only 4%. However, we believe that the highest implementation scenario risks too much of the operators' financial stake.

Table 12 below shows a breakdown of costs under both low and high implementation option of this scenario.

Table 12: Breakdown of Costs for Scenario 2

INDICATOR	Ticket Price Breakdown (ZMW)	Ticket Price Proportion (%)	Daily Revenue (ZMW	SCENARIO 2: REDUCE VEHICLE LEASING			
				LOW: 20% IRR		HIGH 10% IRR	
				Per ticket		Daily	
				LOW	HIGH	LOW	HIGH
Fuel Cost	0.94	24	167	0.94	0.94	167	167
WASH/PARK	0.10	3	18	0.10	0.10	18	18
Bus Station Payment Daily	0.09	2	17	0.09	0.09	17	17
Operator Payment Daily (excluding driver' salary)	1.00	25	177	0.86	0.77	152	136
Call Boys Payment Daily	0.10	2	17	0.10	0.10	17	17
Conductor Payment Daily	0.18	5	33	0.18	0.18	33	33
Driver Income reported	0.23	6	41	0.23	0.23	41	41
Driver's union payment (for pension)	0.42	11	75	0.42	0.42	75	75
Missing: Driver unofficial (50% of missing)	0.46	11	81	0.46	0.46	81	81
Missing: Conductor unofficial (15% of missing)	0.14	3	24	0.14	0.14	24	24
Missing: "Fees" along the way (25% of missing)	0.23	6	40	0.23	0.23	40	40
Missing: Patronage (10% of missing)	0.09	2	16	0.09	0.09	16	16
TOTAL	3.97	100	706	**3.83**	**3.74**	**680**	**664**
Change				**-4%**	**-6%**		
Revised fare for current ZMW 4.5/trip	4.5			4.30	4.20		
Revised fare for current ZMW 5.0/trip	5			4.80	4.70		

6.4. Scenario 3: Subsidize Fuel or Reduce Levies and Payment to Drivers

The third scenario involves subsidizing fuel costs and/or reducing the levies placed on transportation while also reducing driver salaries. Governments typically provide subsidies to public transport because it is a public good, similar to the road network and other public services. In addition, government support to public transport is more expedient as the returns of economic activities when such public support exists are typically higher.

Description
Therefore, the third scenario is for the government to subsidize public transport by offering subsidized fuel for public transport vehicle operators, by reducing levies and taxes on public transport services, or by other mechanisms to subsidize fares for marginalized populations such as pensioners, students and disabled individuals.

Pros
This type of program may be relatively easy to implement, due to the fact that no particular group feels a direct negative impact from the implementation of this scenario. This scenario should be publicly supported because public transport subsidies are widely supported worldwide and have largely positive economic implications. Subsidizing public transport is a common practice in most cities in the world. The European Union's benchmark is 50%-70% of all public transport operating expenses. Our proposed scenario (40%) is similar to a low 9.5% subsidy on operating expenses. Therefore, this type of program is easy to implement once the methods of subsidization are defined.

Cons
However, this scenario requires the amending of laws in order to implement, which may result in some political resistance. A subsidized fuel program will require oversight, because not monitoring this type of program carefully could lead to a black market in fuel due to differential fuel prices. In addition, there will be a loss of tax revenue for the State or Municipality, which is an added burden on the government's budget.

Implementation
The scenario is defined by low level and high level implementation. At a low level of implementation, the operation tax, currently paid by the vehicle's owner, will be reduced by 70%. At the highest level of implementation, the government will subsidize fuel costs to reduce the cost by 40% for registered public transport vehicles.

Levies are easy to cancel and have limited implementation risks if compensation to authorities is in place. Fuel can be subsidized at designated petrol stations where either record will be collected on each vehicle or drivers can pay for fuel using vouchers.

Impact on Fares
Fuel reduction has a direct impact on fares. Tax reductions have an indirect impact on fares because fuel fares reduction would largely dependent on the operators' willingness to reduce the vehicle leasing costs to drivers due to their savings on taxes, effectively passing that saving to the passenger.

Table 13 below shows that a 40% discount in fuel prices will reduce fares by 9% to ZMW 4.53. The table implies that the government could subsidize public transport (or more precisely give up tax revenues) in the amount of ZMW 52 million per year. As a benchmark, it should be noted that free gasoline will reduce fares by 24%, which is the actual fuel share of bus fare revenue.

Table 13: Fares Reduction by Reduction in Fuel Price

Reduction	New Price	New Fare	Government Budget
10%	9.8	4.88	12,977,102
20%	7.9	7.76	25,954,204
30%	6.9	4.65	38,931,307
40%	5.9	4.53	51,908,409
50%	5.0	4.41	64,885,511
60%	4.0	4.29	77,862,613
70%	3.0	4.17	90,839,716
80%	2.0	4.06	103,816,818
90%	1.0	3.93	116,793,920
100%	-	3.82	129,771,022

While a fuel price reduction for public transport may reduce fares by up to 10%, levies play a very limited role in overall prices, and therefore it is not utilitarian to reduce taxes for operators. Table 15 provides a breakdown of costs under both low and high scenarios.

Table 15: Breakdown of Costs for Scenario 3

INDICATOR	Ticket Price Breakdown (ZMW)	Ticket Price Proportion (%)	Daily Revenue (ZMW	SCENARIO 3: FUEL SUBSIDY / TAX REDUCTION			
				LOW: 70% Tax reduction		HIGH: 40% Fuel reduction	
				Per ticket		Daily	
				LOW	HIGH	LOW	HIGH
Fuel Cost	0.94	24%	167	0.94	0.56	167	100
WASH/PARK	0.10	3%	18	0.10	0.10	18	18
Bus Station Payment Daily	0.09	2%	17	0.09	0.09	17	17
Operator Payment Daily (excluding driver' salary)	1.00	25%	177	0.95	1.00	169	177
Call Boys Payment Daily	0.10	2%	17	0.10	0.10	17	17
Conductor Payment Daily	0.18	5%	33	0.18	0.18	33	33
Driver Income reported	0.23	6%	41	0.23	0.23	41	41
Driver's union payment (for pension)	0.42	11%	75	0.42	0.42	75	75
Missing: Driver unofficial (50% of missing)	0.46	11%	81	0.46	0.46	81	81
Missing: Conductor unofficial (15% of missing)	0.14	3%	24	0.14	0.14	24	24
Missing: "Fees" along the way (25% of missing)	0.23	6%	40	0.23	0.23	40	40
Missing: Patronage (10% of missing)	0.09	2%	16	0.09	0.09	16	16
TOTAL	3.97	100%	706	**3.93**	**3.60**	**697**	**639**
Change				-1.2%	-9.4%		
Revised fare for current ZMW 4.5/trip	4.5			4.40	4.10		
Revised fare for current ZMW 5.0/trip	5			4.90	4.50		
Benchmark for this scenario				70%	40%		

6.5. Scenario 4: Introduce High Occupancy Buses

The fourth scenario involves introducing High Occupancy Buses on high demand routes in Lusaka. High occupancy buses allow for higher carrying capacity and less buses to be utilized on the corridor. This reduces driver aggregate salary paid, reduces the number of buses in service and reduces fuel costs.

Description
Therefore, the fourth scenario is to engage private owners to operate large buses with a capacity of 30 seats and 40 standees on designated routes through a public service contract (PSC) with clear service level agreements (SLA). In the meantime, there would be a phase-out of the current inefficient service.

Pros
This scenario would provide passengers with an overall improvement in service provision. The reduction of vehicles on the road would result in reduced roadway congestion, reduced environmental pollutants and improved road safety. There would be a significant operational cost savings as more passengers could be carried on fewer buses. Drivers who cooperate and are able to enter PSCs will become big winners in terms of their income.

Cons
However, this scenario is particularly difficult to enforce on the operators who do not become part of the PSCs. It will require a stiff enforcement to make it work. There will likely be tough opposition from the current 16-seater bus association due to the fact that there will likely be some shifts in employment as fewer drivers will be needed.

Implementation
The scenario is also defined by low level and high level implementation options. At the low level of implementation option, 200 new 12-meter buses could be put into service to replace up to 700 old 16-seater buses. At the highest level of implementation, 400 new 12-meter buses will be put into service to replace up to 1,400 old 16-seater buses.

Implementation needs to be gradual. It is recommended to define one pilot corridor on which only large buses can operate at a reduced fare, and to extend the program if once it has become successful. Strong enforcement mechanisms are necessary to ensure 16-seaters don't compete with the new buses. Drivers could be encouraged to form a cooperative to operate the new buses.

Impact on Fares
Introducing high occupancy buses will have a direct impact on fares as long as reduced fares are agreed upon up front in the PSC with the large bus operator.

Introduction of large buses in Lusaka will reduce most operating and capital expenses. A significant fare reduction of 15% on average for all users in the system will be achieved if 200 new buses are introduced into the system.

Given the completed ridership analysis, it is recommended that the first pilot take place on the Great East Road (Chelstone-Avolende) followed by Kafue Road (Chawama-Makeni). The corridor estimates are shown in Map 2.

Map 2: Proposed Large Bus Corridors

Route	Pilot Color	Demand (Daily)
T4: Great East Road	Blue	75,000
T2: Kafue Rd.	Orange	61,000
T2: Great North Road	Purple	56,000
Burma Rd.	Gray	55,000
Lumumba Rd.	Yellow	51,000
Independence Ave.	Green	41,000
M9: Mumbwa Road	Red	20,000
Los Angeles Rd.	Pink	15,000

Estimation only

Table 20 below shows a breakdown of costs under both low and high scenarios.

Table 17: Breakdown of Costs for Scenario 4

INDICATOR	Breakdown - ticket price (ZMW)	Proportion - ticket price (%)	Daily Revenue (ZMW	SCENARIO 4: HIGH OCCUPANCY BUS			
				LOW: 200 large bus		HIGH:400 large bus	
				Per ticket		Daily	
				LOW	HIGH	LOW	HIGH
Fuel Cost	0.94	24%	67	0.77	0.60	176	205
WASH/PARK	0.10	3%	18	0.08	0.07	18	21
Bus Station Payment Daily	0.09	2%	17	0.09	0.09	21	25
Operator Payment Daily (excluding driver' salary)	1.00	25%	77	0.90	0.85	204	238
Call Boys Payment Daily	0.10	2%	17	0.08	0.06	17	17
Conductor Payment Daily	0.18	5%	33	0.14	0.10	33	33
Driver Income reported	0.23	6%	41	0.18	0.12	41	41
Driver's union payment (for pension)	0.42	11%	75	0.33	0.22	75	75
Missing: Driver unofficial (50% of missing)	0.46	11%	81	0.36	0.24	81	81
Missing: Conductor unofficial (15% of missing)	0.14	3%	24	0.14	0.14	31	31
Missing: "Fees" along the way (25% of missing)	0.23	6%	40	0.23	0.23	52	52
Missing: Patronage (10% of missing)	0.09	2%	16	0.09	0.09	21	21
TOTAL	3.97	100%	706	3.38	2.80	770	839
				Passengers		228	299
Change				-15%	-29%		
Revised fare for current ZMW 4.5/trip	4.5			3.80	3.20		
Revised fare for current ZMW 5.0/trip	5			4.30	3.50		
Benchmark for this scenario							

6.6. Scenario 5: Common Ticketing for Free Transfers

The fifth scenario involves introducing common ticketing across the system in order to facilitate free transfers. Free transfers will save considerable time for passengers, thereby increasing mobility for low to medium income passengers.

Description

Therefore, the fifth scenario is to enable passengers to switch from one bus to another free of charge in order to save considerable amounts of money for those customers who don't terminate their trips in the City Centre.

Pros

This scenario would significantly reduce the cost of public transport for many passengers who do not end their trip in the City Centre. This cost reduction will increase the mobility of urban and suburban residents who need to transfer and will invite additional suburban residents to use public transportation, thereby reducing automobile and taxi trips.

Cons

However, this scenario will reduce revenue for drivers, who will then need an incentive to honor transfers, such as compensation for the loss in revenue. There will also be a challenge to ensure that people do not intentionally misuse transfer tickets, thereby resulting in fraud.

A summary of benefits and challenges of implementing this scenario is provided in Table 21 below.

Implementation

The scenario is defined by low level and high level implementation options. At the low level of implementation option, we assume only 20% of trips are transfers based on today's transfers. However, we are aware that free transfers will lead to an increase in the number of transfers. At the other implementation level, we assume 30% of trips will be transfers.

Implementation demands a careful assessment of the impact of lost revenue for drivers. Implementation can be through issuing a paper ticket valid for at least 20 minutes, which can be provided by drivers to transferring passengers.

According to our bus station survey, 37% of passengers transferred once while 3% transferred twice. This means that 30.1% of the trips were transfer trips. However, out of these transfers, 10% were free of charge, and only 27.1% of trips were paid transfers. In addition, we have reason to believe that there was an over-reporting of transfer trips, and we assume that not all of the trips actually included transfers, such as those trips that did not pass through the public transport station. Therefore, the total transfer rate was calculated to be 19.7% of total trips. Based on the passenger surveys, passengers who currently transfer pay ZMW 6.5 for their entire trip on average. Using our scenario, their trip would only cost an average of ZMW 4.02 for their entire trip. The total savings for all transfers given the low scenario would be 9% of fares for all passengers and given the high scenario, the total saving for all passengers would be 13.4% of all fares.

6.7. Summary of Scenarios

A summary of all five of the developed scenarios was composed. In the summary, the scenarios are ranking in the order of implementation priority based on the proficient analyses of the current status of the system and stakeholders expert advice. Table 19 below shows the composite summary of the scenarios.

Table 19: Summary of All Five Scenarios

	Manage Supply	Cap Vehicle Leasing Cost	Subsidy	High Occupancy Bus	Common Ticketing
Impact on fare	21%-25%	4%-6%	1%-9%	15%-29%	9%-13%
Who will object	Lazy Drivers	Owners	Government	Current drivers & Owners	Owners / Drivers/ Call boys
Who will support (beside passengers)	Car drivers	Drivers	All parties	Some Owners who will pursue new opportunity	Government / Local authority
Ease of pilot implementation	MODERATE	HARD	EASY	MODERATE	HARD
Institutional and regulatory change	Significant change	Significant change	Significant change	Limited change	Significant change
Additional positive impact on passenger	Reliable and frequent service	-	-	1. Low emission 2. Comfort	1. Ease of use 2. Mobility
Increase ridership	Additional	-	-	Additional	Additional++
Priority	First	Fourth	Fifth	Second	Third

When considering the set of scenarios, managing the supply of public transport services become the highest priority because it has a lower cost to implement, improves the reliability of service along with affordability, increases ridership, and sets the stage for the implementation of other scenarios by implementing public service contracts.

7. Proposed Solution: Combined Scenario

It is possible to combine scenarios and put together a single scenario, in which multiple actions can be implemented in stages to allow for a synergy between actions and increase the benefits of each action. The combined scenario includes management of supply and service with clear timetables and an increasing number of departures per vehicle, high capacity vehicles on major corridors, common ticketing with free transfers within at least 20 minutes of alighting the first vehicle, capping of vehicle leasing and capping of driver costs. The combined scenario will reduce fares by 48% as broken down in Table 20

Table 20: Integrated Fare Reduction Scenario

MEASURE	FARE REDUCTION
Manage Supply	21%
High Occupancy Buses	15%
Capping Vehicle Leasing Cost	3%
Common Ticketing System	5%
Subsidy to Reduce Driver Costs	5%
Total Fare Reduction	48%

It is recommended that scenarios be combined in order to maximize the cost savings that can be passed on to the passenger.

It is possible to reduce the bus fare almost immediately. Table 21 below shows the breakdown of potential cost savings from the combined scenario. The majority of savings come from the fuel and operational cost savings.

Table 21: Costs Breakdown for the Combined Scenario

INDICATOR	Breakdown - ticket price (ZMW)	Proportion - ticket price (%)	Daily Revenue (ZMW	COMBINED SCENARIO			
				High Occupancy + Common Ticketing + Supply & Service Management			
				Per ticket		Daily	
				corridor	Average (3 corridors implemented)	1 corridor	3 corridors
Fuel Cost	0.94	24%	67	0.77	0.60	137	107
WASH/PARK	0.10	3%	18	0.06	0.03	10	6
Bus Station Payment Daily	0.09	2%	17	0.08	0.06	13	11
Operator Payment Daily (excluding driver' salary)	1.00	25%	177	0.70	0.51	124	91
Call Boys Payment Daily	0.10	2%	17	0.01	0.00	2	0
Conductor Payment Daily	0.18	5%	33	0.13	0.08	22	14
Driver Income reported	0.23	6%	41	0.16	0.08	28	14
Driver's union payment (for pension)	0.42	11%	75	0.24	0.14	43	24
Missing: Driver unofficial (50% of missing)	0.46	11%	81	0.13	0.01	23	2
Missing: Conductor unofficial (15% of missing)	0.14	3%	24	0.07	0.07	12	12
Missing: "Fees" along the way (25% of missing)	0.23	6%	40	0.11	0.11	20	20
Missing: Patronage (10% of missing)	0.09	2%	16	0.09	0.09	16	16
TOTAL	3.97	100%	706	2.54	1.79	435	302
Change				-36%	-55%		
Revised fare for current ZMW 4.5/trip	4.5			2.9	2		
Revised fare for current ZMW 5.0/trip	5			3.2	2.3		
Benchmark for this scenario							

8. Detailed Implementation Plan

The combined scenario has several moving pieces, and each piece must be handled with care in order for it to be successful in reducing fares and to cause as minimal an impact as possible on those who have a stake in the implementation. Specifically, the implementation of service and supply management and the implementation of high capacity bus service will require particular care in their implementation so as to gain public support and limit opposition and resistance.

8.1. Implementation of Service and Supply Management

In addition to the development of public service supply contracts and leasing in order to implement the management of supply on routes, other institutional issues will have to be overcome. The first issue will be overcoming opposition from PT vehicle operators and owners. The authority would therefore be required to communicate the potential opportunity that owners and drivers have for increased business when supply management is implemented. Further it must be emphasized that there is potential for operators to join with other owners and form larger companies enjoying scale economies and power that can bid as a single unit to provide service on given routes. In this way, they can not only come out winners and continue their service, but competition will be reduced once entering into the contract or obtaining a license.

Routes should be licensed to specific service providers with clear specifications with regards to limitations, rights and obligations. The service license could include at least:

- The designated route that the vehicle will be required to serve,
- The defined timetable for the vehicle, with 6 or more daily round trip departures during a well-defined period,
- The specific round trip travel time, which will thereby enforce limits to waiting times at stops,
- Requirements to display a clear sign showing the route number and destination,
- Requirements to maintain basic standards of cleanliness and service levels,
- Delineation of penalties to be incurred should the driver or owner not meet the minimum standards and requirements within the agreement, and
- Additional requirements as needed.

The regulator or authority will be responsible for enforcement of the service level agreement and will be responsible for the enforcement of the exclusive rights of those with licenses by penalizing any services that operate illegally on the route.

The license on a route is recommended for an initial period of one (1) year and then, the regulator must ensure subsequent rotation between lines in order to safeguard the system against corruption tendencies. The regulator will need to enforce service standards as defined in the agreement and will charge fines to operators who breach the contract. This arrangement will also limit the driver's autonomy, reducing their role as the bosses in the public transport service arrangement to service providers. An example of a public service contract is provided in Appendix 3 of this report.

8.2. Introduction of High Occupancy Buses

In order to gain public support and test the concept, it is recommended that a pilot program be developed for the implementation of high occupancy buses after service and supply management arrangement has been put into place.

The implementation of a pilot program is first recommended on the Great East Road, due to the high demand for public transport service along this corridor. The route map for this corridor is shown in Map 3.

The recommended service on the Great East Road would require approximately 110 large buses; each measuring about 12.75 meters in length, with three doors and low floors for easy boarding. The potential ridership along this corridor is estimated to be 75,000 to 85,000 passengers per day. This kind of ridership would require headway of 1 minute during peak hour, which could be implemented by running one bus every 4 minutes to and from each centre station or every 1 minute from a single location. It is recommended that a separate study be conducted to undertake a comprehensive feasibility study, including demand analysis for public transport along different corridors to identify the most suitable corridors for this pilot.

Map 3: Proposed Pilot Route - Great East Road

Table 22 shows a preliminary estimate of the overall fare reduction implemented when adding large buses on each route shown above, one at a time. Assumptions include the fact that total public transport ridership will increase by 10% when fares are reduced. The fare reduction indicates, not the fare reduction only on the bus corridors, but the overall average fare reduction for all public transport users in Lusaka.

Table 22: Fare Reduction per High Occupancy Bus Corridor

Corridor	Ridership (%)*	Number of Buses	Overall Fare Reduction**
T4: Great East Road	16%	110	-9%
Adding T2: Kafue Road	28%	205	-17%
Adding T2: Great North Road	40%	280	-22%
Adding Burma Road	53%	350	-27%
Adding Lumumba Road	59%	400	-33%

Supply and service management and the introduction of 400 large buses will offer an opportunity to reduce fares by up to 50% for 60% of passengers. This is the equivalent of reducing the average fare price by 33%, when including free transfers.

8.3. Proposed Timetable for Implementation

The following is a proposed timetable for the implementation of high occupancy buses. All other implementations may be implemented immediately. The full concept can be up and running within two years. It would be recommended that owners reduce their fares prior to the introduction of large buses in order to secure higher ridership.

Year 2015

- Capacity building for the development of the chosen regulator,
- Planning and modelling of routes,
- Development of tender document for pilot corridor operation, and
- Consultancy service acquired and setup of roundtable and steering committee for the setting up of bus service

Year 2016

- Selection of concessionaire,
- Introduction of simple PSC,
- Initiation of pilot corridor operations, and
- Tendering for corridor 2 (Great North Road) and corridor 3 (Lumumba Road)

Year 2017

- Selection of concessionaire for the second and third corridor, and
- Initiation of operations on second and third corridor

6.5. Financial Model Comparison

Table 23 presents a summary of the current financial model compared to the financial model based on the high occupancy buses and combined implementation of scenarios on a vehicle by vehicle basis. It is assumed that buses will make six trips daily based on the recommendation for supply and service management. Fares will be reduced 50% from ZMW 4 to ZMW 2. The large buses to be purchased will be relatively new vehicles, costing USD 100,000 per unit. The table shows that the bus fleet operator will still enjoy a sound financial model and good return on investment under the new model.

Table 23: Comparison of Current and Large Bus Financial Models

ATTRIBUTE	CURRENT SMALL BUSES	HIGH OCCUPANCY BUSES
Daily revenue (ZMW)	706	1,510
Operation & Maintenance Cost (ZMW)	110	200
Fuel (ZMW)	170	385
Salaries (drivers, conductor) (ZMW)	250	400
Depreciation & interest (ZMW)	20	167
Margins (ZMW)	156	398
% of revenue	22%	26%
Annual profit (ZMW)	46,000	120,000
Years to return investment	1.5	3.5

6.6. Risks and Mitigation

In order to deal with risk, it is essential to anticipate and plan for that possibility. Table 24 is a table that summarizes the perceived risks and the possible mitigations.

Table 24: Risks and Mitigations

Risks	Impact	Impact on Fare	Mitigation
Lack of capacity to regulate and enforce service	PT management will collapse and city will return to current chaotic condition	Fares will be increased	Set up steering committee right away to make ambitious plan happening
Private Owners will operate illegally along the route	Loss of money for the bus operator may result in poor service	Even if remain along corridor, small buses will need to reduce fares to compete	Tight enforcement and route re-allocation for other operators
Lack of passenger facilities at stops and stations	Passengers will not be able to board buses. Increased congestion and reduced speed	Reduced ridership and potential increase in fares	City to construct large & comfortable bus stops and allocate sufficient space at bus stations
Hard to implement transfers	Passenger will not enjoy this reduction	"Increased fare" for those using bus as they pay twice	Provide "transfer vouchers" for next bus
Corruption in route allocation	Some operator will become stronger on the while smaller will fail to provide service	In non-attractive corridor fare will increase	Define mechanism to ensure fare and transparent route allocation
No space to accommodate / maintain buses	Increased O&M	Might increase fare	Start negotiation with current bus station owners ASAP

13.7. Guidelines for Implementation

The following implementation guidelines are recommended for the suggested PT fare reduction measures in Lusaka.

i. Set up a steering committee for public transport service and supply management that holds periodic meetings to oversee the implementation of the public service contracts and enforcement policies. A steering committee will provide direction and clear decision making methods to the process so that the implementation runs smoothly and plans are managed reasonably.

ii. Appoint a champion to lead the committee and champion the cause. The ideal champion would be an elected representative. The person selected must be a trusted individual who can advocate for the project to stakeholders and to the public.

iii. Appoint a strong and committed project manager to regularly push tasks forward. A committed and skilled individual should be charged with managing the process. A capable project manager will ensure that the project is moving in the right direction.

iv. Get all relevant stakeholders involved in the design process. Paying attention to the concerns of all those with a significant interest makes the project beneficial to the highest possible number of people. Public involvement is important for political acceptance. By involving the stakeholders, the project attains their buy-in for the project and their support. This can be done using charters and other such consensus building mechanisms.

v. Identify the accountable agency that will be responsible for regulating the public transport service and implementation of reforms. Define their responsibilities clearly and how they will

interface with other governmental, quasi-governmental and private entities. This agency will be responsible for managing contracts, regulating service, implementing enforcement with other entities and dealing with other entities and involved partners.

vi. Allocate additional budget in order to increase the capacity of the regulator. It is important to ensure that the regulator has the proper authority to commence operations. In addition, the regulator must be staffed by quality employees with requisite knowledge to manage the process.

vii. Where applicable, seek foreign technical assistance from countries where this has already been done. The provision of international assistance, especially with respect to capacity building, will lead to a process with a local base that brings know-how from the best practices the world has to offer.

viii. Plan and implement a public awareness campaign to gain public buy-in and understanding of the service. This plan should include the appropriate timing for communicating with the public. A well informed and enthusiastic public is a powerful political weapon. Informing the public what this project can provide them and letting them know how to access the service will be central to success.

ix. Identify "losers" of the implementation in early stage and seek out solutions so that their losses are not extreme. Mitigating loss due to the project at an early stage will allow those who do not fare well to be less opposed to the project and will improve the likely of implementation.

x. There will be opposition to these plans. The vocal and influential minority benefiting from the current PT arrangements. The silent but politically powerful majority will support this plan. Even if opposition from the minority is encountered, this project will benefit many and there will be more support than opposition.

13.8. Next Steps

The City of Lusaka's prospects to sustain its rapid development inclines heavily on its ability to provide efficient and affordable mobility for all its citizens. The current alternatives to private vehicles are not affordable, nor are they sustainable and will cause intense traffic jams and other negative impacts which will discourage people from investing or taking residence in the City Centre.

While this study provides methods for reducing the fare for public transport, a much more comprehensive effort is needed to plan and implement a revolution in the public transport system in Lusaka. It is recommended that the City and other stakeholders establish a committee to take the lead on this critical issue. Where necessary, consultants with the experience of planning and implementing PT system remodeling must be engaged.

Reference

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Appendices

Appendix 1: Research Work Plan

Months (counted as of start of the assignment)																					
Phase	**Sub phase**	**Name of (sub) phase**	**1**				**2**				**3**				**4**				**5**			
		Week	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
1		**Inception phase**																				
	1a	Review previous Studies and Related documents and provide base review																				
	1b	Conduct site visits																				
	1c	Conduct stakeholder meeting																				
	1d	Collect available data and review																				
	1e	Design preliminary model, network, and zones																				
	1f	Submit survey collection plan to client																				
	1g	Finalize timetable of Project																				
	1h	Writing and submission of Inception report with first findings & update on project start																				
2		**Data Collections, Surveys & Analysis Phase (Phase 1)**																				
	2a	Conduct GPS survey to establish route locations																				
	2b	Collect Traffic Counts																				
	2c	Conduct Origin-Destination and on-board Surveys																				
	2d	Integrate collected data with other available data																				
	2e	Analyze surveys and develop preliminary report on survey outcomes																				
3		**Model Development**																				

Appendix 1: Research Work Plan

Months (counted as of start of the assignment)																				
Phase	**Sub phase**	**Name of (sub) phase**	**1**				**2**				**3**				**4**				**5**			
	3a	Analyze demand patterns and convert data into OD matrix using surveys from Phase 1																				
	3b	Develop and calibrate the base case strategic model																				
	3c	Validate model using external data from the surveys																				
	3d	Identify major benchmarks for the PT scheme based on model outputs																				
	3e	Develop and run model																				
	3f	Perform model calibration																				
	3g	Finalize model for delivery																				
4		**Cost and Policy Analysis and Reporting (Phase 3)**																				
	4a	Develop scenarios for analysis																				
	4b	Perform analysis of model scenarios and develop trip cost analysis																				
	4c	Analyze policies and develop recommendations based on scenario analysis																				
	4d	Compose and submit final report																				
	4e	Compose and submit summary report																				

Appendix 2: Bus Information Table

ROUTE DEFINITION			ROUTE CHARACTERISTICS							Vehicle KM		PASSENGERS				REVENUE
Route	Origin (station)	Length RoundTrip Km (GIS)	Average No. of Operating Vehicles Official	Average No. of Operating Vehicles Un Official	Average # of trips per bus	Average # of departure per day	Average Vehicle Size	Full Price ticket	Average ticket price	Daily VKMT	Annual VKMT	average passengers per bus OUTBOUND	average passengers per bus INBOUND	# of passengers per round trip	# of passengers per day	Total revenue (Daily)
ZINGALUME	City Market	14.20	42.14	8.43	4.00	202.29	16.00	4.50	4.00	2,872	887,482	22	18	40	8,051	32,188
MATERO	City Market	12.40	17.00	7.40	4.00	177.60	16.00	4.00	4.00	2,202	865,078	21	22	43	7,437	30,132
GARDEN	City Market	8.20	47.00	9.40	4.50	253.80	16.00	4.20	4.00	2,081	628,500	20	18	38	9,549	38,177
HOSPITAL\FINANCE	City Market	10.40	78.71	15.74	4.00	377.03	16.00	4.20	4.00	3,929	1,188,684	21	22	43	16,247	64,953
KANYAMA	City Market	11.40	62.00	12.40	5.00	372.00	16.00	4.20	4.00	4,241	1,280,722	21	22	43	15,996	63,951
CHILENJE	City Market	16.20	55	10.57	3.70	234.69	16.00	4.50	3.83	3,802	1,148,178	24	24	48	11,104	43,249
WOODLANDS	City Market	20.20	44.43	8.89	4.00	213.26	16.00	4.75	4.00	4,308	1,300,954	20	28	47	10,076	40,285
CHUNGA	City Market	18.92	40.29	8.06	4.00	193.37	16.00	4.20	4.00	3,659	1,104,893	19	21	39	7,580	30,168
CHAWAMA	City Market	16.60	94.00	18.80	5.00	388.40	23.22	4.80	3.66	4,841	1,462,078	20	23	43	14,379	33,417
CHIPATA\MANDEVU\KABANANA	City Market	20.00	30.29	6.06	4.00	145.37	16.00	4.80	4.00	2,907	878,043	30	24	55	7,959	31,820
MUTENDERE	City Market	21.00	28	5.51	4.10	135.65	16.00	4.70	4.00	2,849	860,301	20	21	41	5,577	22,296
NG'OMBE	City Market	21.80	40.57	8.11	4.00	194.74	16.00	4.70	4.00	4,245	1,282,109	18	23	41	8,049	32,181
BAULENI	City Market	28.00	60.86	12.17	4.00	292.11	16.00	5.00	4.00	8,179	2,470,118	21	22	43	12,561	50,218
CHELSTONE\AVONDALE	City Market	28.80	61.43	12.29	3.70	272.74	22.50	5.00	4.38	7,855	2,372,308	38	31	69	18,794	82,154
LINDA	City Market	12.40	40.57	8.11	3.00	146.06	16.00	5.00	5.83	4,732	1,429,140	19	18	37	5,464	31,500
HOSPITAL\FINANCE	KULIMA TOWER	9.66	42	8.40	3.80	191.52	16.00	4.20	4.00	1,856	558,725	21	22	43	8,235	32,925
CHILENJE	KULIMA TOWER	15.48	55	10.57	4.50	285.43	16.00	4.50	3.83	4,418	1,334,387	24	24	48	13,748	32,678
LUANDA\MATERO	KULIMA TOWER	19.00	42	8.40	4.00	201.60	16.00	4.50	3.52	3,830	1,156,781	17	17	34	9,754	23,768
CHUNGA	KULIMA TOWER	20.00	42	8.40	4.00	201.60	16.00	4.80	4.00	4,042	1,217,664	19	21	39	7,913	31,653
ULAYI	KULIMA TOWER	20.00	39	7.77	4.00	186.51	16.00	4.80	6.15	3,730	1,126,346	18	18	36	6,789	41,775
CHAWAMA	KULIMA TOWER	16.00	33	6.69	4.60	184.53	16.00	4.60	3.53	2,952	891,628	20	23	43	7,550	26,629
NG'OMBE\GARDEN\CHILULU	KULIMA TOWER	22.90	26	5.20	3.90	121.68	16.00	4.50	3.43	2,786	841,515	21	22	43	5,232	17,922
CHIPATA\MANDEVU\KABANANA	KULIMA TOWER	18.30	26	5.57	4.10	127.22	16.00	4.60	3.38	2,326	703,078	30	24	55	6,565	23,575
MUTENDERE	KULIMA TOWER	20.40	44	8.83	4.20	222.48	16.00	4.70	3.96	4,539	1,370,655	20	21	41	9,146	36,190
KAUNDA SQ	KULIMA TOWER	14.00	18	3.69	4.00	88.86	20.33	4.70	4.69	2,121	641,117	16	20	35	5,714	15,663
MAKENI	KULIMA TOWER	12.60	14	2.71	3.80	58.63	17.63	4.70	4.62	739	223,093	32	27	48	3,834	13,608
BAULENI	KULIMA TOWER	25.80	60	12.00	3.80	273.60	16.00	4.75	4.00	7,094	2,131,782	21	22	43	11,765	47,033
KABULONGA	KULIMA TOWER	25.40	61	12.14	3.70	278.23	16.00	5.00	4.24	8,948	2,695,772	23	21	44	12,960	51,880
WOODLANDS	KULIMA TOWER	20.00	62	12.34	3.70	274.01	16.00	4.75	3.92	5,480	1,655,029	20	28	47	12,947	50,719
CHILANGA	KULIMA TOWER	12.20	42	8.40	4.00	201.60	16.00	5.00	4.00	6,492	1,960,439	21	22	43	8,669	34,658
CHELSTONE\AVONDALE	KULIMA TOWER	29.40	52	10.40	3.00	188.74	29.00	5.00	3.81	5,548	1,675,810	38	31	69	13,000	49,611
GARDEN	Lumumba	8.96	33.71	16.74	4.00	401.93	16.00	4.90	4.00	2,797	844,612	21	22	43	17,279	69,079
GARDEN	Lumumba	8.48	15.43	3.09	4.00	74.06	16.00	4.30	4.00	628	189,657	20	18	38	2,786	11,140
LUANDA\MATERO	Lumumba	16.40	102.14	20.43	4.70	576.09	16.00	4.50	3.39	9,448	2,853,197	17	17	34	19,299	65,490
SEKELELA	Lumumba	13.00	51.34	10.23	4.00	245.49	16.00	4.80	4.00	3,191	963,777	21	22	43	10,556	42,202
CHIPATA\MANDEVU\KABANANA	Lumumba	19.80	17.00	3.40	4.00	81.60	16.00	4.80	4.15	1,551	468,078	30	24	55	4,488	18,551
CHUNGA	Lumumba	17.20	61.34	8.83	4.40	238.15	16.00	4.50	3.79	4,096	1,237,629	19	21	39	9,147	34,672
NG'OMBE	Lumumba	20.60	26.34	5.23	4.40	138.03	16.00	4.70	4.30	2,844	858,739	18	23	41	5,705	24,508
ZINGALUME	Lumumba	12.60	67.57	13.51	4.00	324.34	16.00	4.50	3.70	4,087	1,234,189	22	18	40	12,909	47,707
CHELSTONE\AVONDALE	Lumumba	27.60	26.34	5.23	4.30	134.90	16.00	5.00	4.17	3,721	1,124,195	38	31	69	9,296	38,732
GARDEN	Millenium	8.96	15	3.09	4.00	74.06	16.00	4.20	4.00	665	200,840	20	18	38	2,786	11,140
HOSPITAL\FINANCE	Millenium	11.52	49	9.80	4.50	264.60	16.00	4.20	4.00	3,048	920,554	21	22	43	11,378	45,488
LUANDA\MATERO	Millenium	16.40	42	8.40	3.80	191.52	16.00	4.50	3.18	3,141	948,590	17	17	34	6,416	20,386
CHILENJE	Millenium	15.60	59	11.76	5.00	352.29	16.00	4.50	4.41	5,496	1,659,888	24	24	48	18,968	74,894
CHAWAMA	Millenium	16.20	47	9.43	3.86	203.86	16.00	4.80	4.00	3,299	996,372	20	23	43	8,774	35,079
MUTENDERE	Millenium	21.00	28	5.51	4.20	138.96	16.00	4.70	3.70	2,918	881,264	20	21	41	5,713	21,148
NG'OMBE	Millenium	21.60	11	2.34	4.00	51.43	16.00	4.70	4.00	1,088	328,590	18	23	41	2,129	8,499
CHELSTONE\AVONDALE	Millenium	28.00	27	5.49	4.00	131.66	22.50	5.00	4.20	3,686	1,113,293	38	31	69	9,672	38,694
WOODLANDS	Millenium	20.21	9	1.77	4.00	42.51	16.00	4.75	4.00	859	259,483	20	28	47	2,009	8,031
Summary of routes		911	2,135	427		10,296				184,240	55,640,472				453,469	1,808,110
Average by Route		18.6	43.6	8.7	4.0	210.1	16.8	4.6	4.0	3,760	1,135,520	22.1	22.6	44.7	9,254	36,900

Appendix 3: Record of Meetings Held

DATE	OFFICER	INSTITUTION	PURPOSE OF MEETING
15/08/13	Mr. Friday Mumba	MoF	To hand over the signed contracts.
15/08/13	Mr. Zali Chikuba	ZIPAR	To introduce the company and state our commitment to the two projects.
	Dr. Pamela Kabaso	ZIPAR	To introduce ourselves to the Executive Director.
15/08/13		WORLD BANK	To gather any information that the bank may have regarding the Link Zambia 8000 project.
15/08/13		AfDB	To find out more about the projects from the funding agency.
15/08/13		MTCWS	To meet the Deputy Director of Transport. We had a brief general discussion about the projects to discuss highlights regarding how the projects are to be executed.
16/08/13		LCC	To meet with the officials of the GIS department. We briefly discussed the trip modeling project for the City of Lusaka .
17/08/13		ZIPAR	A meeting organized by the institute to meet with officials from all the companies that had been awarded various contracts in conjunction with these projects.
07/09/13	Mr. Nelson Nyangu	MWSTC	To introduce the company and commence with the projects. Gave a brief description of the methodology to be used in executing the project. Gained support and cooperation for the project.
08/09/13			Meeting with individuals selected as supervisors and briefed them on the projects. Also discussed the projects and their allowances.
09/09/13	ZIPAR Officials	ZIPAR	Introduced Mr. Cohen, the Projects Manager. To announce the official start of the projects and explain the details of the projects. Outlined the methodology/ objectives of the projects and listened to the client's expectations. Discussed the time table with emphasis on the inception report.
09/09/13		CSO	Met with officials at the Department Information Dissemination and Research to ask for specific data from different surveys.
10/09/13		City Council engineering dept.	Presentation of projects' scope. Exploration of available passenger/ operation data regarding PT scheme. Collection of population spatial data and other GIS layers.
10/09/13	Mr. Gladel Banda	RTSA	Introduced our team and explained our mission. Briefly discussed the trip modeling and cost analysis for public transport users within the city. Requested data relating to licensing, bus routes, maps and statistics.
10/09/13		RTSA	Met the officials responsible for licensing of public transport in Lusaka. We had detailed discussions on public transport operations in the City. We learned that besides the buses, there are other informal operators competing in the market.
10/09/13	Bus Station Managers	Kulima Tower & Lumumba Bus Stations	Asked questions and received insight regarding public transport operations in the City and to solicited data regarding buses operating from the station.
10/09/13		Central Statistics Office	Delivered a letter requesting specific data needed for the project.
26/11/2013	Workshop	Various stakeholders	Presenting methodology and proposition for fare reduction. Discussion on alternatives and option for implementation
27/11/2013	Deputy Mayor	City of Lusaka	Presenting main outcome of this report, and discussing the need to initiate public transport Master plan project
27/11/2013	Mr. Zali Chikuba	ZIPAR	To discuss how we should proceed with the project and revision of reports/ outcomes

Appendix 4: Deliverables and Timings

Deliverable	Date Provided	Data
Inception Report	September 23, 2013	Preliminary findings, survey plan and revised methodology
Policy Paper	November 12, 2013	Summary of findings, recommendations and implementation plan
Workshop Presentation	November 26, 2013	Presentation of recommendations, findings and implementation plan
Draft Study Report	December 3, 2013	Draft fare model, recommendations, report findings and implementation plan
Final Report	Upon receipt of this report	Final recommendations, report findings and implementation plan, including summary of methodology and fare model.

Appendix 5: Public Service Contract (PSC)

Rights and obligations under a PSC

An example of rights and obligations under a PSC:

	Transport Authority	Transport Operator
Rights	• to define the quantity of services • to define the quality of services • to set tariffs • to monitor services delivered	• to receive compensation payments for services delivered • to submit proposals for improvement of services (in terms of demand and efficiency)
Obligations	• to pay compensation to the transport operator for servcies delivered • to provide and maintain infrastructure: - stops - bus lanes - priority traffic lights • to co-ordinate passenger information and marketing • to implement policies and make investments • not to interfere in daily operations of the operators	• to deliver public transport services (quantity) • to comply with quality standards • to adhere to the tariff and ticketing system • to provide information about: - passenger numbers - services delivered (quantity) - services delivered (quality) - complaints - turn-over (tickets-sold) - financials

There are many ways to devide rights and obligations among parties

Basic elements of a PSC

Preamble

I. SCOPE

II. RIGHTS AND OBLIGATIONS OF THE TRANSPORT OPERATOR

III. OBLIGATIONS OF THE AUTHORITY

IV. EXECUTION OF AGREEMENT

APPENDICES

The main contract is in principle fixed for duration of the contract. Appendices are updated on a regular basis.

Preamble PSC

- A preamble is a nice way make statement about the intension of the PSC

PREAMBLE

This Agreement for the provision of Public Transport Services is intended to foster improvement and further development of passenger transport in [name City] and the surrounding communities. It is designed to enhance service delivery and financial performance, and ensure value for money for the City and its citizens.

The contracting Parties intend that this Agreement shall contribute to public transport in [name City] and the surrounding communities offering an attractive alternative to individual motorized traffic, and promote tourism, environmental protection, energy savings, traffic safety, and the quality of life.

I. SCOPE OF AGREEMENT

- Scope
- Activities of the Company
- Subcontracting
- Financial Responsibilities
- Overall Transport Planning

II. RIGHTS AND OBLIGATIONS OF THE TRANSPORT OPERATOR

- Public Transport Services
- Vehicles
- Safety
- Service Quality
- Tariffs
- Tickets Sales
- Information
- Marketing Activities
- Control of Passengers
- Customer complaints

III. RIGHTS AND OBLIGATIONS OF THE TRANSPORT AUTHORITY

- Payments for Transport Services
- Control of Legal and Contractual Obligations
- Transport Infrastructure and Traffic Control Measures
- Customer Complaints

IV. EXECUTION OF AGREEMENT

- Duration
- Management of the Agreement
- Information
- Control and Audit
- Invoicing and Payments
- Amendments to the Agreement
- Force Majeure
- Arbitration
- Termination

Appendices PSC

Appendices
1. Public Transport Reference Service Plan (Template)
2. Public Transport Operational Plan (in force) - routes, intervals, operation times
3. Tariffs Public Transport
4. Measures and objectives to improve speed and punctuality (traffic flow quality)
5. Vehicle standard requirements
6. Service Quality Standards (direct performance)
7. Customer Satisfaction Index (survey)
8. Incentives and penalties
9. Calculation of compensation payments to be paid by the City to the Company
10. Price Indexation Formula
11. Assets made available to the Transport Operator

Direct performance measures : example

Penalties for direct performance (examples)

Service indicator	Penalty	Paying/Receiver	Reporting
Cancelled trips	200 EUR/Trip	Company/City	Company
Cancelled trips not reported to the City	500 EUR/Trip	Company/City	City (random inspections)
Deviations from the requirement for clean buses (interior and exterior)	200 EUR/bus and day	Company/City	City (random inspections)
98% of passengers traveling with valid ticket	50% of the lost revenues	Company	City (random inspections)
Delays >3 minutes from departure provided the bus has arrived in time at terminus.	100 EUR/Trip	Company/City	City (random inspections)
Absence of line and/or destination sign on the front of the bus	100 EUR per bus per day	Company/City	City (random inspections)
Absence of timetables and route maps on bus and trolleybus stops	100 EUR/ bus stop and day	City/Company	City (random inspections)

Customer satisfaction Index : example

Customer Satisfaction Survey

Customer Satisfaction	Contracted quality from 2008	Contracted quality from 2010
• Realiability	7.0	7.5
• Safety	7.0	7.5
• Information	7.0	7.5
• Conduct of driver (driving)	7.0	7.5
• Customer approach	7.0	7.5
• Cleanliness	7.0	7.5
• Complaints handling	7.0	7.5

For each Quality Index Category of the Customer Satisfaction Index, the following incentives and/or penalties will apply:

In case the value of a quality index category in higher than the contracted value of Appendix 5, the City will pay an incentive to the Company in the amount of EUR 25,000 for each 0.1 point difference;

Appendix 6 – Stakeholder Workshop Material

1. Expected Institutional Representation

SN	Name of Stakeholder Institution	Number of Persons
1	Lusaka City Council	2
2	Ministry of Local Government and Housing	3
3	Ministry of Transport, Works, Supply and Communications	5
4	National Road Fund Agency	2
5	Road Development Agency	2
6	Road Traffic and Safety Agency	1
7	ROM Transportation Engineering LTD - Consultant	2
8	Zambia Institute for Policy Analysis and Research	7
	TOTAL	25

2. Stakeholder Workshop Program

TRANSPORT AND INFRASTRUCTURE DEVELOPMENT
RESEARCH & STUDIES VALIDATION WORKSHOP FOR STAKEHOLDERS
Tuesday, November 26, 2013
WORKSHOP PROGRAMME

08:00 – 8:30 **Arrival and Registration of Stakeholders (Intercontinental Hotel)**

Session 1: Setting the Scene

Moderator: **Zali Bryson Chikuba**, Associate Researcher - Transport and Infrastructure Development, Zambia Institute for Policy Analysis and Research

08:30 – 08:45 **Welcome Remarks, Overview, Official Opening, & Charge to Participants**
Dr. Pamela Nakamba - Kabaso, Executive Director, Zambia Institute for Policy Analysis and Research

Session 2: Study Presentation 1

Moderator: **Mr. Gibson Masumbu**, Research Fellow – Human Development, Zambia Institute for Policy Analysis and Research

08:45 – 09:30 **Trip Modeling & Cost Analysis for the Public Transport System for Lusaka City**
Ofir Cohen (ROM Transportation Engineering LTD) & **Zali Chikuba** (ZIPAR)

09:30 – 09:45 **Discussion with Sessions 1and 2 Presenters**

09:45 – 10:00 **Health Break**

10:00 – 10:25 **Introduction to Parallel Breakout Sessions**
Zali Chikuba, Researchers - Zambia Institute for Policy Analysis and Research

10:25 – 11:25 **Parallel Breakout Sessions** (self-managed)

11:25 – 11:45 **Plenary Discussion**
Co-Chair: Trophius Kufanga (Environmental Planner at Lusaka City Council - Project Manager for the Inner Ring Road Project),

Session 3: Study Presentation 2

Moderator: **Mr. John Chipuwa**, Coordinator - M&E, Ministry of Transport, Works, Supply and Communication

11:45 – 12:30 **Roads Distance Optimization Study for the Core Road Network to Link Zambia**
Ofir Cohen (ROM Transportation Engineering LTD) & **Zali Chikuba** (ZIPAR)

12:30 – 12:45 **Discussion with Session 3 Presenter**

12:45 – 13:00 **Introduction to Parallel Breakout Sessions**
Bernard Banda, Researcher – Trade & Investment**,** Zambia Institute for Policy Analysis and Research

14:00 – 14:45 **Lunch Break**

14:45 – 15:15 **Parallel Breakout Sessions** (self-managed)

15:15 – 15:45 **Plenary Discussion**
Co-Chair: Eng. William K Mulusa (Senior Manager – Planning, Road Development Agency)

Session 4: Workshop Conclusions

15:45 – 15:55 **Workshop Synthesis**
Mr. Albert Halwampa, Researcher, Zambia Institute for Policy Analysis and Research

15:55 – 16:00 **Closing Remarks**
Dr. Pamela Nakamba - Kabaso, Executive Director, Zambia Institute for Policy Analysis and Research

16:00 End of Programme

"Working towards the formulation of sound economic policies".

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