

# **DfID-KaR Fuel Substitution – Poverty Impacts on Biomass Fuel Suppliers**

## **Uganda** **Urban Biomass Fuel Supplier Profile**

**Draft Report**

# Executive Summary

## 1.0 Introduction

Many sub Saharan countries view the increasing use of traditional fuels (primarily charcoal and to a lesser extent wood) in urban areas as a major cause of environmental degradation. Governments also are concerned about the effects of perceived rising costs of traditional fuels on poor households and seek to reduce those costs. Many also are concerned about the health impacts that the use of traditional fuels may have in households.

In order to reduce these impacts, many governments have promoted a shift from traditional fuels for cooking to kerosene, gas and electricity as substitutes, as well as to energy efficient charcoal and wood stoves. Such interventions can have major impacts on the livelihoods of people engaged in the production, transport and sale of traditional biomass supplies due to the decline in demand for wood based fuels. Often these suppliers and marketers are poor and highly vulnerable both economically and socially. They usually include a high proportion of women for whom there are few alternative employment options. In addition fossil fuels and electricity are almost entirely marketed through formal channels, often organised by multinational companies and the profit are seldom redirected to the poorest classes.

At the same time there are alternative options which can reduce environmental degradation and the harmful effects of indoor air pollution while supporting the use of indigenous natural resources; these include sustainable fuel wood production, improved stoves and use of chimneys and hoods in households. All these options would have a lower impact on the livelihood of those engaged in the provision of traditional fuels.

In the Ugandan context numerous efforts have been undertaken to address concerns of environmental degradation and to counter the harmful effects of indoor air pollution, these included (past and present): **(a) supply augmentation, (b) demand management, and (c) inter-fuel substitution.** Details of these three interventions are discussed below.

<b>BIOMASS</b>	<b>92.7</b>
<b>OIL PRODUCTS</b>	<b>6.3</b>
<b>ELECTRICITY</b>	<b>1.1</b>
<b>TOTAL</b>	<b>100</b>

### 1.1 Project purpose

This project is intended to quantify the impacts of fuel substitution on people engaged in the traditional fuel supply, distribution and trade. It will look at the wider economic impacts in terms of import dependency and the local economy. An assessment matrix will be developed to compare the impacts of different mitigation options on a range of key environmental, health, economic and poverty indicators.

The assessment of the impacts of fuel switching on this key poor group is the main focal area of the study.

## 2.0 Description of Kampala

### 2.1 Population

Kampala is expected to grow at a rate of 5.7% per annum between 1995 and 2004, resulting in an estimated total population of 1.5 million persons – almost double the 775,000 recorded in the 1991 census. (*Note:* Kampala’s day and night time populations vary by a factor of 2 and this is attributed non-resident work force from the neighboring districts of Wakiso and Mpigi). Makindye (24%) and Rubaga (23%) are the most populated divisions, followed by Kawempe (20%), Nakawa (18%), and Central (15%) Divisions. In fact Kampala’s population seems to be spread almost evenly over its divisions. Approximately 49% of the population is male and 51% is female. In turn the age structure follows a typical pattern – the highest proportion (17%) being the youngest (i.e. 0-4 years) and gradually diminishing with age. Approximately 67% of the population is under 24 years old. Average household size is 4.2 persons and there are an average of 1.3 households occupying every dwelling unit in the city. Population density ranges from 6 to 388 persons per hectare with the highest densities occurring in and around the city center.

Table 1: Kampala District Structure Divisional Layout

<b>Division</b>				
<b>Rubaga Division</b>	<b>Kawempe Division</b>	<b>Nakawa Division</b>	<b>Makyindye Division</b>	<b>Central Division</b>
<u>Parish Name</u>	<u>Parish Name</u>	<u>Parish Name</u>	<u>Parish Name</u>	<u>Parish Name</u>
Najjanankumbi I	Makerere I	Kyanja	Bukasa	Industrial area
Najjanankumbi II	Makerere II	Kiwatule	Ggaba	Civic centre
Kabowa	Makerere III	Bukoto I	Buziga	Kisenyi I
Mutundwe	Makerere/Muluka	Bukoto II	Salaama	Kisenyi II
Busega	Wandegeya	Naguru I	Luwafu	Kisenyi III
Natete	Mulago I	Naguru II	Lukuli	Mengo
Rubaga	Mulago II	Ntinda	Kansanga	Nakasero I
Ndeba	Mulago III	Kyambogo (Dist)	Kisugu	Nakasero II
Namirembe	Bwaise I	banda	Kabalagala	Nakasero III
Lungujja	Bwaise II	Kyambogo	Nsambya Estate	Nakasero IV
Lubya	Kyebando	Mbuya	Nsambya Central	Kololo I
Nakulabye	Kikaya	Nakawa Institute	Makindye I	Kololo II
Kasubi	Kanyanya	Nakawa	Makindye II	Kololo III
	kawempe I	Kiswa	Kibuye I	Kololo IV
	Kawempe II	Mbuya II	Kibuye II	Nakivubo
	Kazo	Bugolobi	Katwe I	Old Kampala
	Mpererewe	Mutungo	Katwe II	Bukesa
	Kamanboga	Butabika	Nsambya Railway	Kagugube
		Luzira	Nsambya Police	Kamyokya I
		Luzira Prison	Kibuli	Kamyokya II
			Wabigalo	

## 2.2 Major components

2.2.1 Transportation – Kampala’s road network serves all areas within the District boundaries. Primary roads are generally located within the natural valleys, which run between its hills. Much of its 450 Km network, including 270 paved Km is in poor condition. A network of secondary roads, which facilitate the collection of local traffic, and provide access to primary roads, interlinks the primary roads. Most of Kampala’s residents either walk and/or depend on public transport to meet their basic needs. Given that, over 80% of Kampala’s population can be considered to have low incomes, many cannot afford to make use of public transport at all times. Consequently, many residents walk over long distances.

2.2.2 Commercial areas - the city center covers approximately 250 hectares. A series of smaller commercial centers are dispersed throughout Kampala.

2.2.3 Residential areas – There is a considerable typology of residential communities currently existing within Kampala. These include: -

Low density – including low density fully planned former European residential neighborhoods (e.g. Kololo), as well as unplanned virtually rural, communities located on the periphery (e.g. Kiwatule).

Medium density – including unplanned urban villages (e.g. Nakulabye, Najankumbi) which have grown rapidly in a largely uncontrolled manner as well as most Asian housing (e.g. Kira Road and Bombo Road), as well as a series of planned public housing projects which were built by government during the 1950s and the 1960s to accommodate the urban African population.

High Density – including uncontrolled, lower income, settlements typically based in the valleys close to the central city (e.g. Katwe, Kisenyi, Wandegeya, Mulago) as well as public housing flats built at Bukoto, Wandegeya and Bugolobi.

2.2.4 Industrial Areas

Kampala accommodates a number of major and small industrial enterprises. There are considerably large areas of informal industrial centers, which have attracted a large number of entrepreneurs.

## 3.0 Dynamics of Biomass Fuel Transportation/Delivery/Sale in Kampala

## 4.0 Methodology

This will include fieldwork and data collection through surveys, focus group discussions and case studies in order to identify what steps can be taken to mitigate the effects on the fuel suppliers' livelihoods while still delivering the environmental and other benefits to the wider community.

The project will develop a set of country action plans for Uganda. These will be recommendations on ways to mitigate the negative impacts of fuel substitution on traditional biomass fuel suppliers, whilst mitigating the environmental and health impacts of continued use of traditional fuels.

### Fieldwork planning

#### *Areas selected*

Kampala was parcelled out into its various divisions and each division was studied as a separate unit.

#### *Logistics – plans, practicalities, difficulties encountered, how they were overcome*

The study was conducted in two parts:

- (a) The lorry and charcoal vendors survey – October 2001
- (b) The Kampala wood inflow survey – January 2002
- (c) The firewood vendors survey – January 2002

#### (a) The lorry and charcoal vendor surveys

This survey was conducted over a 3-day period and in it 19 enumerators were deployed around the 5 divisions in Kampala with instructions to

- (i) Track the routes taken by the fuel distribution trucks
- (ii) Observe the charcoal distribution patterns within and around the city
- (iii) Identify the different categories of charcoal vendors
- (iv) Establish the total number of persons engaged in charcoal trade in the city
- (v) Administer the short questionnaire to the different charcoal vendors
- (vi) Administer the short questionnaire to the truckers

The five divisions were visited over a 3-day period a team of 19 experienced researchers.

The fuel substitution survey questionnaire was the same format as that of the 2 other countries involved in the project.

Each of the 19 enumerators was assigned to a given parish around all the divisions. The enumerators then had to board a charcoal truck, interview its driver, map out his fuel supply itinerary and then administer the short questionnaire to the vendors as each delivery was being

made. The data from this exercise was to yield information on route characteristics of the fuel wood transporters and attempt to census all the fuel wood vendors in Kampala. Over the three-day period each enumerator had boarded at least 3 trucks.

Through this method an attempt was made at conducting a census of fuel wood vendors. All divisions in the city were visited.

A team of well-qualified (University graduates) and experienced researchers was used in the data collection exercise. These were trained for one day in Kampala. The training was conducted in two phases. The first phase comprised an introduction to the objectives of the study and a review of the survey instruments. The second phase consisted the field-testing of the enumerators and correction of mistakes. REDC staff conducted the training and handled the field supervision.

A team of 3 persons each trained on how to fill the questionnaires did qualitative Data coding. Data was captured into the computer using an EPINFO package (So far it is the best package for data entry) and exported to MS-EXCEL by REDC staff.

Data manipulation was done in MS-EXCEL and this is where the charts were plotted. Occasionally other packages like Stats Direct and SPSS were applied.

The main results are documented in this report and presented in different sections below.

(b) The Kampala wood inflow survey – January 2002

For the wood fuel traffic inflows into the city six (6) enumerators who had participated previously in the lorry and vendors survey were assigned to man observation points into the city. These points included viz.

Matuga – Bombo Road  
Bulenga – Mityana Road  
Nabbingo – Masaka Road  
Wakiso – Hoima Road  
Seeta – Jinja Road  
Kasangati – Gayaza Road

The observation point were located 10 – 15 Km outside the city. This was done to capture the trucks and the other carriers before they took the main bypasses into the city. All the roads were manned from a Friday evening to Monday evening for 18 - 20 hours daily (a 3-day period); this represented the weekday and weekend patterns.

The enumerators were instructed to record as dedicated all the vehicles and the other carriers solely carrying wood fuel and casual/non-dedicated any vehicle and casual/non-dedicated carrying wood fuel alongside any other product. The capacity of each of the vehicles and carriers was predetermined basing on the experiences from the earlier conducted transporters

survey. For the purpose of this study, lorries refer to vehicles of 2-Ton and above capacity while the pick-ups refer to vehicles of a capacity of less than 2 Tons.

The data capture instrument was the tally questionnaire developed by the ESD team. This was however adjusted to accommodate a longer observation period. Furthermore, only the lorry, pick up and bicycles/boda-bodas featured as relevant in the Ugandan situation. The time of entry into the city, the volumes and the number of vehicles entering into the city were coded and entered into computer for further analysis.

(c) The firewood vendors survey – January 2002

This survey was done for a three days conducted over a one-week period. The study team that comprised 5 persons was picked from enumerators who had previously participated in the transporters and vendors surveys. These were trained in filing the new questionnaire and assigned to study the location and characteristics of firewood vendors operating in the 5 different divisions of the city.

An attempt at a complete census was made. Each enumerator was facilitated to hire a motorbike taxi (boda-boda) whose rider was familiar with the locations of all the firewood traders in each of the parishes. Each of these vendors was visited and interviewed. The data from these interviews was subsequently entered into the computer for analysis.

Survey findings

## **5.0 Profile of the Sector**

(a) Transporters

Motorized transporters; these include the lorry, pickup trucks, fuel tankers, etc.

Non-motorized transporters

- Bicycles / Boda-Boda (motorbike taxis) these are rapidly becoming an acceptable means of transport for low income persons
- Head load; this means of transport does not feature significantly in Uganda's commercial wood fuel scene
- Donkeys/Animal power; this means of transport is not applicable to Uganda

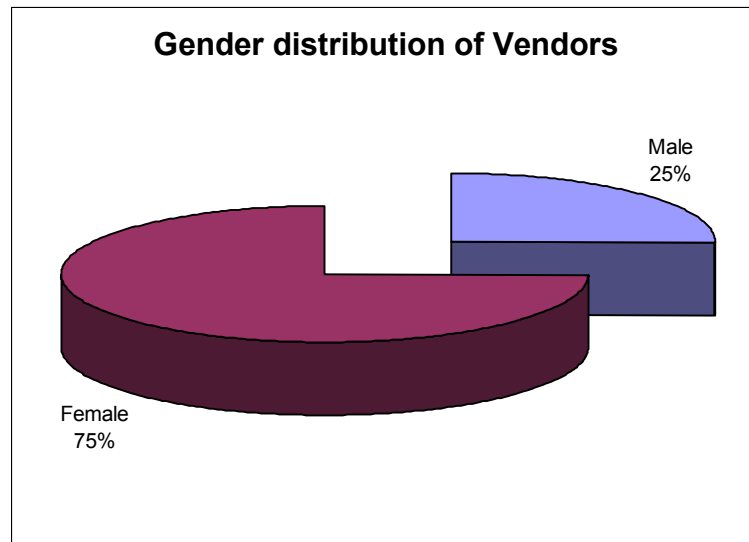
(b) Vendors

- Large wholesalers/Depots – Market based. These are bulk dispensers of wood fuel
- Market stall vendor
- Kiosks/Shop vendor
- Door to door vendors; these are to be studied in more detail later
- Side of the road traders

## 6.0 ANALYSIS OF VENDOR TALLIES

### 6.1 Demographic/General Characteristics of the Fuel wood Vendors

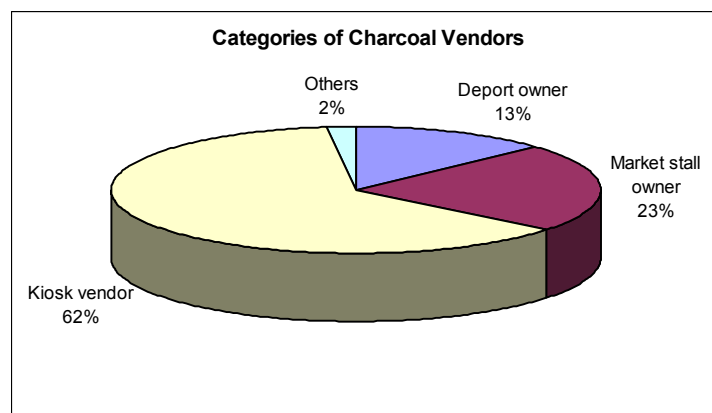
Chart 1: Gender of charcoal vendors



Charcoal vending is a female dominated activity; with women constituting 75% of the group. The trade is generally considered a feminine-petty trade activity by the society and is despised by most men while women do not have any problem doing it.

### 6.2 Nature of Business

Chart 2: Vendor Categorization

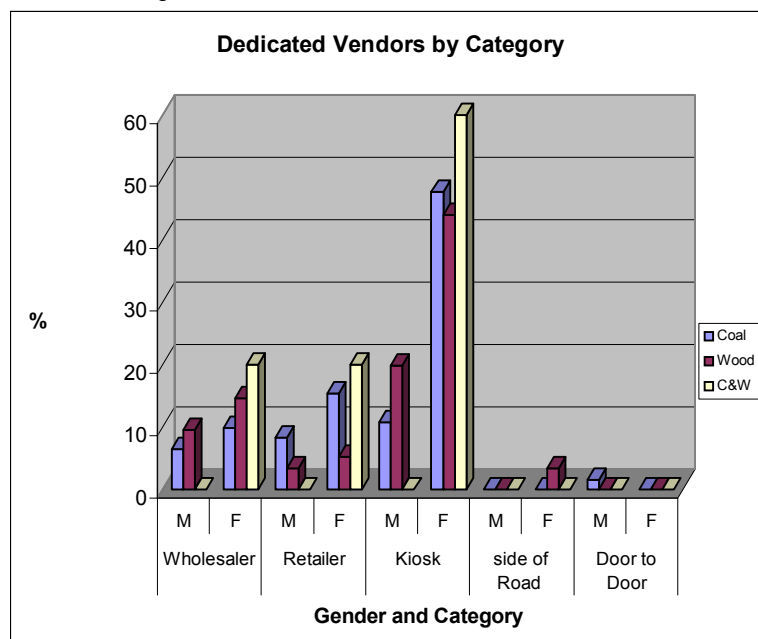


Most of the vendors that the charcoal transporters visited in this part of the study were the kiosk vendors (62.5%) and the market stall vendors (22.7%). However, the relative proportion of the vendors ought to be looked at in context given that the wholesalers/deport owners though not as numerous as the former two might initially handle 75% of the stock. The kiosk and market stall owners at times off load a single sac of charcoal from the transporter. It is quite common to find



a single wholesaler offloading an entire truck. On the other hand, it takes over 6 kiosk and stall vendors to off load a single truck. The transporters have to travel long distances along poorly maintained roads to supply these small stockists. The transporters exact a premium for this extra effort.

Chart 3: Categorization of the dedicated wood fuel vendors in Kampala



### 6.3 The Degree of Dedication

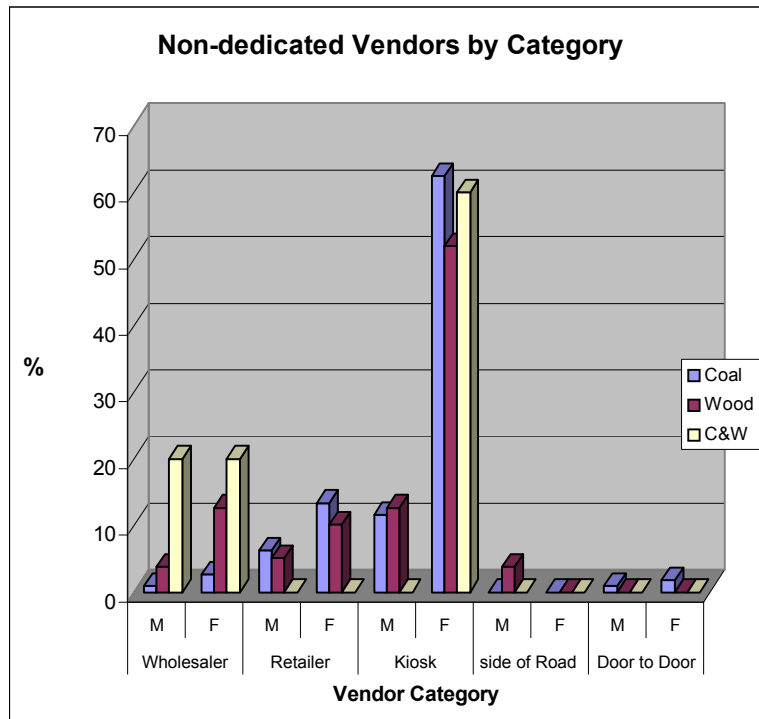
The wood fuel supply mix among the dedicated and non-dedicated vendors followed a similar pattern with a larger proportion of the vendors trading in both charcoal and firewood.

The most common additional trade among the non-dedicated vendors is selling groceries or selling local foodstuff. Many others sell cooked food in eating houses/restaurants. Also common is the selling of charcoal just beside of their small single-room retail shops. In the latter case trading in wood fuel is just an afterthought. For 75% of the vendors, wood fuel trade is their main occupation.

Table 2: The Other Trades of the Non Dedicated Vendors

Occupation	No	%
Grocery or local foodstuff Retail	72	66.0
Retail shop	9	8.3
Restaurant/eating house	12	11.0
Dependants	2	1.8
Farming	4	3.7
Boda-boda cyclist (Bicycle Taxi)	1	0.9
Motorcar Salesman	1	0.9
Building/Construction	2	1.8
Housewife	2	1.8
Secondhand clothes trader	3	2.8
Handicrafts vendor	1	0.9
Total	328	100.0

Chart 4: Categorization of the non-dedicated wood fuel vendors in Kampala



The most common wood fuel dealt in is charcoal. Most charcoal vendors stocked once a week (45.3%) while some 11.2% stocked daily as shown in table 3 below. The latter group normally purchases a single sac off the transporters. This reflects the capacity of the vendor and his/her capital outlay.

Table 3: Average Restocking Level

Frequency of stocking charcoal	No	%
Daily	49	11.2
Weekly	198	45.3
More than once a week	68	15.6
Once a month	68	15.6
More than once a month	41	9.4
Others	13	3
Total	437	100

Save for the female wholesalers the larger proportions of the vendors have been in business for less than 2 years. An easy interpretation of this is that the wood fuel trade has registered many new entrants in the past year or so. This observation reflects growth in the sector.

Chart 5: Experience in the wood fuel trade

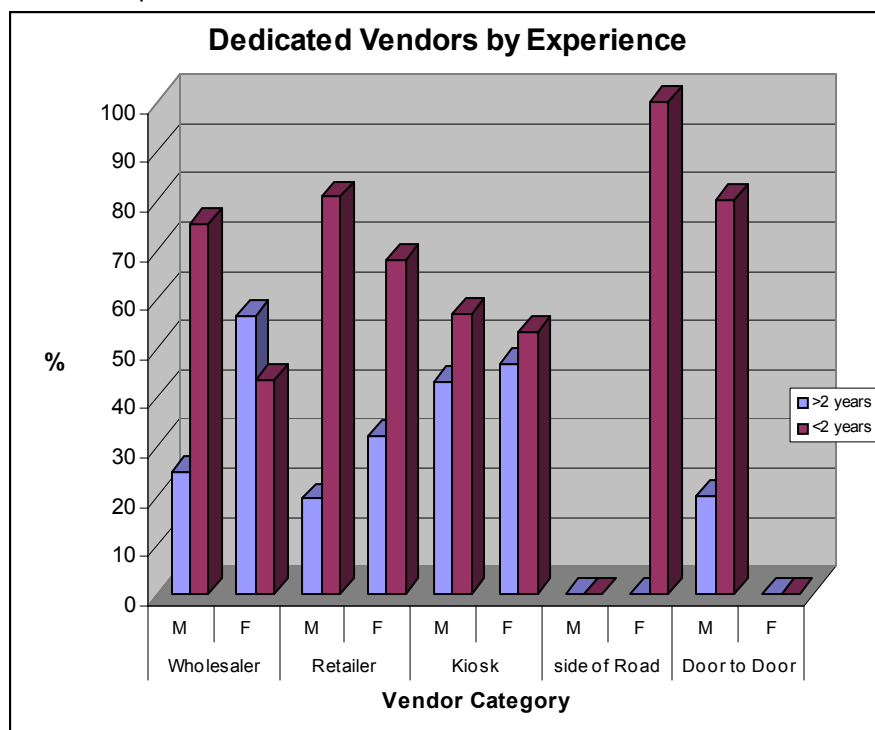


Table 4: Vendor Customer Base

Main customers	No	%
Households	342	82.8
Institutions	6	1.5
Market vendors	33	8
Kiosk vendors	5	1.2
Others	27	6.5
Total	437	100

The most of the charcoal is sold to households (82.8%), Table 4. This fact is attributed to the frequency of purchase of the households. The households tend to purchase charcoal daily, and at times more than once day. A typical kiosk vendor has a low capital base and therefore limited stock. Nevertheless, his/her customers purchase small quantities even as little as 1 Kg or less. 68% of the vendors operate in rented facilities. Charts 7 and 8 below shows that save for the roadside vendor, who deals mostly with the vendors, the larger proportion of the customers are the actual consumers.

The Institutions, market vendors, and kiosk vendors have the depot owners as their main supplier. It was however noted that the transporters of recent do direct deliveries to all the categories of vendors. In Table 5 these constitute approximately 40%. This reflects increased competition in the trade therefore increased consumption. It was actually observed that most of the vendors obtain their supplies from the wholesaler (depot). However, there are cases where the charcoal vendor avoided the middlemen and sourced his/her own supplies.

Table 5: The Vendors Supply Chain

Vendors Source of Supply	No	%
Producers	29	6.8
Wholesaler	261	61.3
Self collect	12	2.8
Transporters	163	38.3
Total responses	465	100

Chart 6: Experience in the wood fuel trade – Non-dedicated Vendors

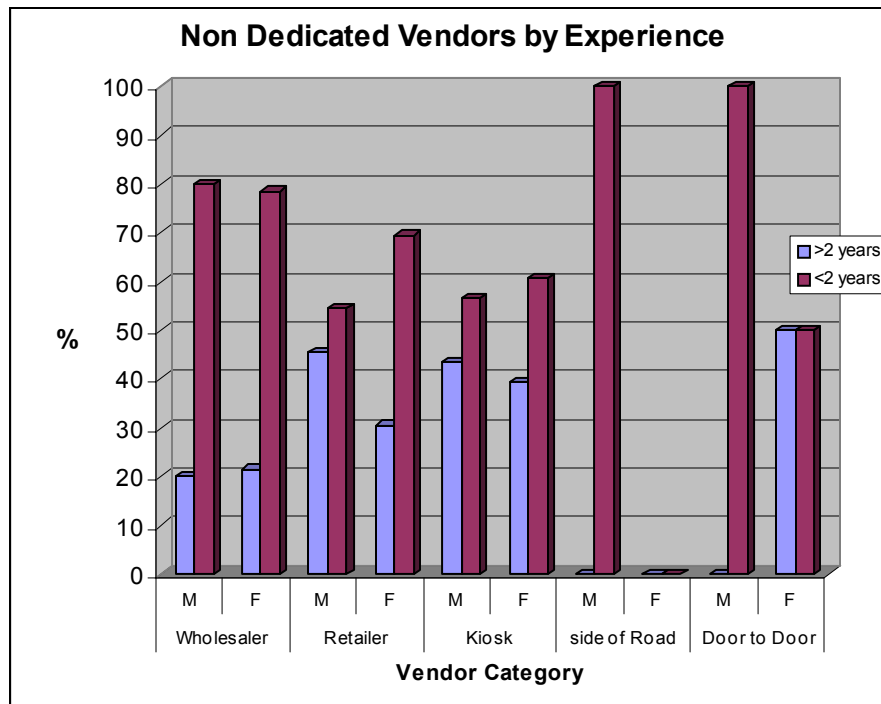


Chart 7: Dedicated Vendors Customers Base

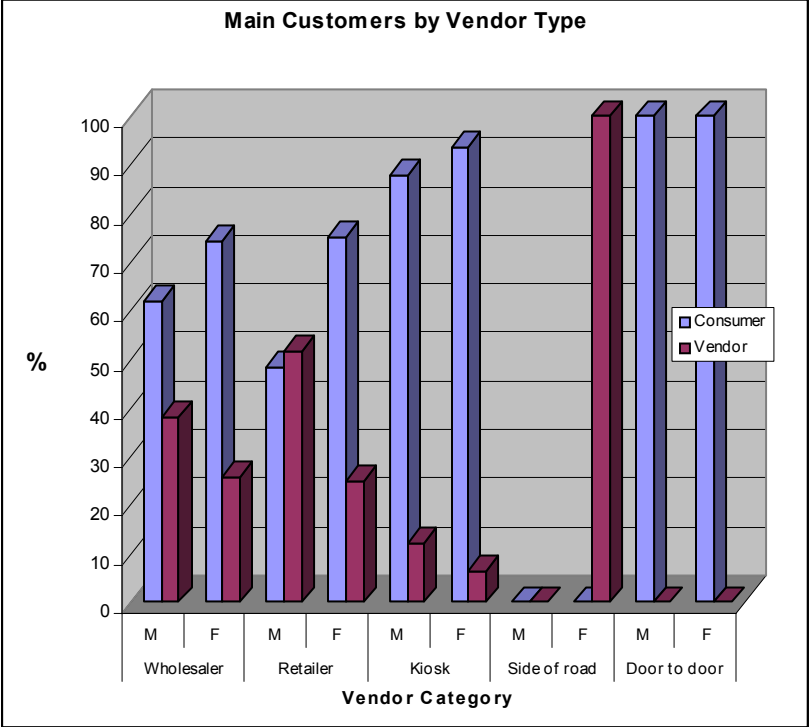
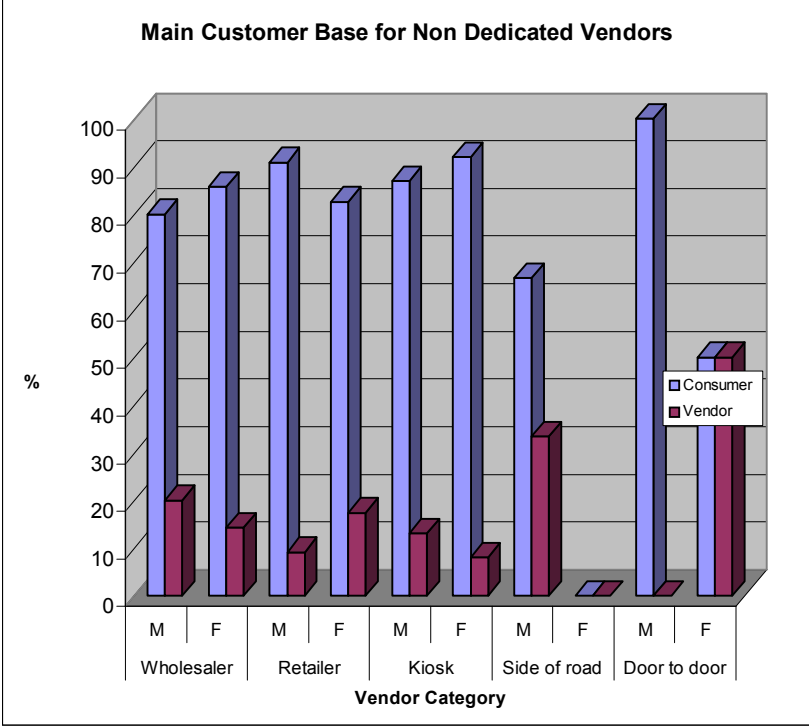


Chart 8: Non-dedicated Customer base



The problems Analysis: As part of the surveys questions were posed with regards to the various problems the different categories of vendors faced. The main problems were categories into 3 - i.e. (i) Vulnerability (ii) Institutional (iii) Power Table X and Y below show that the main set of problems faced by both the dedicated and the non-dedicated vendors were associated with vulnerability then institutional and power, in that order.

Chart 9: Dedicated Vendor Problem Analysis

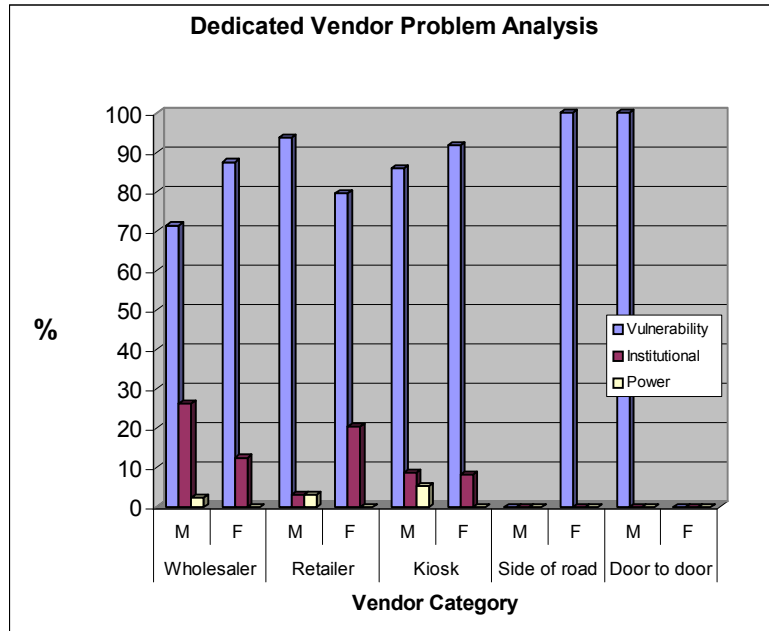
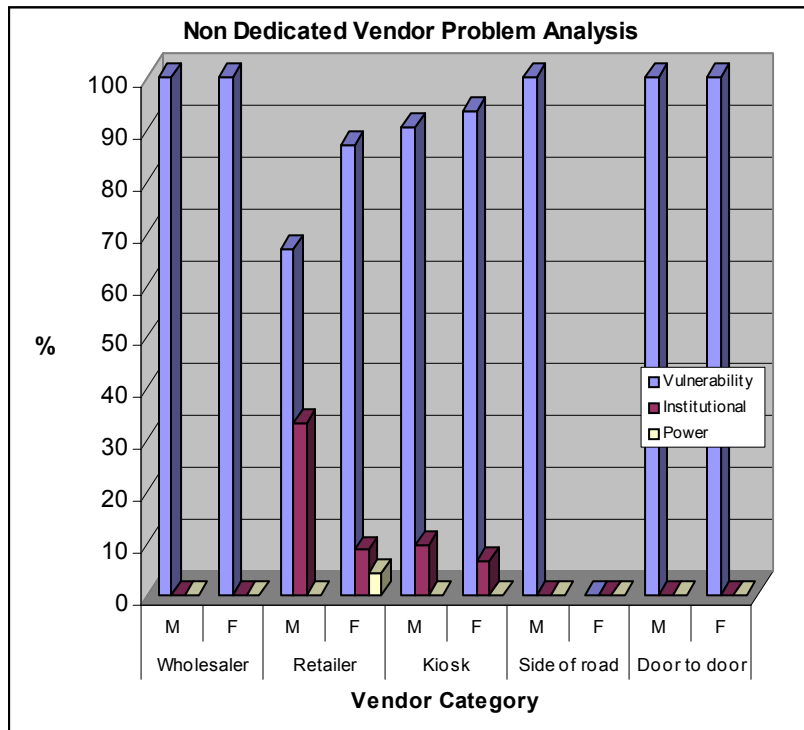


Chart 10: Non-dedicated Vendor Problem Analysis

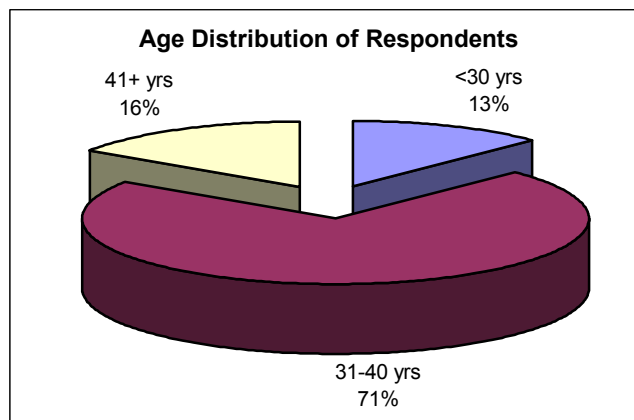


The most common problems mentioned included poor sales and therefore lower profitability. Turnover too, constitutes a big problem. Low quality charcoal cuts into the profitability; and close to 25% of the sac are charcoal fines. In addition, the species of wood burned influences the density and quality of charcoal. The customers are quality sensitive. The vendors suffer largely from vulnerability.

## 7.0 Description of the Wood Fuel Transporters

General: This survey was administered to the truck drivers. For this part of the interview the enumerators concentrated on the drivers of the charcoal ferrying lorries.

Chart 11: Age of the transporters distribution of respondents



Most of the charcoal truck drivers are aged 31-40 years (72%), while very few were less than 30 years old (13%) Chart 11. Truck owners employ 84.4% of the drivers the other 15.6% drive their own trucks. 78% of the times the trucks are hired by individual charcoal wholesalers, while the rest of the time a group of wholesalers jointly hire a truck. The incidence of a society or small group hiring a truck to trade in charcoal didn't apply. Occupation of the charcoal transporters

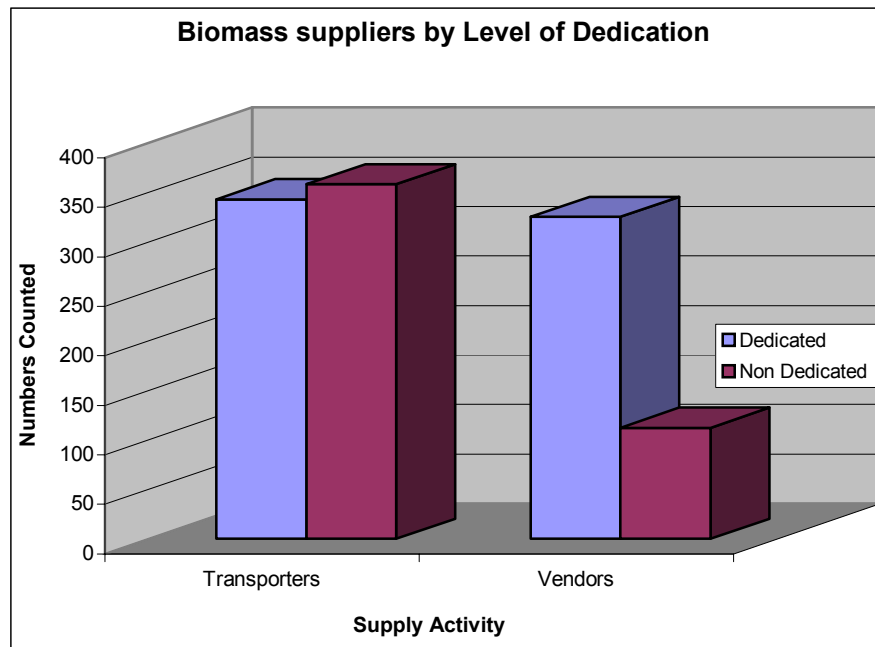
The nature of dedication to fuel transportation. For the purposes of the truck tally the definition of dedication was determined by whether a truck carried solely wood fuel or whether it was transporting fuel in addition to other products. However, 78% of the truck drivers interviewed on their own part claimed that driving was their main stay. However, on the degree of dedication 58% of the transporters reported that switch to other freight whenever the opportunity was available. Only 42% claimed that they were completely dedicated to charcoal transportation. In addition, some 16% of the transporters reportedly engage in other activities such as other businesses and small-scale farming. A summary of the nature dedication for both the truck drivers and the vendors is given in Chart 12 below:

General

**Business details** About 55% of the transporters ferried between 50 and 100 sacs of charcoal, while 25% ferried more than 100 sacs. The remaining 20% ferried 20 to 50 bags. 82% of the transporters argued that the volume of charcoal transported varies seasonally. The major reasons

given for the fluctuations are changing seasons (rainy vs. dry), changing production levels and changes in demand. A number of studies confirm that more charcoal is produced in the wet season. However, 71% of the transporters claimed that they transport more charcoal in the dry rather than the wet season. The trucker’s main distribution points were the depots and kiosks at 23% and 25% respectively. The market vendor, retailer and the private consumers constituted 20%, 16% and 5.4% respectively.

Chart 12: Relative dedication of vendors and transporters



### 7.1 Analysis of the Kampala Wood fuel inflow Survey (Transporter Tallies)

The data from the 3-day inflow study was entered and summarized as shown below.

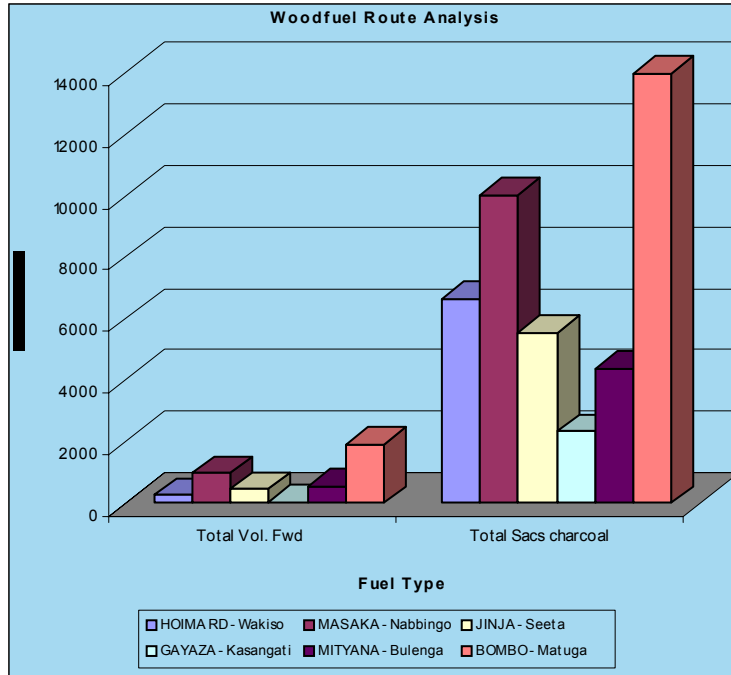
Chart 13 below shows the normal routes of charcoal entry into the city. This chart also summarizes the observations by our enumerators along the 6 obvious entry routes into the city. The origin of the wood fuel differed with the fuel type such that whereas most of the charcoal entered into Kampala along Bombo, Masaka, Hoima, Jinja, Mityana and Gayaza Roads – in that order; the firewood was ferried along Bombo, Masaka, Mityana, Jinja, Hoima and Gayaza Roads – in that order. This can be explained by the fact that the key charcoal production Districts are Nakasongola, Luwero, Kiboga and Masindi that lie along the Bombo Road. Whereas Mukono District is a major charcoal-producing district, much of its production could easily be consumed in Jinja Town and the other towns to the East of Kampala.

It is obvious that the largest volume of the firewood that entered the city is ferried on large trucks by dedicated wood fuel transporters. Wholesalers, as described in the previous chapters, hire the trucks. The others i.e. the non-dedicated lorries, the pick-ups and bicycles contribute largely to ferrying firewood for personal use and family distribution as opposed to “for sale”. 77% of the transporters and their clients purchased their stock directly from the charcoal burners while the



rest dealt with middlemen. The transported charcoal is sold to mainly depots, kiosks, markets and retailers. Rarely do charcoal transporters make direct sales to individual consumers.

Chart 13: Key supply routes for wood fuels to Kampala



The key means of transport by volume are obviously the dedicated among the lorries, pick-ups and then the bicycles as can be seen in Chart 14 and 15 below.

Chart 14: Firewood inflow over the 3-days survey period

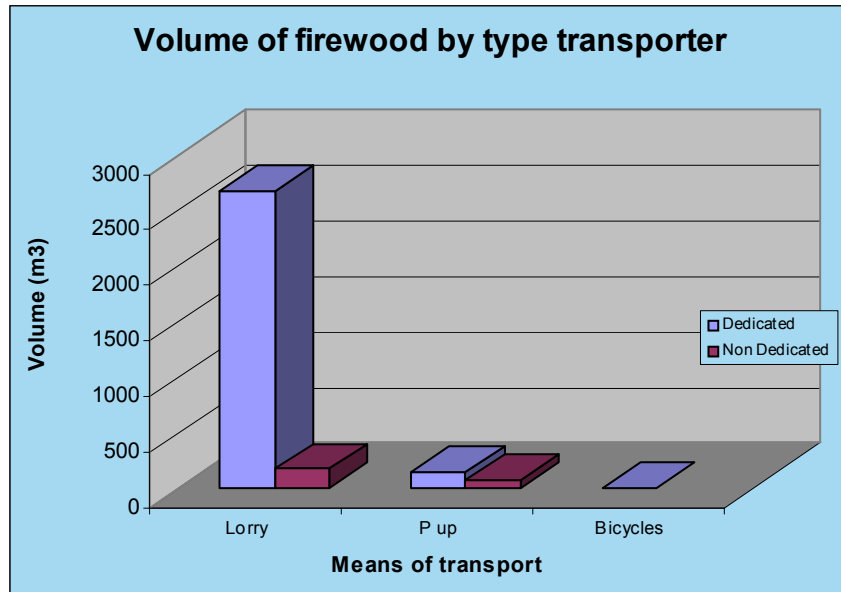
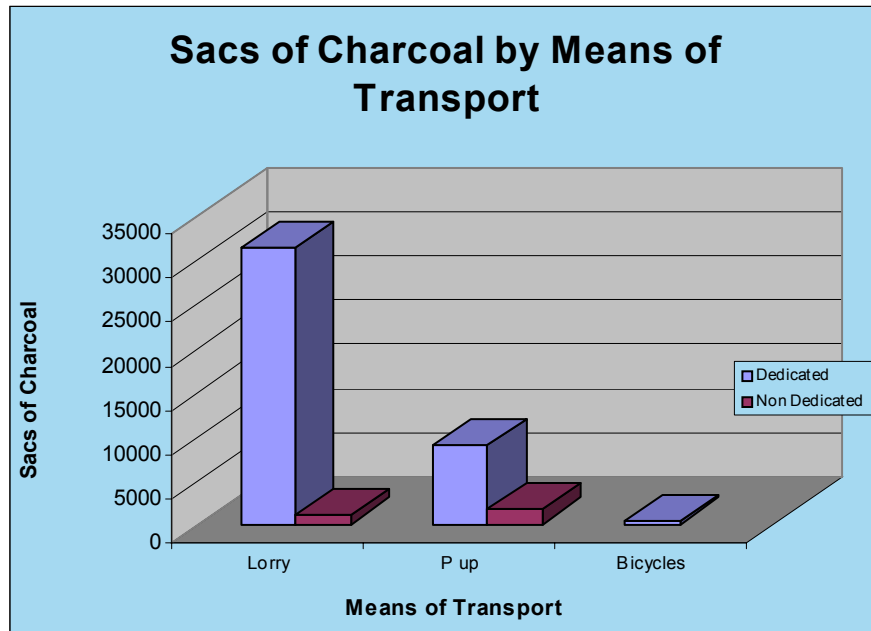


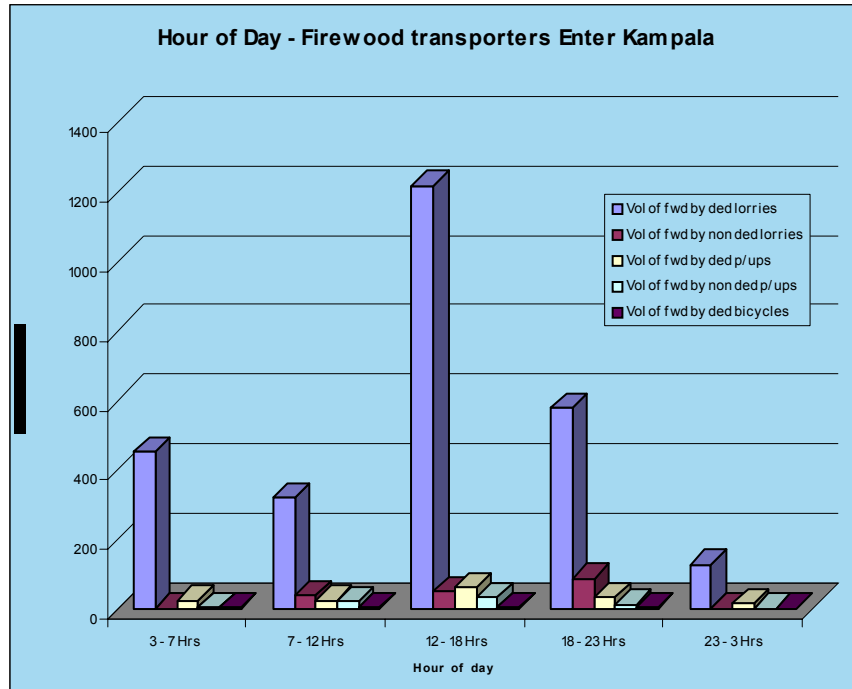
Chart 15: Charcoal inflow over the 3-Day study period



Like with firewood Chart 15 above shows that the dedicated lorries transport the most significant amount of charcoal.

The Hour of vehicle movement this, as in the former case differed with the fuel type being supplied and the level of dedication of each transporter. The largest proportion of dedicated and non-dedicated firewood transporters traveled between 12-18 hours GMT. The next important hour was 18-23 hours. On the other hand, the largest volume of charcoal was transported at night and early morning hours i.e. between 03-07 hours GMT while the second most important time of the day was 18-23 hours GMT. The reasons for this are associated with what for the purposes of this study are categorized as power problems – harassment from authorities or rent-seeking behavior (extortion of bribes). It becomes apparent that the firewood transporters suffer less from harassment. This could be due to the historical association of charcoal with illegality and the need for licensing. This former and latter do not apply to firewood. The total volume of wood fuel transported is proportional to the number of vehicles carrying the fuel.

Chart 16: Time of firewood vehicle travel



A count of over 215 dedicated trucks was made over the tally period all bearing a total of 3,070 cubic meters of firewood. Similarly, a total of 340 dedicated trucks carrying 42,864 sacs of charcoal each weighing 40 – 50 kg was tallied over the same period. The earliest recorded start time for the tally was 3.00 am in the morning while the stoppage time was 11.00 pm at night.

It was observed that the charcoal trucks began their entry into the city early with the most trucks entering before the daybreak.

Chart 17: Time of charcoal vehicle travel

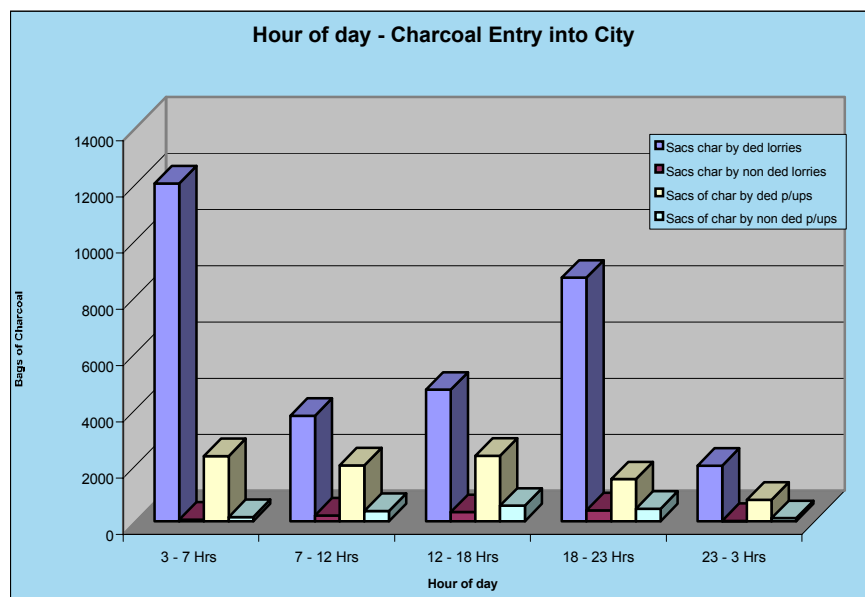
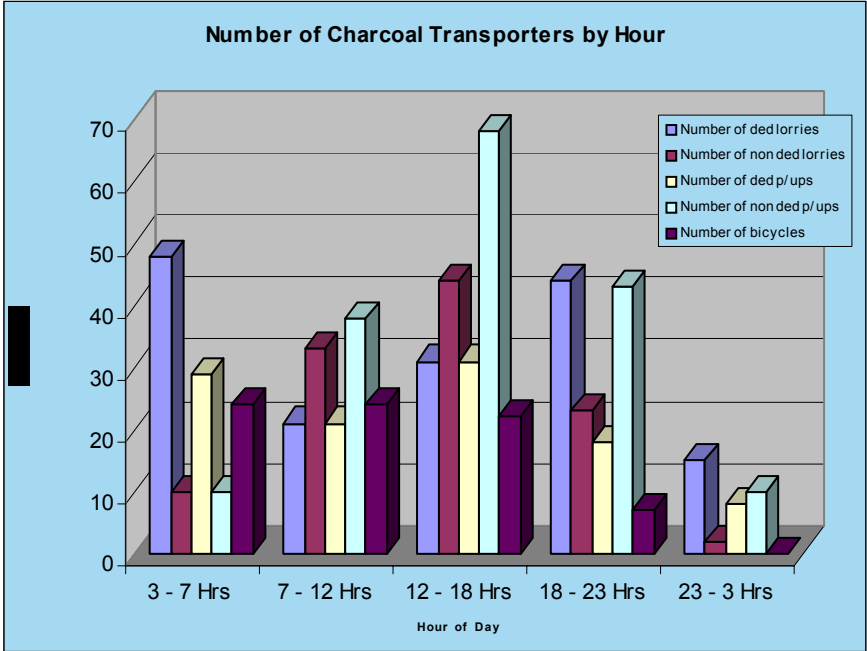


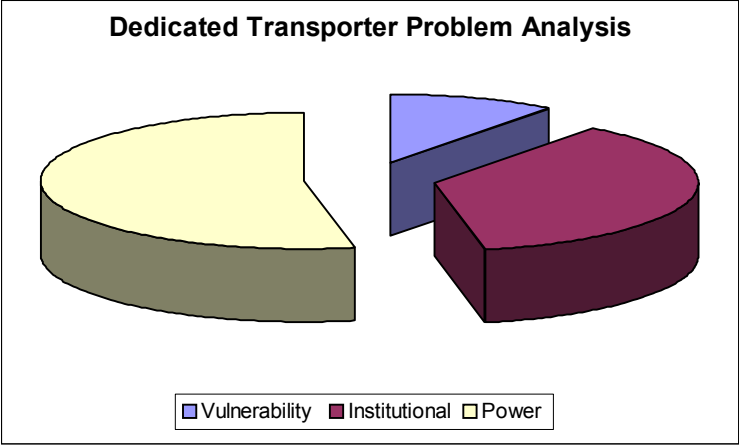
Chart 18: Number of Charcoal Transporters by the Hour



7.2 Problems Analysis with Charcoal Transportation

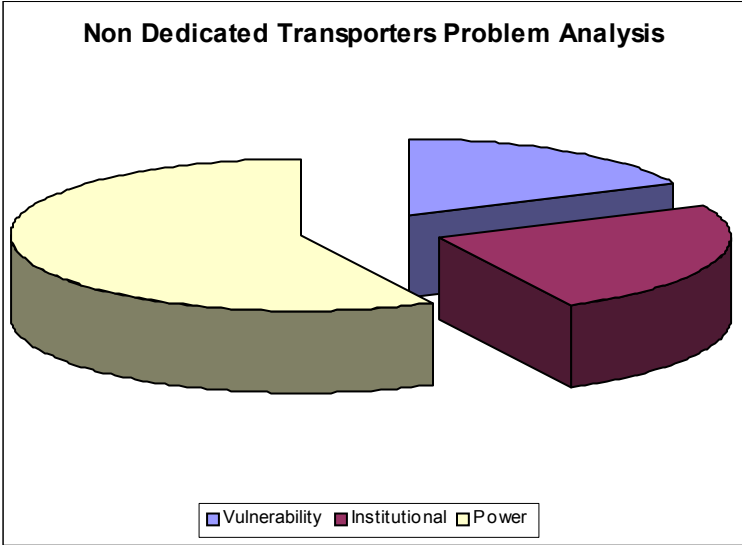
Most of transporters reported that they faced a number of problems in transportation. However, unlike the vendors whose biggest problem was categorized as vulnerability, the larger proportion of transporters is subject to problems associated with power notably the extortion of bribes by the authorities i.e. traffic police and local governments. High taxes levied too posed a major problem.

Chart 19: Problems the Dedicated Wood Fuel Transporters Face



Both the dedicated and non-dedicated transporters faced similar problems as can be seen in charts 19 and 20 above and below respectively.

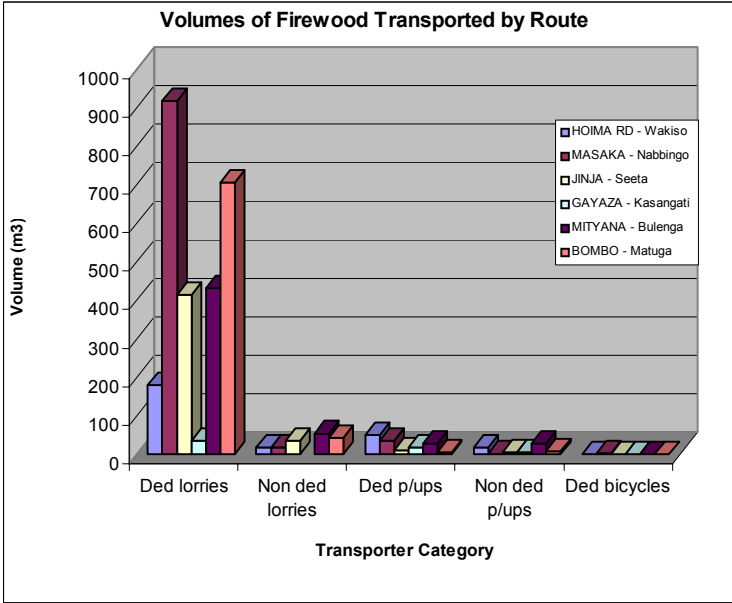
Chart 20: Problems faced by Non-dedicated Wood Fuel Transporters



7.3 Summary of the tallies – Route Analysis

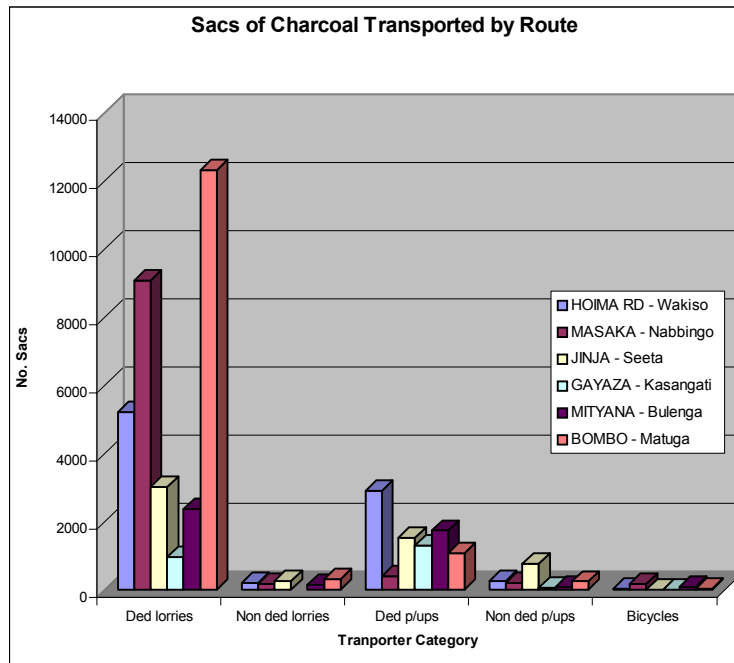
Traffic inflows into the city were observed for 18 - 20 hours daily over a 3-day period and below in charts 21 and 22 are a summary of the total volumes of biomass entering the city.

Chart 21: Firewood transporters Route Characteristics



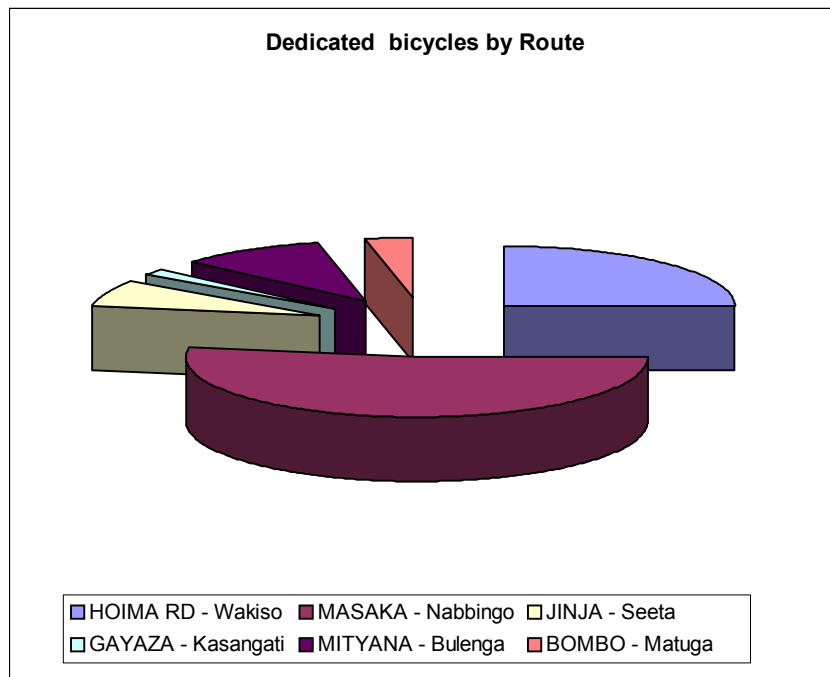
Bombo, Masaka and Hoima roads represented the most important avenues for charcoal entry into the city. The order is reverse that for firewood in that Masaka, Bombo and then Jinja roads represented the most important avenues for firewood delivery into the city.

Chart 22: Charcoal Transporters Route Characteristics



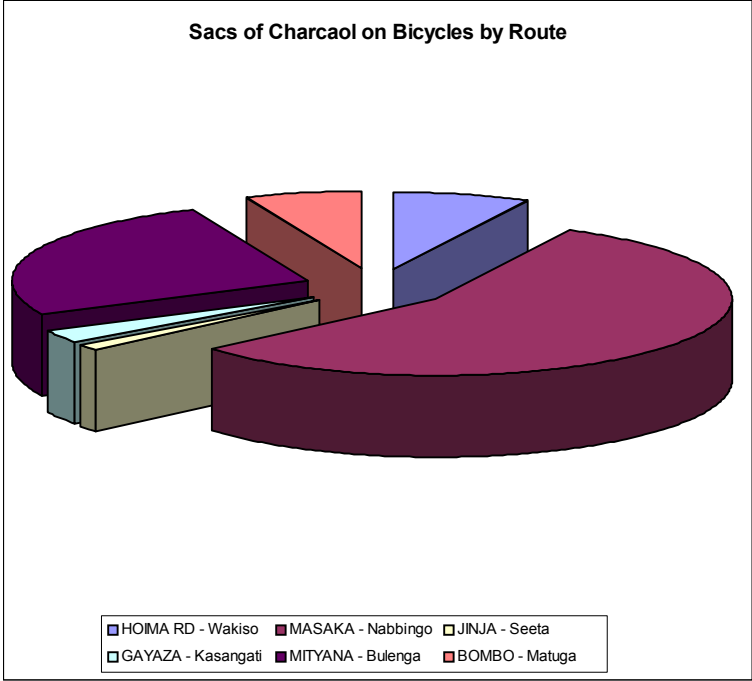
Among the non-motorized transporters were the bicycle transporters. The other form of non-motorized form is the cart and wheelbarrow however these are becoming less and less significant over the years. The charts 23 below are a summary of the non-motorized transporters and shows where they come from.

Chart 23: Number of wood fuel ferrying bicycles on each route



Masaka road represented the main route plied by the cyclists. Their wood fuel is extracted from the forests and wetlands in Mpigi district. The next important concentration of cyclists was seen along Hoima road.

Chart 24: The volume of wood fuel transported by Route







## 8.0 Conclusions and Inferences

Population Estimates on vendors.

To achieve a reasonable estimate on the number of persons vending charcoal within the city of Kampala a series of extrapolations based on a few assumptions were made.

- The average number of deliveries made by each transporter to different vendors is 6
- Total number of charcoal transporters entering the city each week were equal to the product of the average of the transporters counted over the three day period and the seven days of the week
- Distributing the total number of trucks estimated above (b) by the average delivery rate (a) above produces

Based on the above assumptions one is able to infer that there are some 3,630 dedicated charcoal vendors around the city and 1401 non-dedicated charcoal vendors on Kampala. As for the firewood vendors a reasonable attempt was made at enumerating the entire population ref. the *study methodology*.

Table 6: Population estimate of Key Stakeholders in the Urban Wood fuel supply chain

Country		Type	Group	Category	Gender	Fuel type			
						Coal	Wood	C&W	BLT
Uganda	Dedicated	Carriers	Motor	Lorry	M	371	243	0	0
					F	0	0	0	0
				Pickup	M	250	147	0	0
					F	0	0	0	0
			Non Motor	Headload	M	0	0	0	0
					F	0	0	0	0
				Bicycle	M	180	173	0	0
					F	0	0	0	0
		Wheelbarrow	M	0	0	0	0		
			F	0	0	0	0		
		Vendors	Wholesaler	M	296	11	0	0	
				F	432	17	0	0	
			Retailer	M	317	4	0	0	
				F	568	6	0	0	
	Kiosk		M	377	23	0	0		
			F	1578	51	0	0		
	Side of road	M	0	0	0	0			
		F	0	4	0	0			
	Door to door	M	62	0	0	0			
		F	0	0	0	0			
Non Dedicated	Carriers	Motor	Lorry	M	0	23	0	0	
				F	394	0	0	0	
			Pickup	M	0	84	0	0	
				F	0	0	0	0	

		Non Moto	Headload	M	0	0	0	0		
				F	180	0	0	0		
			Bicycle	M	0	173	0	0		
				F	0	0	0	0		
			Wheelbarrow	M	0	0	0	0		
				F	43	0	0	0		
		Vendors	Wholesaler	M	2	3	0	0		
				F	11	10	0	0		
			Retailer	M	62	4	0	0		
				F	148	8	0	0		
			Kiosk	M	151	10	0	0		
				F	934	41	0	0		
			Side of road	M	0	3	0	0		
				F	0	0	0	0		
			Door to door	M	7	0	0	0		
				F	86	0	0	0		
			Tot				0	0	0	0