

# **KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**DEPARTMENT OF CIVIL ENGINEERING**

**KUMASI, GHANA.**

**WATER SUPPLY AND ENVIRONMENTAL SANITATION PROGRAMME**



**PUBLIC PERCEPTION ON SOLID WASTE COLLECTION SERVICES**

**CASE STUDY: KIGALI CITY OF RWANDA**

**BY**

**GAFISHI MUNYABARENZI Clement**

**MSc. Thesis, 2009**

# **KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI, GHANA**

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By

**GAFISHI MUNYABARENZI Clement**

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KWAME NKRUMAH UNIVERSITY OF  
SCIENCE AND TECHNOLOGY  
KUMASI-GHANA



## CERTIFICATION

I hereby declare that this submission is my own work towards the MSc and that, to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text.

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Prof. S.I.K. Ampadu

(Head of Department)

Signature

Date

10/05/2009



## DEDICATION

This thesis is dedicated to my dear wife **Mrs. Maliza Jeannine** for her prayers, love, support, patience, and understanding over the years. It's also dedicated to my two lovely daughters, **Inyange Larissa** and **Gaju Melissa** for coping with my absence.

**God Bless You**



## ABSTRACT

A study was carried out in Kigali City of Rwanda to determine the public perception on solid waste collection services. The Environmental District Department (EDD) is responsible for solid waste management but private sector is involved to ensure effective and efficient solid waste management delivery. A survey was carried out in all three districts of Kigali City of Rwanda (Nyarugenge, Kicukiro and Gasabo) using a structured questionnaire among stakeholders to assess the quality of waste collection services rendered by solid waste collectors private companies. Four companies were found to be involved in waste management in Kigali City of Rwanda. These are COPED, COOCEN, AMIZERO and SAMU. They were all operating on a franchise and house to house collection system. The quality of service provided by the four companies collecting refuse in Kigali City of Rwanda was perceived by the public as satisfactory (83.6%). The public was willing to pay for collection service charge ranging from 1500-5000Frw (550=1US\$) with 80.6% rating it as moderate and 19.4% rating it as high. Most of the respondents (79.5%) also agreed that they should be responsible for the cost of collecting their own refuse. Only 20.5% wanted the Government alone to be responsible for their waste collection. It was realized from this study that Kigali City of Rwanda is making progress towards Solid Waste Management partly because of the House to House collection system and a Franchise system which involved collection, treatment, recycling and disposal of residues. Competition among the companies to remove waste unrestricted to zones could play a major role in the overall performance. Sanitation by laws observed by communities through the "Cellular System" with one head per ten houses might have also played a role. This system in Kigali City of Rwanda is worthy of emulation by cities in other developing countries.



## Table of Contents

CERTIFICATION .....	i
DEDICATION .....	ii
ABSTRACT.....	iii
Acknowledgements.....	xi
1.0 INTRODUCTION .....	1
1.1 Background information .....	1
1.2 Problem statement.....	3
1.3 Justification .....	4
1.4 Objectives of the study.....	5
1.4.1 Specific Objectives .....	5
1.5 Research question .....	5
1.6 Scope of the work .....	5
1.7 Organization of report.....	6
2.0 LITERATURE REVIEW .....	7
2.1 Definition of solid waste.....	7
2.2 Types and sources of solid waste.....	7
2.3. The bulk waste density.....	9
2.4. Generation and Storage.....	9
2.4.1. Waste generation.....	9
2.4.2 Factors that affect waste generation rate.....	10
2.4.3 Household storage.....	11
2.4.4 Communal storage .....	11



2.5 Collection and transportation .....	11
2.5.1 Communal Collection .....	12
2.5.2 Block Collection .....	12
2.5.3 Curbside collection .....	12
2.5.4 House-to-house Collection.....	13
2.6 Collection frequency .....	13
2.7 Collection Equipment and vehicles.....	14
2.8 Cost Recovery Mechanism .....	14
2.8.1 Tariffs.....	15
2.8.2 Subsidies .....	15
2.8.3 Other Financial Support Mechanisms.....	15
2.9 Willingness to pay.....	16
2.10 Municipal Governments.....	17
2.11 The Formal Private Sector .....	17
2.12 The Informal Private Sector .....	18
2.13 Community Based Organizations (CBOs).....	18
2.14 Non-Governmental Organizations (NGOs) .....	19
2.15 Private sector participation.....	19
2.15.1 General reasons to involve the private sector .....	20
2.15.2 Specific reasons to involve the private sector.....	20
2.16 Type of arrangements between Government and Private Sector in MSWM.....	21
2.16.1 Reduced Government Control .....	21
2.16.2 Reduced Government Ownership .....	21
2.16.3 Reduced Government Activity.....	21
2.16.3.1 Service contract.....	22
2.16.3.2 Concession contract .....	22
2.16.3.3 Franchise contract .....	22
2.16.3.4 Open competition contract.....	23



2.17 Public Private-Partnership (PPP) .....	24
2.17.1 Definition .....	24
2.17.2 PPP Dialogue Project .....	24
2.17.3 Criteria to judge feasibility of PPP .....	25
 3.0 STUDY AREA AND METHODOLOGY .....	 27
3.1 Study area .....	27
3.1.1 Description of Kigali City of Rwanda .....	27
3.1.2 Population .....	28
3.1.3 Environmental policy .....	29
3.1.4 Solid waste management .....	29
3.2 Materials and methods .....	30
3.2.1 Research design .....	30
3.2.2 Procedure for data collection .....	30
 4.0 RESULTS AND DISCUSSIONS .....	 33
4.1 Respondents Characteristics .....	33
4.1.1 Age distribution .....	33
4.1.2 Sex distribution .....	34
4.1.3 Educational level distribution .....	34
4.2 Type of contract .....	35
4.2.1 Terms and condition of the contract .....	36
4.2.1.1 Basic services .....	36
4.2.1.2 Registration, permit, Taxes and tariff .....	36
4.2.1.3 Disposal and transfer facilities .....	37
4.2.1.4 Personnel wages .....	37
4.2.1.5 Employees identification .....	38
4.2.1.6 Vehicle identification .....	39
4.2.1.7 Receipt of complaints .....	39



4.2.1.8 Settlement of dispute.....	39
4.3 Mode of management.....	40
4.3.1 Level of service and role of private sector.....	40
4.4 Quality of collection services.....	42
4.4.1 Quality satisfaction on waste services collection.....	42
4.4.2 Frequency of waste services collection.....	44
4.4.3 Mode of waste services collection satisfaction.....	45
4.4.4 Waste services collection satisfaction.....	46
4.5 Characteristics of user charges.....	48
4.5.1 Residents assessment of existing service charge.....	48
4.5.2 Residents assessment of existing rating service charge.....	49
4.5.3 Assessment of residents on who should pay the service charge.....	50
4.5.4 Residents views on when user fees should be collected.....	51
5.0 CONCLUSION AND RECOMMENDATIONS.....	53
REFERENCES.....	54
APPENDIX.....	58



## List of Tables

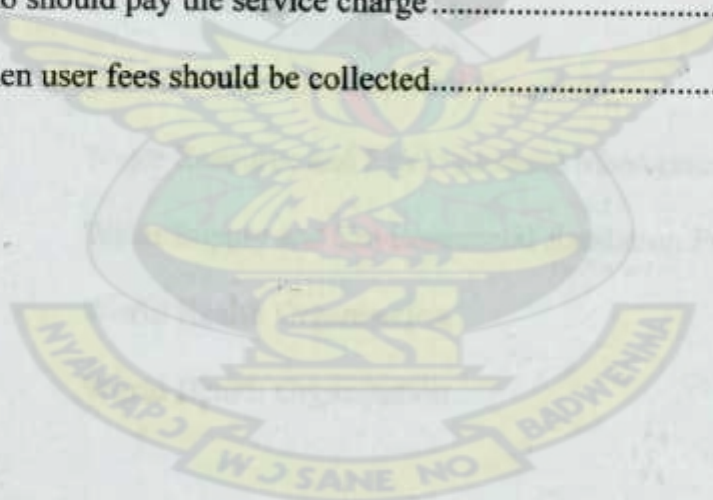
Table 2.1: Types and sources of solid waste.....	8
Table 2.2: Bulk density and moisture content.....	9
Table 2.3: Solid waste generation rates for some cities and counties .....	10
Table 2.4: Major actors in ppp .....	26
Table 3.1: Structure of data collection .....	31
Table 4.1: Organizational arrangements of companies.....	41





## List of Figures

Figure 3.1: Map of study area showing the districts .....	27
Figure 4.1: Respondents age .....	33
Figure 4.2: Respondents sex .....	34
Figure 4.3: Respondents educational level .....	35
Figure 4.4: Residents assessment on service quality .....	42
Figure 4.5: Frequency of waste services collection .....	45
Figure 4.6: House-to-house waste services collection.....	46
Figure 4.7: Service satisfaction.....	47
Figure 4.8: Existing service charge.....	49
Figure 4.9: Rating of existing service charge .....	50
Figure 4.10: Who should pay the service charge.....	51
Figure 4.11: When user fees should be collected.....	52





## Glossary of Abbreviations

CBOs	Community Base Organisations
EDD	Environmental District Department
KNUST	Kwame Nkrumah University of Science and Technology
MDGs	Millennium Development Goals
MSWM	Municipal Solid Waste Management
NGOs	Non-Governmental Organisations
NUR	National University of Rwanda
PPP	Public-Private Partnership
REMA	Rwanda Environment Management Authority
SWM	Solid Waste Management
UN	United Nations
UNDP	United Nation Development Program
WREM	Water Resource and Environmental Management
WSESP	Water Supply and Environmental Sanitation Project
WHO	World Health Organisation
WTP	World Health Organisation



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## 1.0 INTRODUCTION

### 1.1 Background information

The society is more concerned about the environment and is much more aware about its activities and the impact resulting from these activities on the environment (Kassim, 2006). Society demands that waste management must be sustainable, the proper management of solid waste needs appropriate technology, which is economically affordable, socially accepted and environmentally friendly (Kassim, 2006).

The issue of Solid Waste Management (SWM) is a challenge throughout the world, in both developed and developing countries. People always generate solid waste through their daily activities, as world population grows so does the solid waste generation increases as well, especially in urban areas. The world's urban population reached 2.9 billion in 2000 and is expected to rise to 4.2 billion by 2020 (UN, 2002) which will lead to a faster generation of solid waste. The managing of this huge volume of waste effectively is a challenging problem.

Human beings produce waste at all levels of development both in the economic as well as non-economic activities of life (Flintoff, 1984). Solid waste comprises mainly of the organic and inorganic waste generated by households, commercial, institutional and industrial establishments during production and consumption processes (Cointreau, 1982). Categories of waste materials discarded in urban areas, and whose clearance is



generally viewed as municipal responsibility, include household garbage and rubbish, residential ashes, commercial refuse, institutional refuse including hospital and clinical waste (Karanja, 2006). Municipal waste also comprises of construction and demolition debris, street cleaning and maintenance refuse, dead animals, bulky wastes abandoned vehicles and sanitation residues (Cointreau, 1982).

The management of solid wastes is an important urban public service essential to the environment and beneficial to all citizens (Cointreau, 1984). This service is uniquely important in that it benefits all residents and is in most countries a major responsibility of local governments, typically consuming between 20-90% of municipal budget, much of it (75-90%) on collection and transportation (Cointreau, 1982).

Solid Waste Management (SWM) in developing countries has been the responsibility of most government for many years. The activities of the government (public sector) in service delivery have experienced a lot of problems due to financial, technical, institutional, social and legal constraints with subsequent negative impact on the environment and health of most municipalities (Dijk, 2003).

It is evident that in recent years many of such municipal authorities have relegated some of their activities to the private sector in order to achieve the desired aim of riding the cities of solid waste. This involvement is in line with the concept of Public-Private Partnership (PPP) which seeks to involve the private sector in the service delivery. The relevance of assessing performance of service providers in solid waste management in



developing countries is an emerging issue and the assessment of performance of service providers involved is important to understand the impact of private sector participation (Kessey, 1995).

## 1.2 Problem statement

The Kigali City Council of Rwanda has involved private companies in the solid waste collection and disposal activities. The districts' solid wastes are handled by private companies on the basis of franchise contract with households/ landlords or tenants. The Environmental District Department (EDD) is in charge of SWM in addition to its role of overseeing and monitoring the activities carried out by private sector. This study tries to analyze the problems and perceptions of Kigali City of Rwanda residents' on solid waste collection services rendered by the private sector.

According to Karanja (2003), poor collection and uncontrolled disposal of solid wastes leads to the breeding of insects, rodents, and other pathogens. The increases in waste generation rates, inadequate collection and inappropriate disposal as well as uneven coverage have translated into higher management costs.

Also, Cointreau-Levine et al., (1982), stated that, uncollected wastes, clog drains, and hold wastes water for instance, lead to stagnant water that encourage mosquito vector abundance and thus malaria. Even feeding animals on solid waste can be dangerous to human health because it provides a food chain path for transmitting disease. The



increasing waste flows and uncollected garbage imposes numerous environmental adversities including public health risks, pollution and environmental degradation. This can interrupt the production and reproductive capacities of urban populations (Saleh, 2003), which in turn lead to debilitating diseases such as schistosomiasis, trypanosomiasis, malaria, diarrhoea, worms infestation, respiratory diseases and other contagious diseases (Saleh, 2003). In most parts of the world, poor environmental quality is responsible for 25% of all preventable ill health, it is estimated that about 5 million people die each year in developing countries from health problems arising from inadequate collection and disposal of solid waste (UNDP, 1999).

### 1.3 Justification

It is very pertinent that this research is carried out to determine the public perception on solid waste collection services rendered by private companies and to make the necessary changes to ensure sustainable solid waste management and enhance cleanliness.

A healthy city must have a planned program for effective collection and proper handling and disposal of solid waste so as to create a safe and pleasant urban environment (IHE, 2000). An organization planning for SWM in urban areas is essential if cities are to be healthy places to visit or to live in and environmentally attractive to visitors and residents (IHE, 2000).



## **1.4 Objectives of the study**

The main objective of this study is to determine the mode of management and public perception on solid waste collection services rendered by private companies in Kigali City of Rwanda.

### **1.4.1 Specific Objectives**

The specific objectives for this study are:

- To assess the type of contracts and mode of management of solid waste collection.
- To characterize the user satisfaction and quality of services.
- To assess public perception on user charges.

## **1.5 Research question**

What are the perceptions of the residents about the quality of solid waste collection services rendered by private companies?

## **1.6 Scope of the work**

The study was carried out in Kigali City of Rwanda and will focus on the perception of the residents in term of quality of solid waste collection services rendered by private companies and will also focus on the various existing user charge for House-to-house collection. The study was limited to urban areas in developing countries with special



emphasis on Kigali City of Rwanda. This was taken as the research area because no such study has been done in the past; it's the capital city and administrative, commercial and industrial centre of the country.

### **1.7 Organization of report**

This thesis is organized into five main chapters: Chapter one presents the background information of the study and objectives. Chapter two discusses the various literature concerning similar studies undertaken and their relevance to this research. Chapter three is the study area and methodology. Chapter four is the results and discussions. Chapters five comprise major conclusion and recommendations.





## **2.0 LITERATURE REVIEW**

### **2.1 Definition of solid waste**

Basel Convention of 1997 defines solid waste as substances or objects which are disposed off or are intended to be disposed off by the provision of national law. According to the U.S Environmental Protection Agency, solid waste includes any materials resulting from industrial, commercial, mining and agricultural operations and from human activities. The World Health Organization (WHO, 2006) also defined solid waste as things being useless, unwanted or discarded materials that arise from man's activities and are not free flowing. Solid waste comprises all the materials arising from human and animal activities that are normally solid and that are discarded as unwanted.

### **2.2 Types and sources of solid waste**

Sources of solid waste in a community are categories into the residential, commercial, institutional, construction, demolition and agriculture. Each category produces specific types of wastes (Table 2.1).



**Table 2.1 Types and sources of solid waste**

Source	Typical waste producers	Types of solid wastes
Residential	Single and multifamily dwellings	Food wastes, paper, cardboard, plastics, textiles, leather, yard wastes, wood, glass, metals, ashes, special wastes (e.g., bulky items, consumer electronics, white goods, batteries, oil, tires), and household hazardous wastes.).
Industrial	Light and heavy manufacturing, fabrication, construction sites, power and chemical plants.	Housekeeping wastes, packaging, food wastes, construction and demolition materials, hazardous wastes, ashes, special wastes.
Commercial	Stores, hotels, restaurants, markets, office buildings, etc.	Paper, cardboard, plastics, wood, food wastes, glass, metals, special wastes, hazardous wastes.
Institutional	Schools, hospitals, prisons, government centers.	Same as commercial.
Construction and demolition	New construction sites, road repair, renovation sites, demolition of buildings	Wood, steel, concrete, dirt, etc.
Municipal services	Street cleaning, landscaping, parks, beaches, other recreational areas, water and wastewater treatment plants.	Street sweepings; landscape and tree trimmings; general wastes from parks, beaches, and other recreational areas; sludge.
Process	Heavy and light manufacturing, refineries, chemical plants, power plants, mineral extraction and processing.	Industrial process wastes, scrap materials, off-specification products, slay tailings.
Agriculture	Crops, orchards, vineyards, dairies, feedlots, farms.	Spoiled food wastes, agricultural wastes, hazardous wastes (e.g., pesticides).

(Source: Diaz, 2005)



## 2.3 The bulk waste density

The volume-weight analysis is used to determine the density of solid waste materials. This involves the measurement of the weight and volume of waste generated over a period. The density varies with geographical location, season of the year etc. The density is important for election of the storage and collection equipments.

**Table 2.2 Bulk density and moisture content**

	Low income	Middle income	High income
Bulk waste density (kg/m <sup>3</sup> )	250-500	170-330	100-200
Moisture content (%)	40-80	40-60	20-40

(Source: Cointreau, 1982)

## 2.4 Generation and Storage

### 2.4.1 Waste generation

Waste is generated when materials are identified as no longer of value and are either thrown away or gathered together for disposal. Waste generation is an activity that is not controllable at present times. However, in future more control measures would have to be put in place. In states where waste diversion goals are set by law and must met, under threat of penalty, it is necessary to put in place a manifest system to monitor waste diversion. In communities where waste disposal is regulated by law, measures should be put in place to ensure compliance (Obirih-Opareh, 2003).



## 2.4.2 Factors that affect waste generation rate

Municipal solid waste generations are influenced by a lot of factors. These factors include: Season of the year, location, income level of the people, extent of salvaging and recycling and reuse, public attitudes and legislation. A significant reduction in waste generation can be achieved if the public and consumer's oriented companies are willing to change to reuse material and also are willing their habit in order to conserve notional resources and reduce the burden associated with the management of solid waste (Obirih-Opareh, 2003).

**Table 2.3 Solid Waste Generation Rates for Some Cities and Countries**

City counties	Generation (Kg/cap/day)
<b>High income</b>	
New York	1.8
Hamburg	0.85
Rome	0.69
<b>Middle income</b>	
Singapore	0.87
Cairo	0.50
Tunis	0.56
<b>Low in come</b>	
Jakarta	0.51
Culcuta	0.60

(Source: Diaz, 2005)



### **2.4.3 Household storage**

In rich-income areas, households use polythene bags and plastic containers with lids to keep the waste properly stored and away from flies. However in poor-income areas, all manner of containers such as old baskets and metal boxes are used. Though cheaper, this type of waste storage and facilities is not hygienic and can attract can flies. Households waste should be stored in sturdy containers of sufficient capacity which is easy to empty and clean, has a well fitting lid (Obirih-Opareh, 2003).

### **2.4.4 Communal storage**

Communal storage remains a common option for low-income communities. Communal storage containers can be positioned at strategic locations. Household are required to carry the solid waste from house to the storage container, which in some cases may entail walking considerable distance. The containers are usually open, giving access to rats flies and domestic animals and creating a situation which is undesirable for both hygienic and aesthetic reasons (Obirih-Opareh, 2003).

## **2.5 Collection and transportation**

Collection and transportation is one of the main elements of waste management system. It is capital intensive and most expensive part of the system. Organization of operation of collection is the most difficult part. The solid waste collection is expensive and cost



recovery is essential to ensure sustainable waste collection services. Various methods of waste collection are practiced in developing countries, but all may be classified under four headings:

### **2.5.1 Communal Collection**

Under this system, householders discharge their wastes at predetermined locations containing some form of communal storage facility, and refuse- collection vehicles visit these sites at frequent intervals, usually once daily, to remove accumulated waste (UN Habitat, 1996).

### **2.5.2 Block Collection**

Under this system, a collection vehicle travels a predetermined route at prescribed intervals, usually every two to three days, and stops at selected locations where a bell is sounded. Upon hearing the bell, householders bring their refuse containers and hand them over to the collection crew, usually consisting of two men, which empties the containers and returns them to the householders. No containers are left outside the household premises or on communal land (UN Habitat, 1996).



### **2.5.3 Curbside collection**

With this system the collection crew collects bins, bags and other containers of refuse which are deposited at the curbside at fixed intervals, usually on two specific days in the week when collection takes place. This system requires a very regular and well-organised collection, so that householders know when to leave out their waste. Where collection is irregular, it is common to see the containers placed permanently outside, with increased incidence of scattering of waste by scavengers. It is the most commonly used method in high income areas of developing world (UN Habitat, 1996).

### **2.5.4 House-to-house Collection**

In this system, the collection crew enters each premises takes out the container and sets it back after emptying the waste into collection vehicle. The lack of householder involvement in the collection process is, however offset by increased labour costs in entering premises (UN Habitat, 1996).

The house-to-house collection has gain popularity because labour cost for collection can be minimized. Also large containers, which can be emptied mechanically is the common method used for collection of municipal wastes.



## 2.6 Collection frequency

Municipal solid waste should be collected at least twice a week. Waste may be collected weekly in residential areas daily in business areas. Laxity in the collection of MSW leads to unhygienic conditions. The main factors that a direct bearing on the optimal frequency of collection are: Characteristic of the waste, climate, system of storage, type of container provided and unit collection cost (Kassim and Ali, 2003).

## 2.7 Collection Equipment and vehicles

A variety of system and equipments have been developed for used in solid Waste collection. These equipments many be classified based on the mode of operations, driving force used (animal or fuel powered) and kind of interaction with storage facilities (Kassim and Ali, 2003). Some of the equipments and vehicles are human handcart, animal pedal cart, tractor and trailer, convectional truck, Roll top Truck, High-side open-top, Real loading hydraulic (compactor truck).

## 2.8 Cost Recovery Mechanism

In its simplest term is to recover all of the costs associated with sanitation system, programmed services to ensure long-term sustainability. Sanitation services are known to provide economic benefits to communities in the form of health, opportunities for women and poverty reduction (Cardone et al, 2003). Given the overall societal gains



that can be achieved, it is widely accepted that sanitation services must be improved, especially for the poor, who are the most likely to lack access to these services. As a result, strategic thinking is needed about how costs can be recovered whether from users, donors, government or others and what cost need to be recovered to encourage sustainability (Cardone et al, 2003). There are a number of ways in which costs can be recovered. Tariffs, subsidies and financial support mechanisms can all contribute towards sustained service delivery while raising consumer awareness for the financial, economic and environmental aspects of providing such service.

### 2.8.1 Tariffs

Tariffs determine the level of revenues that service providers receive from users. They are designed for different purposes, and often contain some elements to address poverty. They can be either at the service provider level or by national (or local) government. More often than not setting tariffs is a political process that is rife with controversy (Cardone et al, 2003).

### 2.8.2 Subsidies

Within a sustainable development framework, the need for subsidies to provide services to the poor is understood and widely accepted. It is generally agreed that in poor areas of middle and low income countries, subsidies are necessary to cover basic cost of service provision to the poor consumer. Different types of subsidies achieve different



purposes. Some types of subsidies might be better than others, depending on the type of project and the level of data, capacities and resources needed to manage and administer subsidies (Cardone et al, 2003).

### **2.8.3 Other Financial Support Mechanisms**

The financial challenge to increase sustainable access to sanitation services is substantial. Given the large increases in service provision that are required, tariffs, subsidies and taxes will be insufficient to increase coverage and provide system upgrades. In developing countries, most of the financing for sanitation sector comes from the domestic public sector, followed by external aid. Other sources include small-scale domestic private providers, international private sector, international and local non-governmental organizations and neighborhoods, communities and households.

Although much has been said and written in support of increase private sector investment, it will require the coordinate efforts of public, private, civil society, and users to maximize their comparative advantage, to provide the additional financial support mechanisms to meet the MDGs (Cardone et al, 2003).

## **2.9 Willingness to pay**

Willingness to pay (WTP) is an expression of the demand for a service, and it is a strong prerequisite for sustainable cost recovery because it is the materialization of users' satisfaction and of their desire to contribute in monetary terms, but it can also be



in kind. In some cases, users can hardly contribute in cash towards investment cost, but they can do it in kind for example by providing voluntary labour for trench digging, transport and pipe laying as in the case of water supply (Schubeler et al, 1996). Field experience shows that there is not a systematic correlation between willingness and ability to pay. It is necessary to find out the conditions that affect demand and the desire of people to contribute to the service economically. Direct techniques for the estimation of WTP are based on observation of what people actually do in order to ensure the provision of water and sanitation services (Schubeler, et al 1996). WTP studies are carried out to understand what level of services people want, why and how much they are willing to pay for it. A useful way to improve willingness to pay is to improve relationship between consumers and the organization managing the water supply and sanitation services. An increased trust and confidence, through better information and communication, can have a positive influence on users' satisfaction and willingness to pay (Cardone et al, 2003).

## 2.10 Municipal Governments

Local municipal governments have a role in the set-up and operation of waste management systems. Most urban authorities in both industrialized and developing countries receive their powers and obligations from a central government authority, with allocation of powers and responsibilities to protect the rights of the citizens, to provide services and to serve the common good (Kassim et al, 2002).



## 2.11 The Formal Private Sector

The 'formal private sector' is here understood to refer to private sector corporations, institutions, firms and individuals, operating registered and/or incorporated businesses with official business licenses, and generally modern technology (Furedy, 2002). In general, the defining characteristic of the formal private sector is that its main objective is to generate a profit on investments (Furedy, 2002).

## 2.12 The Informal Private Sector

The term informal private sector refers to unregistered or casual activities carried out by individuals and/or family or community enterprises that engage in value-adding activities on a small-scale with minimal capital input, using local materials and labour-intensive techniques (Furedy, 2002). Informal activities, in contrast with the formal sector in waste collecting and recycling, are driven by poverty, and are initiated personally and spontaneously in the struggle for survival (although some enterprises, especially the ones engaged in recycling activities, manage to make considerable profits). While informal-sector activities vary according to socio-cultural, religious and economic circumstances, some generalizations about gender roles are possible. The least sophisticated forms of labour, including collection of waste from streets and dumps and primary sorting of the material fall to the women and children, most of whom work from home and do any handling or sorting in their homes or yards (Reuben, 2006).



### 2.13 Community Based Organizations (CBOs)

The community and its representatives have a direct interest in waste management, as residents, service users and tax payers. Communities in low-income areas generally receive marginal or no services in terms of public transport, electricity, drinking water, sanitation, drainage, and also of waste removal. These communities will sometimes take the initiative to organize themselves into Community Based Organizations (CBOs), with the direct goal of self-help and improving their living conditions. Such CBOs may receive external assistance in the form of technical and/or financial aid from different agencies. CBOs may also take a role in the actual provision of services, including operations and maintenance, and even in the construction of facilities (Cointreau-Levine et al, 2000).

### 2.14 Non-Governmental Organizations (NGOs)

The term NGOs can refer to such diverse organizations as churches, universities, labour organizations, environmental organizations and lobbies. Sometimes even donor organizations can fall under this heading. Generally, NGOs are intermediate organizations which are not directly and continuously involved in community projects. NGOs not only advocate, they can also be involved in awareness-raising, advocacy, and decision-making. NGOs can act as intermediaries between grassroots initiatives (CBOs) and municipal governments or serve the ideological, political, or altruistic interests of international organizations. They can advocate interests on a larger scale than the single



community and provide support and advice to CBOs, but also to marginal groups in the society, such as waste pickers at dump sites and street children (Cointreau-Levine et al, 2000).

## **2.15 Private sector participation**

Private sector participation is defined as a possible opportunity to mobilize private investment and introduce efficiency in solid waste management. There are various advantages to privatization when considering the rapid urbanization and escalating demand for public goods and services (Cointreau-Levine, 1994).

### **2.15.1 General reasons to involve the private sector**

The following reasons are usually put forward to involve the private sector.

- Government has no money
- Government is not efficient
- Government failed to deliver the service in the past
- Complementary resources
- Complementary expertise



### **2.15.2 Specific reasons to involve the private sector**

- Improve quality of service
- Reduce political interventions
- Reduce number of public sector employee
- Expand service coverage to more customer
- Introduce competition
- Improve operating efficiency
- Required capital funding by injecting private investment capita

### **2.16 Type of arrangements between Government and Private Sector in MSWM.**

#### **2.16.1 Reduced Government Control**

Government control is decentralized by commercialization. Government agencies for SWM are restructured into semi-or quasi-private enterprises with some degree of government oversight, but with the management freedom to operate at optimum efficiency and generate revenues exclusively for their own use (Carter and Klein, 1992).

#### **2.16.2 Reduced Government Ownership**

Government ownership is reduced when government owned enterprises are divested and when public/private joint ventures are formed. Divestiture-government owned



enterprises and their related assets are partially or wholly sold to the private sector with the expectation that the basic function of the enterprise would continue. Public/Private Partnership government establishes a joint venture with the private sector to which each party contributes assets and resources and each asset assumes certain risks and responsibilities as stated in the contractual agreement (Carter and Klein, 1992).

### **2.16.3 Reduced Government Activity**

This is achieved when private sector participates in service delivery through contracts, franchises, concessions and open competition (Carter and Klein, 1992).

#### **2.16.3.1 Service contract**

The government awards a finite-term contract to a private company for the delivery of solid waste collection service, street sweeping service, the collection of recyclables, transfer station operating, disposal site operation, or fleet maintenance. The contract award is made after a competitive procurement process. The private firm is paid for service delivery by the government under the terms of the contract.

#### **2.16.3.2 Concession contract**

The government awards a concession to a private firm to set up a facility that utilizes the government-owned resource. This concession may enable the private firm to recycle



materials (paper, plastic, metal, glass) from refuse; to recover resources (compost, heat, electricity) from refuse, or to transfer or dispose of refuse. Concession is the form of a long-term contractual agreement, whereby the private firm builds the facility. In some case, the private firm may maintain indefinitely the ownership and operation of the facility. In others, the private firm may transfer ownership of the facility to the government after a specified period ownership and operation.

#### **2.16.3.3 Franchise contract**

The government awards a finite-term zonal monopoly (a franchise) a private firm for the delivery of solid waste collection service. Firm deposits a performance bond with the government and pays a license fee to cover the government's costs of monitoring. The private firm recovers its cost and profit through direct charges to the households and establishments that are served. Government provides control over the tariff charged to the consumer through: a) development of adequate competition and control of price collusion, or b) price regulation.

#### **2.16.3.4 Open competition contract**

The government freely allows qualified private forms to compete for refuse collection, recycling, or disposal services. In open competition, individual household and establishments make private arrangements with individual firms for refuse collection and or recycling. No firm holds a zonal monopoly, and any number of firms may



compete within the same zone similarly, in open competition, the government grants a license to qualified individual firms for the private provision of disposal services. One city may be served by several disposal sites competing business from the area's local governments and private haulers, as for business from remote governments and haulers. The government's in open competition, costs is directly billed by the firms to their customers.

## **2.17 Public Private-Partnership (PPP)**

### **2.17.1 Definition**

PPP is a co-operation of different actors, usually one from the private and from the public sector, who work together to promote a common interest, using their special qualities (Mensah, 2007). The Webster dictionary defines partnerships as a legal relation between two or more persons contractually associated as joint principals in a business. The second definition provided is a relationship resembling a legal partnership and usually involves close co operation between parties having specified and joint rights and responsibilities. PPP may also be defined as co-operative ventures between a public entity and private party, aiming to realize common projects in which they risk costs and profit (Kassim and Ali, 2003).



### 2.17.2 PPP Dialogue Project

If a dialogue between different parties in developing countries could be organized before actual implementation of sanitation projects with support of the private sector, the chance of success of such project would be enhanced. It can be considered as a contribution to the achievement of Millennium Development Goals (Kassim and Ali, 2003).

### 2.17.3 Criteria to judge feasibility of PPP

The usual criteria are: Technical efficiency, economic efficiency, effectiveness and financial viability (Cointreau-Levine et al, 2000).

#### **Technical Efficiency:**

Technical efficiency is defined as the ratio of outcomes or outputs to input (e.g. Tones of waste collected per vehicle or tone/worker). The choice of vehicle, capacity equipment and physical condition of vehicles affect quality of service. The indicators of technical efficiency include the following: worker and vehicle productivity, rationalize vehicle route and operations, fuel consumption efficiency, service coverage and access, vehicles downtime and utilization.



**Economic Efficiency:**

Service efficiency is defined as the ratio of costs to outcomes or outputs (e.g. Cost per tonne of waste collected).

**Effectiveness:**

Service effectiveness is defined as the extent to which the objectives of the service are met in practice. The indicators of effectiveness include reliability of service, customer satisfaction, service coverage and access, environmental cleanliness and environmental controls.

**Financial Viability:**

Financial viability is defined as the ability of a service provider to raise the funds required to meet its functional requirements in short, medium and long term. Fixed prices for service contracts and user fee for franchisees have ripple effect on the cost recovery of service and financial capacity of service providers (Awortwi, 2003).

**Table 2.4 Major actors in PPP**

<b>PUBLIC SECTOR</b>	<b>PRIVATE OPERATORS</b>
National level	Financial operators, Donors
Metro, <u>municipal</u> and <u>district</u> level	Private companies NGOs, CBO,

(Source: Awortwi, 2003).



### 3.0 STUDY AREA AND METHODOLOGY

#### 3.1 Study area

##### 3.1.1 Description of Kigali City of Rwanda

This study was conducted in Kigali city of Rwanda, the capital and commercial city of the Republic of Rwanda. The city covers an area of  $730\text{km}^2$ . Kigali City of Rwanda is located in the center of the country with a status of a province, one of the five provinces in the country. Kigali City of is built in hilly landscapes sprawling across ridges and wet valleys in between.



Figure 3.1: Map of study area showing the districts



There are several institutions and government establishments in addition to other commercial activities and residential areas like universities, banks, hotels, international organizations, embassies, government offices, commercial buildings and residential areas. The affluent tend build on top of the ridges while the poor people in towards the valley. Other poor neighborhoods are located on the hills which can be seen in the fringes of the city. The fringe-neighborhoods have grown in the recent years due to the implementation of a decentralization policy which have resulted in the adoption of some peri-urban areas which were previously not part of the Kigali City Council.

### 3.1.2 Population

Compared to other African cities, the size and population growth of Kigali has until early nineties been trivial, but its demographic profile was seriously affected by the 1994 genocide which claimed the lives of about 1,000,000 million Tutsis and moderate Hutus country wide (Musahara, and Huggins, 2005).

Since then it is estimated that there has been over 800,000 old refugees of 1959 returning from exile in neighboring countries of Uganda, Democratic Republic of Congo, Burundi, Tanzania, Kenya and oversees, with a big number of them opting to settle in the capital for employment and security reasons. There has also been migration of people resulting in drastic increase of population in Kigali. Besides war and genocide, the immigration to Kigali from late 1990 may be a manifestation of more employment and business opportunities there, compared to other Rwandan towns.



As a result of demographic dynamics and all the above mentioned factors, Kigali City which only covered an area of 112km<sup>2</sup> with 140,000 inhabitants in 1991 is believed to have a population of about 1,000,000 people living in an area of 730 km<sup>2</sup> in 2006 (Musahara, and Huggins, 2005).

### **3.1.3 Environmental policy**

The first ever environmental policy in Rwanda was instituted in 2004, and this was a starting point towards the establishment of Organic law for environmental protection and later Rwanda Environment Management Authority (REMA, 2004). The policy recognizes the adoption of environmentally friendly technologies and that the technology constitutes high priority for central and local authorities. The policy also understands the role of private sector and civil society in coordinated and harmonious actions which favors the environment.

### **3.1.4 Solid waste management**

After interview with city officials, it was understood that under the instruction of the City Council, all the District Councils in City, have put up a bye law which prohibit any kind of dumping of garbage outside ones plot. This has resulted in forcing most of the households to register for solid waste collection services to the private companies. The districts also help in punishing people who fail to pay for services provided to them by private companies. The district's policy is that, private solid waste companies



continue to operate in affluent areas, and at big institutions and businesses, while CBOs are left to operate in neighborhoods, and each neighborhood or sector is encouraged to have its own solid waste management CBOs to serve the neighborhood, and businesses which are located in their neighborhood.

### **3.2 Materials and methods**

#### **3.2.1 Research design**

The research was designed to assess the public perception on the quality of solid waste collection services with respect of the levels of the service quality. The objective of this study was thus to assess the mode of management and public perception on the solid waste collection.

#### **3.2.2 Procedure for data collection**

The data which was required for the analysis and conclusion were obtained through desk study, questionnaire administration, interviews and field observations.

##### **Desk Study:**

Literature material from libraries and internet were reviewed in relevant to the project were reviewed. A structure data collected was developed and followed (Table 3.1).



Table 3.1: Structure of data collection

ASPECT OF THE STUDY	DIMENSIONS	DEFINITIONS	INDICATORS	DATA COLLECTION METHOD
Quality of Service	Effectiveness	Service effectiveness is defined as the extent to which the objectives of the service are met in practice.	<ul style="list-style-type: none"> <li>-Reliability of service</li> <li>-Sanitary conditions at bin site</li> <li>-Cleanliness of surrounding</li> <li>-Neatness of crew</li> <li>-Neatness of collection vehicle</li> <li>-Prompt response to resident's compliances.</li> <li>-Behavior of crew toward residents</li> <li>-Sanitary conditions of drains in the area</li> <li>-User satisfaction</li> </ul>	A survey of a sample size of 220 was used to generate the required qualitative and quantitative data
User Charges	Cost recovery	It is defined as ability or means by which the companies are able to recover their cost and make profit.	<p>Residents were asked to indicate their views on the following;</p> <p>Who should pay for service charges?</p> <p>How service charges should be collected(weekly, monthly, yearly)</p> <p>Rating of existing service charges</p>	survey of a sample size of 220 was used to generate the required qualitative and quantitative data

### Survey:

A structured questionnaire was administered to households using a sample size of 220. Data collected included qualitative and quantitative data on frequency of collection, Service charges, Sanitary conditions at bin/container site and spill-over of waste, cleanliness of surroundings, neatness of waste collection crew, neatness of waste collection vehicles, quick response to residents' complaints and behavior/attitude of collection crew towards residents. In the household's surveys, the head of the households or any adult person resident in the house were referred to as the respondent to the structured interview. Questionnaires were also administered to other the stakeholders to obtain data required for the analyses including Private solid waste collection companies and officials of the Kigali City council.





## 4.0 RESULTS AND DISCUSSIONS

### 4.1 Respondents Characteristics

#### 4.1.1 Age distribution

Most of the respondents were matured. Their age percentages were 45%; 42% and 13% for ages 25-40, above 40 and below 25 years respectively. Their views therefore were a true reflection about solid waste collection services rendered by the private companies.

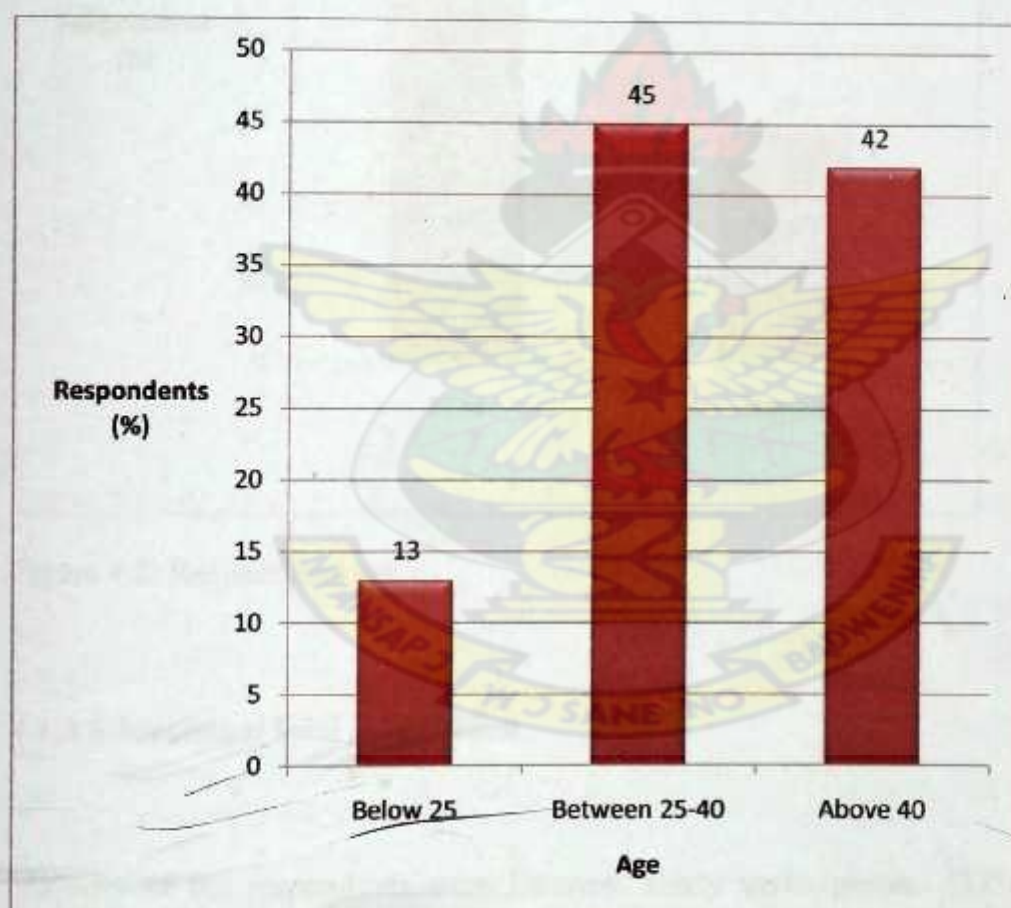


Figure 4.1: Respondents age

#### 4.1.2 Sex distribution

Seventy-one percent (71%) of the respondents were males with 29% being females (Fig4.2). This is because culturally men are the heads of households.

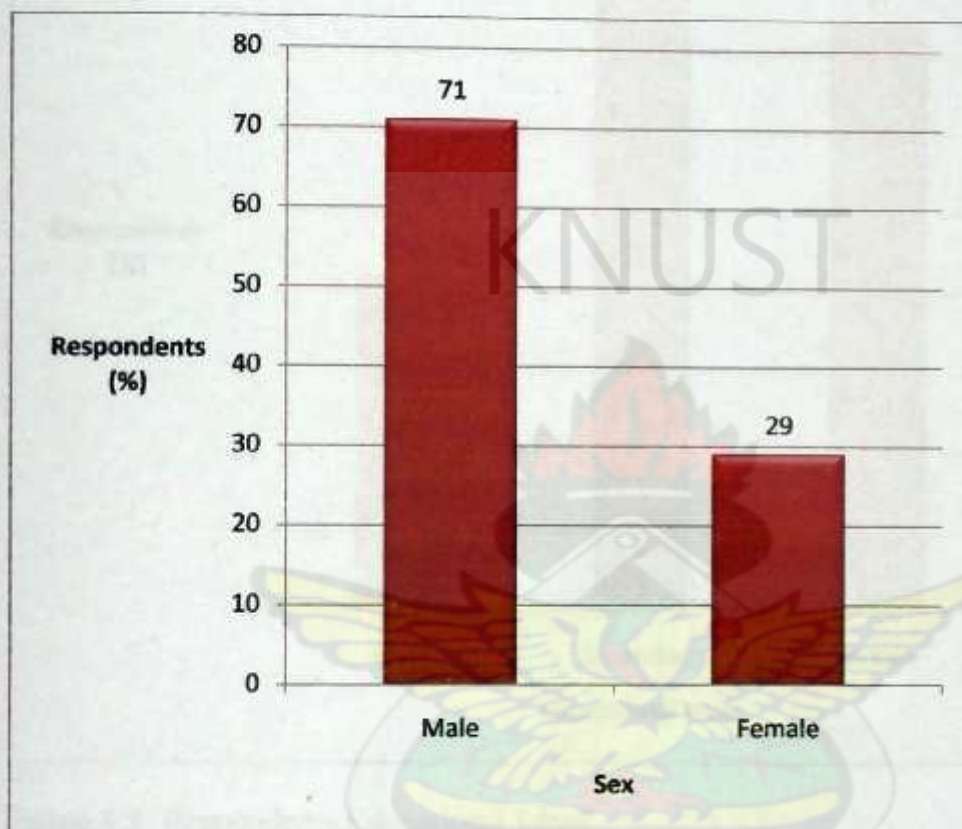


Figure 4.2: Respondents sex

#### 4.1.3 Educational level distribution

Majority of the respondents were literates. Thirty seven percent (37%) had tertiary education with most of them being government and NGOs employees. Also, 42% of the respondents had secondary education while 17% of the residents had basic education



where most of them can read and write (Fig 4.3). This made the understanding of the questionnaires willingness to pay for sanitation services.

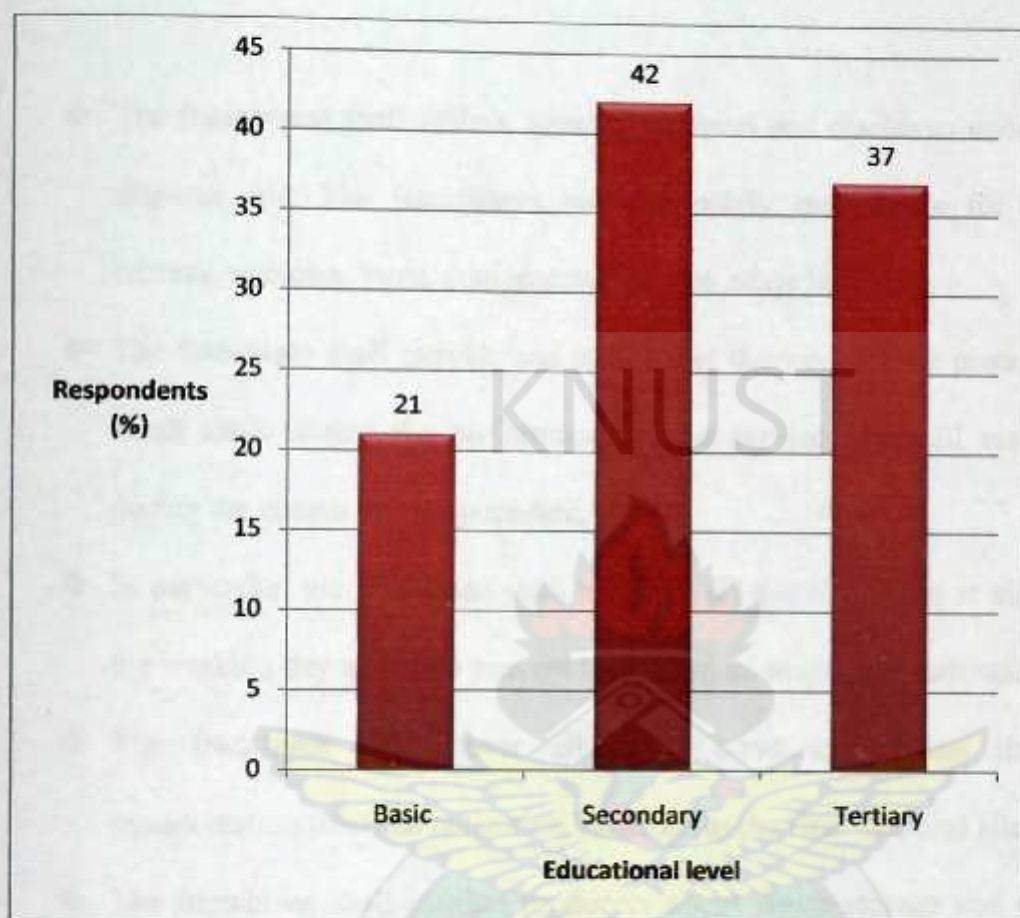


Figure 4.3: Respondents Educational Level

#### 4.2 Type of contract

In Kigali City of Rwanda, the residents are responsible of their wastes collection services. A franchise system is the type of contract used between the private companies and the beneficiaries of solid waste collection services.

#### **4.2.1 Terms and condition of the contract**

##### **4.2.1.1 Basic services**

- ❖ The franchisees shall collect, remove transport and discharge solid waste at the disposal site. The franchisees are also solely responsible for providing all labours, vehicles, tools, equipments, and any other facilities.
- ❖ The franchisee shall provide and ensure that the workers use protective clothing at all times during the performance of the service cover all waste containers during the course of transportation.
- ❖ In particular, the franchisee shall maintain all dustbins clean at all times during the working day and shall prevent the spread of waste into surrounding areas.
- ❖ The franchisee shall cover all waste containers during the course of transportation from the collection locations to the final disposal sites.
- ❖ The franchisee shall instruct producers about waste storage and placement for collection at the scheduled time and about mechanisms for producers to address incomplete performance or other complaints.

##### **4.2.1.2 Registration, permit, Taxes and tariff**

- ❖ The franchisee shall provide to the City Council proof of payment of roads taxes for each vehicle, proof of vehicle registration and insurance, proof of vehicle road-worthiness and adequacy of emissions control, proof of franchisee



registration and payment of income taxes each year, and proof of holding any essential permits in intervals of 12 months from the commencement date of the agreement. The vehicles and equipments shall be resisted and operated under the applicable law.

- ❖ The franchisee shall collect tariffs at rates and date indicated in the signed contract not higher or less than those fixed.

#### 4.2.1.3 Disposal and transfer facilities

- ❖ The franchisee shall at all times properly discharge solid wastes only to official transfer and disposal facilities. Residents and franchisee shall all the times supervise to ensure that unauthorized dumping does not occur. No dumping of solid waste shall be made to drains, sewers, open lands, quarries, rivers, channels, swamps of other locations not officially designated.

#### 4.2.1.4 Personnel wages

- ❖ The franchisee agrees to pay all persons, regardless of race, sex, creed, colour, religion, tribe, ethnic background, or nationality, the prevailing wage for the job classification and level of effort. The franchisee shall comply with the applicable minimum wage regulation.

- ❖ The franchise shall require its employees to be courteous at all times to work quietly and not to use loud or profane language. Each employee shall wear clothing which is as neat and clean as circumstances permit.
- ❖ The franchisee's employees shall not trespass or loiter on private property which does not or should not concern them. Each employee assigned to drive a vehicle shall at all times carry a valid driver's license for the type of vehicle which he/she is driving.

#### 4.2.1.5 Employees identification

- ❖ The franchisee shall provide all franchisee's employees with identification cards, with their name, photo and identification number and require them to carry the said identification cards at all times during their duties. When requested to do so by any of Local Government's Police or the Generator's the franchisee employee shall submit their identification cards for inspection.
- ❖ The franchisee shall in consultation with City Council, provide readily recognizable, brightly colored, shirts (or vests) and trousers (overall) of a single design and color to all its workers, to be worn at all times when performing services, so that they can be readily recognized. Uniforms shall be replaced as they become worn or damaged.
- ❖ The franchisee shall provide protective shoes, nose hoses and gloves to all workers, for use at all times during the performance of services.



#### **4.2.1.6 Vehicle identification**

- ❖ The franchisee shall paint all vehicles and other equipment in the same color as the uniforms provided to the workers and shall provide each vehicle with a readily visible identification number painted on the sides, front and back of the vehicle.

#### **4.2.1.7 Receipt of complaints**

- ❖ The franchise shall establish and operate a complaint public liaison office within a telephone line for receipt of complaints and public comments. The said office shall have at least one responsible person in charge and present during collection hours and shall be open during all the collection hours.

#### **4.2.1.8 Settlement of dispute**

- ❖ The parties to the agreement shall use their best endeavors to settle amicably any disputes that may arise between them. If the parties are unable to settle the dispute amicably, they shall go into arbitration. They shall agree upon and appoint a single arbitrator to hear and determine the dispute. If the parties cannot agree upon an arbitrator, either of them may apply to the Courts for the appointment of such arbitrator. The decision of the arbitrator shall be final and binding on the parties and either party may apply to the Courts for enforcement of the decision.

## 4.3 Mode of management

### 4.3.1 Level of service and role of private sector

House-to-house collection is the only type of solid waste collection practiced by the private companies in Kigali City of Rwanda. In this system, the collection crew enters each premise, takes out the container and sets it back after emptying the waste into collection vehicle.

The house-to-house collection has gain popularity because labour cost for collection can be minimized. It facilitates maximum household separation and avoids low participation behaviors, because greater control is exercised.

Therefore, in practice, it is almost impossible not to collaborate in household separation even though this was not practiced because of the high level of education in Kigali City. Source separation can be easily implemented. The companies franchise system includes collection, treatment, recycle and disposal of residues. In addition, they provide others service to get extra income (Table 4.1).



**Table 4.1: Organizational arrangements of Companies**

Company	Intervention domains	Mission	Recycled products	Number of company employee	Number of registered users
COPED	-Environmental -Health -Development	Hygienic waste management for good Sanitation	-Manure compost -Recycling and Incineration Unit production Project -Combustibles bricks	108	11,800
AMIZERO	-Environmental -Health -Development	Against environmental deterioration Hygiene and Landscape	-Combustibles bricks -Compost bio-fertilizer	83	5,300
COOCEN	-Environmental -Health -Development	A healthy for Environment for Sustainable Development Sanitation	-Plastics Recycling Project -Compost Development Activities -Combustibles bricks	113	7,900
SAMU	-Environmental -Health -Development	-Public Hygiene -Against Environmental Pollution and Sanitation promotion	-Manure compost fertilizer -Recycling Project -Combustibles bricks	78	3,700

#### **4.4 Quality of collection services**

For services, the assessment of quality is made during the service delivery process. Each customer contact is referred to as a moment of truth, an opportunity to satisfy or dissatisfy the customer. Customer satisfaction with a service can be defined by comparing perceptions of service received with expectations of service desired. When expectations are exceeded, service is perceived to be of exceptional quality, and also to be a pleasant surprise. When expectations are not met, however, service quality is deemed unacceptable. When expectations are confirmed by perceived service, quality is satisfactory.

##### **4.4.1 Quality satisfaction on waste services collection**

The variables used to measure quality of service are frequency, sanitary conditions at bin/container site and spill-over of waste, cleanliness of surroundings, neatness of waste collection crew, neatness of waste collection vehicles, quick response to residents' complaints and behavior/attitude of collection crew towards residents. These variables were rated very poor (1), poor (2), fair (3), good (4) and very good (5). The quality of service being provided by private companies can very well be adjudged by the beneficiaries of the service.



The total score for the ratings of the quality of service was calculated using the equation below:

$$\text{Score} = \frac{(1*n_1)+(2*n_2)+(3*n_3)+(4*n_4)+(5*n_5)}{(5*N)} * 100$$

N= Total sample size

$n_1$  = Number of people who responded for very poor

$n_2$  = Number of people who responded for poor

$n_3$  = Number of people who responded for fair

$n_4$  = Number of people who responded for good

$n_5$  = Number of people who responded for very good

The quality of service according to the formula used ranged from AMIZERO (69%) to COPED (74%), which indicate a high quality service. The reason is the competition among the private companies, the House to House collection system, a Franchise system which was directly between the private waste collectors and the residents. In addition the residents were found to be well educated (Figure 4.3) and this might have facilitated, their understanding of the importance of solid waste collection.

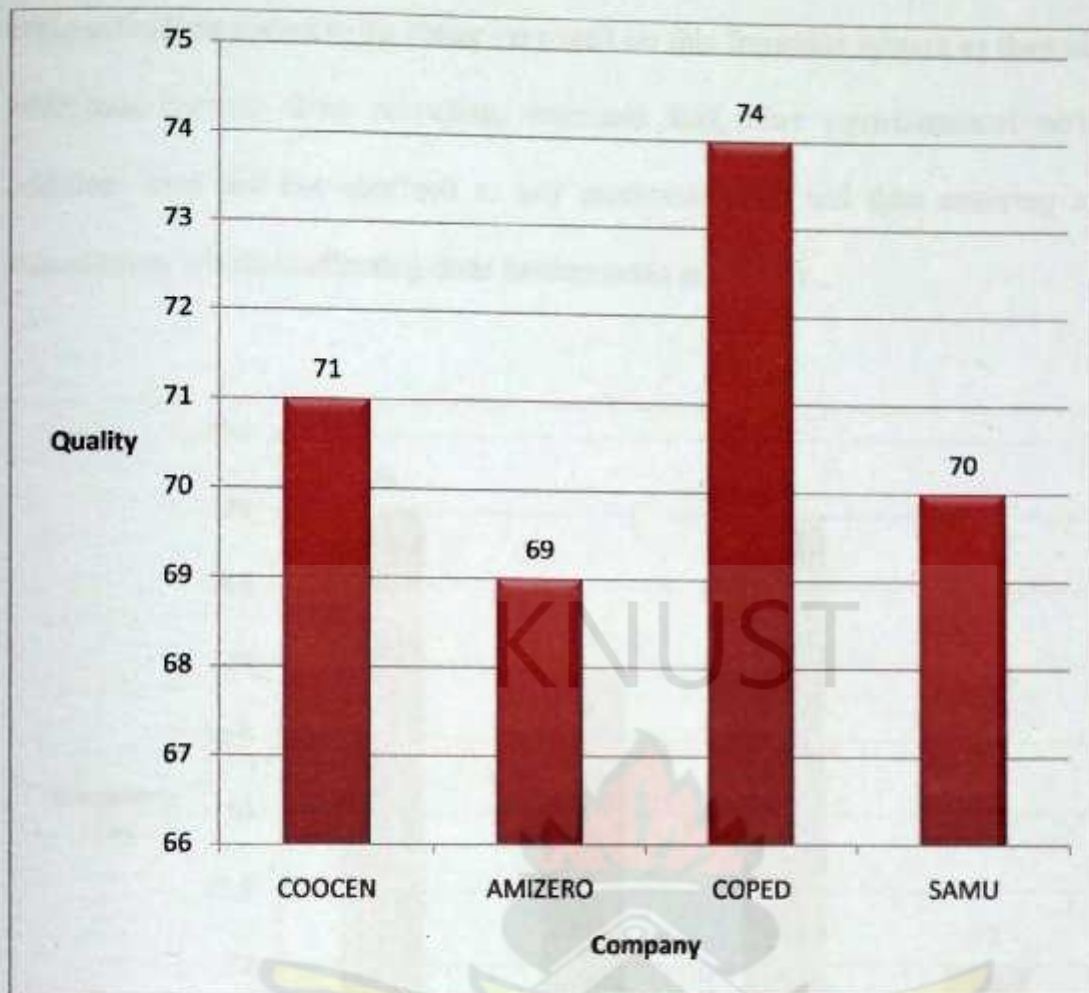


Figure 4.4: Residents assessment on service quality

#### 4.4.2 Frequency of waste services collection

One of the key parameters of solid waste collection is the frequency and ability to follow the frequency rate. In many developing countries the frequency is often not adhered to leading to poor sanitary conditions in many cities. In this study residents rated the performance for frequency of waste collection as good. The collective scores in percentages as depicted by figure 4.5 showed a range of 72-75%. This is a confirmation that the companies are doing well in removing solid from the city. The



companies here seems to be doing very well on this franchise system as they also make additional income from recycling, treatment and other environmental services. In addition, they are not confined to any particular zone and thus ensuring a healthy competition which is affecting their performance positively.

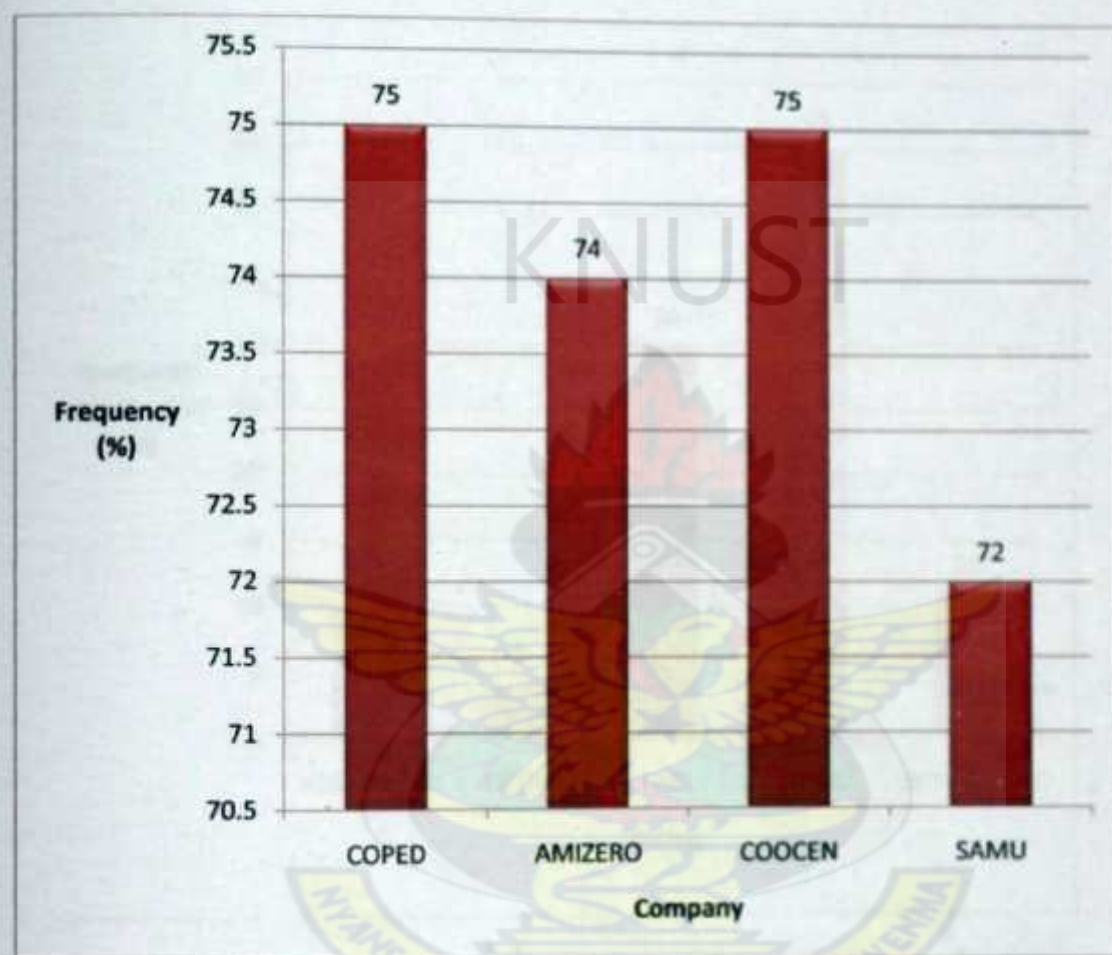


Figure 4.5 Frequency of waste services collection rendered by companies

#### 4.4.3 Mode of waste services collection satisfaction

The mode of solid waste collection services being provided in Kigali-Rwanda is only house-to-house. House-to-house collection is a system of collection of domestic waste

where a collection crew assists the producers by bringing the collection vehicle closer to the point of generation. The producers place the bins (containing the waste) outside their house on specific days of the week for collection. This service is rendered to residents in high, middle and low income areas.

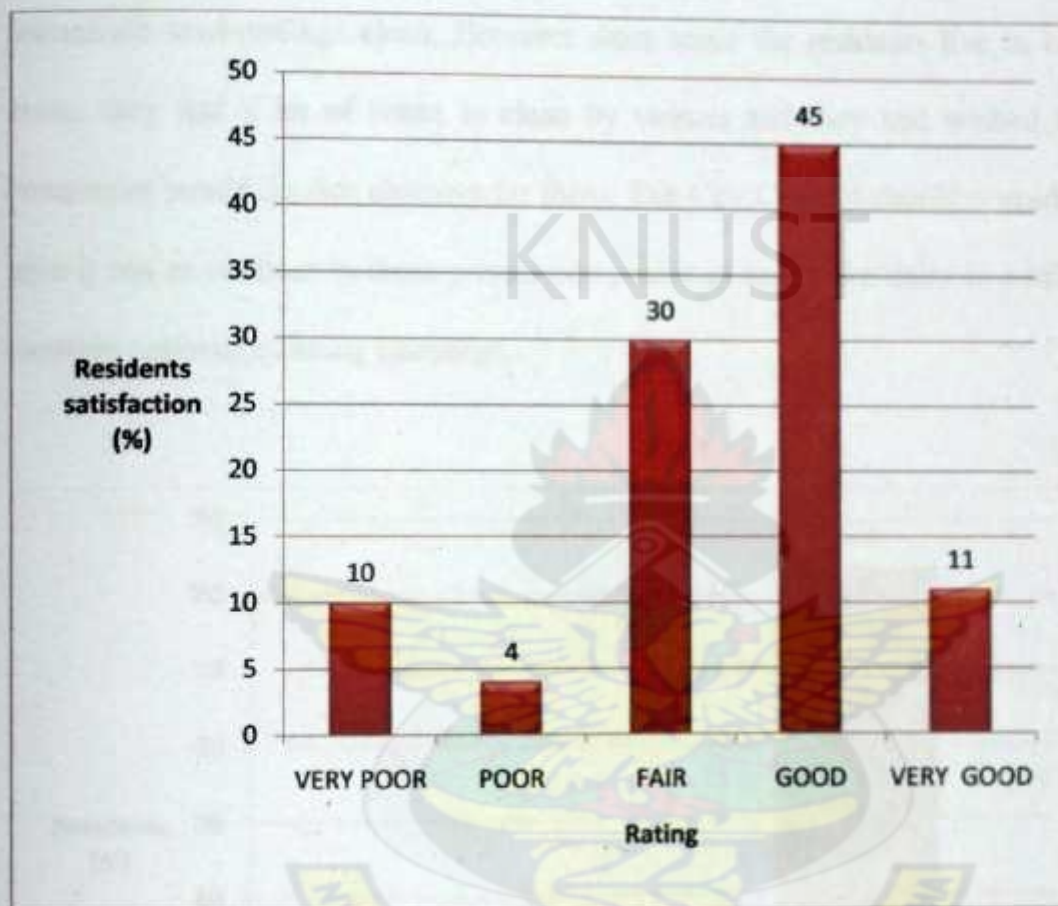


Figure 4.6: House-to-house waste services collection

#### 4.4.4 Waste services collection satisfaction

Figure 4.7 combines all the variables defining service satisfaction. These variables included quality of service, frequency of waste collection and public satisfaction of the house-to-house mode of waste collection. From the results 83.6% of the respondents



were satisfied with the general waste collection services with only 16.4% not really satisfied. The percentage of respondents who were not satisfied was mostly at public commercial places where a lot of waste are generated and left on the ground by both sellers and buyers. This situation could therefore be attributed purely to attitudinal problem of the people. In Kigali City of Rwanda residents are mandated to keep their immediate surroundings clean. However since some the residents live in commercial areas, they had a lot of waste to clean by visitors and they had wished the private companies would do that cleaning for them. The City Council should consider this and give it out as contract to these private companies to undertake daily in addition to the monthly national cleaning campaign.

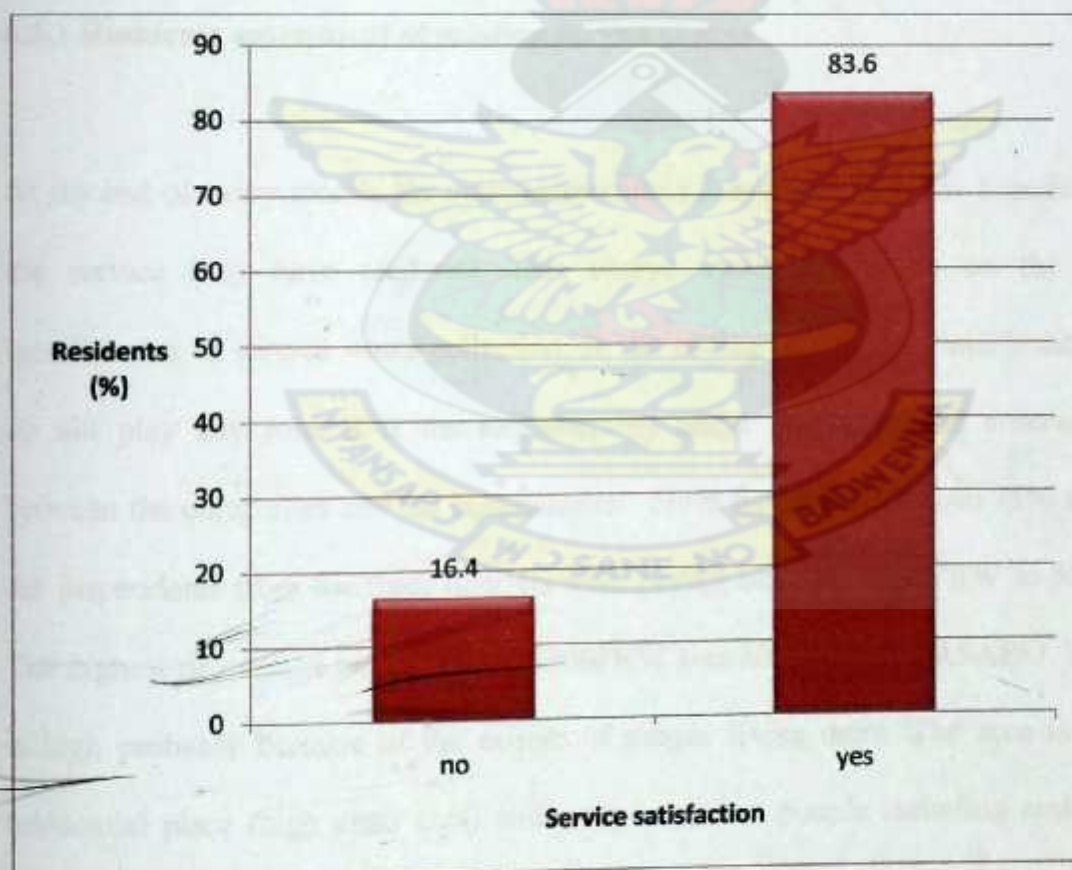


Figure 4.7: Residents Service satisfaction



## 4.5 Characteristics of user charges

It is defined as ability or means by which the companies are able to recover their cost and make profit. The companies get their revenue from the residents at the end of each month. This is because the residents have signed the contract with the companies to collect waste from their houses. With the collaboration of Rwanda Standard Board the private companies set the tariffs so as to ensure that their interest of making profit can be served while they provide the service. The house-to-house service charges are based on the level of income of the beneficiaries. There are three levels of income: first class (high), second class (middle) and third class (low).

### 4.5.1 Residents assessment of existing service charge

At the end of every month, the companies collect the money from the beneficiaries for the service they have rendered. This charge varies depending on the class of beneficiaries of service waste collection. In the setting of user fees/tariffs the Districts do not play any role, it is the responsibility under the agreement contract signed between the companies and the beneficiaries. From figure 4.8 between 75% to 95% of the respondents from the three districts were paying between 1500FRW to 5000FRW. The highest percentage paying above 5000FRW was 20.7% from GASABO. This tariff is high probably because of the calibre of people living there. The area is a highly residential place (high class area) with very important people including ambassadors, ministers and rich businessmen among others. It could also be inferred from the graph



that none of the respondents from NYARUGENGE was paying below 1000FRW. This could be attributed to the fact the district is a commercial area where a high amount of waste is generated and hence the comparatively higher tariffs.

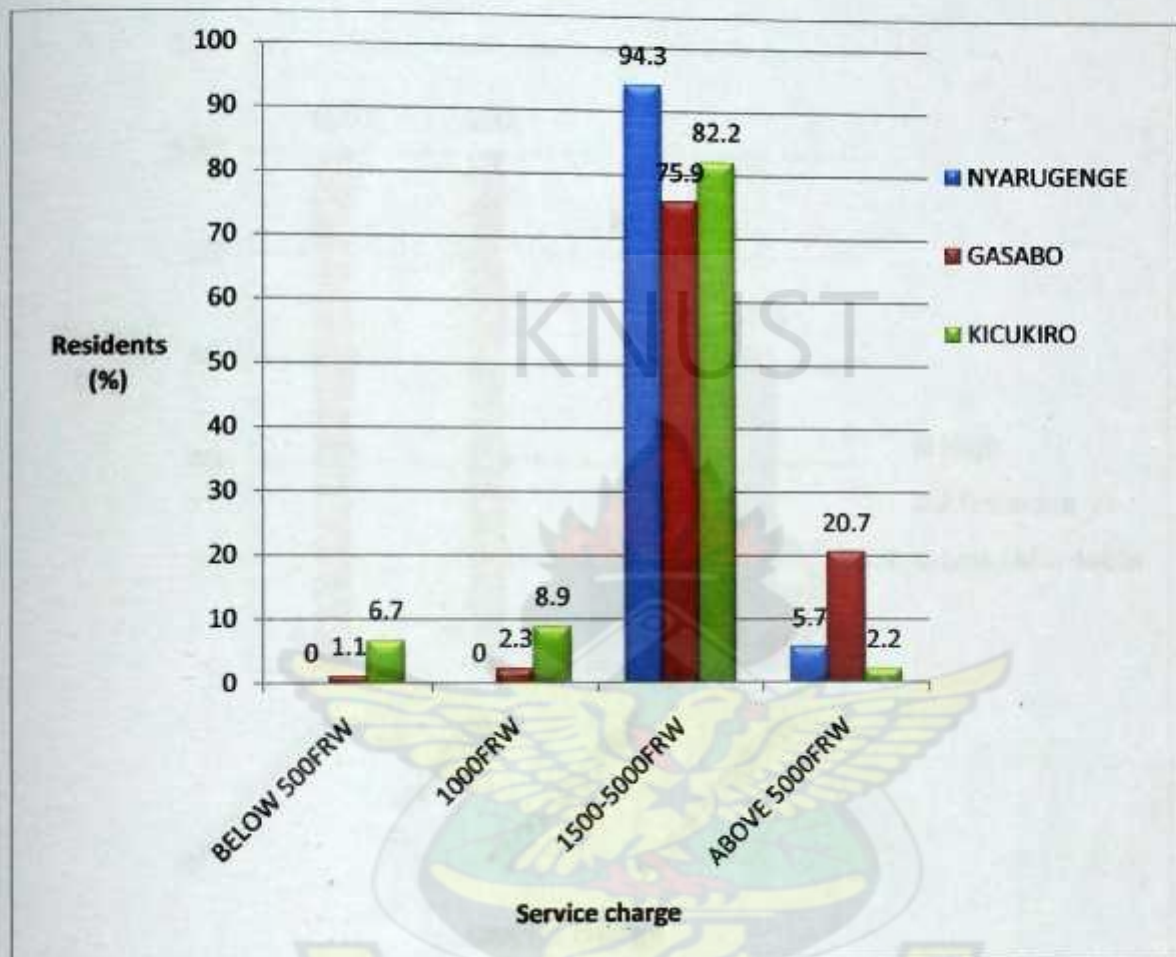


Figure 4.8: Existing service charge

#### 4.5.2 Residents assessment of existing rating service charge

Generally 500-1500Frw was reasonable to respondents. Even between 1500-5000Frw, 80.6% considered it as moderate. This shows the willingness of people to pay for the services at those range charges. How other service charges above 5000Frw were

considered too high (62.5%). The operators should consider the service charge and reduce it. More studies should be done on the cost benefit analysis of the private companies in relation to their charges because of the complaints.

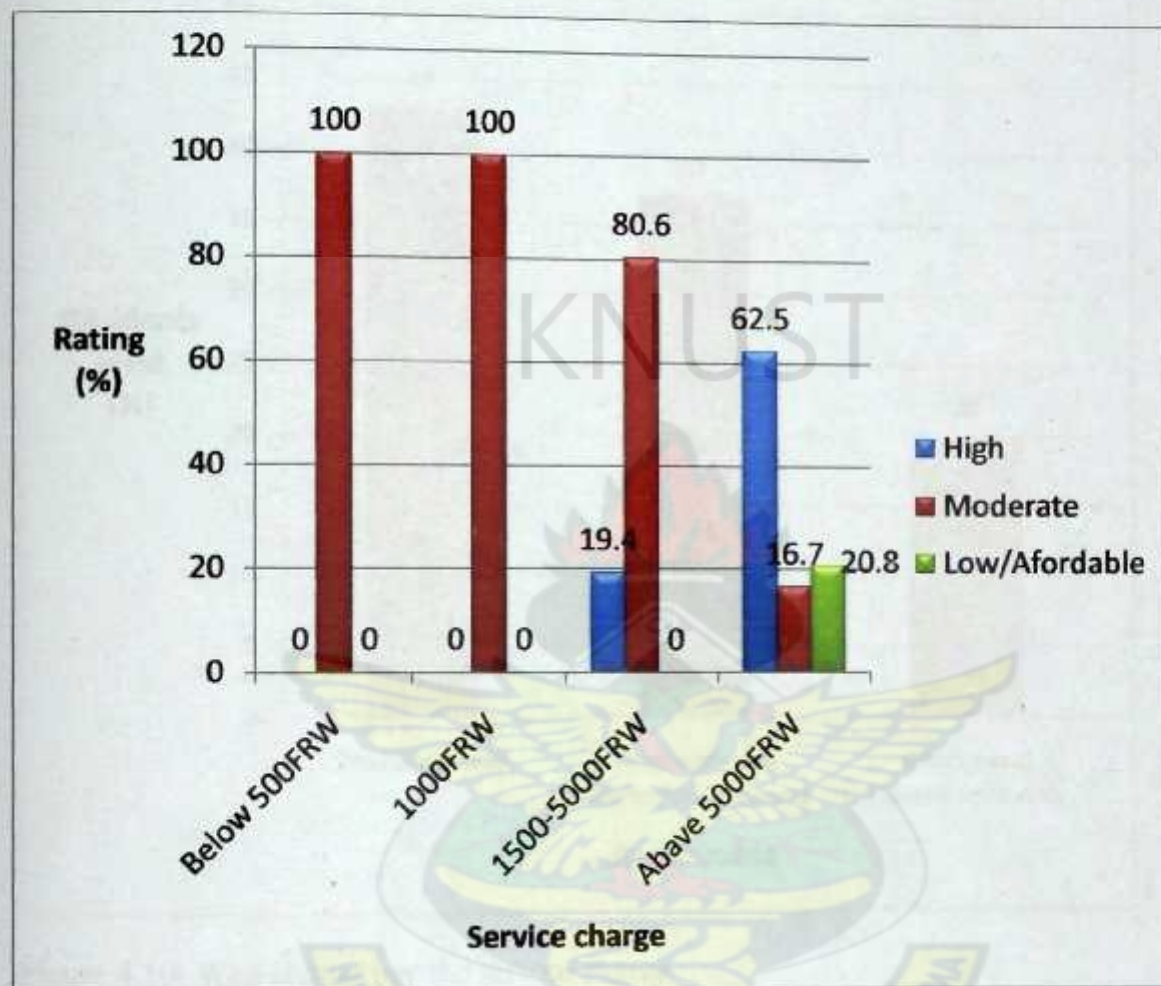


Figure 4.9: Rating of existing service charge

#### 4.5.3 Assessment of residents on who should pay the service charge

Most of the residents (79.5%) agreed that they should also be responsible for the service charge. 42.7% agreed that only producers should pay the service charge. The rest wanted the Government alone to take off all the waste generated. The Government



should assist in terms of cleaning the commercial and public areas. More educational campaigns to the public on the effects of poor sanitation should be done.

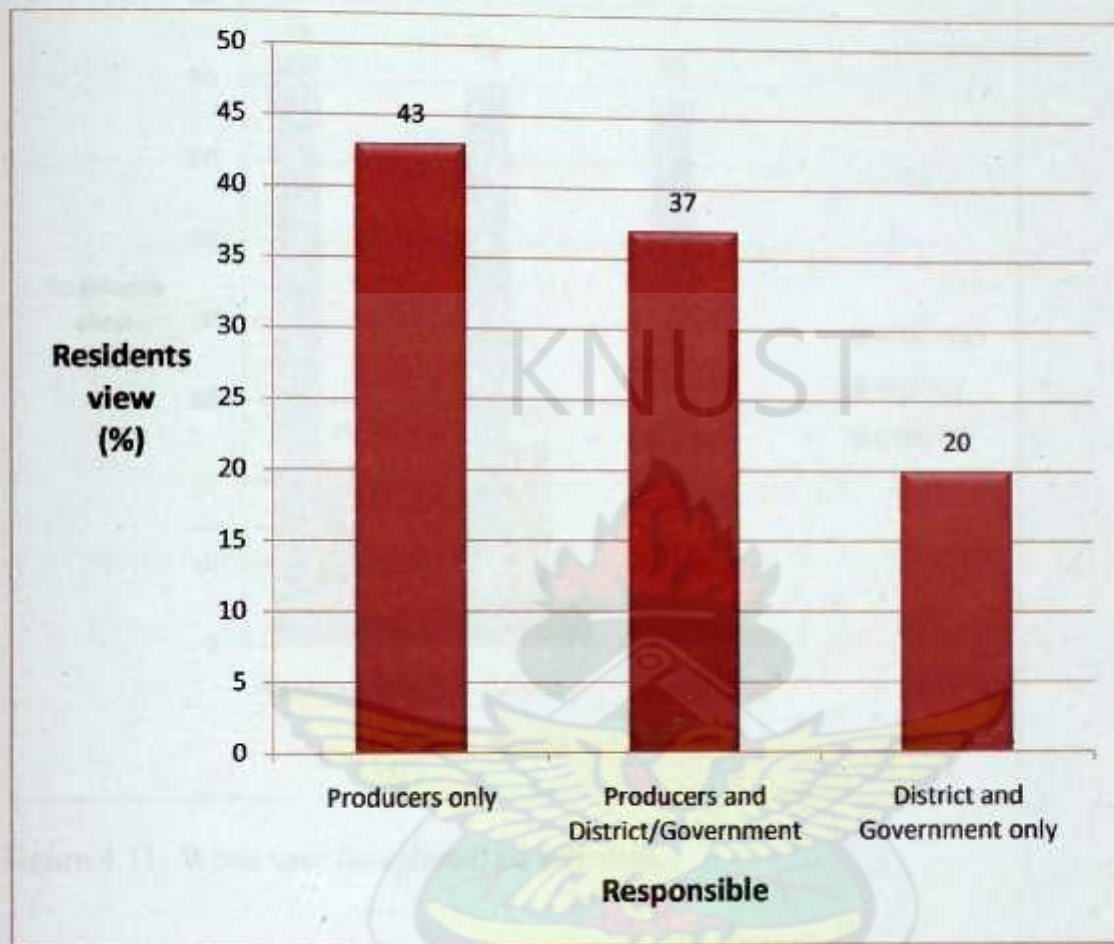


Figure 4.10: Who should pay the service charge

#### 4.5.4 Residents views on when user fees should be collected

Residents were asked to indicate when they wanted their user fees to be collected and from the results obtained as shown in the figure 4.11 below; it can be seen that all the respondents from the three districts indicated that most of the residents (71%) prefer monthly collection user fees. This is because most of the residents employed in the

private sector or public, receives their salary monthly, thus were more comfortable with the monthly collection of service charges.

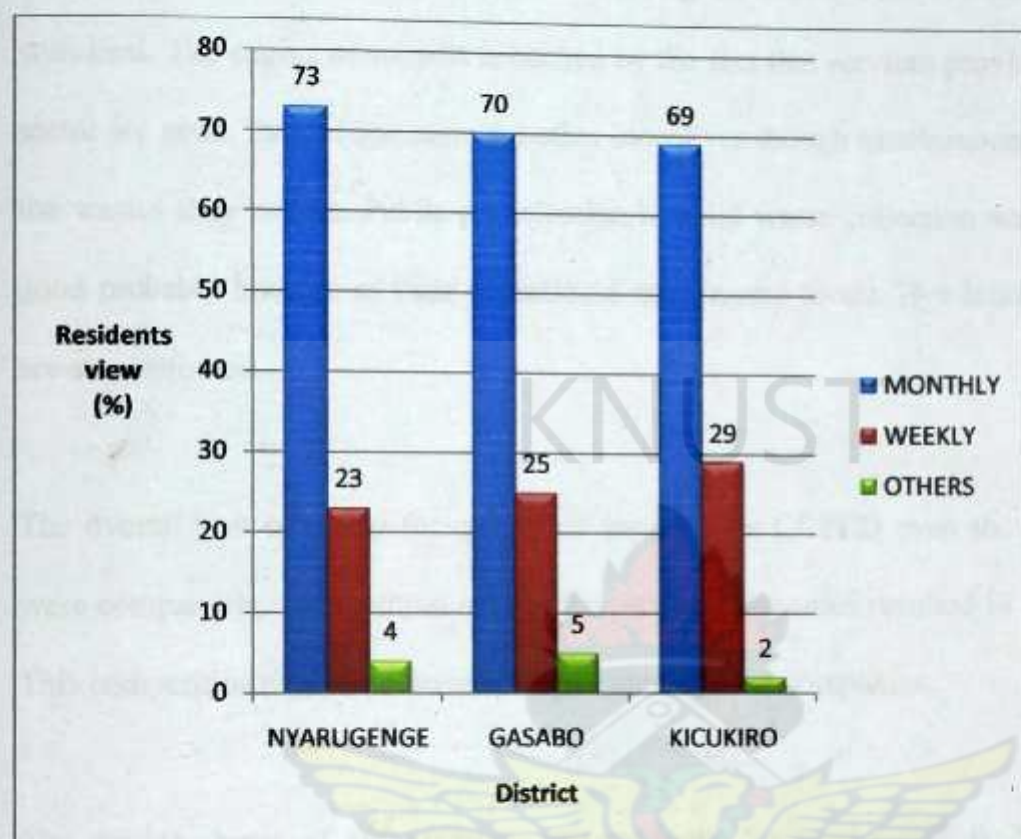


Figure 4.11: When user fees should be collected



## 5.0 CONCLUSION AND RECOMMENDATIONS

The franchise system of waste collection in Kigali City seems to work and must be sustained. The engine of support is backed by the fact that services provided by private sector are good. Private operators get other incentives though treatment and recycling of the wastes they collect. Public participation in solid waste collection was found to be good probably because of their educational and income levels. Bye laws on sanitation are also enforced.

The overall best company for quality of service was COPED even though the others were comparable. Competition among the private companies resulted in good service. This competition should be sustained by rewarding best companies.

The service charge of 500-5000Frw was moderate for most residents. Service charge above 5000Frw is too high and the standard should review this and make recommendation. More studies on the cost benefit analysis of the companies should be carried as a major in the review process. The monthly collection of service charge was found to be suitable and should be maintained.

Districts should be well ~~equipped~~ so that they can intensify their supervisory role in order to improve the quality of service rendered by the private companies.

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## APPENDIX

### RESIDENTS' SURVEY QUESTIONNAIRE

#### I. Residents' Assessment of Solid Waste Management Services

##### 1. Household Characteristics

- 1.1 District.....
- 1.2 Respondent Age-..... Sex: M/F.....
- 1.3 Is respondent household head? ☐ Yes ...☐ no.....
- 1.4 Educational level of Respondent: a) none b) Basic c) Secondary/tech. d) University
- 1.5 Occupation of the household head (s)  
(1) Unemployed (2) Trading (3) Government employee/Retired (4) Self-employed  
(5) Agriculture/farming (6) others, specify.....
- 1.6 How many households/families are in the house?.....
- 1.7 How many are you in the house (population of all households)?.....
- 1.8 Type of house: a) Compound b) single semi detach or flat c) 2 storey block d) 3 or 4 storey block
- 1.9 Do you rent the house? Yes..... No..... Rent per month..... Is the House walled with access road in front? Yes.....no.....

##### 2. Solid waste service characteristics

- 2.1 Where do you empty or dispose your waste? (Give name of collecting organisation.....)
- a. House-to house collection.....
- b. Communal collection (a skip container in the neighbourhood).....
- c. An open dump (waste is collected regularly).....
- d. An open dump (waste is not collected).....



2.2 How often the vehicle does come for collection?

a) every day, b) every 2days c) every 3 days d) once a week

2.3 Does the waste in container overflows before container is collected? ☐ Yes ☐ no

2.4 How will you rate the effectiveness and quality of waste collection service in the city?

Use these Scales (1) very poor (2) poor (3) fair (4) good (5) very good

	1	2	3	4	5
The level of quality of collection service by the company		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Frequency of waste collection and reliability of waste collection		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sanitary conditions at bin/container site and spill-over of waste		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
cleanliness of surroundings (rating of 5 for no littering)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Neatness of waste collection crew, wearing of protective clothing		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Neatness of waste collection vehicles		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Quick response to residents' complaints		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Behaviour/attitude of collection crew towards residents		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sanitary conditions of drains in the area		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2.5 Are you happy or satisfy about the quality of collection service? ☐ Yes ☐ no

Why?.....

2.6 How do you assess the effects of the following?

Use these Scales (1) high negative effect (2) negative effect (3) no effect (4) positive effect (5) high positive effect

	1	2	3	4	5
Impact of waste uncollected on human health,		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Impact of waste uncollected in the neighbourhood on aesthetics		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Impact of offensive odour in the neighbourhood on health,		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Impact of choke drains with waste/breeding of mosquitoes		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2.7 What should Assembly do to prevent wastes being dumped in drains and other unauthorized places?.....



2.8 What occasional illness in your house do you associate with the sanitation conditions in your area?.....

### 3 Payment of user fees and cost recovery

3.1 It cost Assembly more money (say over one 1,000Frw a month) for waste collection and disposal. Who in your opinion should pay for the waste collection services?

☐Producers only ☐Producers and Assembly/government ☐Government and Assembly

1.2 Do you pay for the collection service? ☐Yes ☐no

1.3 If yes, how much do you pay per month?

a) For communal collection, 100Frw, 500Frw, 750Frw others specify.....

b) For House-to-house collection, 1000Frw, 1500Frw, 2000Frw others specify

1.4 If yes, how do you rate the existing tariff? a) High b) Moderate, c) Low / affordable

1.5 If you are not paying now, would you be willing to pay for the service?

☐YES ☐NO

1.6 How much are you willing to pay per month in Frw per Household to improve the service?

a) For communal collection, 1000Frw, 1500Frw, 2000Frw others specify.....

b) For House-to-house collection, 2000Frw, 2500Frw, 3000Frw others specify.....

1.7 How do you want the user fee to be collected?

a) Weekly, b) monthly, c) yearly, d) others specify.....

1.8 If a standard bin is given to you for House-to-house collection would you like to pay for

☐The cost spread over some months (6 to 12 instalments)?

☐ Single payment of the cost of bin?

1.9 What is your total household income per month?.....(estimate)

Who contributes to households' income? .....

What is your monthly Expenses on: a. Food...b. Clothing... c. Housing (rent)...

d. Transport...e. Electricity...f. Education per term...g. Water...h. Health....i. Others ...



## II. Public & Private Companies Questionnaire

### 1. solid waste service characteristics and Performance

Variable name (label)	Values (values to be entered)	measure
1.1 Company name		(nominal)
1.2 City		(nominal)
1.3 Type of collection service	1 Only house-to-house 2 Only communal collection 3 Both house-to-house and communal collection	nominal
1.4 Provision of standard bins for house-to-house	1 Company 2 Assembly 3 residents	(nominal)
1.5 HtH Collection frequency per week		(scale)
1.6 No. of communal containers		
1.7 No. of company owned communal containers		
1.8 No. of company owned collection vehicles		
1.9 No. of collection vehicles on road		
1.10 Total number of vehicles		
1.11 Number of Compactor		
1.12 Number of Skip truck		
1.13 Number of Roll-on-truck		
1.14 Number of Side loader		



1.16	Number of Tractor		
1.17	Other type of vehicles		
1.18	Number of collection crew including driver for Compactor vehicle		(scale)
1.19	Number of collection crew including driver for Skip vehicle, Roll-on Vehicle, Side loader, Tractor, Tipper truck		
1.20	Vehicle productivity		
1.21	Worker productivity		
1.22	Overall productivity		
1.23	Vehicle utilization		
1.24	Actual output (ton/day)		
1.25	Resident satisfaction about the quality of service	1 Yes .... No.....	nominal

#### 1.26 Appreciation of effectiveness and quality of waste collection service.

How will you rate the effectiveness and quality of waste collection service?

Use these Scales (1) very poor (2) poor (3) fair (4) good (5) very good

Frequency of waste collection and reliability of waste collection	1	2	3	4	5
Sanitary conditions at bin/container site and spill-over of waste	1	2	3	4	5
cleanliness of surroundings (rating of 5 for no littering)	1	2	3	4	5
Neatness of waste collection crew, wearing of protective clothing	1	2	3	4	5
Neatness of waste collection vehicles	1	2	3	4	5
Quick response to residents' complaints	1	2	3	4	5
Behaviour/attitude of collection crew towards residents	1	2	3	4	5
Sanitary conditions of drains in the area	1	2	3	4	5

Total score .....



## 2 Company's capacity, technical operations and resources management

### 2.1 Vehicle operations planning ((scale)

2.2 Rated using scales of (1) strongly disagree (2) disagree (3) cannot tell (4) agree (5) strongly agree

- |  |   |   |   |   |   |
|--|---|---|---|---|---|
| a) Supervisor has prepared vehicle route plan for drivers            | 1 | 2 | 3 | 4 | 5 |
| b) Waste pick-up schedules are prepared and strictly followed        | 1 | 2 | 3 | 4 | 5 |
| c) Drivers use their own discretion about which route to take        | 1 | 2 | 3 | 4 | 5 |
| d) Vehicles follow specific routes for solid waste collection        | 1 | 2 | 3 | 4 | 5 |
| e) External experts are hire on part-time to plan vehicle operations | 1 | 2 | 3 | 4 | 5 |

Total score for vehicle operations planning: .....

2.3 Number of operations supervisors... (Scale).....

2.4 Number of vehicles per supervisor... (Scale).....

### 2.5 Vehicle operations supervision

2.6 Rated using scales of (1) strongly disagree (2) disagree (3) cannot tell (4) agree (5) strongly agree

- |   |   |   |   |   |   |
|---|---|---|---|---|---|
| f) Technical personnel has ability to supervise operation       | 1 | 2 | 3 | 4 | 5 |
| g) Top Management is capable of managing the vehicle operations | 1 | 2 | 3 | 4 | 5 |

Total score for vehicle supervision: .....

### 2.7 Mode of vehicle supervision

How is vehicle operations supervised? (Nominal)

1. Field monitoring 2. other

### 2.8 Worker motivation

Rated using scales of (1) strongly disagree (2) disagree (3) cannot tell (4) agree (5) strongly agree

- |  |   |   |   |   |   |
|--|---|---|---|---|---|
| h) The moral of the employees is high due to fair labour practices | 1 | 2 | 3 | 4 | 5 |
| i) The drivers and collection crew put on protective clothing      | 1 | 2 | 3 | 4 | 5 |

Total score for worker motivation: .....

### 2.9 Waste spill over at Communal Container(CC) locations (nominal)

Reasons for waste spill over at communal container (CC) locations (nominal)

1. Inadequate container— 2. Delays in pickup, 3. Others



## 2.10 Cooperation of residents served by HtH

How would you judge the cooperation of residents served by house-to-house service?

1 Very poor 2 poor 3 fair 4 good 5 very good

## 2.11 Residents complaints (Nominal)

What complaints are often received from service beneficiaries or collection crew?

(Nominal) 1. Spill over of waste 2. Non collection of waste 3.others.....

## 2.12 In-house repairs

Where vehicles are repaired? 1. In-house vehicle workshop 2. Workshop elsewhere

## 2.13 Number of mechanics for in-house repairs.....

## 2.14 Number of vehicles per mechanic.....

## 2.15 Vehicle maintenance schedules available

Rated using scales of (1) strongly disagree (2) disagree (3) cannot tell (4) agree (5) strongly agree

## 2.16 Vehicle conditions

Rated using scales of (1) strongly disagree (2) disagree (3) cannot tell (4) agree (5) strongly agree

j) The breakdowns of vehicles depend on the 'make' and 'age' 1 2 3 4 5

k) The higher the age of a vehicle the more breakdowns occur 1 2 3 4 5

Total score for conditions of vehicles: .....

## 2.17 Approximate distance between the service area and the disposal site (scale).....

## 2.18 Condition of road (ordinal)

Rating of the condition of road used for waste collection (ordinal)

1 Very poor 2 poor 3 fair 4 good 5 very good

## 2.19 Nature of traffic conditions (ordinal)

Rating of the nature of traffic conditions along collection routes (ordinal)

1. Low congestion 2. Moderate congestion 3 high congestion

## 2.20 Type of company (nominal)

1. Not registered 2. Limited liabilities by share 3. Partnership

4. Sole proprietor 5.-Limited liabilities by guarantee (NGO)



- 2.21 Year of company registration. (Scale).....
- 2.22 Year of commencement of solid waste services (Scale).....
- 2.23 Management levels (scale).....
- 2.24 Size of the company classified (ordinal):

1. Small scale 2. Medium scale 3. Large scale

- 2.25 Quality of employees (using average salary)..... (Scale) .....
- 2.26 Number of company employee (scale).....
- 2.27 Workers motivation

How are the workers motivated? Nominal

1. Company sponsor employees to undergo short training 2. None training.

### 3. Public-Private Partnership Organisational Arrangements

#### House-to-house service

- a. Type of user fee for HtH service (nominal)

How is user fee charged for house-to-house service? (Nominal)

1 Fee per household 2 fee per house 3 fee per bin 4 fee per volume of waste

- b. User fee charged

Average user fee for all house-to-house service users: (average fee .....)

- c. Total number of registered HtH users

What is the total number of registered house-to-house users? (Scale).....

- d. Number of HtH users who pay regularly

What is the number of house-to-house users/beneficiaries who pay regularly?

(Scale).....

- e. Period allowed for arrears (months)

How many months are defaulters of fee payment allowed to be in arrears? (Scale).....

- f. Sanctions for defaulting HtH fees payment

What sanctions are applied to defaulters of house-to-house service fees payment nominal? 1. Stopped serving 2. No sanction taken 3. Others

- g. Reasons for defaulting payment of user fee for HtH

What factors contribute to the defaulting in paying user fee for house-to-house service?

(Nominal) 1. Low income of people 2. Unreliable service 3. Others

### Communal service

h. Total number of users

How many people are served by communal collection service? (Scale).....

i. Payment of fee by communal users

Do you charge user fee for communal service users? Nominal 1. Yes 2. No

j. Fee being paid for communal (scale).....

k. Reason for not paying communal user fee

Why are communal service users not paying user fee. Nominal.....

1. Low income of people 2. Unreliable service 3 others

### Type of Contract

What type of contract(s) are you operating under?

1. No contract 2. Franchise contract 3. Service contract 4. Performance contract  
5. Other

l. How was the franchise contract procured?

1. No bidding 2. Open competition bidding 3. other, specify.....

m. How was the communal service contract procured?

1 No bidding 2. Open competition bidding 3. Other

### Contractual agreements

n. the house-to-house contract is signed with 1 the Assembly 2 the residents

o. house-to-house service users registered with 1 the Assembly 2 the company

p. HtH contractual agreement



1 Contract signed    2 contract not signed

q. CC contractual agreement

1 Contract signed    2 contract not signed

r. Does the contract have price adjustment formula and cost escalation indices which are tied to the rate of inflation, fuel, labour or consumer price index? 1. yes    2. none.....

### Assembly's Contractual obligations

s. Opinion about the Assembly's adherence to obligations under the contract

Rated using (1) strongly disagree (2) disagree (3) cannot tell (4) agree (5) strongly agree

Assembly provides designated and accessible landfill site	1	2	3	4	5
Assembly provides designated and accessible communal container site	1	2	3	4	5
Assembly provides communal containers (23, 12 and 10m <sup>3</sup> )	1	2	3	4	5
Assembly provides standard bins for house-to-house service	1	2	3	4	5
Assembly promulgates bye-law to assist contractor in the service	1	2	3	4	5
Assembly conducts public education regularly	1	2	3	4	5
Assembly pays contractor within 45 working days after date of claim	1	2	3	4	5
Assembly pays interest charges as stipulated in the contract if payment delayed beyond 3 months	1	2	3	4	5

Total score honouring of Assembly's obligations: .....

t. Is there any political interference in the day-to-day management and operations of vehicles? 1. Yes 2. none

### Company's obligations

u. What is your opinion about honouring of company's obligations under the contract?

Use these Scales (1) strongly disagree (2) disagree (3) cannot tell (4) agree (5) strongly agree

Company provides trucks sufficient for solid waste collection	1	2	3	4	5
Company achieves daily collection target in the contract	1	2	3	4	5
Company disposes off waste at designated landfill	1	2	3	4	5
Company uses professional and technical personnel required	1	2	3	4	5
Company keeps complaints of residents/users	1	2	3	4	5
Company collection crew uses protective clothing	1	2	3	4	5
Company covers waste containers during transporting	1	2	3	4	5
Company keeps vehicles in good appearance/sanitary condition and road worthy,	1	2	3	4	5
Company carries out regular repair and maintenance of containers	1	2	3	4	5
Company maintain container site free of litters and clean	1	2	3	4	5
Total score for honouring of company's obligations: .....					

