

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF CIVIL AND GEOMATIC ENGINEERING

DEPARTMENT OF CIVIL ENGINEERING

**PERCEPTION OF RESIDENTS ON SOLID WASTE SERVICE PROVISION
IN SELECTED CITIES IN GHANA**

By

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**PERCEPTION OF RESIDENTS ON SOLID WASTE SERVICE
PROVISION IN SELECTED CITIES IN GHANA**

Prince Osei Bonsu

MSc. Thesis February 2009

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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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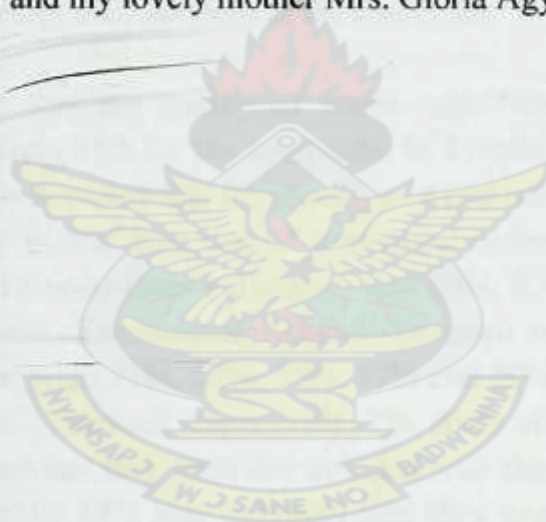
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DEDICATION

I dedicate this work to the Almighty God
and my lovely mother Mrs. Gloria Agyemang



ABSTRACT

The study assessed and compared residents' perception on the quality of solid waste service provision, cost recovery arrangements and waste minimisation practices in five selected cities in Ghana: Kumasi, Accra, Tema, Tamale and Sekondi-Takoradi. Residents' survey questionnaires of total sample size 1260 questionnaires from the cities were used for this study. The survey was conducted in the localities where the service providers render their services in the five cities.

The study revealed that the quality of waste collection service, as perceived by residents, was relatively high for the companies in Tamale than those in the other four cities. The study also revealed that the quality of waste collection service for Door-to-Door was relatively higher than that of communal collection across the five cities. Service quality for Door-to-Door collection were 63%, 65%, 60%, 79% and 63% for Kumasi, Accra, Tema, Tamale and Sekondi-Takoradi respectively, whiles that of communal collection were 51%, 53%, 55%, 57% and 50% for Kumasi, Accra, Tema, Tamale and Sekondi -Takoradi respectively. The study also revealed that 51% of the respondents indicated that they were not satisfied with the quality of service rendered by the companies while 49% also indicated that they were satisfied with the quality across the five cities.

Results of willingness-to-pay more, revealed that 36% of the respondents who were served with Door-to-Door collection services across the five cities indicated that they want the existing user charges to be maintained while 59% also indicated that they were willing to pay more for improved service. Interestingly only 4.7% of the respondents across the five cities indicated that they wanted to pay lower than what they are currently paying for Door-to-Door collection service. For respondents residing in localities where communal collection was practiced, their willingness to pay for improved services were 98%, 50%, 71.4%, 86.8%, 65.2% for Kumasi, Accra, Tema, Tamale and Sekondi -Takoradi respectively.

The study also revealed that 83% of the respondents interviewed, indicated that they were willing to go into source separation of waste, if companies were into waste recycle, while the remaining 17% also indicated that they were not willing to source separate waste. The study also revealed that 75% of the residents interviewed indicated that they re-use their waste(organic) for other domestic purposes such as feeding livestock with organic waste as well as fetching water with plastic containers whiles 25% also indicated that they do not re-use their waste for other domestic purposes.

It was recommended that, introduction of user charges for communal collection service should be considered by the government; to enhance the output of the companies who are into communal collection.

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LIST OF ABBREVIATIONS AND ACRONYMS

ABC	Aryeetey Brothers Company
AMA	Accra Metropolitan Assembly
CBOs	Community Based Organisation
JSO	J-Stanley Owusu
KMA	Kumasi Metropolitan Assembly
MDGs	Millennium Development Goals
NGOs	Non- Governmental Organisation
PSP	Private Sector Participation
SAEMA	Shama-Ahanta East Municipal Assembly
SWM	Solid Waste Management
TAMA	Tamale Metropolitan Assembly
UN	United Nation
UNDP	United Nation Development Programme
UNIDO	United Nation Industrial Development Organisation
W.H.O.	World Health Organisation
WMD	Waste Management Department
WTP	Willingness to Pay
TMA	Tema Metropolitan Assembly
ST	Sekondi-Takoradi
TM	Tamale

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CHAPTER ONE

1. INTRODUCTION

1.1 Background Information

Waste handling is one of the greatest challenges facing humankind in modern times in spite of the numerous technological achievements that have been well documented (Tsiboe and Marbell, 2004). Technology alone has not been able to effectively control waste generated in communities worldwide. Rather, it appears that new technologies bring new types of waste into the environment to add to the complex accumulation puzzle (Tsiboe and Marbell, 2004). 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 which will lead to faster generation of solid waste (Salha, 2006).

In Ghana, there has been an upsurge in concern for the urban environment in recent years, in particular with regard to the management of municipal waste. This arises from the inability of local authorities to cope with the escalating volume of waste production, particularly in the country's urban areas (Obirih-Opareh, 2002). The problem of solid waste collection in Ghana is not only due to the escalating volumes of daily waste generation but also due to the attitudes of residents. Poor or lukewarm attitudes of residents toward payment of waste collection service charges, constitute one of the most important threats to any sustainable solid waste collection programme (Obirih- Opareh, 2002). This is because, of the total expenditure incurred in solid waste management, about 70-80percent goes into the collection and transportation

of the waste. Efficiency in collection and transportation of the waste will therefore go a long way to ensure the overall efficiency of solid waste service provision (UN Habitat, 1996).

In Ghana, most studies and policies concerning the urban environment have been somewhat one-sided, involving few stakeholders. But for effective evaluation of the quality of service rendered, by service providers to be achieved then the views of the recipients will be of great importance. Willingness and ability to pay are also often assumed, based on income levels or general demographic indicators. However, series of researches have clearly indicated that those who are often assumed to be unwilling or unable to pay are able, when provided with a range of different technological and financial options along with knowledge about the possible impact and implication of the option provided (Cardone and Catarina, 2003).

It was in this light that the Civil Engineering Department of KNUST, Ghana, has been conducting research in five cities in Ghana, namely Kumasi, Accra, Tamale, Tema and Sekondi-Takoradi; to assess the performance of companies and perception of residents on the quality of solid waste service provision. This research which builds on the previous studies, seeks to compare the quality of service rendered by companies across the five cities mentioned above. The study also assessed residents' willingness and ability to pay for waste collection service. Additionally, cost recovery arrangements and waste minimisation practices in solid waste service provision were also assessed across the five cities.

1.2 Justification

The importance of research in solid waste management cannot be over emphasised, in achieving sustainability in the overall day-to-day management of the urban environment. The outcome of this research will assist solid waste collection service providers to effectively evaluate the quality of service they render. Additionally the study will assist the Municipal/District authorities in monitoring the quality of service rendered by the private waste management companies in the country. The study may also assist policy makers in the area of solid waste management in the country.

1.3 Objectives of the Study

The main objective of this study is to assess and compare residents' perception of the quality of solid waste service provision, level of user charges and waste minimisation.

Specific Objectives of the Study

The following are the specific objectives of the study;

- To characterise user satisfaction and quality of solid waste collection services rendered by the service providers.
- To assess the level of existing user charges and cost recovery arrangements.
- To assess residents' perception on waste re-use and source separation in solid waste management.

1.4 Scope of work

- ❖ The research assessed and compared the quality of solid waste collection services rendered by the companies and the waste management departments of the municipalities in five selected cities in Ghana (Kumasi, Accra, Tamale, Sekondi-Takoradi and Tema).
- ❖ The study also assessed the level of user charges for both Door-to-Door and Communal collection (Pay as you dump) across the five cities.
- ❖ Cost recovery arrangements in solid waste management were also assessed.
- ❖ Residents' willingness to pay for waste collection service was also assessed.
- ❖ Residents' perception on waste minimisation practices across the five cities. Was assessed.

1.5 Organization of reports

Chapter one presents the background information of the study and objectives. Chapter two presents the various literature concerning similar studies undertaken and their relevance to this research. Chapter four and five are the results and major conclusions/recommendations respectively.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Global Issues on Solid Waste Management

The importance of solid waste management has been recognised at international, national and Community level. The number of conferences dealing with the Solid waste Management is increasing every year. This increase reflects the level of interest in the subject matter on a worldwide basis (Diaz, 2005).

The Earth Summit of 1992 focused on promotion of the integrated provision of environmental infrastructure including water and solid waste management. Emphasis was placed on an integrated approach to the provision of environmentally sound infrastructure in human settlements, in particular for the urban and the rural poor, as an investment in sustainable development. This can improve the quality of life, increase productivity, improves health and reduces the burden of investment in curative medicine and poverty alleviation (Earth Summit, 1992).

Similarly, the Agenda 21 declaration of the United Nations (UN, 1993) addressed the issues of environmentally sound management of solid waste, with emphasis on the extension of solid waste service coverage to all urban and rural areas.

Priorities of the UN Agenda 21 were assigned as follows:

The first priority was to minimize wastes, particularly waste destined for final disposal. The second priority was to maximize environmentally sound waste reuse and recycling. The third priority was to promote environmentally sound waste disposal and treatment. The fourth priority was to extend solid waste service coverage to all urban and rural areas (UN Agenda, 21).

In 1994 The World Development Report of the World Bank advocated the privatisation of infrastructure including solid waste services and it argued that: "Market forces and competition can improve the production and delivery of infrastructure services that is the consensus emerging from a re-evaluation of the sector based on experience, technological change and new insights into regulatory design" (World Bank, 1994).

One of the seven Millennium Development Goals is that of "ensuring environmental sustainability", which includes improved sanitation and solid waste management (UNDP, 2003). The Vision 21 on water and sanitation (UN, 2002) addressed the importance of a clean and healthy world. The relationships between the vision and SWM are reflected in the deterioration effect of solid waste management on the quality of the environment and on human health. In 2003 the World Development Report of the World Bank emphasised again that "One of the solutions for improving service is to separate the policy makers from the providers, dispersing ownership through decentralization and Private Sector Participation" (PSP), (World Bank, 2003). Although the Solid Waste Management agenda is targeted to all countries, both developed and developing, the challenges of SWM are more in developing countries. It is easier to achieve environmentally sound practice in developed countries than in developing countries. Some of developing countries still struggle with the primary solid waste collection service, and it is very difficult to achieve. Therefore, the solution for the problem and future planning for solid waste management needs to be different in developed and developing countries. However, some market-based approaches, such as privatisation of solid waste services (completely private provision) which are practiced successfully in developed countries, cannot be useful

for the developing countries instead Public private partnership can be useful. Firms and entrepreneurs of all types play a central role in poverty reduction and availability of service to consumers, however the tax revenues government can draw on to fund health, education and other services, depend more on a good investment climate of the government (World Bank, 2005). On the other hand this raises a number of social, economic, and environmental issues as many people now survive on waste-related activities such as solid waste collection, recycling, composting etc.

2.2 Service Provision

The provision of sanitation services may be organized in three different ways ;(1) through government administration, where services are provided in accordance with politically determined rules and procedures;(2)through economic markets, in which a variety of enterprises operate for profit;(3)through networks involving communities(CBOs) and self-help groups.

Economic theory suggests that when services are organized through the market, competition require numerous buyers and sellers such that no single entity can dominate. It also requires low cost of entry and exit such that there no barriers to setting up or winding up business. This makes the market competitive and marked by quality assessment between service beneficiaries and service providers. As suppliers seek to maximise profit, they cater to the demands of consumers. The competitive buying behaviour of consumers in markets serves as a perfectly adequate signal of their taste (Awortwi, 2003).It is however doubtful whether a competitive market can be the place for exchange of all types of services. It is argued that services such as national defence, education, health, environmental improvement, have excludability and externality problems and thus should not be left to individual decision. And

because one of the roles of the state is to ensure the welfare of its citizens, services with such characteristics are generally described as public good and should be provided by the state and not through the market (Baden, 1977as cited by Awortwi, 2003).However, the category into which a good or service falls is not always the same in each country or historical period but depends on technological and institutional factors, which may change over time and vary from country to country(Helmsing,1991as cited by Awortwi,2003).

Excludability: This concept describes the situation where the operator of the service should be able to exclude potential users who are not willing to pay. Once residents are cognizant of the fact that it is impossible or prohibitively costly to exclude any member that service becomes a public good. But when a potential user can be prevented from benefiting from the service without paying the price, and no other alternative way of free-riding is available, the service becomes a private good. In real terms there are very few absolutely/pure public goods, but common ones are national defence, street lighting, parks etc (Awortwi, 2003).

Externality: An externality exists whenever the consumption or production activities of one individual affect the economic activities of another individual either positively or negatively, and where no mechanism exists to compensate those bearing external costs or to charge those receiving external benefits (Loehr and Sandler, 1978 as cited by Awortwi, 2003).

2.3 Solid waste management in developing countries

The provision of solid waste services is a vexing problem in most developing countries (Ahmed and Ali, 2005). Since the early 1990s many developing countries have been showing a great deal of concern over SWM (Kasseva and Mbuligwe,

2004). However, although the local authorities in most countries have been commissioned to deal with solid waste, many administrations still fail to provide the basic public services, including solid waste, to a large section of the population (UNDP, 2003). Local authorities generally do not have the capacity to effectively carry out SWM. Lack of funds, human resources, low priority in terms of municipal development plans and lack of innovation for SWM practices are some of the reasons for the insufficient solid waste service provision (Ahmed, 2004).

It is reported that only 12.5 % of solid waste is disposed of formally in developing countries, while in developed countries 95% of solid wastes are formally disposed of and the rest are formally recycled (UN, 2005). The uncollected waste is burned, creating air pollution, left on the streets, collected and recycled by scavengers, or eaten by animals, dumped into storm drains, creeks, and canals. A crisis of this waste is pollution of ground and surface water sources by leachate from unmanaged and illegal solid waste dumps, and unhealthy living conditions.

The main reason for this situation is the rapid growth of urban population coupled with the expansion of cities together with diminishing financial resources.

The population in urban areas in developing countries is increasing at a rapid rate, for example, in Africa alone it is expected to rise from 0.29 billion in 2000 to 0.59 billion in 2020 (UN-Habitat, 2003). Hence the local authorities have difficulty in keeping pace with this development and in meeting the growing demand for infrastructure and public services, such as solid waste collection in particular and solid waste management in general. Political priority related to waste and social prestige of people dealing with solid waste management is still very low. Other reasons for the inadequate service coverage include the use of inappropriate technologies, which

leads to an inefficient use of time and resources (UMP, 1994; Pfammatter, 1996). All of the above reasons contribute towards the poor state of solid waste management and urban decay. The cities in developing countries generate about 40% of the world's total municipal solid waste, which is increasing rapidly with the combination of unprecedented high population growth and economic development.

Municipal activities typically consume 25-50% of municipal budgets for solid waste management but still the service is poor (UMP, 1996). The impact of this poor performance on solid waste management leads to public health risk, loss of life, environmental degradation and decreased economic growth of the affected cities. Therefore, there is a need to recognise the difficulties experienced in managing solid waste in developing countries, understand the reasons for those difficulties and develop solutions; hence there is a need to study solid waste management practice in developing countries. The existing system should be explored and utilised in the planning of appropriate solid waste management systems, including solid waste collection by the local private sector (Salha, 2006).

2.4 Descriptions of the main participants and their roles

PSP assumes that the public sector municipal authorities retain ultimate responsibility for the service. More and more municipalities are becoming convinced of the need for PSP and community involvement. Steps have been taken towards various forms of public-private partnerships and this section thus introduces the various actors who participates in solid waste management in developing countries, and begins to clarify and define their roles. In principle, these actors are part of every solid waste

management system, both those in developing and developed countries. (Ahimbisibwe, 2006).

2.4.1 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 (Ahimbisibwe, 2006).

2.4.2 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. In general, the defining characteristic of the formal private sector is that its main objective is to generate a profit on investments (Ahimbisibwe, 2006).

2.4.3 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, 1990). 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 (UNIDO, 1998)

2.4.4 Community Based Organisations (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 organisations (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 (Awortwi, 2003).

2.4.5 Non-Governmental Organisations (NGOs)

The term NGO can refer to such diverse organisations as churches, universities, labour organisations, environmental organisations and lobbies. Sometimes even donor organisations can fall under this heading. Generally, NGOs are intermediate

organisations 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 organisations. 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.

2.5 Theoretical Perspective

2.5.1 The waste management hierarchy

Options for waste management are often arranged in a hierarchical manner to reflect their desirability. The first priority is waste avoidance that is, not producing waste in the first place. If the waste must be produced, then the quantities should be minimized. Once that has been achieved, the next priority is to maximize recovery, reuse and recycling of suitable waste materials. Taken together, these three options are often called waste prevention, although strictly speaking only the first two are prevention whereas the third is already an end of pipe solution.

Once the possibilities for waste prevention have been exhausted, the next priority is to reduce the volume of residual waste being passed on for final disposal, extracting resources in the form products and/or energy in the process (UNIDO, 1998).



Figure 2.1: Waste Management hierarchy

2.5.2 Solid waste management

The discipline associated with the control of generation, storage, collection, transfer and transport, processing, and disposal of solid wastes in a manner that is in accord with the best principles of public health, economics, engineering, conservation, aesthetics and other environmental considerations and that is also responsive to public attitudes Peavy et al (1985). Management of urban services is a basic responsibility of municipal governments; however it is usually advantageous to execute service provision tasks in partnership with private sector and /or with the users of services (participants). In recent times computers have played an increasingly visible part in the management system, and there are dozens of software programmes available to help collectors be more efficient and cost-effective and to allow landfill operations to make the best use of space, equipment and time (UNIDO, 1998). The management of municipal solid waste is a complex and costly undertaking with direct activities that must be considered and coordinated on a daily basis. These activities include determination of waste generation rates, on-site storage, collection and transfer,

transport, processing and disposal (Peavy et al, 1985). The other integral part of municipal solid waste management include financing operations equipment, personnel, cost accounting and budgeting, contract administration, legislations, ordinances and guideline, as well as public communication. In recognition of the fact that our world is finite and that the continued pollution of the environment will, if not controlled. Be difficult to rectify in future, countries especially in the developed world adopted the principles to manage their wastes. Currently, more awareness of environmental issues has lead to global policies aimed at protecting our environment (UNIDO, 1998).

2.5.3 Types of Solid Waste Management Studies

Research on urban solid waste management in developing countries has developed from two main concerns: from a public health perspective (normally referred to as public management approach), and from a contribution to sustainable development approach(including reuse, recycling and composting).Historically, the primary objective of solid waste management is that of public health. Solid waste accumulating in densely populated urban areas posed epidemiological health hazards, which local authorities sought to control by providing effective collection, transport and safe disposal services (Obirih-Opareh, 2002).In modern times, efficient collection and disposal of municipal solid waste is recognised not just as critical for maintaining a healthy environment- a key factor in ensuring the health and safety of the population-but also as an important indicator of the level of development of the nation.

Accordingly, cities in the developed world have devised complex procedures for handling waste and have established a variety of institutional mechanisms to ensure that these procedures are adhered to (Obirih – Opareh, 2002). In the USA many cities have adopted stringent regulations to govern their waste management. These include the kinds of material that can be thrown away by a household or business, the type of storage containers and the kind of equipment to use to pick up waste. It also indicates the exact procedure for disposing waste in a sanitary landfill, and the specification for liners, covers and aeration procedures for those landfills and the proportion of the cost of this service to be paid by the consumer (Doan, 1997).

Many solid waste management studies focus on public health challenges through community participation. These studies acknowledge the close inter-relationship between urban health and the urban environment. An example is the WHO Health cities project for the period 1995-1999, which aimed to improve the urban environment and the health conditions by raising awareness and mobilising community participation through partnerships with local (municipal) agencies and institutions, thereby helping them to deliver effective environmental and health services. Other studies focus on how public health can be improved or how to do more with the same amount of money. The private sector participation in solid waste is based on this idea (Obirih-Opareh, 2002). Another area is that of livelihood and poverty-based studies which seek to improve employment opportunities and reduce poverty for the people working with waste (Baud, 2002). The focus on livelihood was not based on public health/private management perspectives. It was inspired more by alternative development views that started from people's own initiatives (bottom-

up). These studies recognised the economic potentials of waste, while simultaneously streaming the positive impacts on the environment (Post, 2001).

2.6 Management Modes and Private sector Participation

The types of private sector participation most common to solid waste management are Service Contract, concession, franchise, and open competition and these have been discussed by (Cointreau-Levine, 1994) and summarised as follows:

2.6.1 Service Contract

In this type the government awards a finite – term contract to a private firm for the delivery of solid waste collection services, street sweeping service, the collection of recyclables, transfer station operation, disposal site operation, or fleet maintenance. The contractor 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.

2.6.2 Concession

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 solid waste; to recover resources e.g. composting from solid waste; or to transfer or dispose of solid waste.

The concession is in the form of a long-term contractual agreement whereby the private firm builds the facility. In some cases, 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 of private ownership and operation.

2.6.3 Franchise Contract

The government awards a finite-term zonal monopoly (a franchise) to a private firm for the delivery of solid waste collection services. The franchise award is made after a competitive qualification process. The private firm deposits a performance bond with the government and pays a licence fee to cover the government's costs of monitoring. The private firm recovers its costs and profit through direct charges to the households and establishments that are served. Government provides control over the tariff charged to the consumer through the development of an adequate competition and control of price agreement and/or price regulation.

2.6.4 Open competition

The government freely allows qualified firms to compete for solid waste collection, recycling, or disposal services. In open competition, individual households and establishments make private arrangements with individual firms for solid waste 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 licence to qualified individual firms for the private provision of disposal services. One city may be served by several disposal sites competing for business from the area's local governments and private haulers. The government's role in open competition is to license and monitor. Under open competition, costs are directly billed by the private firms to their customers.

2.6.5 Mode of Collection

Various methods of waste collection are practiced in developing countries, but all may be classified under four headings; Communal collection, Block collection, Curbside collection and Door-to-Door collection.

2.6.5.1 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).

2.6.5.2 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).

2.6.5.3 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).

2.6.5.4 Door -to - Door 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).

2.7 Assessment of Service Quality

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. The only criteria that count in evaluating service quality are defined by customers. Service-quality perceptions stem from how well a provider perform vis-à-vis customers' expectations about how the provider should perform.

Customers do not evaluate service quality solely on the outcome of a service

(eg How the surroundings looks like after waste collection); they also consider the process of service delivery e.g., how involved, responsive and friendly the waste collection crew are. 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. Customers use five dimensions namely; reliability responsiveness,

assurance, empathy, and tangibles to form their judgments of service quality, which are based on a comparison between expected and perceived quality. The gap between expected and perceived service is a measure of service quality.

(Parasuraman et.al, 2003) In this study service quality was measured with the following; reliability of the companies, sanitary conditions at collection container site, cleanliness of surrounding, neatness of collection crew, neatness of waste collection vehicles, quick response to residents compliances, attitudes of collection crew and sanitary conditions of drains in the area.

Table 2.1: Dimensions of Service Quality

DIMENSIONS OF SERVICE QUALITY IN BUSINESS	DIMENSIONS OF SERVICE QUALITY IN SOLID WASTE MANAGEMENT
Reliability	Reliability /Frequency
Responsiveness	Quick response to residents' complaints
Empathy	Behaviour/attitude of collection crew towards residents.
Tangibles	<ul style="list-style-type: none">❖ Sanitary conditions of drains in the areas.❖ Sanitary conditions at bin/container site and spill-over of waste.❖ Cleanliness of Surroundings.❖ Neatness of waste collection vehicles.❖ Neatness of waste collection crew, wearing of protective clothing.

2.8 Users' attitudes towards waste management

The waste generated by a population is primarily a function of the people's consumption patterns and of their socio-economic characteristics. At the same time, waste generation is conditioned to certain degree by people's attitude towards waste, their patterns of material use and waste handling, their interest in waste reduction, the degree to which they separate waste and the extent to which they refrain from indiscriminate dumping (Awortwi, 2003). Furthermore, waste collection and disposal are not normally a priority demand by households or waste generators as long as the quality of their own living environment is not affected by refuse dumps. Only informed citizens are concern with the broader objective of environmentally sound waste disposal.

In communities wherein residents have been sensitized on the need for public cleanliness, solid waste collection can be treated as private good for which those receiving the service will be willing to pay, while in communities where resident have not been similarly sensitized, there will be resistance(Awortwi, 2003).

This analysis seems over-simplistic because in many neighbourhoods in Ghana,(even in low-class areas) overwhelming majority of households are aware of the need for public cleanliness but are unwilling to pay because it is easy to free-ride. Secondly, the majority of household in these areas are aware of the negative consequences of environmental untidiness, but they are unwilling to reveal their preference and effective demand for the service because common benefit in the form of communal container collection will be provided. In areas where many users have a tendency to dump indiscriminately, community-based delivery, (where users have themselves are members of the organization) is a better option. This is because, the members will co-

ordinate, check and enforce behaviour on a face –to-face basis. Franchising and open competition, where users pay directly for the services provided (Awortwi, 2003).

2.9 Cost Recovery Arrangement

Water supply and sanitation services are known to provide economic benefits to communities in the form of health, opportunities for women and poverty reduction. Given the overall societal gains that can be achieved, it is widely accepted that water and sanitation services must be improved, especially for the poor, who are the most likely to lack access to these services. But, providing sanitation services is not free. 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 and Catarina, 2003). In its simplest term cost recovery mechanism is the means to recover all of the costs associated with a water and sanitation system, programme or service to ensure long-term sustainability. There are a number of ways (mechanisms) 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.

2.9.1 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 set 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 and Catarina, 2003).

2.9.2 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 and Catarina, 2003).

2.9.3 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 the 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 organisations and neighbourhoods, communities and households. Although much has been said and written in support of increase private sector investment, it will require the coordinated 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 and Catarina, 2003).

2.10 Waste Reuse and Recycle

2.10.1 Waste Reuse

The reuse of organic waste material to feed domestic livestock and reuse of inorganic waste materials is a widely practiced phenomenon in many developing countries. Moreover, the reuse of non-organic materials e.g. old furniture, refrigerator, and shirts is a common practice in both developed and poor countries. In many developing countries people usually recognise the value of the used item and remove them from the waste at source (Baud, 2002; Furedy, 2002). At the household level in low-income areas, resource recovery begins with the reuse of plastic bags, bottles, paper, cardboard and cans for domestic purposes. In most parts of Africa, materials recovery takes place only in the informal sector. The rate of reuse in this instance is high, and these materials enter the waste stream only when they are no longer fit for domestic use. The informal recovery and reuse of materials from the waste stream occurs at several levels in Africa. At the household level items are reused before entering the waste, thereby extending their useful life. Waste pickers also recover materials for personal and commercial purposes (UNIDO, 1998).

2.10.2 Waste Recycle

Recycling (including composting) promotes the processing of materials in our waste stream into beneficial products (refuse into soil conditioner, plastics and thin film into fluffy carpets, for example) and thus preserves the natural and virgin natural resource (Mensah, 2008). Waste recycling forms a key component of sustainable waste management in developing countries (Baud et al, 2002; Hasan, 1998:445).

Recycling is influenced by factors such as (i) the direct value of raw material, (ii) technology, (iii) costs, and (iv) market structure. In most developing countries, there

is a strong inclination to economise on resource use and to make optimal use of resources, since labour costs are usually low enough to facilitate recycling.

The provision of new recycled products needs careful targeting and a high level of consumer participation in order to increase return on investment and minimize any shortfall in meeting targets (Tucker et al., 1998). In many countries recycling remains a voluntary activity. However, a lot of individuals participate in recycling for philanthropic reasons. In most developed countries, and even in many developing countries, waste recycling is carried out by the private sector (Obirih-Opareh, 2002).

2.11 Residents' Appreciation of Service and Willingness to pay

Willingness to pay (WTP) is an expression of the demand for a service. 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. Field experience shows that there is not a systematic correlation between willingness and ability to pay (Cardone and Catarina, 2003). 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. 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

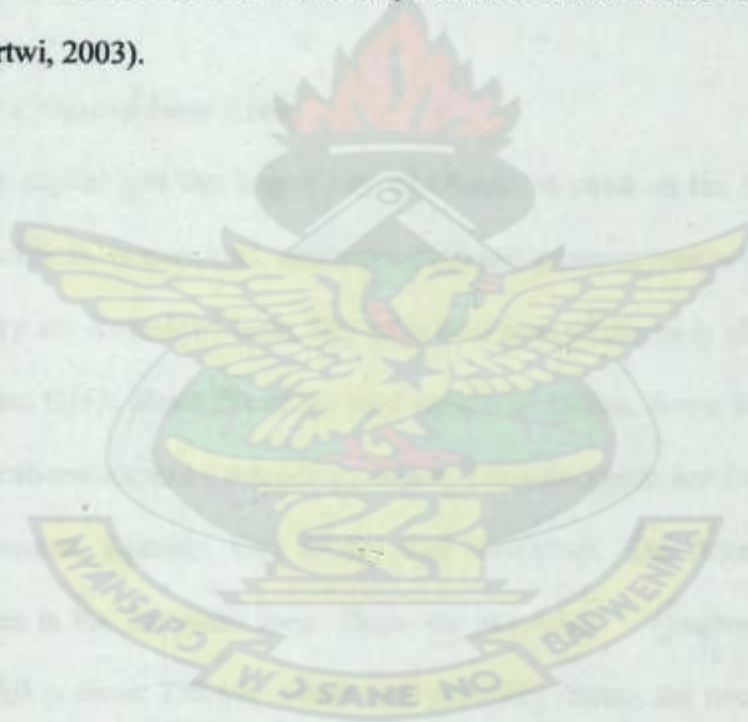
services. An increased trust and confidence, through better information and communication, can have a positive influence on users' satisfaction and willingness to pay (Cardone et al, 2003). However in Ghana, surveys conducted by AMA/Colan consult (1995) and Ghana living standards survey (1987) showed that many low-income households spend an average of 66.4% of their meager income on food (Awortwi, 2003).

Tagoe (1998) argues that most users in this class may want to exercise prudence in spending the remaining 33%. So given the opportunity, they would spend nothing on solid waste collection services (even if the fee is small). It is easier for these households to discard waste by littering without being seen (free-riding) or resort to dumping clandestinely, so why bother to pay? On the other hand, many low-income residents show high willingness to pay for latrine services because it is relatively difficult to free-ride and people frown on open defecation. Another reason is that in low-income communities, consumer habits are based on the 'hand-to-mouth principle' and residents are not accustomed to having to accumulate money to pay after a period (Awortwi, 2003).

To adapt fees to residents' low income, revenue collection would have to be a daily affair, as households can only afford to spend small amounts of money each day on waste disposal rather than a large sum at the end of the month. However, daily fee collection might not be economically efficient as it involves a lot of administrative costs, so local governments as well as agents ignored that option. Even though public information and educational awareness may positively influence people's attitudes

towards demand for the service and may change their unwillingness to pay, but local authorities have been poor in organizing that(Awortwi, 2003).

The combined effects of low-income and unwillingness to pay user fees have affected the ability of local Authorities to adopt franchise and open competition modalities of solid waste collection in many poor neighbourhoods. Franchising and open competition are better options for middle to high – income areas where willingness to pay is high and also because the demand curve of households in these areas is inelastic (that is the quantity of waste generation does not respond to user fee), service contract then becomes the choice modality for local authorities to serve low-income areas (Awortwi, 2003).



CHAPTER THREE

3 RESEARCH METHODOLOGY

3.1 Description of study areas

The more affluent a country or community is, the greater their waste generation rate. Since Accra, Kumasi, Tema, Tamale and Sekondi-Takoradi are the most populated and well developed cities in the country; they have higher waste generation rates and more waste management problems. It is from this background that the five cities were selected for this study, so that the outcome can be replicated in other smaller cities in the country.

3.1.1 Accra Metropolitan Area

Accra is the capital and the largest city of Ghana, situated on the Gulf of Guinea. Important political, commercial, manufacturing and communication activities of the entire country are embedded here. The total land area of Accra is about 228 square kilometers and this is about 2% of the land surface of Ghana. Accra has been divided into six (6) sub-metros and managed by AMA. The sub-metros are Okaikoi, Ashiedu Keteke, Ayawaso, Kpeshie, Osu Klotey and Ablekuma. The Accra Metropolitan Assembly lies in the Savannah zone. There are two rainy seasons. The average annual rainfall is about 730mm, which falls primarily during the two rainy seasons. The first begins in May and ends in mid-July. The second season begins in mid-August and ends in October. Rain-usually falls in intensive short storms and give rise to local flooding where drainage channels are obstructed. There is very little variation in temperature throughout the year. The mean monthly temperature ranges from 24.7°C in august (the coolest) to 28°C in March (the hottest) with annual average of

26.8°C. As the area is close to the equator, the daylight hours are practically uniform during the year. Relative humidity is generally high varying from 65% in the mid-afternoon to 95% at night.

3.1.2 Kumasi Metropolitan Area

Kumasi metropolis is the regional capital of Ashanti region in the central part of the republic of Ghana. The city is the second largest in the country, made up of ten (10) sub-metros; Asawase, Asokwa, Bantama, Kwadaso, Manhyia, Nhyiaeso, Oforikrom, Suame, Subin and Tafo. It lies within latitudes 6° 31' and 6° 40' and longitudes of 1° 30' and 1° 35' with an area of 254 square kilometers. The climate of the city is the wet sub-equatorial type with a double maxima rainfall regime of about 214.3mm in June and 165.2mm in September. The average temperature ranges between 21.5 to 30.7 degrees Celsius with humidity of about 84.16% at 0900GMT and 60% at 1500GMT.

3.1.3 Tema Metropolitan Area

The administrative authority is Tema Municipal Assembly with its capital as Tema. The Tema Municipal Authority is administered by two different but complementary levels, the traditional and political levels. The traditional level of administration is through an intricate network of local governance dealing with purely traditional affairs concerning customs and land administration. The political level of administration is through the local government system that derives its authority from the 1991 constitution of Ghana and the local Government Act 1993 (Act 462). The main economic activities in the municipality are manufacturing industries (light and heavy). Deep sea port, fishing harbour, retail/whole sale trade. Tema is about

25kilometers east of Accra; it is bounded to the south by the Gulf of Guinea and lies on the Greenwich meridian 5°37'40" north of the equator. Tema has a total land area of 368.3 square kilometres. Tema is relatively dry since it falls within the dry coastal equatorial climatic zone with mean temperatures between 22 to 32 degrees Celsius.

3.1.4 Tamale Metropolitan Area

Among the eighteen (18) Districts in the Northern region tamale metropolis is the larger urban settlement. It covers an area of approximately 73.1 square kilometers. Most of the people are traders, Artisans, office workers, factory workers e.t.c. Tamale metropolitan Assembly (TAMA) is moving away from district provision of waste management service and promoting active involvement of both communities and private sector in the service delivery. The Metropolis experiences one rainy season starting from April/May to September/October with a peak season in July/August. The Metropolis experiences a mean annual rainfall of 1100mm within 95 days of intense rainfall. Staple crop farming is highly restricted by the short rainfall duration. The dry season is usually from November to March. It is influenced by the dry North-Easterly (Harmattan) winds while the rainy season is influenced by the moist South Westerly winds. The mean day temperatures range from 33o C to 39o C while mean night temperature range from 20o C to 22o C. The mean annual day sunshine is approximately 7.5 hours. The climactic conditions have to a greater extent influenced the vegetation of the area. The Tamale Metro lies within the Guinea Savanna belt of Northern Ghana.

3.1.5 Sekondi-Takoradi

Sekondi- Takoradi is the administrative capital of the western region. The city has a land area of 334.43 square-kilometers and is strategically located in the South-Western part of Ghana, about 242 kilometers to the west of Accra, the capital city.

The city is characterised by an equatorial climate; maximum temperature could be as high as 35 degrees Celsius. It has a mean annual rainfall of about 2350 mm, which is experienced heavily in May and June. The minor rains occur between September and October for varying agricultural production.

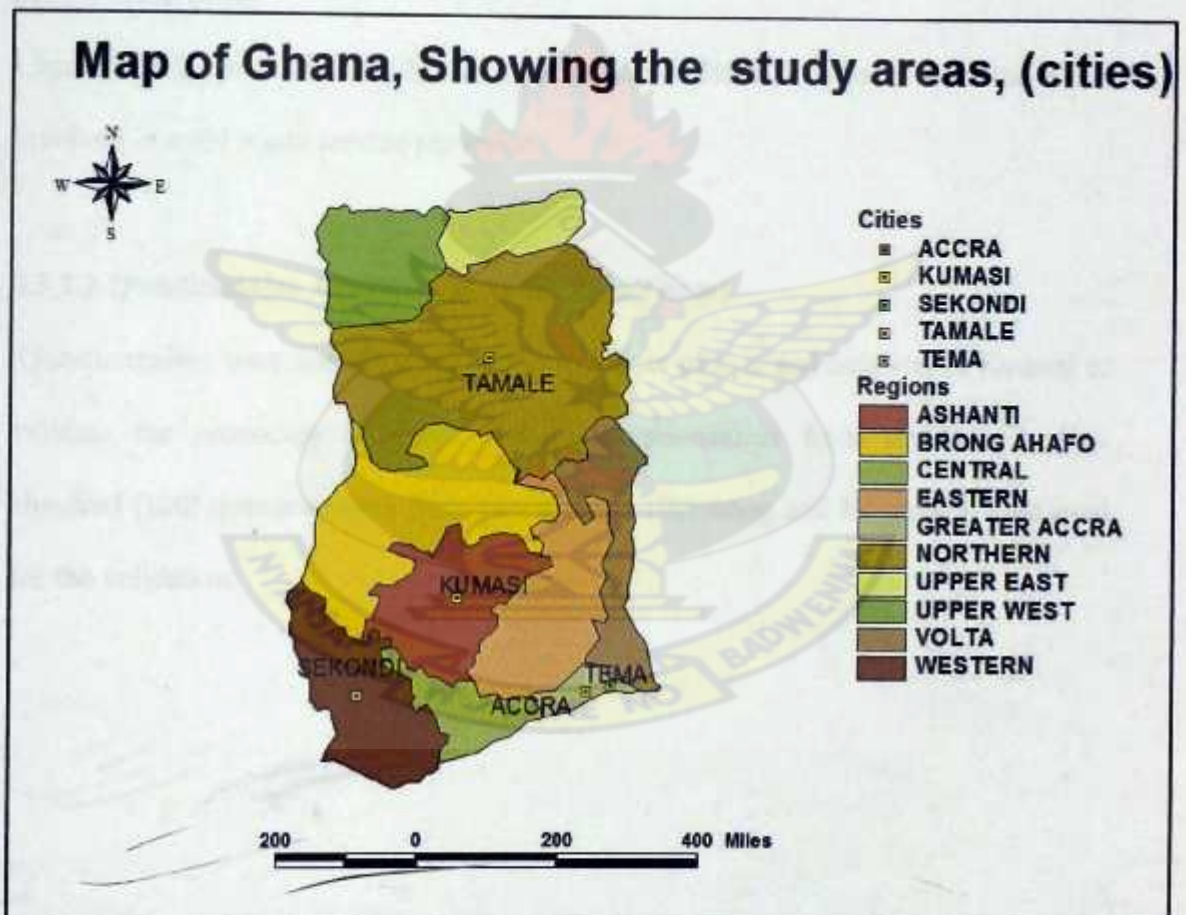


Figure 3.1: Map of Ghana showing study Areas

3.2 Unit of Analysis

The unit of analysis is the residents in the various localities where the private companies involved in solid waste collection, render their services.

3.3 Materials and Methods

3.3.1 Procedure for Data Collection

The data used for this study was acquired through, desk study, Administration of questionnaires and structured interviews.

3.3.1.1 Desk Study

Literature relevant for this study was consulted, in order to fully understand the issues involved in solid waste service provision.

3.3.1.2 Questionnaire Administration (Primary data)

Questionnaires were administered to the residents of selected Suburbs in Kumasi to validate the secondary residents' survey questionnaires from previous studies. Hundred (100) questionnaires from two suburbs (Bremang and Boukrom) were used for the validation.

3.3.1.3 Secondary Data

Residents' survey questionnaires from previous studies were used in this research and the total sample size used is as shown on Table 3.1 below.

Table 3.1: Sample size (Secondary Data) used for the study

CITY	SAMPLE SIZE (QUESTIONNAIRE)	NUMBER OF COMPANIES	POPULATION(CENSUS,2000)
KUMASI	290	6	1,170,270
ACCRA	297	18	1,658,937
TEMA	225	11	506,400
TAMALE	256	6	293,881
SEKONDI- TAKORADI	192	3	369,166
TOTAL	1260	44	399,865,4

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3.3.1.4 Operationalisation of Concepts

The Operationalisation of the service quality concepts provides key indicators for service quality assessments. The key indicators used to measure service quality and other variables in this research are as shown on Table 3.2 below

Table 3.2: Operationalisation of Concepts

ASPECT OF THE STUDY	INDICATORS	DATA COLLECTION METHOD
SERVICE QUALITY	<ul style="list-style-type: none"> Reliability of collection. Sanitary conditions at bin site. Cleanliness of surrounding Neatness of crew Neatness of collection vehicle. Prompt response to residents compliances. Behaviour of crew toward residents Sanitary conditions of drains in the area. User satisfaction 	Questionnaire administration
USER CHARGES	Residents were asked to indicate their views on the following: <ul style="list-style-type: none"> Who should pay for service charges? How service charges should be collected(weekly, monthly, yearly) 	Questionnaire administration
WASTE RE-USE	Residents were asked to indicate whether they re-use their waste or not.	Questionnaire administration
WASTE RECYCLE	Residents were asked to indicate their willingness to go into source separation for waste recycle.	Questionnaire administration

NB: Detailed questionnaire is at Appendix (1)

3.4 Data Analysis

A comparative analysis for the five (5) selected cities (Kumasi, Accra, Tema, Tamale and Sekondi-Takoradi) was done to assess the perception of residents on the quality of solid waste collection service provision, level of user charges and residents' perception on cost sharing in solid waste collection service. The analysis was extended further to assess residents' appreciation of waste minimisation across the five cities. The data was also tested statistically using Chi-square analysis.

3.4.1 Calculation of service quality

$$\text{score for service quality(\%)} = \frac{\sum((n_1 \times 1) + (n_2 \times 2) + (n_3 \times 3) + (n_4 \times 4) + (n_5 \times 5))}{\sum(N \times 5)} \times 100$$

Where n_1 = number of respondents who ticked very poor (1)

n_2 = number of respondents who ticked poor (2)

n_3 = number of respondents who ticked fair (3)

n_4 = number of respondents who ticked good (4)

n_5 = number of respondents who ticked very good (5)

N = Total number of respondents

CHAPTER FOUR

4. RESULTS AND DISCUSSIONS

4.1 Introduction

In this chapter the perception of residents on the quality of solid waste service provision across the five cities will be analysed.

4.2 Respondents' Characteristics

4.2.1 Respondents' Age

It was seen from the analysis that about 40.9 % of the respondents across the five cities were between the ages 25- 40 years while about 42.6% of the respondents were above 40years; the results is as presented on Table (4.1) below. This also gives an indication that most of the people who were interviewed were adults who are responsible in the community, when it comes to decision making and therefore their views may be taken as a true representation of what was really on the ground.

Table4.1: Respondents Age

AGE	FREQUENCY	PERCENTAGE (%)
BELOW 25	201	16.5
25- 40	497	40.9
ABOVE 40	518	42.6
TOTAL	1216	100

4.2.2 Gender Distribution of Respondents across the Cities

The analysis also showed a fair distribution of the questionnaires between males and females in the communities; where 50% were females and about 49.9% males respectively.

Table 4.2: Distribution of respondents' Gender

SEX	FREQUENCY	PERCENTAGE (%)
MALE	612	49.9
FEMALE	613	50.0
TOTAL	1225	100

4.2.3 Respondents' Educational Level

In assessing the educational level of the respondents, the analysis showed that most of them can read and write; about 93.8% of the entire people interviewed had been to school and therefore facilitated their understanding of the questions asked on the questionnaire. But on the whole about 40.8% of them had secondary school education.

Table 4.3: Educational level of respondents

EDUCATIONAL LEVEL	FREQUENCY	PERCENTAGE (%)
NONE	75	6.2
BASIC	230	18.9
SECONDARY/TECH.	495	40.8
TERTIARY	414	34.1
TOTAL	1214	100

4.3 Quality of Collection Service

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. The quality of collection service was assessed in two parts ;(1) residents were asked to indicate their level of satisfaction by responding either satisfied or not satisfied and (2) they were also asked to rate companies(from very poor to very good) in terms of the quality of collection rendered by the companies in their communities. The result is as presented on Figure 4.1 below

4.3.1 Residents Assessment/Rating of the Quality of Service Rendered by the Companies

Residents across the five cities were asked to rate the companies operating in their localities, in term of service quality and the entire result is as presented on Figure (4.1) below. Detail calculation of service quality is also at Appendix (2).

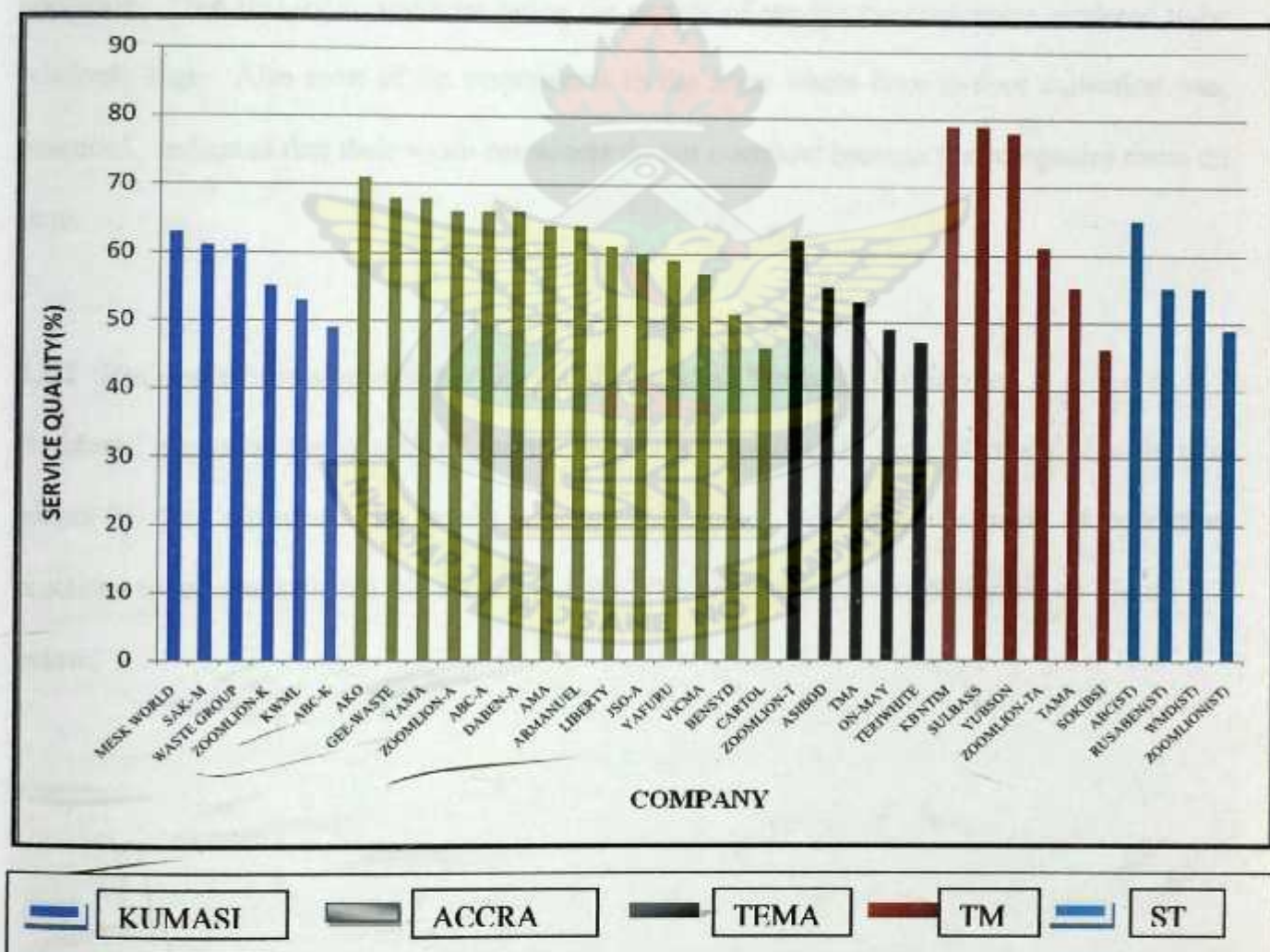


Figure 4.1: Service quality of companies across the cities

It is seen from Figure 4.1 that companies in Tamale had higher service quality followed by those in Accra. Residents also rated the quality of service rendered by companies operating Door-to-Door collection to be higher than those into communal collection service. That was the reason why companies like KB Ntim, Ako, Mesk-World and Sulbass, had higher values in terms of service quality. In the localities where KB Ntim, Ako, Mesk-World and Sulbass operated, residents paid for collection services and as a result companies were eager to regularly collect the waste generated in those areas. Because residents paid for the services, companies had enough money to pay their staff especially the collection crew and also repair their vehicles when they break down, and hence were able to frequently come for the waste generated in their areas of operation. That also led to residents rating the quality of service the companies rendered to be relatively high. Also most of the respondents in the areas where door-to-door collection was practiced indicated that their waste containers do not overflow because the companies came on time.

4.3.2 Residents Assessment of Service Quality against Mode of Collection

Residents' views on the quality of service were also classified in term of mode of collection across the five cities and the results revealed that across the cities, the mode of collection practiced in an area affected the service quality. The entire result is as presented on Figure 4.2 below;

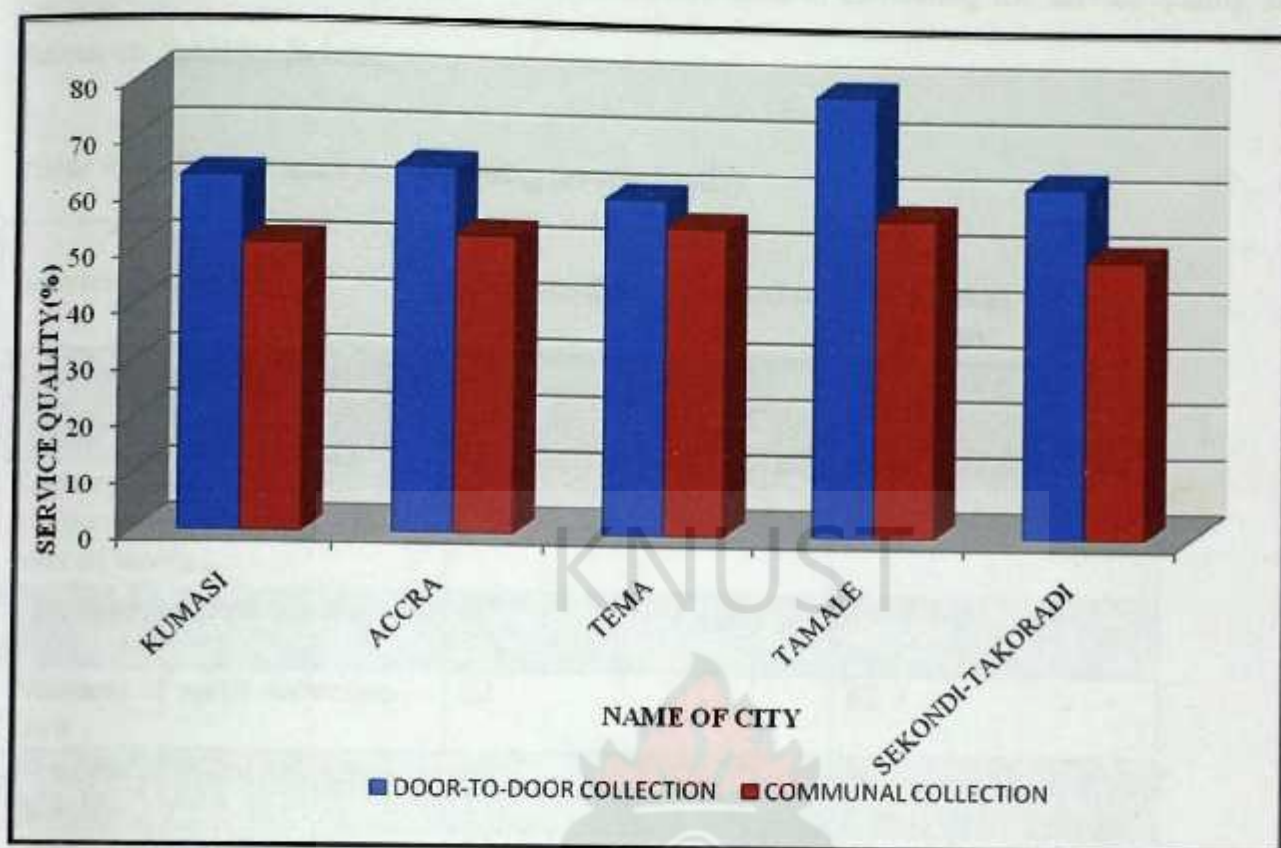


Figure 4.2: Service quality against mode of collection across the five cities

The results showed that service quality for door-to-door collection were 63%, 65%, 60%, 79% and 63% for Kumasi, Accra, Tema, Tamale and Sekondi-Takoradi respectively. But on the other hand, service quality for communal collection were 51%, 53%, 55%, 57% and 50% for Kumasi, Accra, Tema, Tamale and Sekondi-Takoradi respectively. Service quality for door-to-door was high because, in the localities where door-to-door collection was practiced residents paid for the collection service and as a result companies were eager to come on time for the waste generated in those areas. Companies were able to come on time because they had enough money to pay their workers, especially the collection crew and their drivers as well as the maintenance and fuelling of their vehicles. But in the case of communal collection, a higher percentage of the service cost was borne by the Municipal Authorities, who always delayed in the payment of service charges

to the waste management companies. The factors used in estimating the service quality is as shown on Table 4.4 Below;

Table 4. 4: Factors used for estimating service quality

Service Quality	Door-to-Door collection (%)	Communal collection (%)
Frequency of waste collection	61	46
Sanitary conditions at bin/container site and spill-over of waste	65	45
Cleanliness of surroundings	69	49
Neatness of waste collection crew	62	62
Neatness of waste collection vehicles	62	60
Quick response to residents' complaints	57	48
Behaviour/attitude of collection crew towards residents	64	60
Sanitary conditions of drain in the area	67	47

4.3.3 Service Satisfaction by Mode of Collection

4.3.3.1 Door-to-Door Collection

In this system, the collection crew enters each premise, takes out the container and sets it back after emptying the waste into the collection vehicle. The lack of householder involvement in the collection process is offset by increased labour cost in entering all premises (UN Habitat, 1996). Residents in the communities where door-to-door collection was practiced, across the five cities were asked to indicate their level of satisfaction with the quality of service rendered by the

companies. Table 4.5 presents the results from the communities served with door-to-door collection.

Table 4.5: Service satisfaction by mode of collection (door-to-door collection)

CITY	NOT SATISFIED		SATISFIED		TOTAL	
	N	(%)	N	(%)	N	(%)
KUMASI	62	46.6	71	53.4	133	100
ACCRA	69	30	162	70	231	100
TEMA	118	76	37	24	155	100
TAMALE	11	15	62	85	73	100
SEKONDI-TAKORADI	9	15	51	85	60	100
TOTAL	269	41	383	59	652	100

NB: Chi -Square value =174.925, Critical Chi-square Value = 15.507,

Sig (2- sided) = 0.00, Significance level =0.05, df. =8

It can be seen that in Kumasi, Accra Tamale and Sekondi-Takoradi, 53%, 70%, 85% and 85% of the residents respectively, indicated that they were satisfied with the quality of door-to-door collection. Interestingly in Tema only 24% of the residents indicated that they were satisfied with the quality of the door-to-door collection service this was probably due to lack of proper supervision on the part of the Assembly and also delays in the payment of services charges on the part of both residents and Municipal Authorities to the waste management Companies. But on the whole 59% of the respondents indicated that they were satisfied with the quality of door-to-door collection service while 41% were not satisfied; this was due to the fact that residents in communities where door-to-door collection services was practiced paid for the services rendered by the companies and as a result companies had enough money to repair their vehicles and also

pay their staff well leading to higher service quality for door-to-door and hence higher service satisfaction. Additionally, the chi-square analysis done on the response from the residents presented a Chi-square value of 174.925 which fell within the critical range (critical chi-square value =15.507). This indicates that the views of the residents in the various cities is a true reflection of their level of satisfaction and also shows that the differences in the values for service satisfaction are significant across the five cities.

4.3.3.2 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 to remove accumulated waste (UN Habitat, 96). Table 4.6 presents the results of residents' satisfaction with the quality of waste collection service in communities where communal collection is practiced.

Table 4.6: Service satisfaction by mode of collection (communal collection)

CITY	NOT SATISFIED		SATISFIED		TOTAL	
	N	(%)	N	(%)	N	(%)
KUMASI	122	88.4	16	11.6	138	100
ACCRA	21	67.7	10	32.3	31	100
TEMA	11	44	14	56	25	100
TAMALE	78	67	39	33	117	100
SEKONDI-TAKORADI	28	85	5	15	33	100
TOTAL	260	76	84	24	344	100

NB: Chi-Square value =170.583, Critical Chi-square Value = 15.507 ,

Sig (2- sided) = 0.00, Significance level =0.05, df = 8

It can be seen that in Kumasi, Accra, Tema, Tamale and Sekondi-Takoradi, the proportion of residents' who were satisfied were 12%, 32%, 56%, 33% and 15% respectively. But on the whole 76% of the residents across the five cities said that they were not satisfied with the quality of collection while 24% indicated that they were satisfied, as can be seen on Table 4.6. Furthermore, the chi-square analysis done on the responses from residents presented a chi-square value of 170.583 which was far greater than the critical chi-square value of 15.507, indicating that the observed data from residents in the various cities is a true reflection of their level of satisfaction for the quality of communal collection service. In conclusion user satisfaction for door-to-door collection was far higher than that of communal collection, as can be seen from Tables 4.5 and 4.6 respectively, this was attributed to the fact that resident in those areas where door-to-door collection is practiced, paid for the service rendered to them by the companies and as a result companies regularly come for their waste as compared to those in areas where communal collection was practiced.

4.3.3 Service Satisfaction across the cities

Residents were asked to indicate their satisfaction with the collection service offered by the companies across the five cities. In all 1208 of the residents out of 1260 across the five cities responded. The entire result is as presented on Figure 4.3 below;

Averagely resident's level of satisfaction was very low in Kumasi and Tema, where as in Accra, Tamale and Sekondi-Takoradi it was relatively high ranging from 51% to 62%.(Figure4. 3).

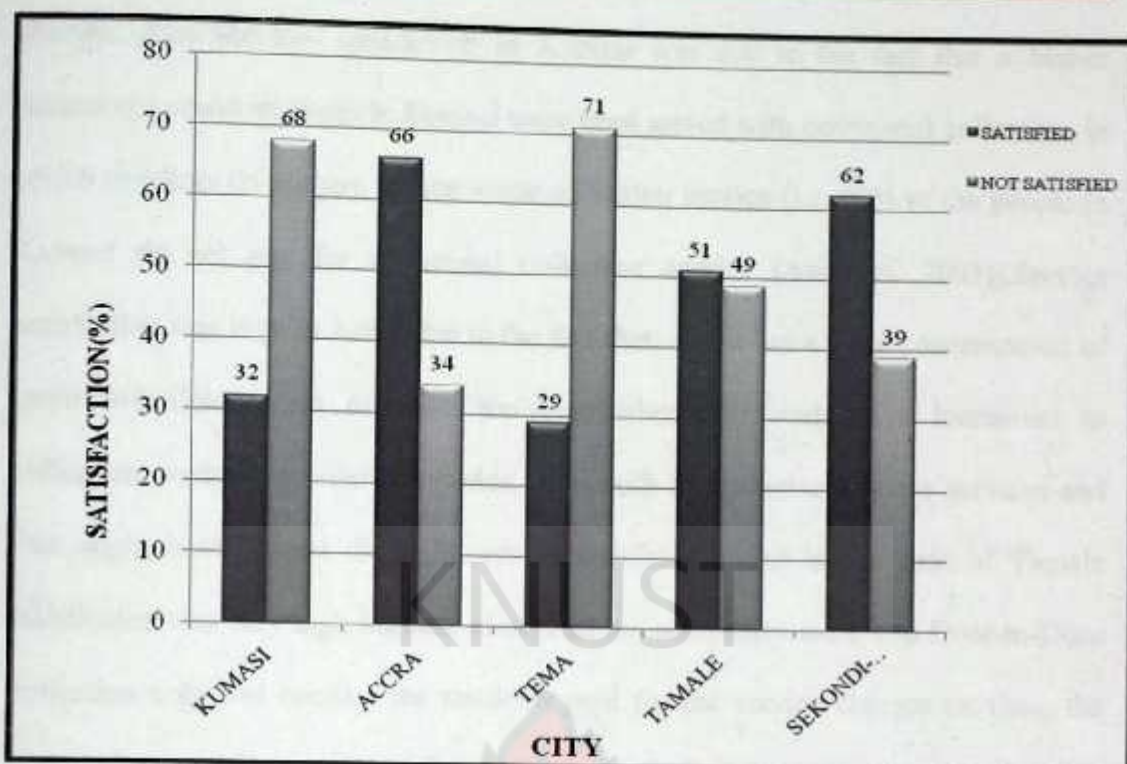


Figure 4.3: Service satisfaction across the five cities

But on the whole 47% of the respondents indicated that they were satisfied with the collection service, while 53% indicated that they were not satisfied with the quality of collection service rendered by the solid waste collection companies across the five cities. The low level of satisfaction may be partly attributed to the unreliability of the waste collection companies. Secondly, although in Tema service charges was predominantly borne by the residents (80% from users, 15 % from TMA and 5% from the central government) (Nooni, 2008) nonetheless user satisfaction was 29%, due to lack of proper supervision and delays in the payment of service charges on the part of the Tema municipal Assembly. Residents also do not fulfil their part of the contract on time. But in the case of Kumasi where user satisfaction was 32%, it was predominantly due to the delays in the payment of service charges by the Assembly, since it is responsible for the payment of a higher percentage of collection service

charges. Also the low satisfaction in Kumasi was due to the fact that a higher percentage of the residents in Kumasi were been served with communal collection, in which residents do not pay for the waste collection service (i.e. 90% of the people in Kumasi do not pay for communal collection service (Awortwi, 2003)). Service satisfaction was high in Accra due to the fact that, Accra has a large concentration of prominent Government officials; top dignitaries who could give incentives to collection workers in order to provide them with comparatively better services and that might have caused the high service satisfaction. But in the case of Tamale satisfaction was very high because almost all the companies were into Door-to-Door collection only and because the residents paid for the service charges on time, the companies' eagerness to come for the waste in their areas of jurisdiction was very high. Also from the interview, most of the residents indicated that the Assembly performs its supervisory role very well and that has resulted in the high service quality and hence higher residents' satisfaction and this was also the case in Sekondi – Takoradi (i.e. proper supervision by the Assembly).

4.4 User Charges and Cost Recovery Arrangements

4.4.1 User Charges

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. But, providing sanitation services is not free. 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 and Catarina, 2003). There is a major distinction between the collective container and door-to-door system in terms of user fees: the communal

collection is free in some areas whilst the door-to-door collection is carried out in return of user fees. Even though the communal collection system is free, there were some areas where it was 'pay as you dump'.

4.4.2 Franchise (Door-to-Door) Charges

Residents in the communities where door-to-door collection service was practiced were asked to indicate the amount they pay for the services rendered to them by the various waste collection companies. In all 617 of the residents out of 1260 responded. The entire result is as shown on the Figure 4.4 below;

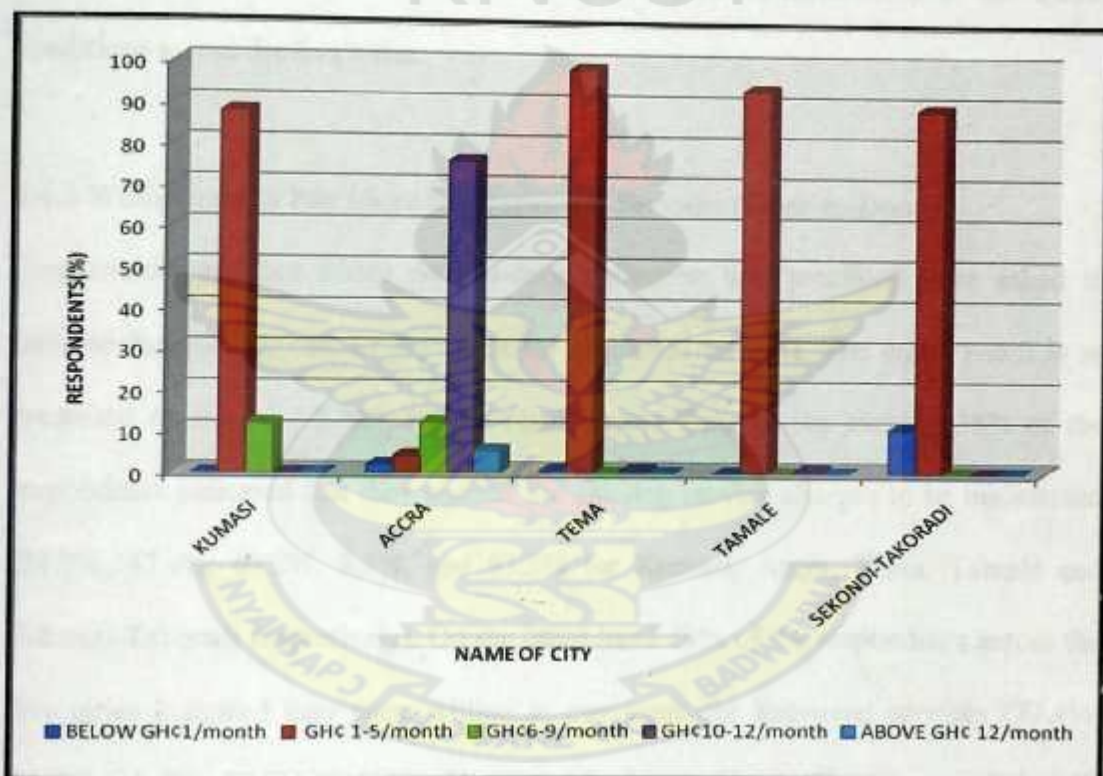


Figure 4.4: Existing service charges (door-to-door) across the five cities

It can be seen from Figure 4.4 that, in Kumasi, Tema, Tamale and Sekondi-Takoradi about 88%, 98.7%, 93.8% and 89.3% of the respondents respectively, who were being served with the door-to-door collection, paid between GH¢1 and GH¢5 per

month where as in Accra, 76.2% of the respondents indicated that they paid between GH¢10 and GH¢12 per month. This was due to the fact that in Accra, the communities where door-to-door was predominant the frequency of waste collection was high (i.e. about three (3) times a week) as compared to the other cities where the frequency was relatively low. (i.e. once a week). But on the whole 55.4 % of the respondents across the five (5) cities indicated that they paid between GH¢ 1 and GH¢5 where as 32.6% of the respondents paid between GH¢10 and GH¢12 per month. The variation in user charges may be as a result of differences in the frequency of collection, income level of the residents, as well as differences in the traffic conditions across the five cities.

4.4.3 Willingness to Pay More for Improved Services (Door-to-Door)

Respondents in areas where door-to-door collection was practiced were asked to indicate their willingness to pay more for improved services. The entire result is as presented on Figure 4.5 below: The result shows that, on the average 36% of the respondents indicated that they wanted the existing service charges to be maintained (21.7%, 47.9%, 69.2%, 9.5%, and 83.3% for Kumasi, Accra, Tema, Tamale and Sekondi-Takoradi respectively). On the other hand 59% of the respondents across the five cities indicated they were willing to pay more for improved services (77.4%, 44.2%, 26.9%, 88.9% and 0% for Kumasi, Accra, Tema, Tamale and Sekondi-Takoradi respectively). Interestingly only 4.7% of the respondents across the five cities indicated that they wanted to pay lower service charges than what they are paying now.

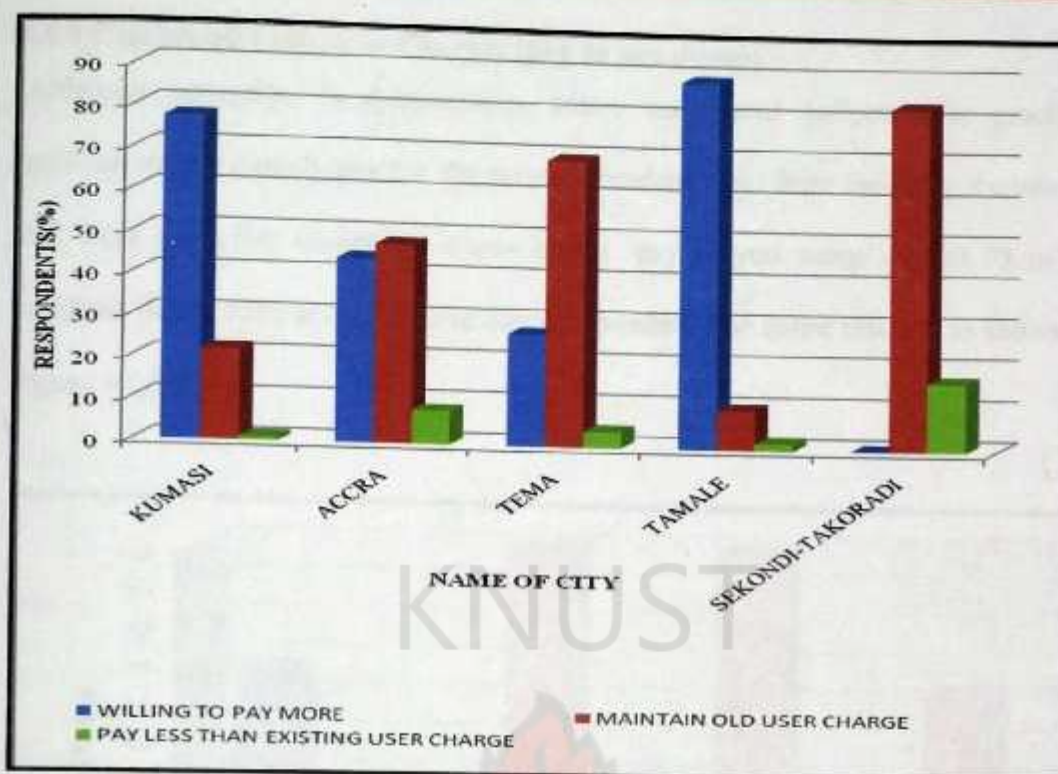


Figure4.5: Residents willingness to pay more for improved services

The variation in respondents' willingness to pay more for improved service across the cities may be as a result of the differences in the income level of the respondents. Also the high percentage (59%) for residents' willingness to pay more for improved service across the five cities may be as result of the relatively higher quality of service for Door-To-Door collection as compared to communal collection. Additionally the chi-square analysis done on the responses of respondent s gave a chi-square value of 86.339 which was far greater than the critical chi-square value of 15.507giving an indication that respondents willingness to pay more for improved service is city dependent. Which also indicates that the difference in their willingness to pay across the cities is significant.(Sig=0.00(2-sided))

4.4.4 Communal Collection Charges (pay as you dump)

Although generally, in communities where communal collection is practiced residents do not directly pay for the services rendered, but from the study it came out that there were few exceptions where it was 'pay as you dump'. In all 93 of the residents out of 1260 across the five cities responded. The entire result is as shown on Figure 4.6 below;

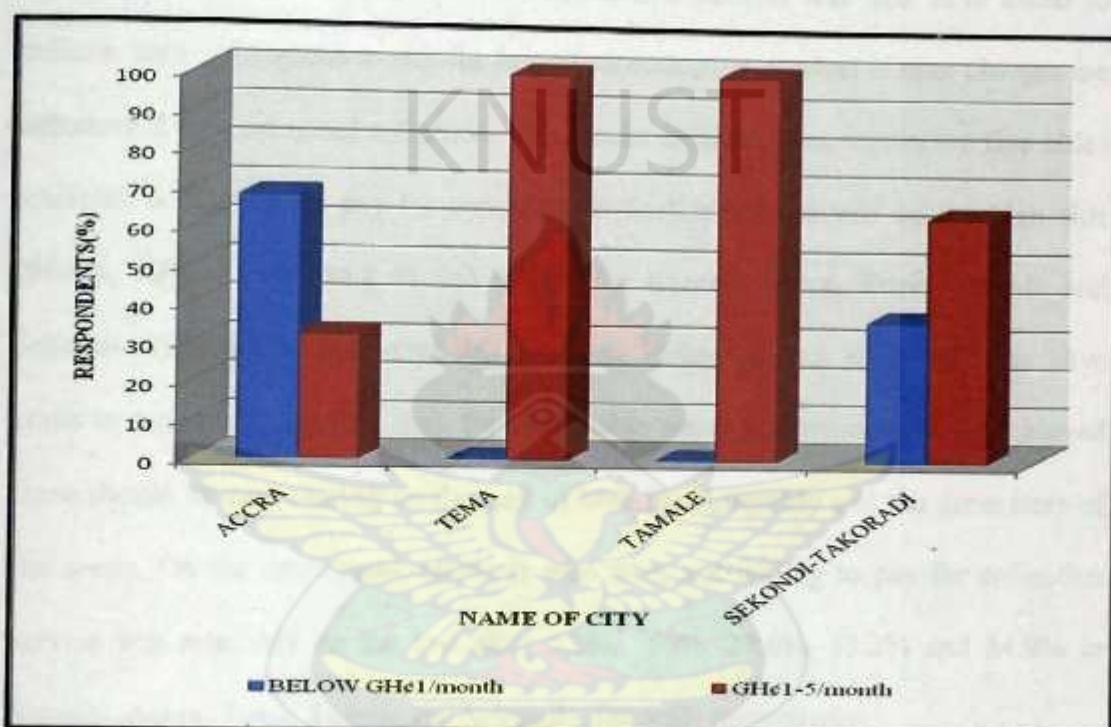


Figure 4.6: Existing service charges across the five cities (pay as you dump)

Residents in the communities, were asked to indicate the existing user charges in their communities where it was 'pay as you dump' for communal collection. It is seen from figure (4.6) that, in Tamale and Tema all the people interviewed were paying between GH¢1 and GH¢5 per month. But in Accra and Sekondi- Takoradi the situation was different: 68 % were paying below GH¢1 and 32% were also paying between GH ¢1 and GH¢5 per month for the people interviewed in Accra. Where as in Sekondi-

Takoradi 36% were paying below GH¢1 and 64% were also paying between GH¢1 and GH¢5 per month. The variation in level of service charges may be due to differences in income level of the respondents and frequency of waste collection across the cities.

4.4.5 Willingness to Pay for Communal Collection

Residents in the communities where communal collection was free were asked to indicate their willingness to pay for improved collection service; if user charges are introduced for communal collection. The results indicate that, across the five cities residents willingness to pay for communal collection service was on the high side (94.8%, 50%, 71.4%, 86.8 % and 65.2% for Kumasi Accra, Tema, Tamale and Sekondi- Takoradi respectively) this gives an indication that most residents have come to terms with the fact that, for sustainable waste management to be achieved there should be cost sharing on the part of both the Assembly and the generators of the waste. On the other hand, residents who were not willing to pay for collection service was relatively on the low side; 5.2%, 50% ,28.6%, 13.2% and 34.9% in Kumasi, Accra, Tema, Tamale and Sekondi –Takoradi respectively.

The entire result is as shown on Figure 4.7 below;

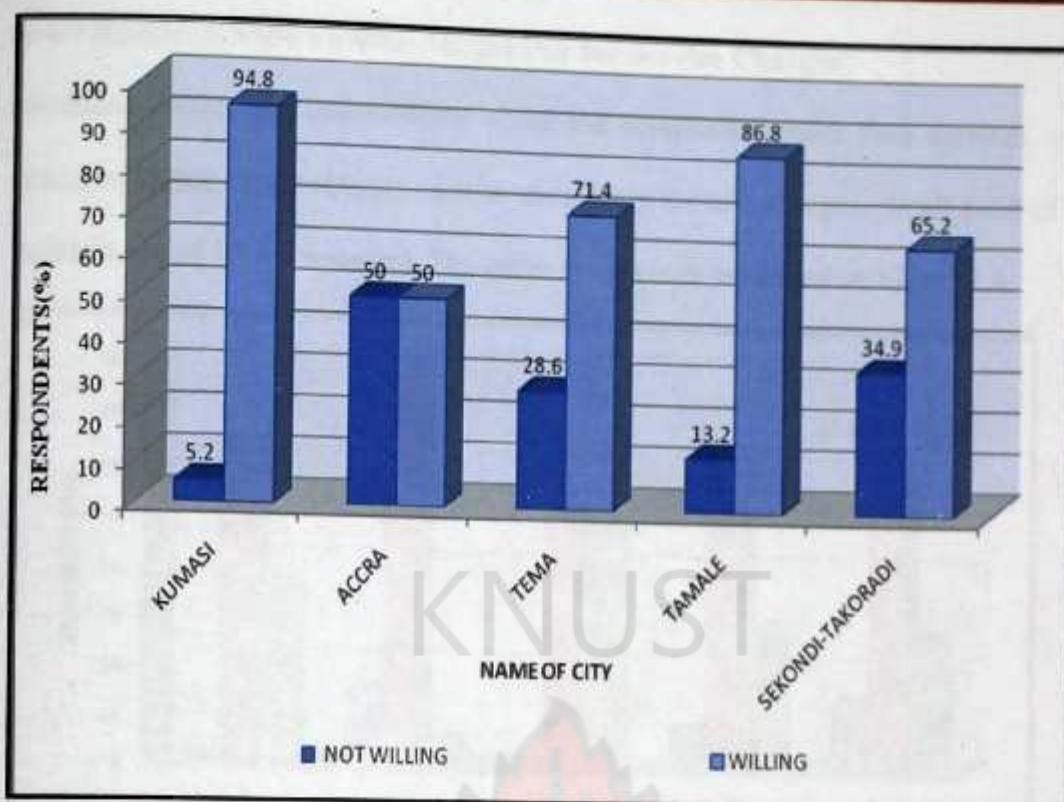


Figure4.7: Residents willingness to pay for communal collection

4.4.6 Cost Recovery Arrangements

It is generally agreed and widely accepted that users should, in most cases, pay for recurring costs, there are varying opinions about whether users should pay for capital cost, and if so, what percentage is reasonable, and how might it be paid(cash, sweat equity, smaller payments over time coinciding with crop or livestock market season) (Cardone et al,2003).Residents across the five cities were asked to indicate their views on who should pay for service charges as well as how the charges should be collected.

4.4.7 Residents View on Who Should Pay for Service Charges

Residents within the communities where the companies render their services were asked to indicate their opinion on who should pay for user charges. In all 1208 of the resident out of 1260 responded. The entire results is as presented on Figure 4.8

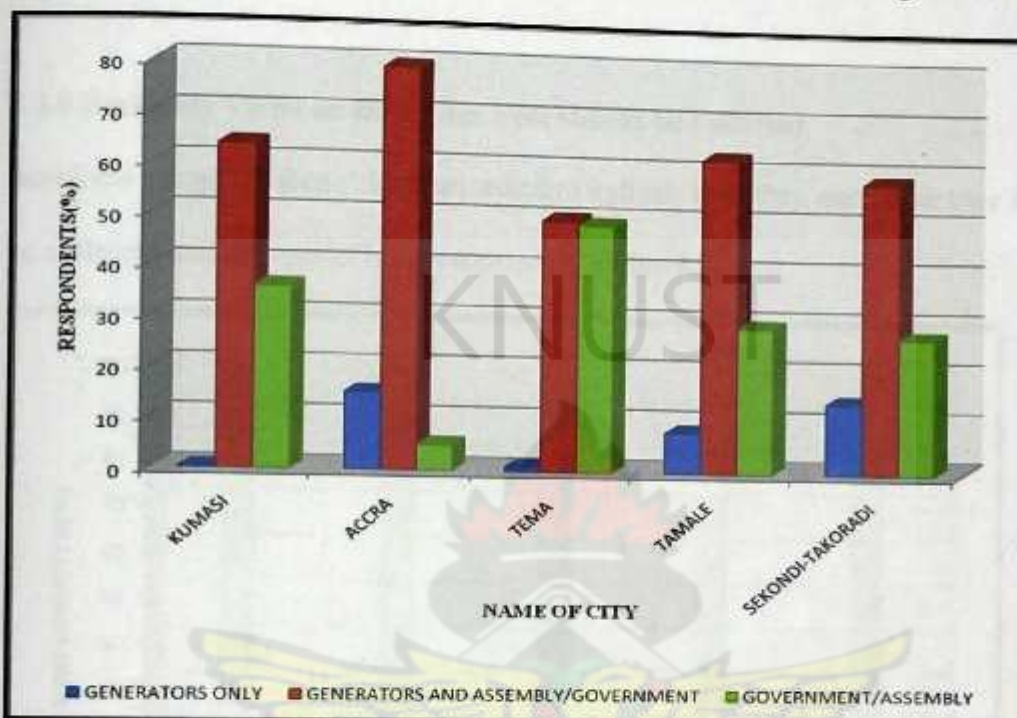


Figure 4.8.: Residents views on who should pay for collection service across the five cities

The majority of the respondents across the five cities indicated that service charges should be borne by generators and Assembly/government (63.8%, 79.6%, 50%, 62.8%, 58.5% for Kumasi, Accra, Tema, Tamale and Sekondi-Takoradi respectively), as presented on Figure 4.8. But on the whole about 7.6% of the respondents said that only generators should pay, whereas 28.2% indicated that only government/Assembly should pay for collection services. The higher percentage for those who indicated that both generators and assembly should pay for collection services is an indication that residents have come to terms with the fact that generators

have a part to play when it comes to financing solid waste collection services. This may be partly due to an increase in awareness creation concerning the consequences of a poorly managed environment on human health and its ripples effect on the national economy.

4.4.8 Residents Views on How User Fees should be collected

Residents across the five cities were asked to indicate how they want their user fees to be collected and the results is as presented on Figure 4.9

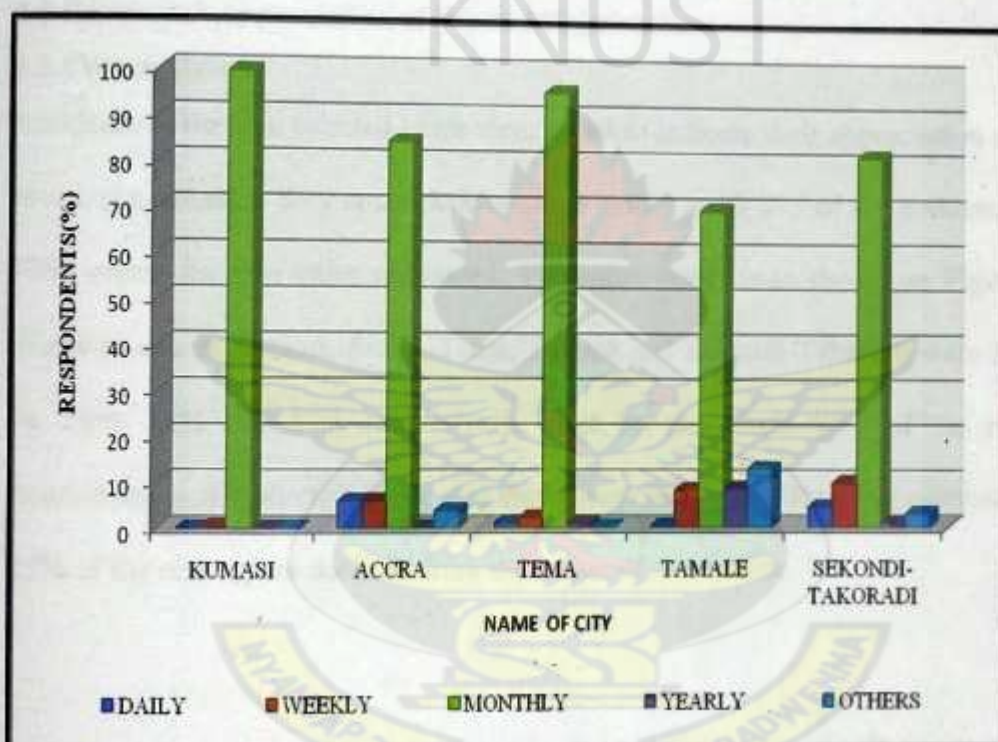


Figure 4.9: Residents view on how user charges should be collected across the five cities

It could be seen that most residents across the five cities want their user fees to be collected monthly (99.6%, 84.5%, 95.6%, 69.9% and 82% for Kumasi, Accra, Tema, Tamale and Sekondi-Takoradi respectively). Most residents, across the five cities whether employed either in the private or public sector, receive their salary on

monthly basis and therefore they were more comfortable with monthly collection of service charges. Additionally the chi-square analysis also revealed that a chi-square value of 509.760 which was far greater than the critical chi-square value of 26.296, giving an indication that the observed data from residents in the various cities is a true reflection of their views on how service charges should be collected. It also gives an indication that residents views on how service charges should be collected vary from city to city and the differences in the responses are significant.

4.5 Residents' Appreciation of Waste Minimisation

4.5.1 Waste Re-use

Residents in the five selected cities were asked to indicate their appreciation of waste re-use (i.e. whether they reuse their waste or not) . In all 875 of the residents out of 1260 across the five cities responded. The entire result is as shown on Figure 4.10. Waste re-use in Kumasi, Accra, Tema, Tamale and Sekondi-Takoradi were 94%, 87 %, 56%, 56% and 87% respectively. But on the whole 75% of the residents interviewed across the five cities said they re-use their waste for other purposes while 25% of the respondent declined from the re-use of their waste.

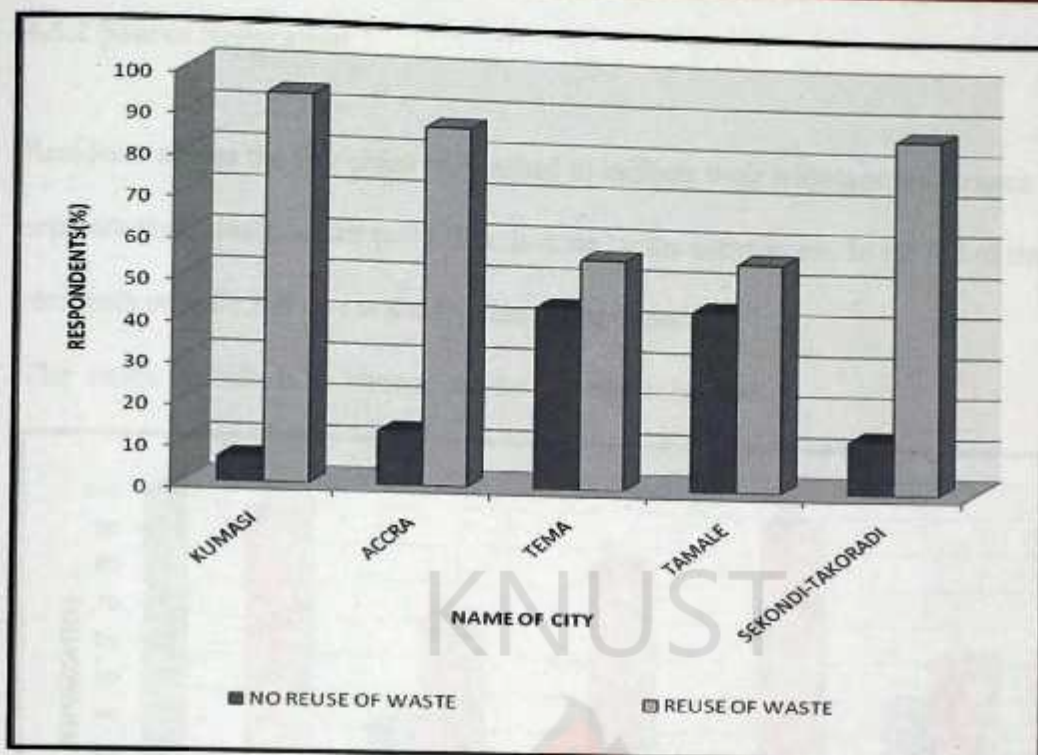


Figure 4.10: Residents appreciation of waste re-use

Most of the residents either re-use their organic waste (i.e. plantain or cassava peels) to feed their animals whiles other sections of the public said they re-use their plastic containers for collecting water in their individual houses. But on the whole waste re-use was on the high side, as depicted on Figure 4.10 above. Furthermore, the chi-square analysis conducted on the responses from residents presented a chi-square value of 590.498 which was far greater than the critical chi-square value of 9.488 indicating that the observed data from residents in the various cities is a true reflection of their views on waste reuse and also the variations in the responses is significant across the five cities.

4.5.2 Source Separation

Residents across the five cities were asked to indicate their willingness to source separate their waste before collection is done by the companies. In all 783 of the residents out of 1260 across the five cities responded.

The entire results is as shown on the Figure 4.11 below:

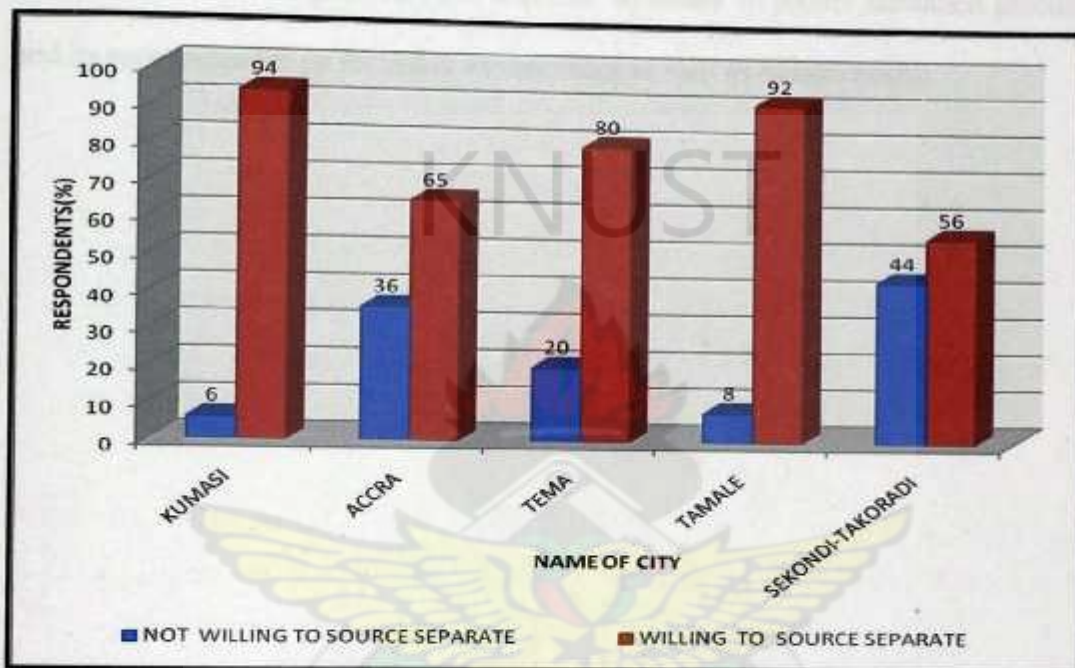


Figure 4.11: Residents willingness to separate organic waste across the five cities

It can be from Figure 4.11 that, residents willingness to source separate waste across the five cities was very high. In Kumasi, Accra, Tema, Tamale and Sekondi – Takoradi residents willingness were, 94%, 65%, 80%, 92% and 56% respectively. This gives an indication that if companies are to go into waste recycling, a higher percentage of residents may be willing to source separate their waste and therefore will enhance the work of the companies. Averagely 82% of the respondents across the cities indicated their willingness, whereas 18% declined from source separation. Additionally, the chi-square analysis done on the responses from residents

presented a chi-square value of 730.053 which was greater than the critical chi-square value of 9.488, indicating that the observed data from residents in the various localities was a true reflection of their willingness to source separate their waste. It is believed that Accra, Kumasi, Tema, Tamale and Sekondi-Takoradi have a higher percentage of their residents been literate and therefore it is expected that most of them will be more enlightened when it comes to issues of proper sanitation practises and its repercussions on the entire environment as well as human health.

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CHAPTER FIVE

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

The following general conclusions were drawn from the analysis of the results:

SERVICE QUALITY

- Companies who were into only door-to-door collection had higher service quality than those into only communal collection. Clear examples were KB Ntim (79%), Ako (75%), Mesk-world (63%) and ABC (ST) (65%), who were into only Door-to-Door collection service. Secondly service quality of the companies in Tamale was relatively higher than those in the other four cities.
- The mode of collection service practiced in an area affected the quality of service rendered by the companies, across the five cities.
- The quality of waste collection service for Door-to-Door collection service was higher than that of communal collection across the five cities.

SERVICE SATISFACTION

- Generally about 53% of the residents interviewed indicated that they were not satisfied with the quality of collection service rendered by the companies while 47% indicated that they were satisfied.

SERVICE SATISFACTION AGAINST MODE OF COLLECTION

Door-to-Door collection

- 59% of the residents interviewed across the five cities indicated that they were satisfied with the quality of service while 41 % said they were not satisfied.

Communal collection

- 24% of the residents interviewed indicated that they were satisfied while 76% indicated that they were not satisfied with the quality of the collection service rendered by the companies. Especially in Kumasi, only 11.6% of the residents interviewed said they were satisfied as compared to 88.4% indicating that they were not satisfied with the quality of service.

EXISTING USER CHARGES AND COST RECOVERY ARRANGEMENT

Door-to-Door (Franchise) collection service charges

- Across the five cities, about 55.4% of the residents indicated that they were paying between GH¢1 and GH¢5 per month for the collection service.
- In Accra about 76.2% of the residents indicated that they were paying between GH¢10 and GH¢12 per month for the collection service.

Willingness to pay more for improved services (Door-to-Door)

- On the whole about 59% of the respondents across the five cities indicated that they were willing to pay higher charges than what they were paying for improved services.
- Also about 36% of the respondents across the five cities indicated that they wanted the current user charges to be maintained.

Communal collection service Charges

- Generally in communities where communal collection was practiced residents were not paying for the collection services.
- But in areas where, it was 'pay as you dump' about 62.4% of the residents indicated that they were paying between GH¢ 1 and GH¢5.
- Furthermore about 37.6% of the residents were paying below GH¢ 1 for communal collection (Pay as you dump) across the five cities.

Willingness to pay for communal collection

- 85.8 % of the residents in communities where communal collection was practiced indicated that they were willing to pay for the collection services, if user charges were introduced.
- 14.3% of the residents also indicated that they were not prepared to pay for the collection services.

COST SHARING

- Majority of the residents indicated that user charges should be borne by Generators and Assembly/Government (63.8%, 79.6%, 50%, 62.8%, and 58.5% for Kumasi, Accra, Tema, Tamale and Sekondi-Takoradi respectively.

- On the whole about 86% of the residents indicated that user charges should be collected monthly, since most of them are paid monthly.

RESIDENTS APPRECIATION OF WASTE MINIMISATION

Wastes re-use

- 75% of the residents interviewed indicated they re-use their waste (organic) for other purposes such as feeding of the animals while 25% of the residents declined from the re-use of their waste.

Source Separation

- 83% of the residents indicated that they were willing to go into source separation at the household level while the remaining 17% declined.



5.2 RECOMMENDATIONS

- Government should equip the Municipal Authorities well so that they can intensify their supervisory role in order to improve on the quality of service rendered by the companies.
- Government should re-consider the introduction of user charges for communal collection to enable the assembly to gather enough revenue to pay the companies on time.
- The Assembly should set-up committees who will come out with better ways of collecting user fees from residents, in order to avoid delays in the payment of service charges to the companies.
- There should be further sensitization/ education of residents to see the need to pay for the waste collection service rendered by the companies operating in their localities.
- The study should be extended to other cities in the country so that enough information will be acquired to help curb the escalating waste management problems in the country and other developing countries as well.
- Finally Government should create the enabling environment that will encourage waste management companies to go into waste recycling.

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APPENDICES

Appendix 1: Sample of Residents Questionnaire

RESIDENTS' SURVEY QUESTIONNAIRE Residents' Assessment of Solid Waste Management Services

Household Characteristics

- 1.1 Locality/Suburb..... Sub-metro.....
 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) Tertiary
 1.5 Occupation of the household head (s)
 (1) Unemployed (2) Trading (3) Government employee/Retired (4) Self-employed
 (6) Agriculture/farming (7) 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.....
 1.10 Is the House walled with access road in front? Yes.....no.....

Solid waste service characteristics

- 2.1 Where do you empty or dispose your waste? (give name of collecting organisation.....)
 a. Door-to-door collection
 b. Communal collection (a skip container in the neighborhood).....
 c. An open dump (waste is collected regularly).....
 d. An open dump (waste is NOT collected).....
 2.2 How often does the vehicle comes 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

Appreciation of effectiveness and quality of waste collection service

- 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

- | | | | | | |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| (a). The level of quality of collection service by the company | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (b). Frequency of waste collection and reliability of waste collection | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (c). Sanitary conditions at bin/container site and spill-over of waste | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (d). cleanliness of surroundings (rating of 5 for no littering) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (e). Neatness of waste collection crew, wearing of protective clothing | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (f). Neatness of waste collection vehicles | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| (g). Quick response to residents' complaints | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

(h). Behaviour/attitude of collection crew towards residents

☐ ☐ ☐ ☐ ☐

(i). Sanitary conditions of drains in the area

☐ ☐ ☐ ☐ ☐

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

(a). Impact of waste uncollected on human health,

☐ ☐ ☐ ☐ ☐

(b). Impact of waste uncollected in the neighborhood on aesthetics

☐ ☐ ☐ ☐ ☐

(c). Impact of offensive odour in the neighborhood on health,

☐ ☐ ☐ ☐ ☐

(d). Impact of choke drains with waste/breeding of mosquitoes

☐ ☐ ☐ ☐ ☐

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?.....

2.9 Do you think the location of the waste container or dump site is the best? Yes....No....

Give reason.....

Payment of user fees and cost recovery

2.10 It cost Assembly more money (say over one billion cedis a month) for waste collection and disposal. Who in your opinion should pay for the waste collection services?

☐ Generators only ☐ Generators and Assembly/government ☐ Government and Assembly

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

3.2 If yes, how much do you pay per month in Ghana cedis?

a) For communal collection, GH¢ 1, GH¢ 1.50, GH¢ 2 others
specify.....

b) For door-to-door collection, GH¢ 2.50, GH¢ 3 GH¢ 6 others
specify.....

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

3.4 If you are NOT paying now, would you be willing to pay for the service? ☐ YES ☐ NO

3.5 How much are you willing to pay per month in cedis per Household to improve the service?

a) For communal collection, GH¢ 1, GH¢ 1.50, GH¢ 2 others
specify.....

b) For door-to-door collection, GH¢ 2.50, GH¢ 3 GH¢ 6 others
specify.....

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

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

3.7 If a standard bin is given to you for door-to-door collection would you like to pay for

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

☐ Single payment of the cost of bin

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

3.9 Who contributes to household income?

3.10 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 |



APPENDIX: 2

Table A₂ 1: Service quality of Waste collection Companies

QUALITY OF WASTE COLLECTION SERVICE									
COMPANY	FREQUENCY (%)	CONDITION OF BIN SITE(%)	CLEANLINESS OF SURROUNDINGS (%)	NEATNESS OF CREW(%)	NEATNESS OF COLLECTION VEHICLE(%)	QUICK RESPONSE TO COMPLAINTS(%)	ATTITUDE OF CREW(%)	CONDITIONS OF DRAINS(%)	AVER. (%)
ZOOMLION-K	63	58	60	60	59	49	58	36	55
TMA	44	52	57	54	51	49	57	59	53
TaMA	54	46	51	67	60	40	60	60	55
KB NTIM	86	85	90	80	79	61	71	78	79
SABTA	48	49	52	72	72	55	68	46	58
SOKIBSI	25	34	37	70	57	43	59	41	46
SULBASS	77	68	94	94	67	60	76	93	79
YUBSON	83	83	73	83	90	77	74	59	78
KWML	51	45	53	61	61	44	61	50	53
MESK-WORLD	57	64	70	61	62	54	65	67	63
SAK-M	31	52	77	61	63	57	65	78	61
AMA	71	65	67	65	65	60	66	49	64
WMD(ST)	49	54	70	52	52	54	53	54	55
ABC-K	48	35	47	60	60	37	60	48	49
BENSYD	50	50	40	50	60	40	60	60	51
ARMANUEL	58	67	67	68	68	60	60	64	64
DABEN-A	63	72	75	58	63	57	67	71	66
RUSABEN(ST)	52	56	58	53	57	54	57	54	55
YAFURU	58	60	60	60	60	60	60	51	59
VICMA	59	60	60	60	60	40	60	59	57
ABC(ST)	65	66	71	69	58	58	67	68	65

ZOOMLION(ST)	47	61	39	46	51	51	57	40	49
LIBERTY	62	62	66	58	61	57	62	61	61
GEE-WASTE	71	72	72	62	62	62	70	76	68
AKO	74	75	80	58	60	65	74	81	71
ABC-A	67	69	71	55	58	61	67	77	66
ZOOMLION-Ta	64	59	63	78	65	47	65	49	61
ZOOMLION-T	62	60	74	64	63	59	61	59	62
ZOOMLION-A	64	72	62	70	70	60	64	66	66
WASTE -GROUP	58	61	73	59	58	48	58	75	61
CARTOL	35	43	45	58	59	60	27	39	46
YAMA	63	77	77	59	63	59	68	75	68
JSO-A	53	67	70	53	57	50	63	67	60

KNUST



Table A₂3: Service Quality against mode of collection across the five cities

CITY	SERVICE QUALITY	
	Door-to-Door (%)	Communal (%)
Kumasi	63	51
Accra	65	53
Tema	60	55
Tamale	79	57
Sekondi-Takoradi	63	50

$$\text{score for service quality}(\%) = \frac{\sum((n_1 \times 1) + (n_2 \times 2) + (n_3 \times 3) + (n_4 \times 4) + (n_5 \times 5))}{\sum(N \times 5)} \times 100$$

Where n_1 = number of respondents who ticked very poor (1)

n_2 = number of respondents who ticked poor (2)

n_3 = number of respondents who ticked fair (3)

n_4 = number of respondents who ticked good (4)

n_5 = number of respondents who ticked very good (5)

N = Total number of respondents

SAMPLE CALCULATION

Service Quality for Door -to-Door collection (Kumasi)

$$n_1 = 0$$

$$n_2 = 6$$

$$n_3 = 102$$

$$n_4 = 24$$

$$n_5 = 0$$

$$N = 132$$

$$\text{service quality(\%)} = \frac{\sum((0 \times 1) + (6 \times 2) + (102 \times 3) + (24 \times 4) + (0 \times 5))}{\sum(132 \times 5)} \times 100$$

$$= 63 \%$$

KNUST



Table A₂4: SERVICE SATISFACTION ACROSS THE FIVE CITIES

CITY	NOT SATISFIED		SATISFIED		TOTAL	
	RESPONDENTS	(%)	RESPONDENTS	(%)	RESPONDENTS	(%)
KUMASI	184	68	87	32	271	100
ACCRA	90	34	172	66	262	100
TEMA	129	71	53	29	182	100
TAMALE	108	49	111	51	219	100
SEKONDI-TAKORADI	39	39	62	62	101	100
TOTAL	550	53	485	47	1035	100

NB: Chi -Square value =245.527, Critical Chi-square Value = 9.488, Sig (2- sided) = 0.00, Significance level =0.05

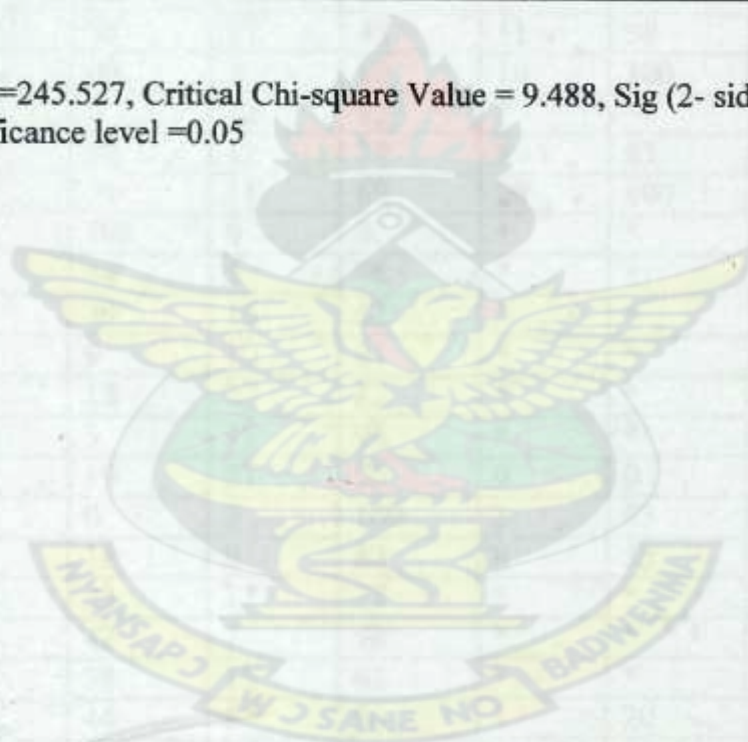


Table A₂ 5: Service satisfaction against mode of collection for all the companies

COMPANY	DOOR-TO-DOOR COLLECTION				COMMUNAL COLLECTION			
	NOT SATISFIED		SATISFIED		NOT SATISFIED		SATISFIED	
	R	(%)	R	(%)	R	(%)	R	(%)
ZOOMLION-K	0	0	10	100	41	85	7	15
TMA	55	81	13	19	9	64	5	36
TaMA	1	50	1	50	4	100	0	0
KB NTIM	1	3	30	97	*	*	*	*
SABTA	4	50	4	50	26	84	5	16
SOKIBSI	0	0	2	100	39	98	1	2
SULBASS	1	6	17	94	*	*	*	*
YUBSON	0	0	2	100	4	14	25	86
KWML	9	26	26	74	31	97	1	3
MESK-WORLD	21	55	17	45	11	58	8	42
SAK-M	18	90	2	10	10	100	0	0
AMA	1	8	12	92	*	*	*	*
WMD(ST)	5	29	12	71	5	83	1	17
ABC-K	5	31	11	69	29	100	0	0
BENSYD	1	100	0	0	*	*	*	*
ARMANUEL	4	44	5	56	*	*	*	*
DABEN-A	10	39	16	62	*	*	*	*
RUSABEN(ST)	1	9	10	91	*	*	*	*
YAFURU	6	18	27	82	*	*	*	*
VICMA	1	5	19	95	*	*	*	*
ABC(ST)	3	10	27	90	0	0	1	100
ZOOMLION(ST)	0	0	2	100	5	83	1	17
LIBERTY	2	18	9	82	6	55	5	45
GEE-WASTE	5	23	17	77	*	*	*	*
AKO	5	42	7	58	*	*	*	*
ABC-A	9	38	15	63	*	*	*	*
ZOOMLION-Ta	4	44	5	56	1	20	4	80
ZOOMLION-T	6	60	4	40	0	0	9	100
ZOOMLION-A	8	30	19	70	*	*	*	*
WASTE-GROUP	10	53	9	47	*	*	*	*
CARTOL					18	90	2	10
YAMA	8	42	11	58	*	*	*	*
JSO-A	5	83	1	17	*	*	*	*

Table A₆: FRANCHISE (HOUSE-TO-HOUSE) CHARGES

CITY	BELOW GHC 1		GHC1-5		GHC6-9		GHC10-12		ABOVE GHC12		TOTAL	
	RESPONDENTS	(%)	RESPONDENTS	(%)	RESPONDENTS	(%)	RESPONDENTS	(%)	RESPONDENTS	(%)	RESPONDENTS	(%)
KUMASI	0	0	117	88	16	12	0	0	0	0	133	100
ACCRA	5	1.9	11	4.2	32	12.3	199	76.2	14	5.4	261	100
TEMA	1	0.7	149	98.7	0	0	1	0.7	0	0	151	100
TAMALE	0	0	15	93.8	0	0	1	0.7	0	0	16	100
SEKONDI-TAKORADI	6	10.7	50	89.3	0	0	0	0	0	0	56	100
TOTAL	12	1.9	342	55.4	48	7.8	201	32.6	14	2.3	617	100

NB: Chi -Square value =553.234, Critical Chi-square Value =26.296 , Sig (2- sided) = 0.00, Significance level =0.05

Table A₂7: COMMUNAL COLLECTION SERVICE CHARGES (PAY AS YOU DUMP)

CITY	BELOW GHC 1		GHC 1- 5		TOTAL	
	RESPONDENTS	(%)	RESPONDENTS	(%)	RESPONDENTS	(%)
ACCRA	19	67.9	9	32.1	28	100
TEMA	0	0	10	100	10	100
TAMALE	0	0	11	100	11	100
SEKONDI- TAKORADI	16	36.4	28	63.6	44	100
TOTAL	35	37.6	58	62.4	93	100

NB: Chi -Square value =23.599, Critical Chi-square Value =7.815 , Sig (2- sided) = 0.00, Significance level =0.05



Table A₂ 8: WILLINGNESS TO - PAY FOR IMPROVED COMMUNAL COLLECTION SERVICE

CITY	NOT WILLING		WILLING		TOTAL	
	RESPONDENT	(%)	RESPONDENTS	(%)	RESPONDENTS	(%)
KUMASI	8	5.2	147	94.8	155	100
ACCRA	1	50.0	1	50.0	2	100
TEMA	4	28.6	10	71.4	14	100
TAMALE	28	13.2	184	86.8	212	100
SEKONDI-TAKORADI	23	34.9	43	65.2	66	100
TOTAL	64	14.3	385	85.8	449	100

NB: Chi -Square value =570.522, Critical Chi-square Value = 9.488 , Sig (2- sided) = 0.00, Significance level =0.05

Table A₂9: RESIDENTS VIEW ON WHO SHOULD PAY FOR COMMUNAL WASTE COLLECTION SERVICE

CITY	GENERATORS ONLY		GENERATORS ASSEMBLY/GOVERNMENT AND		GOVERNMENT/ASSEMBLY		TOTAL	
	RESPONDENTS	(%)	RESPONDENTS	(%)	RESPONDENTS	(%)	RESPONDENTS	(%)
KUMASI	1	0.3	185	63.8	104	35.9	290	100
ACCRA	45	15.3	234	79.6	15	5.1	294	100
TEMA	2	0.9	107	50	105	49.1	214	100
TAMALE	19	8.1	147	62.8	68	29.1	234	100
SEKONDI-TAKORADI	25	14.2	103	58.5	48	27.3	176	100
TOTAL	92	7.6	776	64.2	340	28.2	1208	100

NB: Chi -Square value =223.847, Critical Chi-square Value = 15.507, Sig (2- sided) = 0.00, Significance level =0.05

TABLE: A₂10 ASSESSMENT OF WASTE RE-USE ACROSS THE FIVE CITIES

CITY	NO		YES		TOTAL	
	RESPONDENTS	(%)	RESPONDENTS	(%)	RESPONDENTS	(%)
KUMASI						
ACCRA	16	6	266	94	282	100
TEMA	18	13	124	87	142	100
TAMALE	85	44	108	56	193	100
SEKONDI-TAKORADI	93	44	119	56	212	100
TOTAL	6	13	40	87	46	100
	218	25	657	75	875	100

NB: Chi -Square value =590.498, Critical Chi-square Value = 9.488, Sig (2- sided) = 0.00, Significance level =0.05

TABLE: A₂11 RESIDENTS WILLINGS TO SEPARATE ORGANIC WASTE ACROSS THE FIVE CITIES

CITY	NOT WILLING		WILLING		TOTAL	
	RESPONDENTS	(%)	RESPONDENTS	(%)	RESPONDENTS	(%)
KUMASI	17	6	273	94	290	100
ACCRA	88	36	160	65	248	100
TEMA	0	0	47	100	47	100
TAMALE	13	8	158	92	171	100
SEKONDI-TAKORADI	12	44	15	56	27	100
TOTAL	130	17	653	83	783	100

NB: Chi -Square value =730.053, Critical Chi-square Value =9.488 , Sig (2- sided) = 0.00, Significance level =0.05

SPSS OUTPUT

Chi-Square
Tests^a

	Value	df	Asymp. Sig. (2-sided)	Monte Carlo Sig. (2-sided)		
				Sig.	Lower Bound	Upper Bound
Where do you empty or dispose your waste						
Door-to-Door collection	Pearson Chi-Square	8	.000	.000 ^b	.000	.002
	Likelihood Ratio	8	.000	.000 ^b	.000	.002
	Fisher's Exact Test			.000 ^b	.000	.002
	N of Valid Cases	694				
Communal Collection(a skip container in the neighbourhood)	Pearson Chi-Square	8	.000	.000 ^b	.000	.002
	Likelihood Ratio	8	.000	.000 ^b	.000	.002
	Fisher's Exact Test			.000 ^b	.000	.002
	N of Valid Cases	377				
An open dump(waste is collected regularly)	Pearson Chi-Square	4	.000	.000 ^b	.000	.002
	Likelihood Ratio	4	.000	.000 ^b	.000	.002
	Fisher's Exact Test			.000 ^b	.000	.002
	N of Valid Cases	66				
An open dump(waste is not collected)	Pearson Chi-Square	3	.019	.025 ^b	.016	.033
	Likelihood Ratio	3	.017	.010 ^b	.004	.015
	Fisher's Exact Test			.025 ^b	.016	.033
	N of Valid Cases	123				

a. 2 cells (13.3%) have expected count less than 5. The minimum expected count is 3.87.

b. Based on 1260 sampled tables with starting seed 2000000.

c. 2 cells (13.3%) have expected count less than 5. The minimum expected count is 2.36.

d. 3 cells (33.3%) have expected count less than 5. The minimum expected count is .52.

e. 4 cells (50.0%) have expected count less than 5. The minimum expected count is .62.

TABLE A₃2: FREQUENCY OF COLLECTION (MODE OF COLLECTION)

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Monte Carlo Sig. (2-sided)		
				Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Pearson Chi-Square	1261.572(a)	15	.000	.000(b)	.000	.002
Likelihood Ratio	872.220	15	.000	.000(b)	.000	.002
Fisher's Exact Test	845.986			.000(b)	.000	.002
N of Valid Cases	1260					

a 1 cells (4.2%) have expected count less than 5. The minimum expected count is 4.03.

b Based on 1260 sampled tables with starting seed 2000000.

**TABLE A₃3: SANITARY CONDITIONS AT BIN/CONTAINER SITE
(MODE OF COLLECTION)**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Monte Carlo Sig. (2-sided)		
				Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Pearson Chi-Square	1243.622(a)	15	.000	.000(b)	.000	.002
Likelihood Ratio	898.533	15	.000	.000(b)	.000	.002
Fisher's Exact Test	878.228			.000(b)	.000	.002
N of Valid Cases	1260					

a 1 cells (4.2%) have expected count less than 5. The minimum expected count is 3.67.

b Based on 1260 sampled tables with starting seed 2000000.

TABLE A₃4: CLEANLINESS OF SURROUNDINGS (MODE OF COLLECTION)

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Monte Carlo Sig. (2-sided)		
				Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Pearson Chi-Square	1296.620(a)	15	.000	.000(b)	.000	.002
Likelihood Ratio	918.470	15	.000	.000(b)	.000	.002
Fisher's Exact Test	896.095			.000(b)	.000	.002
N of Valid Cases	1260					

a. 2 cells (8.3%) have expected count less than 5. The minimum expected count is 4.24.

b. Based on 1260 sampled tables with starting seed 2000000.

TABLE A₃5: NEATNESS OF COLLECTION CREW (MODE OF COLLECTION)

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Monte Carlo Sig. (2-sided)		
				Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Pearson Chi-Square	1065.940(a)	15	.000	.000(b)	.000	.002
Likelihood Ratio	718.642	15	.000	.000(b)	.000	.002
Fisher's Exact Test	697.380			.000(b)	.000	.002
N of Valid Cases	1260					

a. 3 cells (12.5%) have expected count less than 5. The minimum expected count is 1.36.

b. Based on 1260 sampled tables with starting seed 2000000.

TABLE A₃6: NEATNESS OF WASTE COLLECTION VEHICLE (MODE OF COLLECTION)

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Monte Carlo Sig. (2-sided)		
				Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Pearson Chi-Square	989.343(a)	15	.000	.000(b)	.000	.002
Likelihood Ratio	673.911	15	.000	.000(b)	.000	.002
Fisher's Exact Test	654.448			.000(b)	.000	.002
N of Valid Cases	1260					

a. 4 cells (16.7%) have expected count less than 5. The minimum expected count is .94.

b. Based on 1260 sampled tables with starting seed 2000000.

TABLE A₃7: QUICK RESPONSE TO RESIDENTS' COMPLAINTS (MODE OF COLLECTION)

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Monte Carlo Sig. (2-sided)		
				Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Pearson Chi-Square	1122.534(a)	15	.000	.000(b)	.000	.002
Likelihood Ratio	785.636	15	.000	.000(b)	.000	.002
Fisher's Exact Test	761.743			.000(b)	.000	.002
N of Valid Cases	1260					

a. 3 cells (12.5%) have expected count less than 5. The minimum expected count is .79.

b. Based on 1260 sampled tables with starting seed 2000000.

TABLE A₃8: BEHAVIOUR/ATTITUDE OF COLLECTION CREW (MODE OF COLLECTION)

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Monte Carlo Sig. (2-sided)		
				Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Pearson Chi-Square	1099.085(a)	15	.000	.000(b)	.000	.002
Likelihood Ratio	734.838	15	.000	.000(b)	.000	.002
Fisher's Exact Test	713.569			.000(b)	.000	.002
N of Valid Cases	1260					

a. 4 cells (16.7%) have expected count less than 5. The minimum expected count is .89.

b. Based on 1260 sampled tables with starting seed 2000000.

TABLE A₃9: SANITARY CONDITION OF DRAINS(MODE OF COLLECTION)

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Monte Carlo Sig. (2-sided)		
				Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Pearson Chi-Square	1237.137(a)	15	.000	.000(b)	.000	.002
Likelihood Ratio	885.154	15	.000	.000(b)	.000	.002
Fisher's Exact Test	862.716			.000(b)	.000	.002
N of Valid Cases	1260					

a. 1 cells (4.2%) have expected count less than 5. The minimum expected count is 3.04.

b. Based on 1260 sampled tables with starting seed 2000000.

TABLE A₃10 : RESIDENTS APPRECIATION OF WASTE REUSE ACROSS THE FIVE CITIES

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Monte Carlo Sig. (2-sided)		
				Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Pearson Chi-Square	590.498(a)	8	.000	.000(b)	.000	.002
Likelihood Ratio	596.714	8	.000	.000(b)	.000	.002
Fisher's Exact Test	591.351			.000(b)	.000	.002
N of Valid Cases	1260					

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 33.22.

b. Based on 1260 sampled tables with starting seed 475497203.

TABLE A₃11: RESIDENTS WILLINGNESS TO SEPARATE ORGANIC WASTE ACROSS THE FIVE CITIES

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Monte Carlo Sig. (2-sided)		
				Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Pearson Chi-Square	730.053(a)	8	.000	.000(b)	.000	.002
Likelihood Ratio	816.529	8	.000	.000(b)	.000	.002
Fisher's Exact Test	802.952			.000(b)	.000	.002
N of Valid Cases	1260					

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 19.81.

b Based on 1260 sampled tables with starting seed 508741944.

TABLE A312: RESIDENTS VIEW ON WHO SHOULD PAY FOR COMMUNAL WASTE COLLECTION SERVICE ACROSS THE FIVE CITIES

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Monte Carlo Sig. (2-sided)		
				Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Pearson Chi-Square	223.847(a)	12	.000	.000(b)	.000	.002
Likelihood Ratio	269.139	12	.000	.000(b)	.000	.002
Fisher's Exact Test	260.432			.000(b)	.000	.002
N of Valid Cases	1260					

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.92.

b Based on 1260 sampled tables with starting seed 1585587178.

TABLE A₃13: SERVICE SATISFACTION ACROSS THE FIVE CITIES

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Monte Carlo Sig. (2-sided)		
				Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Pearson Chi-Square	245.527(a)	8	.000	.000(b)	.000	.002
Likelihood Ratio	225.643	8	.000	.000(b)	.000	.002
Fisher's Exact Test	224.190			.000(b)	.000	.002
N of Valid Cases	1260					

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 34.29.

b Based on 1260 sampled tables with starting seed 403768731.

TABLE A₃14: COMMUNAL COLLECTION SERVICE CHARGES

(PAY AS YOU DUMP)

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Monte Carlo Sig. (2-sided)		
				Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Pearson Chi-Square	23.599(a)	3	.000	.000(b)	.000	.002
Likelihood Ratio	30.331	3	.000	.000(b)	.000	.002
Fisher's Exact Test	24.794			.000(b)	.000	.002
N of Valid Cases	93					

a 2 cells (25.0%) have expected count less than 5. The minimum expected count is 3.76.

b Based on 1260 sampled tables with starting seed 1487459085.

TABLE A₃15 : HOUSE-TO-HOUSE SERVICE CHARGE(FRANCHISE)

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Monte Carlo Sig. (2-sided)		
				Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Pearson Chi-Square	553.234(a)	16	.000	.000(b)	.000	.002
Likelihood Ratio	699.366	16	.000	.000(b)	.000	.002
Fisher's Exact Test	664.671			.000(b)	.000	.002
N of Valid Cases	617					

a 10 cells (40.0%) have expected count less than 5. The minimum expected count is .31.

b Based on 1260 sampled tables with starting seed 1066061003.

TABLE A₃16: RESIDENTS WILLINGNESS TO PAY MORE FOR IMPROVED SERVICE (COMMUNAL COLLECTION)

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Monte Carlo Sig. (2-sided)		
				Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Pearson Chi-Square	323.783(a)	20	.000	.000(b)	.000	.002
Likelihood Ratio	252.415	20	.000	.000(b)	.000	.002
Fisher's Exact Test	235.565			.000(b)	.000	.002
N of Valid Cases	278					

a 20 cells (66.7%) have expected count less than 5. The minimum expected count is .03.

b Based on 1260 sampled tables with starting seed 1660843777.