UNIVERSITY OF CAPE COAST

HOUSEHOLDS' ATTITUDE AND STRATEGIES TOWARDS SOLID WASTE MANAGEMENT IN THE ACCRA METROPOLIS

BY

THEODORE KWASI AGBEVEADE

Dissertation submitted to the Institute for Development Studies of the Faculty of Social Science, University of Cape Coast, in partial fulfilment of the requirements for award Master of Arts Degree in Development Management.

DECEMBER 2013

DECLARATION

Candidate's Declaration

I hereby declare that this dissertation is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Name: Theodore Kwasi Agbeveade

Candidate's Signature: ..... Date: .....

Supervisor's Declaration

I hereby declare that the preparation and presentation of the dissertation were supervised in accordance with the guidelines on supervision of dissertation laid down by the University of Cape Coast.

Supervisor's Name: Dr. Owusu Boampong

Supervisor's Signature: ..... Date: .....

ABSTRACT

The Accra Metropolitan Assembly (AMA) is increasingly finding it difficult to grapple with managing municipal solid waste. Attempts to address this waste menace have rather been ad hoc instead of holistic approaches. With solid waste generation outstripping collection and disposal, it is not surprising to find parts of the city engulfed in filth. Low and middle income areas are at the peril of this problem. Waste collection and disposal options are generally inadequate.

The study set out to investigate how attitudes, perceptions and waste disposal strategies affect municipal solid waste management. Data was primarily collected from 156 households from 16 selected localities in 6 Sub Metropolitan areas within the Accra Metropolis. Data collected centred on households' perceptions, attitudes and strategies adopted in the management of household solid waste.

The results show that roadside collection and communal dumping are most preferred strategies for waste disposal. Waste segregation at source is virtually non-existents. Households' exhibition of poor environmental habits is a measure of perception on various issues bothering environmental consciousness. People who are positively aware of the need to keep the immediate and larger environment clean tend to litter less and adopt safer approaches to solid waste disposal.

Based on the findings of this study, the institution of holistic measures that would address the immediate need of keeping clean the environment and in the long term, altering perceptions and attitudes is recommended.

ACKNOWLEDGEMENTS

My special thanks go to my entire family, especially Vincent and Beatrice for their encouragement and support in diverse ways throughout and particularly during this stage of my life. My sincere and profound gratitude also goes to my supervisor, Dr. Owusu Boampong for his patience, guidance and constructive contribution to this work.

Finally, I wish to express an earnest appreciation to Mark Amenyo-Xa, Joseph Mills, Abigail Klokpa and Edem Botchway; and to all my friends and course mates for their encouragement and support.

DEDICATION

To my lovely parents Vincent & Beatrice Agbeveade

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

INTRODUCTION

Background to the Study

The urban poor living in sub-Saharan Africa reside in what the United Nations (UN) defines as slums – i.e. communities in which there is no security of tenure, no access to improved water and sanitation and where dwellings units are made of nondurable materials and are generally overcrowded usually with three or more people per room. Many of these slum dwellers live under all or most of these conditions (UN-Habitat, 2009). Again, more than half of Sub-Saharan Africans' population have no access to improved sanitation. Waste generation in particular is on the ascendency and disposal strategies are nothing to write home about.

UN-Habitat (2009) identified that slums and other densely populated low income areas contend with many social and economic problems. It is common to see residents living next to mountains of solid waste, a phenomenon which is hardly observed in the less densely populated or high income areas. This clearly has a negative effect on the environment and human health.

Developing countries are at the peril of the effects of their drive to catch up with the developed nations, typical of which include population growth (occurring at rates which make it difficult for national and local governments to effectively provide social amenities to cater for its citizenry). This consequently results in haphazard urbanisation leading to unbalanced development. Many

urban residents are thus left to grapple with the fast decline in environmental conditions.

The worsening environmental conditions are mainly as a result of uncontrolled solid waste generation which is directly proportional to consumption patterns and diversity in products; coupled with poor collection and disposal. The generation of solid waste has assumed frightening heights with its attending life threatening issues (Onibokun, 1989; as cited in Ogbonna, Amangabara & Ekere, 2007).

Undoubtedly, the urban solid waste phenomena become increasingly complex as human societies develop and urbanise. The degradation of the physical environment impacts on its aesthetic quality and affects life forms in general. Problems associated with solid waste management–with special reference to safe disposal–are globalised yet more pronounced in the third worlds. The effects of ineffective collection can include unprecedented morbidity and mortality in urban areas (Ogbonna, Amangabara & Ekere, 2007; Majumder & Karim, 2012).

The sanitation situation in many African cities has over the years lacked major improvements, thus evolving into a multi-complex factor posing as a bane to growth and development that successive central governments and local authorities contend with. The city of Accra suffers a similar plight with its environment characterised by choked drains, tonnes of waste indiscriminately disposed with several uncollected solid wastes in central waste containers all throughout the city. Earlier works have attributed this situation to a variety of factors (Acheampong, n.d.; UN-Habitat, 2009 & Agyepong, 2011).

The challenges of disposing of solid waste become increasingly difficult as towns and cities continue to receive influx of large numbers of people congregating in relatively small areas in pursuit of livelihoods (Shafiul & Mansoor, 2004). The rise in towns and cities and their population meant a reduction in available lands for waste disposal. By this phenomenon, it was imperative that the time for managing the generation, handling and disposal of municipal solid waste has come.

Managing municipal solid waste is a complex function and may incorporate activities such as source separation, storage, collection, transportation and disposal of solid waste. It is seen as a necessary environmental health service that forms an integral part of basic urban health service (Puopiel, 2010).

MSW management has always been generally carried out by metropolitan governments in both developed and developing world. In Ghana, the Metropolitan, Municipal and District Assemblies are tasked to perform this basic function of the government. These local governments like many others in Africa are overwhelmed by the tonne of waste generated daily especially in urban centres such that Zerbock (2003) suggests that the management of MSW is a number-two priority on the agenda of environmental health concerns.

Unsanitary conditions in Ghana have been propelled by the manner in which people handle solid waste. The disregard for the use of waste bins provided in public areas according to Adelaide (1995; as cited by Freduah, 2007) demonstrates people's reluctance to walk distances to dispose of their refuse appropriately; a reason partly ascribed to the indiscriminate littering engulfing many cities and towns in Ghana. This poses challenges not only to

sanitation officers, but also to the waste management departments of the metropolitan, municipal and district assemblies in Ghana.

It is estimated that local governments spend between 35 – 60 percent of their budget on waste management with collection and disposal consuming the chunk (70 – 90%) of this amount (UNEP, 2010). Despite this huge chunk of amount expended by the assembly, waste management is yet to be adequately catered for.

Again, due to the large quantities of waste generated on daily basis, the Accra Metropolitan Assembly's Waste Management Department is faced with the task of delivering solid waste management services in a sustainable manner (Boadi & Kuitunen, 2004).

In Ghana, the participation of the private sector in waste management has received massive boost in times past (Benneh *et al.*, 1993; Laryea, 1997; Boadi & Kuitunen, 2004). Actors range from individual waste carters to multi-national waste management consortiums. Their formal participation in the management of solid wastes which was hitherto non-existent saw the sector gaining a greater control of the city's garbage collection and disposal needs from the Accra Metropolitan Assembly. It thus concentrates typically on the supervision and monitoring services of municipal waste management services carried out by private contractors (Boadi & Kuitunen, 2004; Oteng-Ababio, 2010; Hormenu, 2011).

Despite this, the participation of privately owned municipal waste management companies has not been adequate especially in middle and low income areas. The percentage of solid wastes effectively collected and disposed are far lower than the backlog. Many of these end up in the streets, drains, water

bodies and open areas, thus leaving the city in filth (Boadi & Kuitunen, 2002; Oteng-Ababio, 2010). This phenomenon has been attributed to institutional capacity challenges which make it difficult for both the private firms and AMA to effectively carry out their responsibilities (UN-Habitat, 2009). Other writers have cited public apathy to environmental issues as a delimiting factor hinging not only on the nation's developmental agenda but also on the activities of waste management firms (Tsiboe & Marbell, 2004; Mariwah, Kendie & Dei, 2010; Puopiel, 2010).

Though the decline in the acceptable quality of the environment is as a result of uncontrolled population growth, haphazard urbanisation and unbalanced development (Whittington *et al.*, 1993), Banjo *et al.* (2000) suggests that people's attitudes, as well as their choice for disposal strategies. Notwithstanding this, these factors are occurring at a rather unprecedented rate than ever expected several years ago. Developing countries are at the peril of these declining environmental conditions (Post, 2002; UNICEF, 2006).

Drawing inference from Barr (2007) who put forward that a person's perceived value of the environment, situational characteristics and psychological factors play significant roles in the prediction of waste management behaviour; thus sees attitudes as an important factor in any waste management programme.

To throw light on the importance of attitudes in SWM, Begum, Siwar, Pereira and Jaafar (2009) expatiated how attitudes and behaviours affect waste management and found that positive attitudes toward waste management yield satisfactory behaviours – largely promoting solid waste management schemes. They suggested that source reduction, reuse and recycling schemes, frequency

of waste collection, participation in programmes designed to improve waste management and waste disposal method are some important and significant factors that factors affect attitudes and behaviours and are necessary to effectively improve solid waste management, as well as to reduce the environmental degradation of different waste producers.

Statement of the Problem

It is increasingly becoming difficult for the Accra Metropolitan Assembly to grapple with managing the municipal solid waste situation within the city of Accra. By and large, attempt to address these wastes menace has seen several ad hoc solutions rather than a focus on holistic approaches. With SW generation outstripping collection and disposal, it is not surprising to find parts of the city engulfed in filth.

The several tonnes of SW left uncollected or improperly disposed have implications on environmental health; including *(i.)* increase in the prevalence of diseases such as diarrhoea, cholera, dysentery and malaria as a result of exposures through ingestion of contaminated water or food, contact with disease vectors and inhalation; *(ii.)* flooding as a result of uncollected waste clogging drains and obstructing storm water runoff, resulting in loss of lives and properties; and *(iii.)* loss of the aesthetic value and the life-supporting ability of the land, water and air as a result of leaching, direct dumping of untreated waste into water bodies and release of poisonous gases into the atmosphere from putrefying solid wastes from poorly engineered dumpsites (Korfmacher, 1997; Post, 1999; Pokhrel, & Viraraghavan, 2005; Abel, 2007; Ogbonna, Amangabara & Ekere, 2007; Sharholy, Ahmad, Mahmood & Trivedi, 2008).

Low and middle income areas are at the peril of this problem. Waste collection and disposal options are generally inadequate and the upshot can be bad for public health. Effort has been centred on strengthening the inter-institutional relationship in a bid to address this bane to development. The abuse of the environment is gradually being viewed more as one of societal failure, a norm rather than an aberration, where the manufacture of goods and services is occurring at the expense of the environment.

The attitudes and values of people are important in determining pro-environmental behaviour (Dillon & Gayford, 1997) and these attitudes though cannot be measured through direct observation; the Theory of Planned Behaviour (TPB), posits that they are predictable and can be measured given prior knowledge of the behavioural, normative and control beliefs that a person has or perceives (Ajzen, 2002; as cited in Mariwah *et al.*, 2010). Thus the inference that the attitudes of people towards waste generation and management including choice disposal methods are largely volitional can be made (Dillon & Gayford, 1997).

Efforts must be devoted to managing solid waste in a more efficient through a significant gain in knowledge of the attitudes of people and the underlying factors for waste disposal strategy deployed by waste generators. This is expatiated by Appasamy and Lundqvist (1993) stating that it pays to give considerable attention to knowledge and attitudes in resource management. This goes a long way to have an impact on the performance of institutions as well. Thus attitudes and strategies towards waste are an important feature to consider in any waste management research.

Research Objectives

The main objective of this study is to investigate how household's attitudes and perceptions affect MSW management.

The specific objectives to help achieve these are;

i. Identify the various household solid waste disposal strategies deployed by residents
ii. Ascertain the attitudes and perceptions of households towards solid waste management
iii. To find out how these attitudes and perceptions affect MSW management
iv. To identify the quality of solid waste management services residents receive from their service providers
v. To assess the perception of households with regards to paying for solid waste management services
vi. To make recommendations for enhancing the management of solid waste in AMA

Research Questions

The solid waste situation in The Metropolis is greatly influenced by people's attitudes and perceptions with respect to SWM and these consequently affect the willingness of households to pay for enhanced SWM services. To ascertain this, answers to the following questions are needed:

1. What strategies exist in disposing of household solid waste?
2. What are the attitudes and perceptions of households towards waste management?

3. What effect does households' attitude and perception have on MSW management?
4. What quality of MSW management service do residents receive?
5. What perceptions do households have with regard to paying for the waste management services?
6. In what ways can MSW management be improved in the Accra metropolis?

Significance of the Study

The management of solid waste is a major challenge to development in many urban centres. The challenges associated with MSW management is heightened so much so that it is no longer the reserve of the Metropolitan Assembly and their private waste management partners to deal with. Rather it calls for a concerted effort, bringing on board several other stakeholders and the civil society to find holistic resolutions that would stand the test of time.

Also, with the millions of Ghanaian cedis spent annually to address the solid waste situation (Cointreau-Levine, 2000; Boadi & Kuitunen, 2004; Mariwah *et al.*, 2010) creating a deepened understanding of how attitudes and perceptions can affect waste management strategies both positively and negatively, goes a long way to provide basis for harnessing and altering social character and thinking, thus providing data relevant for the design and implementation of future waste management programmes centred on behaviour change. This can go a long way to reduce the daily volumes of solid wastes generated, improve waste handling and disposal; all of which can have a

significant impact on the cost metropolitan, municipal and district assemblies bear on municipal solid waste management.

Additionally, the information provided in this research can serve as a useful resource for use by government, the Metropolitan Assembly, private waste management firms and other stakeholders engaged in solid waste management in the formulation of policies for sound waste management.

This research is also relevant to the academic community since it seeks to confirm and deepen the existing pool of knowledge on the effect people's attitude towards waste have on municipal solid waste management and goes further, within the context of this work to see how this knowledge can be applied. It can also stimulate further research on the subject of how attitudes and perceptions impact on solid waste management activities.

Research limitations

The major factor that greatly affected the research work was the relatively large size of the metropolis. Though the cost in conducting this research affected the conduct of this exercise, time as a factor was significantly paramount as it also contributed not only in determining the number of questionnaires distributed but also the number of localities reached for the study. In other words, the nature of this study would have required a larger geographical perspective of the metropolis rather than limiting it to the selected 16 localities.

In some instances, field officers had to help in the completion of the questionnaires for some respondents who could not understand, read nor write in English via the use of an interpreter where needed. Not only was this phenomenon time consuming but also may have introduced a bit of inaccuracies in responses perhaps due to translation. However, efforts were made to reduce these inaccuracies as much as possible by explaining each question to make it easier to translate to and fro both languages.

Lastly, though the response rate to most questions were generally good, some questions were left answered. This is particularly true for questionnaires that were completed by respondents themselves.

Organisation of the Study

The organisation of this study is presented in five (5) chapters. Chapter one provides an introduction to the study. It focuses on providing a background to the study, analysis the extent of the problem, whilst stating the research questions and objectives. It further addresses the significance and limitations of

the study. Chapter two examines related literature in detail. It addressed issues concerning the definition of waste as a concept, MSW management in totality, the concepts of attitudes, perceptions and how these are related to SW management. Chapter three discusses the methodology employed in the study. It delves into a description of the study area, the sampling and selection procedure, instrument for data collection, data collection and analysis. Chapter four presents the results and discussions and chapter five gives a summary, conclusions and recommendations of the entire study.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter discusses theoretical and conceptual issues generally pertaining to solid waste management, people's attitudes and perceptions and how these affect their solid waste management activities. It also discusses in bit how behavioural changes can be stimulated for the benefit of societies.

Municipal solid waste

Definition of waste

Ita (2003) sees waste as any material lacking direct value to the producer and so must be disposed of or as any residue that is of no use in its current state to the people who caused it. In other words, it is the substance generated during the production process of turning raw materials into finished products, the consumption of final products and many other human activities.

Also UNEP (2009) defines the term as substances or objects which are disposed or are intended to be disposed or are required to be disposed of by the provisions of national laws. Similar to this, UNICEF (2006) explains the terminology as any material that is thrown away as unwanted.

In view of this, the term waste has several definitions and an attempt to provide all this will create an inexhaustible list. However, the definition of waste is characteristic of its form, properties, origin and perspective of the generator.

This means that the term waste is also subjective since different people have different perceptions of what they consider to be waste. It is thus worthwhile to look at it from the perspective of the person currently in possession of it since this concept is peculiar to the judgement of its owner. Such conceptions have connotations to the successes of solid waste management schemes and strategies designed to address problems associated with municipal solid waste (World Bank, 1999; Tsiboe & Marbell, 2004).

Source and characterisation of waste

Solid waste may be generated from sources such as households, offices, shops, markets, restaurants, public institutions, construction and demolition sites, industries and agricultural activities (Refer to Table 1). The summation of solid wastes from all of these sources is what is referred to as municipal solid waste. Domestic solid wastes are the results of household activities. They are usually semi-solid to solid materials considered to be worthless to households for which reason they must be disposed of. The term is synonymous to refuse, garbage, rubbish, etc. and are used interchangeably in most cases.

Table 1: Sources and types of solid wastes

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

Source: World Bank, 1999.

Nature and composition

The varying nature and composition of municipal solid waste is attributed to factors such as geographical location, climatic conditions, prevailing standard of living and energy source. The composition of municipal solid waste may include varied quantities of food waste, garden & park waste, paper and cardboard, wood, textiles, nappies (disposable diapers), rubber and leather, plastics, metal, glass (and pottery and china) and many others (e.g., ash, dirt, dust, soil, electronic waste etc.). Most of the solid wastes (55.6%) generated in Africa south of the Sahara contain high levels of degradable organic materials (Pipatti, Sharma & Yamada, 2006) and these are mostly bulky and difficult to handle.

The increase use of plastics has altered the organic waste composition of municipal solid waste. Though the percentage composition today is a little lower, albeit municipal solid waste still contain more organic waste matter than other components with plastic wastes component coming second (Oteng-Ababio, 2010). The organic components are largely garden cuttings, kitchen wastes, leftover foods and food processing waste (World Bank, 1999).

Overview of MSW management in Ghana

Waste management in Ghana lacks a well designed and operational system, thus plagued by challenges that militate against efficient and safe disposal methods (Asase *et al.*, 2009) making high the risks of health challenges to human through the loss of the environment's life-supporting characteristics. In their work, they compared MSW management systems in the cities of London, Ontario-Canada and Kumasi, Ghana, suggesting that an integrated

waste management system is a sustainable approach to solid waste management in both developed and developing countries.

Municipal governments in Ghana are usually responsible for solid waste collection and disposal. The Waste Management Department of the Accra Metropolitan Assembly was established in the mid-1980s with the help of the German Government to have oversight responsibilities on waste disposal in the city of Accra. It is particularly responsible for the management of municipal solid waste within the Accra metropolis. As the population of the city grew, it became increasingly difficult for the Waste Management Department to adequately carry out cleaning services. This was the case until the 1990s when the participation of the private sector had to be introduced in municipal solid waste management. The failure of the Waste Management Depart to adequately tackle the waste management needs of the Metropolis was hinged on several factors. These include difficulty in raising funds to cater for huge capital need of the department and institutional weakness—with respect to lack of political will or political interference—to carry out its responsibilities. It is also attributed to inadequate human resource capacity needs and partly to the poor performance of the Ghanaian economy between the 1970s and 1980s. It was in this period that the Ghanaian economy saw the introduction of several structural adjustment programmes as a way to go (Hormenu, 2011).

In the face of the worsening solid waste collection and disposal activities of the department, it was not surprising that the Waste Management Department was affected by these adjustments. The inadequacies of the Waste Management Department led to the privatisation of at least 80 percent of the waste management services of the Metropolis. The involvement though was purposed

at achieving desired results have however not brought about any significant improvement in solid waste management due to similar constraints the Waste Management Department of the Accra Metropolitan Assembly encountered. Many discussions on this subject matter linked the ill-performance of the private sector to the then monopolisation of the market by the foreign-owned firm, City and Country Waste, whose presence overshadowed the participation of local small-scale firms (Benneh *et al.,* 1993; Boadi & Kuitunen, 2003). Since then, several re-modifications have been made in policies and infrastructure all in a bid to keep the city clean. Yet the question "why is Accra dirty?" still remains.

The role of private firms in providing solid waste services involves mainly house-to-house and curb or roadside collection. In areas were accessibility is limited or impossible, communal solid waste bins are provided at specified locations and are removed periodically. Today, Accra is still overwhelmed with filth and garbage. Challenges in solid waste management are general and cut across both privately-owned and publicly-owned waste management firms. More pronounced amongst them has to do with equipment and logistics, budgetary constraints and insufficient revenue generation (Laryea, 1997; Mensah & Larbi, 2005).

Efforts have been put in place by some local governments to increase revenue for waste collection and disposal. One common approach is the Pay-As-You-Dump initiative recommended by Puopiel (2010) where households are required to pay some amount before disposing wastes at communal dumpsites. Good as it may seem, the impact of this strategy is yet to be felt in the revenue mobilisation activities of Metropolitan, Municipal and District Assemblies.

The Greater Accra region is a home to over 4,010,054 people with growth rates soaring beyond 3.1 percent annually (Ghana Statistical Service [GSS], 2010). As evident in many parts of the city, the rapid state of urbanisation does not commensurate the capacities of the Metropolitan Assembly and private waste management firms in the management of municipal solid waste. Huge chunks of financial resources are spent daily to collect and dispose of municipal solid waste yet the expected results of these cleaning services are practically non-existent. Solid waste generation rates far outstrip collection (Mensah & Larbi, 2005).

In an attempt to give an explanation to this phenomenon, Zerbock (2003) suggests that the prior knowledge and understanding of the political and economic frameworks within which the national government operates is a necessity to adequately examine the challenges bedevilled municipal governments in managing solid wastes. In this work, the discussion alludes to the fact that demands for waste management services will rise steeply as the towns urbanises but the same will not be true for municipal revenue generation. This offset pans out from the economic background of the people moving into the city, majority of whom are likely to be poor migrants from rural areas in search of employment. These people in many cases are unable to contribute significantly to the revenues of the municipality. Thus municipal governments are likely to continue to spend up to 50% or more of their revenues on waste-related issues (UNEP, 2009; Puopiel, 2010).

Again Zerbock (2003) put forward that the budgetary constraints faced by local governments is not only because revenue generation does not commensurate their expenditure pattern. The attempts by municipal

governments in tackling these wastes problems have mostly been ad hoc and have not been able to address the root of the problem in the longer term. In the face of the city's growing population, the financial demand of MSW managements continues to pose challenges. This has become a matter of great concern as earlier works has suggested that residents' willingness to pay for waste collection and disposal services remains poor (Fobil & Hogarh, n.d.; Mariwah *et al*., 2010).

Willingness to pay for waste collection and disposal services are mostly lacking among residents in poor and middle income areas. The refusal of households to pay for solid collection and disposal affects the sustainability of most cleaning services (Daily Graphic, 2009:42 & Oteng-Ababio, 2010).

Exploring the issues further, Fobil *et al*. (2008) identified that the proportion of the population of the Greater Accra Metropolis' that receive periodic door-to-door or roadside collection services are few. Many of these residents live in high income neighbourhoods. In such areas, periodic curb side pickups are provided and residents are charged fees for the service and lease of the garbage containers. They explained that despite the payment for these services by waste generators, the accrued revenue is not reflective of the true cost incurred by waste management authorities in their collection and disposal functions. Thus, they are forced to augment in funding the most part of this service.

Shifting attention to urban dwellers in low income areas, the explanation in the previous paragraph paints a clear picture of why huge funding is required for collecting and disposing of solid waste as the population practically receives this service for free. Within this urban population, central containers are placed

at designated points for households to deposit their domestic wastes. Waste authorities responsible for these areas provide variable services because the collections are less lucrative and less reliable. A variety of pay-as-you-dump initiatives – posting a person near each central collection container to collect fees as residents dump – have been instituted to provide some cushioning revenue for better services.

With this, Fobil *et al*. (2008) concluded that roadside collection of household wastes was limited mostly to high and some middle income areas. Less adequate consideration is given to how households living in poor and less privileged urban communities within and at the peripheries of the city are to contend with the waste they generate daily.

Further works by Kendie (1999), Boadi and Kuitunen (2003) and Mariwah *et al.* (2010) suggested that weak authorities, resource constraints, ineffective hygiene management, people's attitude and perceptions of waste and disposal methods have significantly contributed to how MSW is handled in Ghana. According to them, addressing the waste menace the city is faced with cannot be pursued through a single approach. They alluded to the integration of a host of carefully thought-out and well-designed solid waste management schemes as a way forward to significantly achieve success in addressing SW management issues.

In other words, many activities come into play if the management of solid waste is to be enhanced. A combination of two or more of these activities – i.e. waste prevention, recycling, composting, controlled burning or landfilling – can add significantly to efforts in waste management. In addition to this, the avoidance and reduction of waste generation are the various ways by which

solid wastes are and can be managed (Laryea, 1997; Seik, 1997 & Post, 2002). These activities form the basis for integrated solid waste management schemes. They are however less common in Ghana. Management functions for municipal solid waste mostly concerns itself with collection and disposal.

Recycling, composting, controlled burning and source reduction are virtually non-existent in waste management plans of the Metropolitan assembly and other private waste management firms (Hormenu, 2011).

According to Hormenu (2011) solid waste management is a complex issue and must usually involve various stakeholders at all levels of planning and implementation. Involvement of stakeholders fully into waste management has had significant improvement in service provision and has affected desired results to some heights. It is therefore not surprising to observe that the era of side-lining stakeholders and monopolising waste management activities by municipal authorities is fading out. In its place is the promotion of a concerted and collaborated effort between municipal governments and various stakeholders to effectively find lasting solutions to the waste problems engulfing urban centres (Addai, n.d.; Achankeng, 2003).

In Ghana, the waste management activities of Metropolitan, Municipal and District Assemblies are supervised by the Ministry of Local Government and Rural Development with the Environmental Protection Agency vested with regulatory functions. The Accra Metropolitan Assembly and other waste management companies spend at least 50 percent of available budgets in managing solid wastes. Management activities are typically characterised by collection and disposal. Average collection rate is a little over half of all waste generated daily, thus services rendered do not commensurate the huge sums of

money spent on waste management (Acheampong, n.d.; World Bank, 1999; Mensah & Larbi, 2005; Puopiel, 2010; Hormenu, 2011).

The disposal sites are usually improperly selected and poorly engineered leaving much to be desired. MSW in many cases have not been separated and this undesired phenomenon has also been blamed on the use of inappropriate technology (Whittington *et al.*, 1993; World Bank, 1999; Longe, Longe & Ukpebor, 2009). With all of these in-depth review of previous works, it is not surprising that inefficient waste management was listed as one of Ghana's environmental problem in the First Step of Ghana's Vision 2020 report on economic and social development policies. This inefficiency, believed to be as a result of insufficient facilities and insanitary practices, usually arises from the engaging in economic activities. Sadly enough, they are still a reality today.

In a bid to improve municipal solid waste management, various governments have been committed to resourcing Metropolitan, Municipal and District Assemblies with waste management equipment and providing an enabling environment for effective private sector participation. Nevertheless, major gaps still exists (World Bank, 1999; Longe, Longe & Ukpebor, 2009). Metropolitan, Municipal and District Assemblies are invariably faced with the arduous task of properly managing municipal solid waste since these services are essential for urban residents to maintain, if not enhance their quality of life. Ideally, solid waste management at the municipal level comprises a host of activities; starting from collection and ends with disposal.

The challenge of managing municipal solid waste is usually connected with generation, storage, treatment and disposal. Transportation is required to

cart the waste in between each of these management stages (Banjo, Adebambo & Dairo, 2009).

Solid waste generation and handling

Globally, over 2 billion tonnes of solid waste is generated annually (UNEP, 2009). With Ghana's population standing at over 24 million and per capita MSW generated daily estimated at 0.55kg, the annual rate of MSW is estimated at over 4.9 million tonnes (Mensah & Larbi, 2005). Accra as a result of population growth is experiencing the creation of several low income and poor infrastructure areas which are direct upshots the proliferation of the urban population into the peripheral regions. The population density of Accra stands at over 1,200 persons per sq. kilometre according to the 2010 PHC (GSS, 2010). These peripheries accommodating the vast of the people have implications on the volume of waste generated on daily basis. Anomanyo (2004) has confirmed that at least about a 1800 tonnes of MSW is generated in Accra daily. Boateng and Nkrumah (2006) make similar contribution and go further to attribute this figure to the growth rate the region as a whole experiences annually.

Since a wide array of non-biodegradable materials are continually being produced daily into a finite amount of space, waste volumes are more and more becoming difficult to manage. As more waste is produced, more space is required to dispose them. The inability to adequately cater for collection and disposal is a contributing factor to littering (Chandra, n.d.; Fobil & Hogarh, n.d.; Mensah & Larbi, 2005). Littering destroys the natural beauty of the earth and impacts negatively on the environment. It also increases cost on MSW management since metropolitan assemblies are forced to employ the necessary

machinery to clean the city. Studies have shown that keeping a place clean and pleasing to the eye is the best way to reduce littering, as people are more likely to litter in an area which already has ample aggregates of litter (Keep America Beautiful [KAB], 2009).

Evidently, the effective management of solid waste in urban towns and cities is more and more becoming difficult for individuals, private waste management firms and the local governments. These difficulties have intensified the call for proper handling and disposal of waste especially when these have consequences for both public health and environmental damage (Anomanyo, 2004).

Waste segregation into various categories i.e. biodegradable (kitchen garbage, vegetables, fruits, leaves and papers) and non-biodegradable (e.g. plastics, glasses and oil/grease) is not extensively practiced in Ghana (Tsiboe & Marbell, 2004). The separation function of SWM usually occurs at the household. According to World Bank (1999) separating different types of waste components is an important step in the handling and storage of solid waste at the source which goes a long way to improve the efficiency of recycling and composting schemes. Furthermore, Banjo *et al*. (2009) identified that several advantages can be derived from source separation, their investigation into attitudes towards domestic waste disposal, pointed out that source separation was often absent among residents. Domestic wastes were left in piles for several days before disposal.

It is also observed that there is no system in place in Accra to handle recycling and re-use, concluding that the system of household solid waste collection does not encourage recycling. This serves as a disincentive for solid

waste separation at source. Sadly, both the Accra Metropolitan Assembly and the private waste contractors are not even looking at waste separation at source (Tsiboe & Marbell, 2004).

Also, Charuvichaipong and Sajor (2006) in their work on the promotion of solid waste separation at source argued that any project targeted at realising this practice would have to conceptualise, design and implement mechanisms that will deliberately promote salient local governance reforms.

According to Benneh *et al*. (1993) sixty-five, fifty, and thirty-two percent of households in upper, middle and low income residential dwellings respectively store solid waste in standard bins with lid. This notwithstanding, the use of sub-standard receptacles such as open baskets, empty/used paint containers, sacks and many others for solid wastes storage is prevalent amongst households in low income areas, accounting for at least 40 percent of this population in the Accra Metropolis.

The use of sub-standard receptacles for storing household waste has serious health and wellbeing implications for residents. This is especially so when a greater proportion of the population live in densely populated areas where sanitary infrastructure is practically absent. In areas like these, the importance of source separation cannot be overemphasised. Source separation comes with immense benefits. An immediate benefit to households is its ability to greatly reduce the bulk nature of waste and make its handling much easier. It also comes with some economic benefits directly for the waste producer and indirectly for the waste management authority (Freduah, 2007)

Solid waste separation, collection and disposal

Solid waste separation is an important waste management process prior to undertaking composting on any scale. The organic composition of municipal solid waste such as plant material, food scraps, and paper products separated from other inorganic materials serve as raw materials for composting. Municipal and private waste management authorities are increasingly looking for ways to enhance source separation of household waste. This need when achieved will make it easier to handle and transfer the various materials to recycling facilities (Qian, Burritt & Monroe, 2011). Solid waste separation is not widely practiced in Ghana. Several of the private waste management firms engaged by local governments are poorly equipped to carry out this function of solid waste management. Despite the benefits of source separation of waste including waste minimisation and increased recycling identified by Baud, Grafakos, Hordijk and Post (2001), this is largely lacking in various households in Ghana with the AMA yet to have policies or schemes that encourage the collection of separated waste from source (Addo-Yobo, & Ali, 2003).

Waste collection is the component of waste management which results in the passage of waste material from the source of production to either the point of treatment or final disposal (Hamdu, 2009). Municipal solid waste collection can be grouped into two categories, primary and secondary. Generally it involves the transport of waste materials by specialised vehicles to the location where the collection vehicle is emptied. It also involves all activities of gathering and sorting of solid waste into reusable or recyclable components. The difference between these two categories is found in the type of actors involved in it. Primary collection is carried out in households by residents. This

household solid waste management activity include sweeping, gathering, segregation and storage of solid waste prior to disposal at kerbsides, dumping sites and/or designated communal containers or depots for onward collection and transportation to final disposal site. Waste management firms are responsible for secondary collection and this is the collection and transport of waste from streets, designated communal containers or depots usually by use of specialised vehicles to final disposal site or treatment site (Oteng-Ababio, 2010 & Hormenu, 2011).

The collection and disposal of municipal solid waste is the most difficult and expensive aspect of solid waste management. The nature of solid waste, cost of transportation, availability of transport vehicles, distance to final disposal sites all have immense impact on the this function of solid waste management and can thwart effort to improving the efficiency in cleaning services.

The importance of collection and disposal cannot be overemphasised. Solid waste collection activities of local governments and other private waste management firms from residencies have been described as inadequate and these in many cases have been linked to financial constraints (Fobil *et al.*, 2008; Hormenu, 2011; Mayowa & Aribisala, 2012).

These inadequacies are defined in terms of the frequency of collection and timely or prompt nature of the collection and are basically as a result of the insufficient revenue making difficult the acquisition of equipment for the collection and disposal of waste (Hormenu, 2011).

Participation of the private sector in solid waste management focuses primarily on collection and disposal and is characterised by door-to-door

collections. This service is predominantly received by residents in most high income areas in Accra. Though some middle and low income areas receive such services, they come rather at an unsatisfactory manner compared to high income areas. Other authors have observed that the willingness to pay plays a vital role in the efficiency of these services (Tsiboe & Marbell, 2004; Macawile & Su, 2009; Mariwah *et al.*, 2010). Collected wastes ends up in landfills. Recycling and composting are least in the services private waste firms provide. In low income areas central container system is operational. There are designated points where containers are placed for households to dislodge their domestic waste for on-ward carriage to final waste disposal and incineration sites. Under this system the companies are paid according to the total tonnage conveyed to the final disposal point. Households pay no fees for waste generated (Laryea, 1997; Boadi & Kuitinen, 2003; Hormenu, 2011).

Nevertheless, municipal solid waste collection generally refers to the activities carried out at the secondary level. It is at this level that problems posed by waste become a subject of public concern. Solid waste collection can be a very labour-intensive undertaking, with relatively small capital outlay. Logistics for collection, transportation and disposal vary and are specialised in some cases. In a developing country like Ghana, collection services are carried out by a sizable crew of unskilled labourers, equipped with any of the following; shovels, rakes, baskets or bins, wheelbarrows or push-carts, cart with a draft animal, motorised or manual tricycles, or a dump-truck (Kumar & Chakrabarti, 2010; Mayowa & Aribisala, 2012). In some cases, residential communities have transfer stations where household garbage from an entire neighbourhood is disposed of for onward transfer to final disposal sites.

The collection, transportation and final disposal of municipal solid waste management as carried out by the Metropolitan Assembly according to Tsiboe and Marbel (2004) constitute up to about a fifth of the waste management needs of the metropolis. The rest are contracted to private firms, though the provision of this service leaves much to be desired. Collection capacities and efficiencies in disposal are enhanced if the necessary infrastructure is in place. This must go along with adequate access to requisite resources.

Disposal methods for municipal solid waste

In developed countries, efforts are put in place to reduce the percentage of municipal solid waste discarded since environmental degradation is intensified as dumping grounds for municipal solid waste becomes scarcer. EPA (2009) particularly indicated that a little over half of all the MSW (54.2%) generated in 2008 in the United States alone were passed for disposal after about a third of the wastes (33.2%) had been recovered for reuse. According to the EPA's report, final disposal is seen as a measure of last resort. Waste production is an endless cycle. Disposing solid waste inefficiently increases the chances of pollution in the environment. It contaminates surface and ground water supplies. Urban communities are hit most since solid waste clogs drains, creating enabling environment for pests to breed, more so floods during rainy seasons.

Disposal strategies thus adopted must be able to incorporate mechanisms that would safeguard the ecosystem. Disposing of municipal solid waste through the adoption of unscientific and improper techniques in the long term tend to be economically unviable and a nuisance to society. Though the selection of methods for the disposal of municipal solid wastes depends largely

on cost, it is imperative that the quantity and characteristics of these are considered in the design of efficient, cost effective and environmentally friendly disposal method. In Ghana, the disposal of municipal solid waste on land is by far the commonest and likely the cheapest. Almost all Metropolitan, Municipal and District Assemblies in the country dispose of municipal solid waste at open dumps or landfills. Other disposal methods also include incineration (open burning quite common), composting, resource recovery and recycling (Tsiboe & Marbell, 2004).

Composting

Though the decay and stabilisation of organic solid waste material occurs naturally under natural conditions, composting is another decomposition process where the reactions are subjected to human control. The control mechanisms – i.e. the introduction of biological organisms such as fungi and bacteria – accelerate the natural process of organic matter decomposition. This method is probably one of the oldest forms of disposal. Apart from being clean, cheap and safe, composting can significantly reduce the amount of disposable municipal solid waste. Composting methods and technologies vary from simple home-compost heaps to industry-scale enclosed vessel digestion (Hormenu, 2011).

Resource recovery and recycling

Energy recovery in well planned waste management systems occur either through combustion or pyrolysis. The heat generated as a result of the combustion of waste converts the water into steam. Steam is a resource for

generating electricity in some steam-powered turbines. Pyrolysis is the breakdown of complex chemical substances into simpler substances resulting in products such as methane, hydrogen and oxides of several compounds that are harnessed and repackaged for use (EPA, 2009).

Recycling is a form of resource recovery where materials from solid waste are used as raw materials for the manufacturing of new products. Recycling reduces the amount municipal solid waste to be disposed of and makes it possible to use relatively fewer new raw materials in the manufacturing of new products. Recycling has evolved in many ways from simple to complex industrial processes, making use of shredding, magnetic separation of metals, air classification that separates light and heavy fractions, screening and wet pulping in separating recyclables for use (Kofoworola, 2007; EPA, 2009).

In advanced countries, composting, recycling and resource recovery are waste management practices that precede final disposal at landfills. Though these methods entails enormous economic cost, nevertheless when established and well incorporated into the waste management stream have potentials of reducing the final volume of residue either incinerated or used in landfilling (Qian, Burritt & Monroe, 2011).

Open dumps

Open dumps virtually cost nothing to create. It is probably the cheapest and oldest form of solid waste disposal (Whittington *et al*., 1993). Community dumpsites are common solid waste disposal points for some urban dwellers in developing countries. These dumpsites are usually poorly designed without provision for leachate or gas recovery thus making them a major source of life

and health threatening factors and a host of other unpleasant conditions. By their nature, they are susceptible to open burning and are a great concern for pollution of the air and underground water (Rosqvist & Destouni, 2000).

In the selection of sites for open dumping especially at the municipal level, swamp lands or low-lying areas at the outskirts of towns and cities are usually considered. They are not scientifically engineered and lack environmental controls. In the few instances where sites are selected for the purposes of land reclamation, liners are rarely used and consideration hardly given to the pollution of groundwater (Joseph, 2002). The operation of these dumpsites is below the recommended standards of sanitary practice coupled with inadequate budgetary allocation for their maintenance (Mensah & Larbi, 2005).

Because most of the solid waste that end up at open dumps are untreated, uncovered and hardly segregated, they are opened to flies and rodents and are characterised by foul smell and unsightly appearance. Municipal workers are scarcely provided with protective clothing and are thus exposed to many health risks whiles working at the dumps (Kungskulniti, Pulket, Miller, & Smith, 1991; Ogwueleka, 2009). Also the financial consequences for managing this cheaply engineered dumping ground are rather huge particularly for large metropolis (Whittington *et al*., 1993).

Landfill

Landfills are the most traditional ways for advanced societies to deal with waste disposal. They are engineered areas designed to reduce (or block) the permeability of the underlying soil to lessen leaching from the waste. Proper

designing and selection of site for landfills is crucial to avoid groundwater contamination. Joseph (2002) describes it as a vital component of any well-designed MSW management system adding that it serves as the final disposal point of municipal solid waste after all other options have been exercised.

Landfills have the capacity to accommodate several tonnes of solid waste. A well-engineered landfill site is able to last at least 25 years. They are considered the most satisfactory means of solid waste disposal and are relatively cheap to operate provided landfill site is within economic range of the solid waste source. Unlike an open dump, landfills are carefully planned and uniquely engineered to reduce the pollution of surface and ground water. This is achieved through the lining and contouring of every layer of garbage filling. Several other factors such as compacting, proper site selection, provision of vents help to reduce the problems of air and water pollution and explosions that characterise landfills (Mwiganga & Kansiime, 2005; Osei *et al*., 2011).

Hamdu (2009) and Puopiel (2010) indicated that municipal solid waste usually gets dumped in ill-prepared landfills in poorer developing countries. These solid waste are spread in thin layers and compacted. Thin layers of clean earth are spread on the layer of garbage when a thickness of about 3m is achieved. These alternating layers of garbage and clean earth are carefully compressed with earthmoving equipment to form cells.

In instances where these are not properly done, these municipal solid waste which usually contain considerable quantities of raw human waste and often hazardous toxic wastes which may leach into the groundwater and/or provide breeding ground for rats, flies, and mosquitoes (Boadi & Kuitunen, 2003; Hormenu, 2011). According to Tsiboe and Marbell (2004) the Accra

Metropolitan Assembly's Waste Management Department has as part of its responsibility the management of landfills; and monitoring and supervision of private waste contractors.

Incineration

Combustion in an incinerator is not always perfect and there have been concerns about micro pollutants in gaseous emissions from incinerator stacks. Particular concern has focused on some very persistent toxic substance such as dioxin which may exist at varying levels in both the fly ash and the ash that is left in the furnace after burning. Disposing of this ash may also come with some challenges. This notwithstanding, incineration is gradually becoming popular especially in the developed world due to its ability to reduce waste volumes. This disposal method is largely energy intensive and involves the complete combustion of municipal solid waste and other hazardous compounds into ashes in large furnaces at temperatures beyond 1000° C to as high as 1700° C. Other by-products apart from the ashes produced are simpler and less toxic greenhouse gases such as oxides of carbon, sulphur and nitrogen. Modern day incinerators have additional mechanisms such as wet scrubbers, electrostatic precipitators and filters that trap and lessen the release of these pollutants into the atmosphere (UNEP, 1996; Zerbock, 2003).

Technological advancements have also paved the way for combustion with energy recovery mechanisms. They are thus able to capture energy back from the heat that is produced, making it somewhat more sensible to use as a disposal and waste-volume reduction method (EPA, 2009).

These additional pollution-control and energy-recovery devices installed on incinerators together with the cost of building one make this disposal process capital intensive. Incineration is carried out both on a small scale by individuals and on a large scale by industry. It is used to dispose of solid, liquid and gaseous waste. Incineration facilities generally do not require as much area as landfills. Waste-to-energy or energy-from-waste is broad terms for facilities that burn waste in a furnace or boiler to generate heat, steam and/or electricity. At the end of the process all that is left behind is ash. It is recognized as a practical method of disposing of certain hazardous waste materials—such as biological medical waste.

Open burning of garbage is another form of SW disposal. This exacerbates the air pollution problems of most developing country cities as opposed to properly controlled incineration. Open burning occurs at the household levels and is prevalent in low income areas. Households that undertake this mode of disposal usually have a designated area close to the house a communal refuse dumpsite where the burning is done (Boadi & Kuitunen, 2003).

Challenges of solid waste management

The generation of waste and per capita waste increases as populations expand and economies become urbanise. This calls for approaches to properly manage these solid wastes in order to avert the risks these pose to human health and the environment at large. The challenges that uncontrolled dumping and improper handling of waste give rise to are numerous and may include water body contamination, breeding and attraction of insects and rodents; and

increased rate of flooding due to choked storm drains. The absence of adequate waste management systems raises the propensity of emitting greenhouse gas into the atmosphere; which directly contribute to global warming as a result of the change in climatic conditions. The direct and indirect consequences of improper solid waste management cannot be overemphasised. Nevertheless, making adequate and realistic considerations for planning and implementing comprehensive programmes targeted at improving the collection, transport and disposal of solid waste can go a long way to do away with these problems (Ivens *et al*., 1999; Boadi & Kuitunen, 2003).

Again, SWM pose a major challenge to several local government authorities in developing countries. This challenge is chiefly in respect of the overburdening of municipal budget to dispose of solid waste. Undoubtedly, the waste management systems in developing countries are characterised by poor engineering, political influences that result in the lack of understanding over a multiplicity of issues that impact on the different stages of the SWM system (Guerreroa, Maasa & Hoglandb, 2013). Thus, resorting to integrated approaches to managing solid waste goes a long way not only to safely and effectively dispose of solid waste but also make considerations for waste prevention.

Infrastructural development, environmental health services and technology

Inadequate infrastructure and environmental health services adversely impacts on human health and on the environment. Disregard for effective and efficient waste management services has implication for public health, sustainable environment and productivity (Schubeler, 1996; as cited in Zerbock,

2003). Shafiul and Mansoor (2004) also substantiates this by showing how poorly designed solid waste management services pose several health risks to urban dwellers and asserts that it possibly accounts for up to 25 percent of all diseases in low income countries (as cited in Puopiel, 2010). Despite the need for adequate provision for infrastructure and environmental health services, many urban dwellers in low income areas continue to lack these services particularly due to budgetary constraints, inadequate managerial capacities, lack of political will in enforcing some environmental laws; and hard-to-control urban growth rates.

Section 10 of Ghana's Local Government Act (Act 462) mandates metropolitan, municipal and district assemblies to initiate programmes and projects aimed at developing basic infrastructure and also assume responsibility for the development, improvement and management of their environment. This mandate makes the planning, programming and budgeting for efficient provision of infrastructure to support and promote socio-economic development the responsibility of metropolitan, municipal and district assemblies. Unfortunately, solid waste management infrastructure development in Ghana is underfunded. The few existing ones hardly receive regular and effective maintenance. It has been pointed out that the ability to manage and maintain technological requirements of sanitation interventions has underpinned these infrastructural developments. In view of these, it is not surprising that averagely less than thirty percent of urban populations in Africa have access to effective and regular solid waste collection services (Achankeng, 2003; Senkoro, 2003 cited by Zerbock, 2003).

Mensah and Larbi (2005) also linked this fact to the ineffective and over-burdened waste management systems catering for the tonnes of waste generated daily in urban centres. According to them, efforts are needed in the creation of tailored-solutions to local problems rather than the reliance on imported (foreign) ideas/solutions.

The need to incorporate technological needs in the design and implementation of any sanitation intervention is a key aspect of sustainability of such interventions. Since every technology has a specific set of operational requirement, the considerations must revolve around putting in measures to ensure the continuous availability of maintenance and institutional needs. Technological and infrastructural needs in any environmental health service provision according to Shafiul and Mansoor (2004) requires substantial initial capital for which many municipal governments in developing countries lacks the ability to provide. Nevertheless, the provision of such facilities must be fashioned in such a way to ensure capital recovery and revenue generation from beneficiaries, along with costs for operation and maintenance. Additionally, providing the infrastructure to cater for improved environmental health services using latest technology are expected to meet certain standards which can help to make them prohibitively expensive. These and many other reasons are some of the major barriers to access and inclusion in the provision of these facilities.

Kalbermatten, Middleton and Schertenleib (1999) argue that the need for adequate stakeholder participation are often less incorporated into the planning, design and implementation of sanitation interventions, suggesting that they are often viewed solely as an engineering problem with little or no consideration given to possible linkages with other engineering services. This

lack of regard for the institutional and socio-economic environment has been widely demonstrated in several campaigns to deal with solid waste problems and somewhat their absence has contributed to some level of failures in addressing the problem (Macawile & Su, 2009).

Banjo *et al*. (2009) also added that the acquisition of effective personnel and efficient machinery is possible if attention is given to integrate the roles of the waste management firms with that of other emerging actors in the field of waste disposal. This will go a long way to motivate the participation of NGOs and other stakeholders in waste management.

Attitudes and perceptions in MSW management

Early definitions of attitudes see it as the social behaviour pattern a person portrays that can be anticipated, predisposing such a person to specific response to particular social situations (LaPiere, 1934). According to Fazio (1995) attitude is a memory based association between an object and an abstract evaluation such object. People's perceptions with respect to particular situations are equally important in gaining better understanding their behaviour; thus Firdaus and Ahmad (2010) suggest that environmental programmes that does not properly create massive awareness and ensuring the right perception environmental pollution cannot reach sustainability.

Waste management authorities are faced with the task of effectively dealing with the increasing bad environmental attitude of people in order to adequately keep the larger environment clean. Puopiel (2010) identified the challenges the public's negative attitude towards the environment has on waste management. The adoption of safe and proper means of solid waste disposal is

to a large extent dependent on the adequate provision of waste bins and people's attitudes (Omran *et al.*, 2009).

Waste management authorities are not only unable to dispose of the daily amount of waste generated but also the capacity to manage is negatively affected due to the increased complexity of this problem, arising from the unsafe waste management attitude exhibited by the generator. Antwi (2008) conducted a study that indicated that many people (70% or more) perceive that the management of MSW is the sole responsibility of municipal governments. This public opinion has over the years shaped the attitudes of people. These attitudes (apathy, low participation in programmes designed for making the environment clean, etc.) unfortunately have worsened the efforts of local governments in disposing of solid waste.

Banjo *et al.* (2009) study to ascertain the attitudes and perceptions of people toward domestic waste management revealed that the absence of waste separation activities at source, the use of unhygienic storage receptacles and the adoption of certain disposal options have largely affected the effective management of municipal solid waste carried out by municipal governments. In this work, they saw the need for people to change their attitude and perception toward waste and recommended that concerted efforts by national government, municipal authorities, private sector waste management firms and the civil society at large will be a step in the right direction to spreading and intensifying the awareness among the people about the importance of protecting the environment.

In the work of Afroz *et al.* (2011), they observed that environmental consciousness, income groups, particularly of middle-income earners and the

willingness to separate household wastes at source tend to have significant influence on solid waste generation whereas all of the aforementioned in addition to age and options for storage facility as factors affect the willingness to minimise SW generation. The results of this study thus alludes to the notion that respondents' behaviour toward solid waste management practices when taken into consideration can help achieve considerable levels of success in sustainable SW management. Much of this work confirms an earlier study of Afroz *et al.* (2010) who reported that since households form a part of waste generators, success of waste management depends significantly on behaviour and the inclusion of households in such schemes. Both works also agreed with Vicente and Reis (2008) who suggested that the environmental-conscious attitudes that householders may possess is a significant positive predictor of their recycling behaviour.

The need for people's attitudes and perceptions to be taken seriously if sustainable solid waste management should be realised is thus reiterated. In view of this Pieters (1991), Dembach (2007) and Agyapong (2011) all saw the need for well-engineered urban growth strategies, the institution of purposive attitudinal change programmes, strict enforcement of environmental regulations and building the capacities of waste management authorities in meeting the ever-growing needs of communities.

McDougal and Munro (1987 as cited in Mariwah *et al*., 2010) see people's attitude as an enduring predisposition towards a particular aspect of their behaviour. The need for understanding the behaviour of key stakeholders was seen as a prerequisite for effective design and implementation of waste

management systems. Understanding these behavioural patterns therefore called for an analysis of the attitudes, values and perceptions of people.

Participation of households in waste management schemes is enhanced if householders are well able to perceive the benefits or otherwise of the programme. Again if householder-perception of sharing in the responsibility of waste management efforts is based on the conviction that such responsibilities are an obligation, Vicente and Reis (2008) see that conviction as an outcome of an understanding of the solid waste issues that embodies residents; stating that households who are less responsive to waste management efforts tend to have a less positive propensity to contribute in the success of waste management schemes.

Improved participation and contribution to the success of recycling schemes is also possible and made easier when information is readily available to residents and the public and in a manner that is easy to understand and use (Tonglet, Phillips & Read, 2004). This information should embody communication packages to address issues concerning materials that can/cannot be recycled, appropriate containers for each material and points where these materials can be disposed of.

Banjo *et al.* (2009) after studying people's perceptions on disposing domestic waste drew a relationship between their level of education and perceptions about waste management, suggesting that many people who aare likely to dispose of waste inappropriately are likely to have little or no formal education. Presupposing that the higher a person's level of education, the better his understanding of environmental issues and the more effort made to keep it safe.

Pacey (1990) making reference to the fact that women are mostly responsible for house cleaning services and therefore play vital roles in household waste management saw the need for education and sensitisation particularly for women as a prerequisite for improving sanitation and behaviour.

More than half of local government officials surveyed in a study to ascertain the perception and attitudes towards solid waste management saw the segregation of domestic solid waste as a significant step in mitigating the problem of solid waste, more importantly if accompanied with recycling efforts (Macawile & Su, 2009).

Dernbach (2007) saw the behaviour of people as the cause of a significant number of environmental problems. In this study, it was identified that effort to mitigate these problems largely targeted the enactment of environmental legislation to curb primarily environmental pollution from industrial sources. Considerations to the effect of individual behaviours on the environment are not targeted using legislation.

In view of this, Banjo *et al*. (2009) recommended the revision of obsolete environmental policies and legislation, coupled with the strict enforcement to ensure proper disposal of domestic waste and compliance.

Some schools of thought have it that attitudes and perceptions of an individual are strongly affected by that of another and these work in like manner as the implementation of mechanisms to promote new behaviours. They have seen the continuous practice of particular pro-environmental waste management behaviour as incentive for others to join in such behaviour. This ideology is what Ajzen (2002, cited in Mariwah *et al*., 2010) describes as the normative influence in his Theory of Planned Behaviour. This explains the intensity of

poor environmental attitudes of people exhibited in their daily lives due to "the visual stimuli of seeing others behave" (Tucker & Speirs, 2001, p. 7). The concepts of subjective norms and perceived behavioural controls as embodied in this theory are discussed in the next section of this work.

Theory of Planned Behaviour (TPB)

TPB posits that human behaviour is voluntary and results from planned, purposed and driven intent to perform the behaviour. Human behaviour is guided by three kinds of considerations.

i. Behavioural beliefs — also called seen as the attitude towards the behaviour, concerns the likely outcomes of the behaviour and the evaluations of these outcomes;

ii. Normative beliefs — Beliefs about the normal expectations of others and motivation to comply with these expectations and are also referred to as subjective norms; and lastly

iii. Control beliefs — also known as perceived behavioural control, describes the presence of factors that may facilitate or impede performance of the behaviour and the perceived power of these factors.

The aggregation of these three considerations produces an intention to act or perform a particular behaviour.

The theory further suggests that the subjective norms arising from an indication of an individual's perceived social pressures shapes his normative beliefs. It was developed by Ajzen in 1988 to enhance the measurement of human actions, thus enabling the prediction of the occurrence of particular

behaviours. Furthermore, the prediction of one's intent is enhanced if it is known whether or not:

(i) the person is in favour of performing the action

(ii) the person is pressured to perform the action; and lastly

(iii) the person feels in control of the intended action.

Ajzen (2002, cited in Mariwah *et al.*, 2010) suggests that the altering of these predictors has contributed to the success of many interventions designed to help people adopt healthier behaviours or lifestyles. The theory's central theme lies in the individual's intention to perform a given behaviour given the assumption that those intentions somewhat explains the motivational factors that influence one's behaviour.

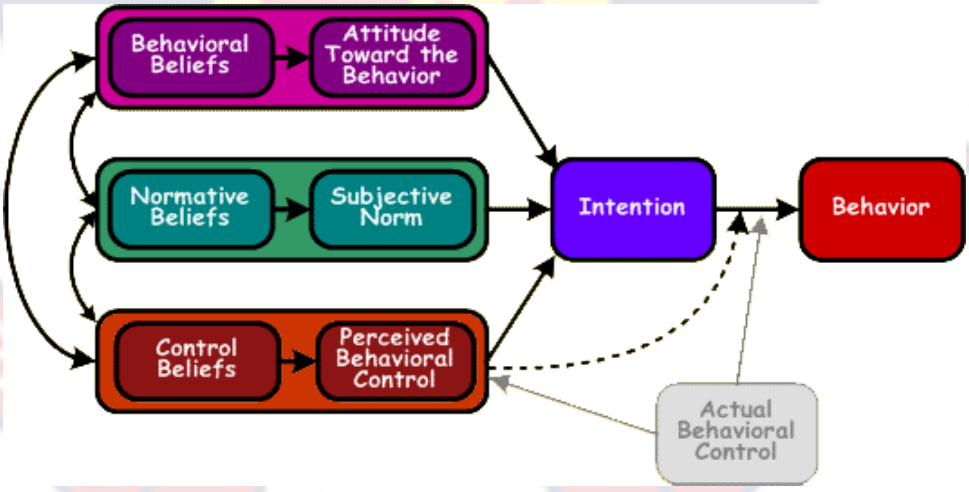

Figure 2: Theory of Planned Behaviour (TPB)

Source: Ajzen, 2002 (as cited in Mariwah *et al.*, 2010)

An understanding of the factors that underpin the reasons why people act the way they do is needed in order to design and implement effective

programmes. The theory of planned behaviour (TPB) as indicated by Ajzen (1991, cited in Davis & Morgan, 2008) provides a theoretical framework for systematic identification of these behaviour-influencing factors. The theory developed from an earlier theory of reasoned action (TRA), operates on the premise that people are rational in their behaviours, reason logically and consider the implications of their actions [when privy to available information]. It makes reference to behaviour tendencies of people based on reasons – significant enough – for the choice made. In other words, TPB assumes that people's behaviour can be changed or improved to achieve a desired goal.

Ajzen and Fishbein (1990, as cited in Tonglet *et al*., 2004) identified an individual's intentions whether or not to perform a particular behaviour as the immediate determinants of his actions. These intentions are further controlled/based on two factors i.e. the individual's attitude and subjective norm. Attitude here refers to one's evaluation of how favourable or unfavourable performing a particular behaviour is whilst subjective norm relates to a person's perception of social pressure to either perform or not to perform the behaviour.

Recognising that certain behaviours are constrained by the absence of appropriate opportunities, skills and resources, a third variable called perceived behavioural control is introduced to measure the individual's perceptions of his ability to perform certain behaviours. This variable was thus incorporated into the TRA to form the TPB. In other words, the likelihood of a person engaging in a given behaviour is a function of the routine performance of that behaviour, the intention to perform the behaviour and the pertaining conditions facilitating or militating against the performance of the behaviour. Repeated interpersonal

behaviours increasingly become automated and require less consciousness to perform.

Intentions describe the level of willingness people have to perform particular behaviours. Ajzen (1991) concluded that the stronger the intention to engage in a particular behaviour, the more likely its performance (cited in Davis & Morgan, 2008). This implies that the more convinced a person is, e.g. about the possible benefit of engaging in household solid waste separation activities, the more inclined the person is towards building this behaviour.

The theory is purposed to predict and understand motivational influences on behaviour that is not under the individual's volitional control, identify how and where to target strategies for changing behaviour and explain virtually any human behaviour.

Behavioural change

Attitudes are believed to form a principal antecedent to pro-environmental waste management behaviours amongst households. This assertion is supported by Tucker and Speirs (2001) indicating that though research is yet to explain the specific attitudes that inform these behaviours, it has been proven that they are influenced fundamentally by demographic factors serving as proxies for the real antecedents to such attitudes, beliefs, and perceptions held by householders. In citing an example, they explained how housing type and stage in family life cycle can influence composting and recycling behaviours.

Tucker and Speirs listed a host of issues i.e. inconvenience factors, perceived effectiveness, normative influence and knowledge as factors that can

impact on household waste management behaviour. Attitudes and perceptions that inform household waste management behaviour are influenced to a large extent by a person's subjective norms (both internal and external) and the perceived controls for such behaviour. This was explained by McKenzie-Mohr (1995; as cited in Tucker & Speirs, 2001) after identifying waste reduction, convenience, availability of time and personal satisfaction among others as important factors in undertaking household composting.

Some work has been done in the area of altering household waste management behaviour and its sustainability (McKenzie-Mohr, 2000; Uitto *et* al., 2004; Zhou, 2010). Replacing old practices for disposing of household waste requires the formation of new habits which should be sustained through increasing and persistent stimulus uniquely designed to arouse participation. Until the new habit is intrinsically engraved in people, they may forget to act upon them as a result of the tenacity to perform their old habit (Pieters, 1991).

Triggering mechanisms that might stimulate positive behavioural change include: firstly instituting planned management interventions, e.g. promotional campaigns set out to trigger a coherent behavioural change amongst whole groups of individuals whilst running on-going background stimuli such as those provided through general waste awareness campaigns, TV gardening programmes etc. and lastly ensuring social dialogue amongst residents or the targeted population (Tucker & Speirs, 2001).

CHAPTER THREE

METHODOLOGY

Introduction

This chapter describes the area of study, research design, sampling technique and selection of respondents, instruments for data collection, data collection and data analysis procedures.

Study area

The study area is the Accra Metropolis. It forms part of the Greater Accra Metropolitan Area (GAMA). It is bounded, specifically by the Ga South, Ga East and Ga West Districts, Adentan and Ledzokuku-Krowor Municipalities. The study area is located in the core of the GAMA and lies within the coastal savannah vegetation. It is characterised by two seasons – dry and wet. Temperature ranges between 20 and 30 degree Celsius. Rainfall pattern is bimodal, occurring between April – July and September – October and annual rainfall figures falling within 635mm and 1,140mm.

The population of Accra Metropolis is almost half (46%) of GAMA. The population of GAMA constitute about 93 percent of the regional population of Greater Accra which according to GSS (2010) is 4,010,054.

Lower and middle income residential areas in the Accra Metropolis were considered for the study due to the varied and existing dichotomy in living standards of this urban residence. The selection criteria also centred on the

researcher's interest in studying the waste disposal behaviour of people living in urban centres. The differences in the waste management behaviours of respondents in these areas are paramount to the success of this research. This is based on Barlow and Durand (1995) observation that people's behaviour is influenced by their environmental conditions.

Again the majority of Accra's population (97%) live in high density populated areas whereas the remainder dwell in high income, low density residential areas (Colan Consult, 1998). This statistic raises concerns about where most of the solid waste issues confronting the city come from. Aside this, it also raises concerns on where much attention needs to be focused if attempts to sanitise the city's environment should experience any success. World Bank (1999) suggests that by 2025, the density of waste generated on daily basis by developing countries would reach at least 0.50kg per cubic metre. This represents about 15 percent increase from 0.44kg per cubic metre.

This notwithstanding, Banjo *et al.* (2009) suggested that the majority of people generating wastes were low-income earners living in densely populated areas. Furthermore, there is a vast difference between the various residential classes of urban dwellers when it comes to their perceptions about waste disposal and their attitudes especially with regard to payments for waste collection services (Freduah, 2007; Banjo *et al*., 2009; Lounge *et al*., 2009; Mariwah *et al*., 2010). These reasons justify the selection of middle and low income areas within the metropolitan area for this study.

Research design

This study was carried out using a descriptive quantitative survey approach to investigate particular characteristics of the respondents. A descriptive survey primarily is set out to find out what the nature of an existing phenomenon is, thus play an important role in educational research.

This study is set to collect descriptive data on the perceptions, attitudes and strategies for waste disposal that is peculiar to the target population

Target Population of the study

The target population of the study are households located in middle and low income areas within the Accra Metropolis.

Sample frame and sample size determination

The target population for this study is representatives of householders between the ages of 15 and 64 years, thus the sample for this study is drawn from this age bracket. The 2010 Population and Housing Census states the population of people with ages between 15 and 64 years in the Accra Metropolis to be about 1,055,063. This figure represents the sample frame for this study from which the sample were drawn. Hence the mathematical formula $n = \frac{N}{1+N(\alpha)^2}$ is used in deriving the sample size, where n = sample size, N = sample frame and α = error margin.

For the purposes of this study, an error margin of 0.08 at 92% confidence level is used. This choice of margin for error is arrived at based on factors such as resource constraints and time available for the study. Thus

$$n = \frac{1055063}{1 + 1055063(0.08)^2}$$

$$n = 156$$

Sampling techniques & selection of residential respondents

The sample population was drawn from the Accra Metropolitan Area. Selection of respondents was done in three stages. The first of which dealt with the random selection of 6 sub metropolitan areas in the metropolis. This was taken from a total of 11 sub metropolitan areas. Codes were initially assigned to each and all eleven placed together in a basket from which 6 were drawn one after the other with replacement. These six Sub-Metro Areas constituted Ayawaso Central, Ablekuma North, Osu Klottey, Ayawaso East, Ayawaso West and Ablekuma South sub metropolitan areas.

The second stage involved the coalition of all middle and low income areas (which are mostly characterised by second, third and possibly fourth class residential areas) identified in the six selected Sub-Metro Areas. These were also put together in a basket and sixteen (16) locations made up of; Odorkor, Darkuman, Okaishie, Kotobabi, Kokomlemle, Accra New Town, Chorkor, Nima, Kwashieman, Assylum Down, Adabraka Mamobi, Alajo, Abelenkpe, Mamprobi and Avenor were selected for the study.

Table 2: Distribution of questionnaire within the sampled areas

Residential areas	Number of households	
	Middle Income	Low Income
Accra New Town	6	3
Darkuman	4	4
Kotobabi	7	2
Kokomlemle	10	0
Odorkor	8	5
Chorkor	4	7
Okaishie	3	9
Kwashieman	7	2
Alajo	7	3
Assylum Down	11	0
Adabraka	9	0
Mamobi	4	6
Abelenkpe	9	2
Mamprobi	6	3
Nima	5	2
Avenor	4	4
Total	**104**	**52**

Source: Author's construct, December 2011

A matrix presentation of the number of households selected from the middle and low income zones is given in Table 2. In all, 104 and 52 households from the middle and low income zones respectively were selected using a

systematic random sampling approach. Data was collected using self-administered questionnaires.

A study carried out by Järvinen (1995) and Kiljunen (2003) indicated that women generally have a more positive attitude towards the environment as compared to males (cited in Uitto *et al*., 2004). A perspective similar to this is also supported by Stern *et al*. (1993), Macawile and Su (2009) and Banjo *et al*. (2009) suggesting that the inclusion of women in stakeholder discussions at the planning, creation and implementation of strategies targeted at improving household and municipal waste management can help to enhance its success rate. In view of this, an attempt was made to ensure the representativeness of females in the sample to enhance reliability. To ascertain this, females were given inclusion-priority in each household; and where this was not achievable, any other member of the household was chosen to complete the questionnaire. To ensure the reliability of the responses received, only respondents who are principally responsible for household cleaning and waste management were considered.

For multiple dwelling units (i.e. compound houses), one household within was selected at random to represent the entire unit based on the assumption that people's waste behaviour patterns are affected or influenced by their neighbours. For the purposes of this study, the household is seen as the elementary unit of every society. According to GSS (2005), it is a residential group defined as a person or groups of persons, who live together in the same compound, sharing the same house-keeping arrangements and are catered for as one unit.

Data collection instrument

The primary data instrument was a structured questionnaire. It was basically categorised into four parts. The first part sought to identify and describe respondents and their household with respect to some demographic characteristics that were relevant to this study. The second and third parts delved into finding out more about the solid waste management activities usually carried out in their households and an attempt to find out their perception about the state of the existing solid waste management system respectively. Lastly, data was collected on how solid waste management in the metropolis can be improved as perceived by the respondents. Other forms of gathering data included the use of checklist and observations.

Data Collection

The first stage of data collection involved preliminary field investigations whilst keeping field notes of phenomenon pertaining to solid waste management at the household level. This prime data collection activity involved exploring through the study area. During this exercise, notes were taken and observations made on communal dumpsites or waste collection containers, the solid waste storage facilities and refuses bins existing within these areas. This exercise made it possible to weigh the problems of solid waste and served as a guide for the formulation of the questionnaire and the conduction of the study. The completion of this exercise provided an understanding into the dynamism of the study areas. This stage of data collection was started and completed in December 2011.

The second and final stage of data collection was the administration of questionnaires which begun in January 2012 and lasted for seven weeks. Periodic calls were made to these respondents to facilitate the timely completion and return of questionnaires. A sample of this questionnaire is shown in appendix IV. In all, 156 questionnaires were administered to 156 households that were selected via systematic random sampling.

Data Analysis

Quantitative data from the field survey was then processed using SPSS version 16 and MS Excel 2010. The results are presented in statistical tables and charts for further interpretation and discussion. Further analysis was also conducted employing frequency analysis and severity index calculations. The severity index (SI) for responses to questions directly related to the objectives of this study was calculated based on the equation Al-Hammed and Assaff (1996) created i.e. $Severity\ Index\ (SI) = \frac{\sum_{i=1}^{5} a_1 x_1}{5\sum_{i=1}^{5} x_1}(100)\%$

where a_i = the class index, i.e. the constant that expresses the weight assigned to the class of responses

x_i = the frequency of responses for the class

i = 1, 2, 3, 4, and 5 indicate the points on the 5-point likert scale described as; x_1, x_2, x_3, x_4 and x_5 thus representing frequencies of responses and at the same time corresponds to a_1 = 1, a_2 = 2, a_3 = 3, a_4 = 4 and a_5 = 5, respectively.

a_1 =	[Strongly Agree]	$0.0 \leq SI < 12.5$
a_2 =	[Agree]	$12.5 \leq SI < 37.5$
a_3 =	[Neutral]	$37.5 \leq SI < 62.5$

a_4 = [Disagree] $62.5 \leq SI < 87.5$

a_5 = [Strongly Disagree] $87.5 \leq SI < 100.0$

The above classification for rating the responses put forward by Majid and McCaffer (1997; as cited in Longe, Longe & Ukpebor, 2009) is employed in order to offer explanations for the severity indices calculated. Personal observations would be analysed qualitatively and results presented in thick descriptions.

Factors that facilitated the data collection process

In spite of the challenges faced during the data collection process, there were few other factors that contributed immensely to the success of this exercise. These include:

- Information gathered from the offices of the Accra Metropolitan Assembly was particularly helpful in selecting the sample study area (residential) from which data was collected.
- Readiness of people volunteering to translate from the local language into English and vice versa.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

Introduction

This chapter presents the results of the analyses that were performed on the data gathered during the field survey. A general description of the demographic characteristics of the respondents is presented and discussed in relation to the subject matter. A further discussion is presented, elaborating on some key observations made during the study; and on households' attitudes, perceptions and strategies to managing solid waste with an attempt to establish the reasons and/or justifications for such perceptions/attitudes. Tables and figures are used where appropriate to throw more light on the discussion.

Demographic characteristics

All 156 households reached have a combined population of 974 made up of 542 people 18 years and above and 435 below the age of 18. The average size per household as revealed in this study is 6. The largest household this study covered had 17 persons. Households with greater number of people are likely to generate more waste compared to those with smaller numbers. Household sizes have implications for the planning of future interventions in waste management. This situation is much critical given the fact that local and central governments are yet to adequately provide the needed logistics for effective and efficient delivery of waste management services (Agyepong, 2011). Population

size is a key factor in municipal solid waste management. As it grows, management becomes difficult and more complex (Fei-Baffoe, 2006; Hormenu, 2011).

Table 3: Household size

Household size	Frequency (F)	% of case
Less than 4	32	20.5
4 – 6	55	35.3
7 – 9	52	33.3
10+	17	10.9
Total	**156**	**100.0**

Source: Field work, 2012

As shown in Table 3, approximately 11 percent of the sampled household population have the largest household sizes of at least ten people.

Table 4: Sex distribution of respondents

	Sex		**Total**
	Male	Female	
F	32	124	**156**
Percentage	20.5	79.5	**100.0**

Source: Field work, 2012.

From Table 4, majority of the respondents (79.5%) are females. This result primarily indicates that females are principally responsible for household

cleaning and waste management, thus supporting the assertion of Puopiel (2010) of culture-based exemption of males from this household chore. This result is important because women seem to have more positive attitude towards the environment (Uitto *et al*., 2004).

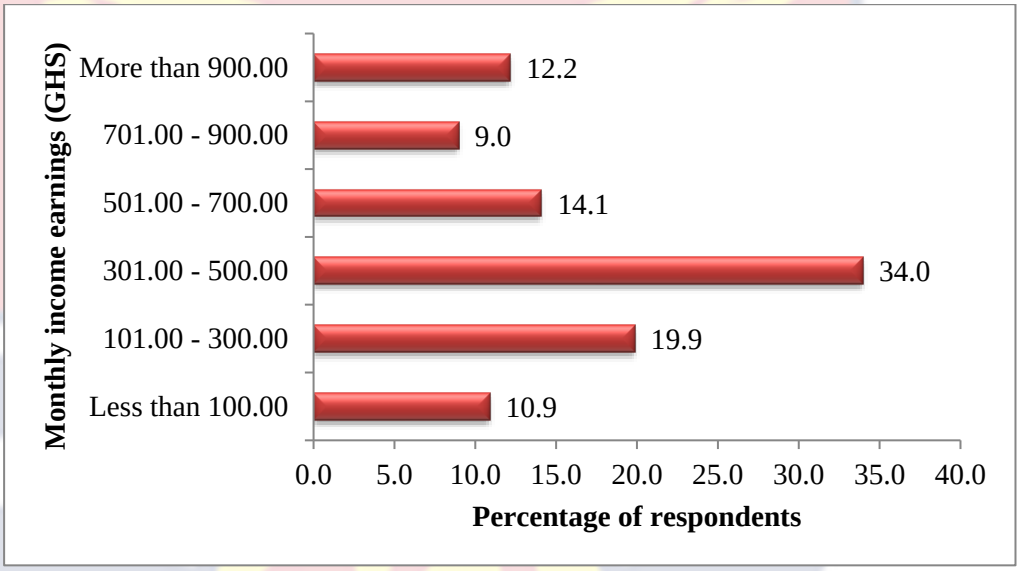

Figure 1: Monthly income distribution per households

Source: Field work, 2012.

The income earnings of the sampled households is presented in a bar graph under Figure 1. Per the survey, about 11 percent of households earn less than GHS 100.00per month and about 19 households earning GHS 900.00 or more every month. Households that earned between GHS 301 and GHS 500 formed the largest group in the distribution, constituting 34 percent.

Income status plays an important role in people's attitude towards managing waste according to Mariwah *et al.* (2010). They found significant differences existing in particular waste habits as they examined the willingness to pay for waste management services across income zones and noted that as

income reduced across the zones, willingness to pay also reduced. They tied this willingness to pay for better environmental services to the achievement of higher economic development.

Table 5 shows the marital status distribution. From this table, ninety one respondents (i.e. 58.3%) of the sample population are married and about a third (30.1%) is single.

Table 5: Marital status of the respondents

Marital status	F	% of cases
Single	47	30.1
Married	91	58.3
Divorced	9	5.8
Widowed	9	5.8
Total	**156**	**100.0**

Source: Field work, 2012.

Table 6: Educational status of respondents

Educational status	F	% of cases
No formal education	27	17.3
Primary	16	10.3
Secondary/Vocational	47	30.1
Post-Secondary/Training college	32	20.5
Tertiary	34	21.8
Total	**156**	**100.0**

Source: Field work, 2012.

In Table 6, the majority of respondents (82.7%) have formal education and at least 88 percent of this number, representing 113 has a minimum of secondary or vocational level formal education. It can be inferred from this statistics that the literacy rate for the respondents is at least 72 percent whiles almost a fifth of the sampled population (17.3%) have no form of formal education.

Kendie (1999) has indicated the role education has on the perception of people and their attitudes towards household waste management. In his work, he found that the more education a person attained, the better it is for such a person to contribute significantly to waste management. A simple deduction that can be drawn from his study is that people who have no formal education at all are unlikely to contribute to efficient household waste management.

Adding to this, Klein and Merrit's (1994) study recorded significant value amongst residents who saw the need for enhanced waste management activities at the household level as an important and a necessary factor in curtailing the waste menace engulfing urban areas. Most notably was the level of education attained by these people. They agreed that public support was vital in alleviating the impacts of the problems particularly on solid waste; noting that this support is negatively affected if public awareness and knowledge about the problem and the management goals set by waste management authorities is lacking.

Going further, analysing the disposal strategies adopted by respondents from time to time by comparing it with the level of education, the results obtained showed that at least about 69.3 percent dump household solid waste into gutters from time to time. The majority of the respondents (71.8%) also

indicated roadside collection as a preferred choice for disposing waste for the household (Refer to Table 7).

Table 7: Comparing educational status against SW disposal strategy

Educational status	Common SW disposal strategy	
	Dumping into gutter	Roadside Collection
No formal education	13.5	13.5
Primary	9.6	8.3
Secondary/Vocational	20.5	20.5
Post-Secondary/Training college	13.5	16.0
Tertiary	12.2	13.5
Total	69.3	71.8

Source: Field work, 2012.

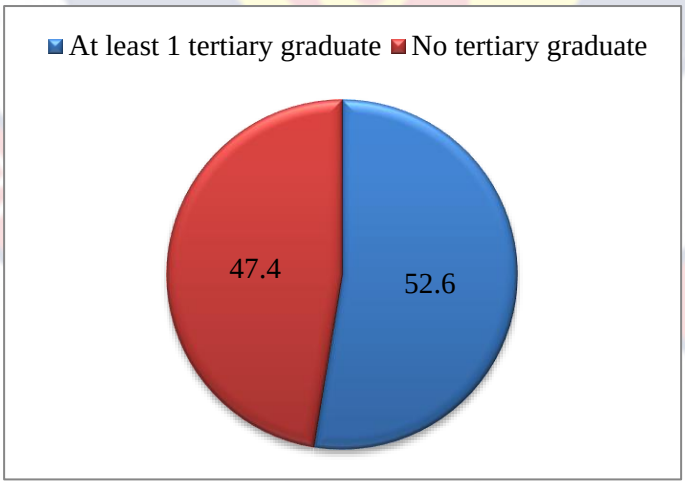

Figure 2: Percentage of respondents who have at least one member who has attained tertiary level education

Source: Field work, 2012.

Interestingly, results from the survey show that at least about 52.6 percent of the households have at least one person who has been educated up to the tertiary level (Refer to Figure 2). Nevertheless, majority of the respondents (72 out of 108 responses – constituting 66.7%) who indicated that their households dispose of solid waste into gutters from time to time have attained at least secondary or vocational education level. This phenomenon gives cause for worry and goes to suggest that education is not a stand-alone determinant of good environmental practices. Making inference from Ajzen's Theory of Planned Behaviour, it is not out of place to point that perceived behavioural control play a vital role in shaping people's attitudes and behaviour.

Household solid waste disposal strategies

Figure 3 show that 13.5 percent of households in this study dispose their wastes at communal dumpsites or containers. These are provided and managed by the waste management companies responsible for these areas. The designated areas serve as a primary collection point for waste management companies. There is a schedule collection where refuse trucks come to load – usually overflowing containers – for onward transfer to final disposal sites. Disposal at these sites cost households minimum of GHS 0.50 and maximum of GHS 2.00 depending on the quantity of waste being disposed. There is no variation in disposal cost across the various income zones.

More than half of the households (61.9%) that dump solid wastes at communal dumpsites do so largely because of their inability to receive door-to-door or roadside collection services primarily due to inaccessibility. From Figure 3 the number of households that preferred door-to-door or roadside

collection services to other methods of waste disposal shot up by 22.1 percent. This goes to support the argument that inaccessibility is a hindrance to effective solid waste collection services. All other methods of disposal recorded some level of decrease in preference compared to the number of household that currently deploy this method.

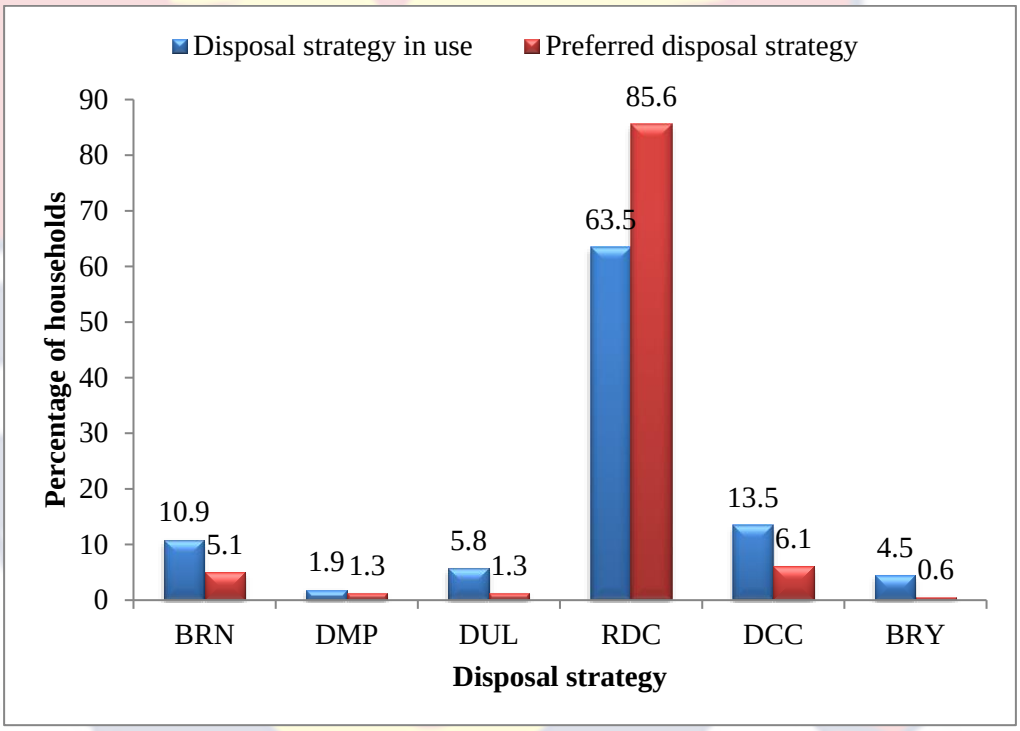

Figure 3: Current and preferred disposal strategy

Source: Field work, 2012.

BRN = burning; DMP = dumping into gutters; DUL = dumping on undeveloped land; RDC = roadside collection; DCC = dumping at communal dumpsites/container; BRY = burying

Regardless of the availability of other options for solid disposal, solid wastes continue to end up in wrong places. The fact then still remains, who is responsible for the magnitude of wastes that end up in the gutters and storm

drains? This phenomenon stimulated an interest that needed to be explored further. Respondents were thus asked to indicate all other options they would and sometimes adopt including their preferred choice for disposing of their waste.

Table 8: Common waste disposal strategies deployed by households

Disposal strategies	F**	% of cases
Burning	123	78.8
Dumping into gutter	108	69.2
Dumping on undeveloped land	97	62.2
Roadside collection	112	71.8
Dumping at communal dumpsite/container	93	59.6
Burying	75	48.1

**Multiple responses (*n* =156)

Source: Field work, 2012.

The results from Table 8 show that at least 69.2 percent of the households dump waste into gutters and storm drains from time to time. This was particularly pronounced in the settlements that were close to major drainages across the study area. It is not surprising that this phenomenon is again highlighted among households' preference for solid waste disposal as shown in Figure 3 where about 2 percent of households resort to disposing of waste into gutters and storm drains. A phenomenon that raises many concerns as the repercussions of this action poses threat to the environment and human health.

Attitudes of this kind are partly responsible for the choking of many gutters and drainage systems.

Containers for storing household waste before disposal are largely sub-standard. The survey revealed. The proportion of households that had refuse bins with lid for storing solid waste constituted 55.1 percent. The rest of the households use various receptacles for storing waste (Refer to Figure 4). Given the fact that majority of the households produce solid wastes that have significant compositions of organic substances, the low standard receptacles used in waste storage impacts on the choice of method for disposal.

Waste storage prior to disposal

Figure 4 shows that almost half (44.9%) of households surveyed employ waste storage materials other than standard solid waste bins. Nylon or polythene bags are common amongst 16 percent of households whereas 5.1 percent use baskets for storing solid waste.

The use of refuse bins cuts across all the 16 areas where this study was conducted. All households that employed this system of storage relied predominantly on the door to door or roadside collection services provided by waste management companies. In most cases, the refuse bins are provided by the companies. A few other households who patronise the roadside collection service store waste in other containers other than the refuse bins. Some of the containers used by householders are without lid and expose the waste to rodents, houseflies, mosquitoes and other insects.

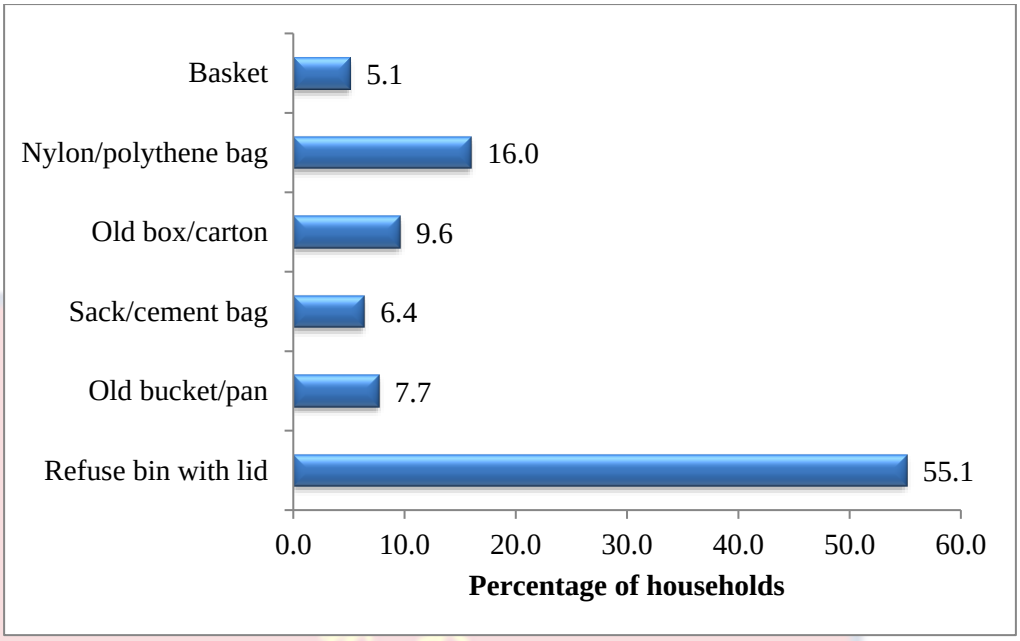

Figure 4: Containers for storing household solid waste

Source: Field work, 2012.

Table 9: Availability of containers for waste separation

	F (*n* = 27)	% of cases
Yes	22	81.5
No	5	18.5
Total	27	100.0

Source: Field work, 2012.

This brings to mind the importance of having containers for each component of separated household waste. In assessing the difficulty that these people face in waste segregation, 96.3 percent of the people agree that the collection and disposal activities of waste management companies are not supportive of waste separation at source in that many of these firms collect and

gather everything (i.e. plastic waste separated from other household waste) together for disposal. A phenomenon many of them believed is a disincentive to their waste separation activity.

In an attempt to identify why households adopt particular disposal options, reasons such as convenience and affordability were common amongst households. Some households also adopt particular strategies because it is the only option available in the community. Others adopt particular strategies because it is the commonest practice amongst neighbours. The latter has implications for behavioural change campaigns that theorise that people can adopt and adapt new environmentally positive attitudes if they see others performing it (Tonglet *et al.*, 2004).

Nonetheless, one thing common to all of these households who benefit from the services of waste management companies is the irregularities in the collection and transfer of municipal solid waste to final disposal sites. This has led many households to question the quality of services they enjoy from waste management authorities. Results from the study as shown in Table 9 shows that averagely households do not perceive the services they receive from their respective waste management companies to be reliable and efficient and do not agree to the existence of a well organised solid waste disposal scheme to serve their needs.

This household perception possibly accounts for why some resort to other inappropriate strategies of dumping household wastes. Earlier works have cited high population growth, inadequate funding, limited trained and skilled personnel, large tonnes of solid wastes generated daily, inadequate infrastructure support, poor condition of services, weak enforcement of

environmental regulations as contributing factors in poor collection rates (Anomanyo, 2004; Tsiboe & Marbell, 2004; SPREP, 2006).

The results shown on Table 10 again suggests that though quality of service is generally perceived to be poor or inadequate, households had little interest in knowing the specific waste management firm operating within the locality. They are also indifferent about the challenges inaccessibility to homes pose to these authorities.

Table 10: Households' perception about existing solid waste management systems

	SA		A		N		D		SD		SI
	F	%	F	%	F	%	F	%	F	%	
There is a well organised solid waste disposal programme in my area	20	12.8	26	16.7	11	7.1	59	37.8	40	25.6	**69.4**
The services of the solid waste management company operating in my area are adequate	3	1.9	13	8.3	17	10.9	65	41.7	58	37.2	**80.8**
The waste management company operating in my area is reliable and efficient in their service delivery	45	28.8	10	6.4	3	1.9	41	26.3	57	16.0	**67.1**
I don't want to pay extra because my monthly income is low	22	14.1	16	10.3	21	13.5	51	32.7	46	29.5	**70.6**
No matter the level of sensitisation or education, people will never change their behaviour	5	3.2	7	4.5	14	9.0	61	39.1	69	44.2	**83.3**
Waste management activities are the sole responsibilities of the metropolitan assembly and other waste management companies. I have no role to play in it.	24	15.4	19	12.2	14	9.0	43	27.6	56	35.9	**71.3**

Source: Field work, 2012.

The availability of and accessibility to disposal or drop-off points is a factor that affects people's choice of disposal strategy and consequently their waste disposal behaviour. In this regard, the study sought to find out the distance people travel with respect to time to dispose of household waste. The result is presented in Figure 5.

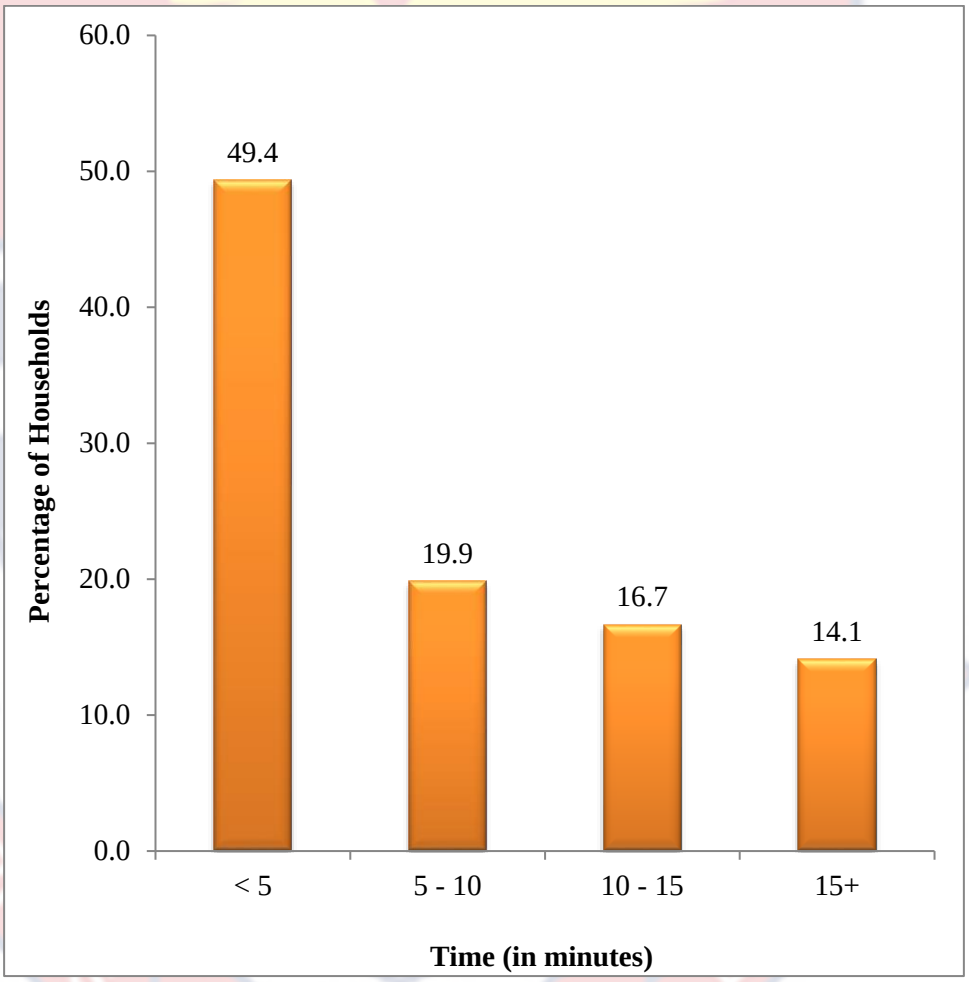

Figure 5: Duration from house to the nearest disposal point

The distribution shows that 77 households constituting 49.4 percent of the sampled population take at most five minutes to go dispose of their household waste whereas about a third (31%) take a minimum of 10 minutes.

Tonglet *et al.* (2004) suggests that the individual's awareness of good environmental habits may not necessarily be put into practice especially where certain pertinent constrains exist. According to them, such constrains surface in the form of the lack of opportunities, skills or resources, yet not limited to these three. They stated the impact distance to disposal sites have on choice of safe disposal strategies. To further investigate this phenomenon, four out of the six options presented in this study were used in analysis to throw more light on this perspective.

Table 11: Selected SW disposal strategies commonly deployed by households against distance to disposal site with respect to time

	Walking distance to disposal site (minutes)			
Disposal strategy**	<5	5 – 10	10 – 15	>15
BRN	15	34	36	38
DMP	7	3	68	30
RDC	59	34	11	8
DCC	12	32	28	21

**Multiple responses (n =156)

Source: Field work, 2012.

Making inference from the results displayed in Table 11 suggest that households that travel less time to dispose of garbage often adopt safer methods of disposal compared to those that travel in relatively more time. This finding agrees with Tonglet *et al.* (2004).

Over 90 percent of the households that indicated dumping in gutters as a possible option for waste disposal travel not less than 10 minutes to the nearest refuse disposal or collection point. The difficulty in accessing collection points is attributed to this choice.

According to Zerbock (2003), the composition or nature of solid waste is a factor that can determine the method of disposal. Secretariat of the Pacific Regional Environment Programme [SPREP] (2006) shares a similar view point, thus in view of this, attempt was made to identify the basic composition of solid wastes that households generate daily.

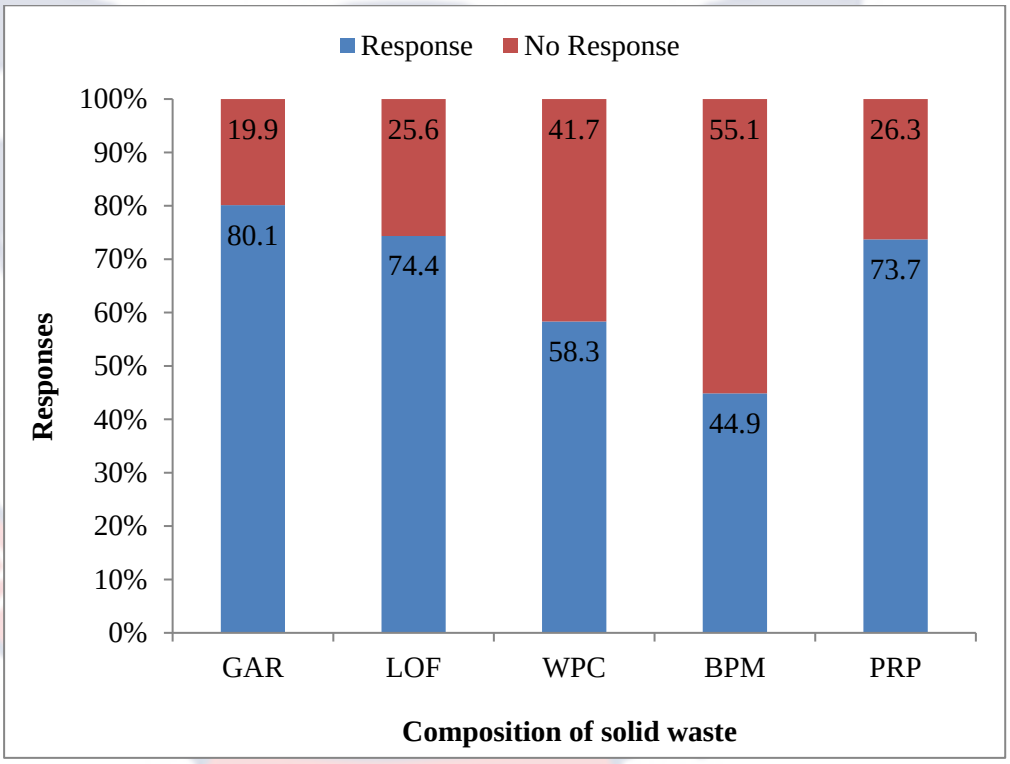

Figure 6: Basic composition of household solid waste

GAR = Garden trimmings, grass, kitchen waste and other vegetative materials; LOF = Left over foods; WPC = Wood pieces, paper cards and cartons; BPM = Broken glass pieces, metallic materials; PRP = Plastic and rubber products

For each component of solid respondents indicated whether or not it formed part of their basic waste generated on daily basis. Each bar constitutes the total sample used in the study. The result is labelled Figure 6 and it shows that biodegradable components of household wastes constitute part of the waste generated by the majority of the households visited. These biodegradable components include left over foods, kitchen waste, garden trimmings, grass and other vegetative materials. Others include wood pieces, paper cards and cartons.

The large chunk of biodegradable materials in the household solid waste has positive implications for the development of a composting scheme, in that it would not lack raw materials given the large tonnes of wastes generated daily as suggested by Mensah and Larbi (2005). Success of such a scheme is further enhanced if waste generators understand the need for source separation.

This goes to agree with World Bank (1999), Boadi and Kuitunen (2000), Zerbock (2003), Tonglet *et al*. (2004) and Hormenu (2011) whose work emphasise the impact the nature and composition of household solid waste has on waste management. According to them, the decision to design and institute a sustainable integrated waste management scheme is dependent to a large extent on accurate data on household waste composition.

Knowledge on the nature and composition of solid waste is an important factor in deciding where to focus attention and commit resources in managing MSW. It also aids planning adequately for future disposal needs (SPREP, 2006; UNEP, 2009).

Urban residents have a vital role to play in bringing about improvements in managing solid waste. Their role as stakeholders is significant so much so that Puopiel (2010) implicitly put forward that technological advancement that are introduced without appropriately integrating the role of households will fail in the long run to achieve considerable changes in municipal solid waste management. This study specifically called for tailored solutions to address the particular needs of specific residential communities, adding that such a technology must be engineered to conform to the institutional and technical capabilities of the community to enhance its adaptability and address issues of sustainability.

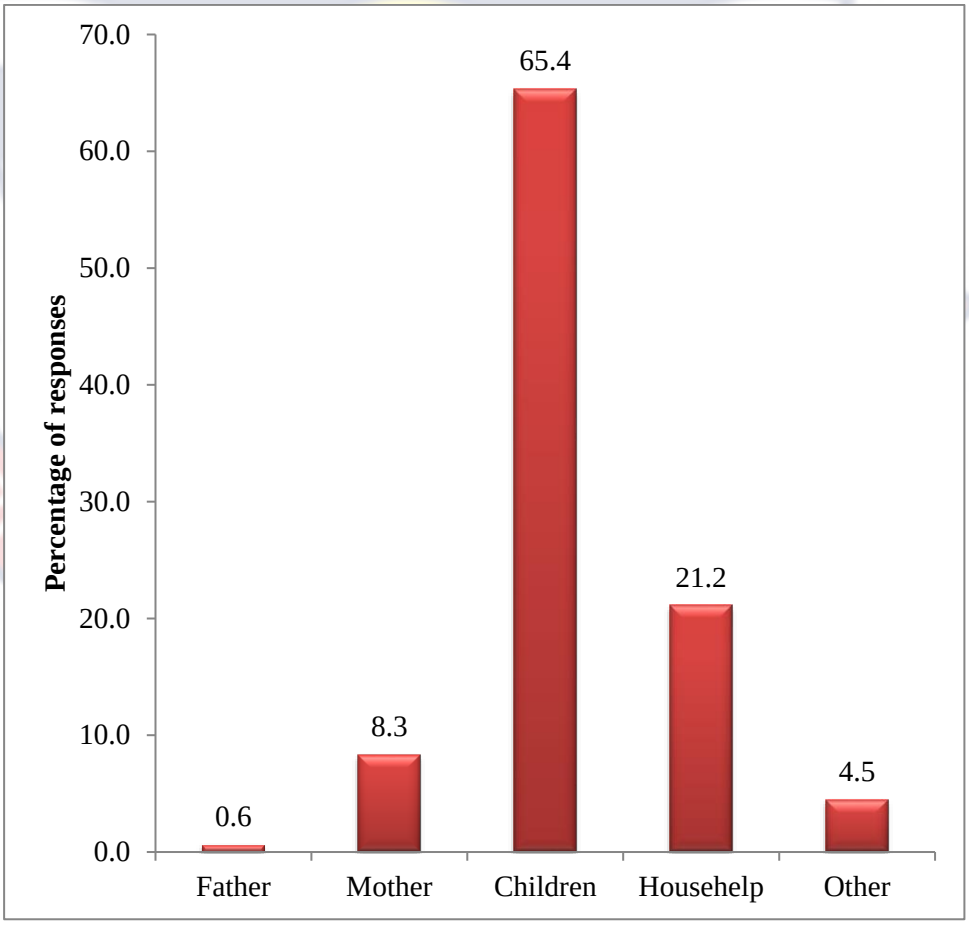

Figure 7: Persons responsible for disposing of household waste

Figure 7 shows that 65 percent of the responsibility of household solid waste disposal is assumed by children. A single case was recorded where the father is responsible for waste disposal and 13 for the mother. Domestic helps follow next, accounting for at least 21 percent of all households.

Attitudes and perceptions of people towards solid waste management

Behavioural theories have assumed most behaviour as volitional with the individual having the ability to decide at will whether or not to perform the behaviour. Since the performance of much behaviour is influenced by the presence or otherwise of certain constraints as espoused in Boldero's (1995) study, some objectives of this study necessitated attempts to ascertain the perceptions that people have on the existing solid waste management system within their locality.

Households perceive the non-existence of a well-organised solid waste disposal programme. Out of the 156 responses, 123 representing at least 78 percent of the population disagreed to the adequacy of the services they receive from waste management companies.

The severity index was found to be 80.8 percent. Using Majid and McCaffer's (1997; as cited in Longe, Longe & Ukpebor, 2009) classification for rating responses, SI from 62.5 to 87.5 percent corresponded to a disagreement. These perceptions form the basis of their attitudes and behaviour and are described predictors of success in municipal solid waste management schemes.

Table 12: Existing state of the solid waste situation in the study area

Current SW state	F	% of cases
Extremely serious	133	85.2
Normal	11	7.1
Slightly serious	12	7.7
Total	156	100.0

Source: Field work, 2012.

To underscore the impact of the weaknesses of waste management companies in carrying out their duties as perceived by householders, it was identified that 133 out of 156 respondents indicated that the existing state of solid waste situation in the area was extremely serious. This is in agreement to the findings of Mariwah *et al.* (2010) found that low-income-area residents in urban centres agreed that the seriousness of the current waste situation is as a result of indiscriminate dumping on streets and in gutters as well as open burning of solid waste.

Individual perceptions borne by people affect the way they manage and handle waste. One household solid waste management that tends to have positive impacts on municipal solid waste management is separation at source (Tsiboe & Marbell, 2004; Mariwah *et al.*, 2010). From this study, the majority (82.7%) of households do not separate household wastes before disposal as shown in Table 13.

Table 13: Frequency of solid waste separation activities

Rate	F	% of cases
Almost always	14	9.0
Not all the times	13	8.3
Never at all	129	82.7
Total	156	100

Source: Field work, 2012.

One thing was peculiar about households that indicated they usually undertake waste separation activities prior to disposal. Though these households were rather few (17.3%), it was interesting to find that the separation activity practically involved sorting out plastic wastes (polythene materials) from other household wastes. Out of all the 27 households that undertook separation on regular basis, 22 representing 81.5 percent, have containers for their separated waste as presented in Table 13.

Inference drawn from the results in Table 14 suggests that education or sensitisation for both householders and waste management companies is necessary for the establishment of source separation activities. Other reasons for the difficulties included time factor, unavailability of containers and inadequate knowledge on the need for this activity.

Table 14: Reasons accounting for waste separation difficulty

Reason	F**	% of cases
Unavailability of containers for different wastes	10	37.0
Inadequate knowledge on the need for this activity	11	40.7
Time factor	16	59.3
Lack of support from waste management companies	26	96.3

**Multiple responses (*n* =27)

Source: Field work, 2012.

The practice of disposing of household solid waste without prior separation is quite common not only among lower and middle class residential areas dwellers but as well as residents in affluent communities. The absence of separation activities in waste management activities among many residents has created immense challenges for authorities and personnel involved in the collection, transportation and disposal of municipal solid waste. For instance, non-segregation of municipal solid waste goes further to affect the effective management of landfills and dumpsites. It also serve as a disincentive for recycling schemes either by making raw materials hard-to-get or increasing cost of recycling.

Paying for SWM services: Householder perception

More than half of the households in this study spend between GH¢ 5.00 and 10.00 a month on disposing of solid waste whiles a few others constituting 16.6 percent pay more than GH¢ 10.00 per month to receive this service.

Table 15: Cost of disposal per month

SW disposal cost per month	F	% of cases
Less than GHC 5.00	40	25.6
Between GHC 5.00 - 10.00	90	57.6
Between GHC 10.00 - 15.00	20	12.8
More than GHC 15.00	6	3.8
Total	156	100.0

Source: Field work, 2012.

Results from this study are not different from these earlier works. The unwillingness to pay had nothing to do with income earnings of respondents as they holistically disagreed to the statement "I don't want to pay extra because my monthly income is low" (Table 16). Results from further questions presented to ascertain the willingness to pay for services are provided in appendix II. All of these further questions had the SI for the responses determined.

Table 16: Willingness to pay for cost of disposal per month

I don't want to pay extra because my monthly income is low

	F	% of cases	SI
SA	22	14.1	
A	16	10.3	
N	21	13.5	70.6
D	51	32.7	
SD	46	29.5	

Source: Field work, 2012.

It can be deduced that from table 17 that households generally disagree to paying more even if this would bring some appreciable level of improvement in the current state of service delivery.

Appendix II gives full account of the perceptions and attitudes of households with regards to payment for SWM services. The severity indices were determined for these responses. Except for reason of finance for which households generally disagreed to paying extra for improved waste management services, they are indifferent about the cost of receiving this service. Households are also willing to pay for the waste they generate.

Willingness to pay for services is hinged on a number of factors. Mariwah *et al*. (2010) suggests that respondents' perception about whose responsibility it is to clean the environment, their level of education and to some extent their economic activity vis-à-vis their income status largely defines their willingness to pay for services they receive. A similar assertion is provided by Post (2002), Vicente and Reis (2008) and Popiel (2010) who add that the

existing perceived quality of services already being provided can be an advantage or disadvantage to willingness to pay.

Computing the SI for the above chart gives a percentage of 50.4 which in line with the classification of Majid and McCaffer (1997) falls within the nuetral class. This has implications for the development of schemes to manage SW at the metropolitan level in that it suggests to some extent that residents level of awareness of the current waste situation makes them ever ready to commit to improving environmental sanitation.

Quality of SWM services: Householder perception

Generally, it was observed throughout all the 16 localities within which this study was conducted that despite the effort of waste management authorities to clean and keep these communities clean, their effort were rather not adequate — as perceived by households, drawing from the responses received (Refer to appendix I). In many of these communities, communal refuse containers were often and completely full with residents forced to dump around within the vicinity of these containers. Further details of the observations made included but not limited to the following:

i. **Full and overflowing refuse containers —**

This phenomenon is typical to communities where communal containers are the basic means of collecting and disposing of MSW. Informal interviews conducted for some individuals responsible for managing the dumping area revealed that collections are periodical. Collections are however not adequate hence, containers are usually full leaving households no option than to dump in and around the

sited-area for such containers. These have tendencies in increasing the time needed to complete cycles of collection and disposal. The long hours spent in transfers is fundamentally attributed to road traffic congestions during peak times.

ii. **Waste generation far outstrips collection and disposal —**

The daily-generated quantity of MSW is conceivably beyond the frequency of collection, transfer and disposal to final disposal sites. Biodegradable wastes (good resources for composting) and materials that have reusable or recyclable values form the bulk matter of MSW. Solid waste separation at source can impact positively on the amount of waste that has to finally be disposed of.

iii. **Dirty and unkempt surroundings in and around transfer or collection points —**

Except for dumping grounds where refuse is dumped into containers or communal dumpsites that have at least a person responsible for dumpsite-area-management, none of the collection points for residents who receive roadside or door-to-door services have area-management personnel.

In some of such communities, the stench from putrefying organic components of the waste attracts insects and rodents.

With all these prevailing phenomena, respondents were asked to indicate their perception of the quality of the SWM service — in relation to collection and disposal — they receive from waste management authorities in their area.

The perception of quality was assessed under six specific categories or parameters and the severity indices (SI) determined for each.

Implications of attitudes and perceptions on MSW management

The perceptions that people have to some extent tend to form the basis for the adoption of certain attitudes (Macawile & Su, 2009; Tonglet *et al.*, 2010; Mariwah *et al.*, 2010), be it good or bad. In the work of Macawile and Su (2009) the segregation of domestic solid waste is a significant step in mitigating the problem of solid waste. They established this particularly in line with recycling schemes.

This management activity is particularly important because of the likelihood of reducing the final volumes of sent to dumping grounds. However, the survey on the frequency of solid waste separation activities as presented in table 11 shows that at least 82 percent of the sample population do not separate household waste. This phenomenon no doubt contributes to the difficulty in municipal waste management as espoused by Freduah (2007) and Fobil *et al.* (2008).

The unresponsiveness and low efficiency with which some waste management firms operate in their jurisdiction is gradually leaving many residents indifferent about the presence and functions of waste management firms in their locality. This indifference is partly exhibited in the adoption of certain unsafe disposal strategies including dumping into water ways and gutters results. Floods, outbreak of diseases, insects and pests infestations and a lot more are some of the effects of unsafe disposal.

Improving SW management: Householder perception

As discussed earlier with reference to table 9, householders have the perception that appreciable level of improvements can be achieved in waste management schemes if environmental education and sensitisation campaigns are promoted to intensify and instil an environmental consciousness into neighbours. This goes to highlight the importance environmental awareness campaigns have on the success of waste management strategies (Banjo *et al*., 2009; Mariwah *et al*., 2010).

In recent times, the negative perceptions and attitudes of people have been seen as a delimiting factor in waste management. This fact is highlighted in a recent publication by one of Ghana's largest waste management companies – Zoomlion – stating that the best way to adequately deal with the current waste situation is to strategise and incorporate change-in-attitude campaigns to augment the effort of various waste management companies in the Accra Metropolis in particular and the nation as a whole (Agyepong, 2011).

To buttress this finding, Kennedy (2010) who saw individual behaviour as the cause of a significant number of environmental problems went ahead to suggest that the provision and enforcement of regulations can directly address some of these problems. Kennedy's (2010) work established the necessity to introduce certain measures that will encourage the desired environmental behaviour.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

The chapter presents a summary of the findings from the study. It further makes recommendations based on the findings of this study.

Summary

The perceptions households have on the payment for SWM services unwillingness of residents to pay for enhanced solid waste management services is not based on their poor understanding of the current waste problem since the results has so far shown that urban dwellers are well aware of the magnitude of the current waste situation. The apathy in the attitudes of urban dwellers can significantly be attributed to their perceived poor quality of environmental cleaning services they receive from waste management authorities. The practice of waste separation, recycling and reuse of waste are undertaken less frequently.

In all the sixteen localities from which the study was carried, it was observed that the majority of households rely on roadside collection as a means of disposing of household solid waste. Aside this, other methods for disposing of solid waste exist. These methods comprise the use of communal containers or holding units, burning, burying; and dumping into gutters.

The adoption of some of these options comes with some financial commitment for households; ranging from as low as GHS 0.50 to as much as

GHS 2.00 per disposal for those who dispose of household waste at communal dumpsites or holding units; whereas roadside collection and disposal cost fall within the ranges of GHS 5.00 and GHS 20.00 monthly.

Households indicated that the services of waste management companies are inadequate largely because of the perceived unreliability in the services delivered. Generally, households believe that education and sensitisation can cause people to adopt good environmental behaviour and to significantly contribute to improving MSW management.

Residents tie their need to pay for environmental service to the level of quality they perceive to be receiving from the waste management authority. Having measured quality particularly in relation to responsiveness of waste management companies, frequent collection and disposal and enforcement of certain environmental laws, this study has established that the level of service received by residents in general is poor. This poor quality of solid waste management services residents receive has shaped their perception and willingness to pay more for improved services.

Conclusions

The study set out to investigate how attitudes and perceptions of households affect MSW management. Specifically, it aimed at identifying the various household solid waste disposal strategies. To this end, the findings show that majority of households studied dispose of solid waste through the services of waste management companies that render roadside collection or door-to-door services. The least of deployed method is dumping of household waste into gutters or storm drains. Other methods of disposal households deploy that was

identified in this study include burning, dumping on undeveloped land, dumping at communal dumpsites/container and burying.

Secondly, the study sought to find out the attitudes and perceptions of households towards solid waste management and how these affect MSW management. It was found that a large proportion of the households perceive the seriousness of the existing state of solid waste situation in the country. This perception however does not impact positively on the options for solid waste disposal.

Again, the quality of services that households receive from solid waste companies is quite unsatisfactory. The households have adjudged the various waste management firms generally to be unresponsive to their needs. Their collection and disposal services are mostly inadequate. This phenomenon translates on households' perceptions about paying for waste management services. Many do not see the need to pay extra owing to the perceived sub-standard services they already receive.

Recommendations

Based on the findings of this work, the following are recommended for the enhancement of solid waste management in Accra Metropolis. These are discussed below:

Improve regular collection of waste

From the study, it is evident that, collection and disposal of waste needs to be improved. Frequency of collections needs to be enhanced. However this cannot be fully achieved without investing in road infrastructure so as to

improve road networks; and build systems and structures that will ease road traffic congestion and subsequently reduce operation cost of collection and disposal.

Obviously this would require huge capital injection from the government and other development partners such as national and international NGOs. While this is being recommended as a long term measure, the following can be put into effect as interim measures to achieve this purpose;

- Instituting and intensifying environmental education campaigns targeted at inculcating habits of waste separation at household levels by civil society groups in partnership with NGOs and the Metropolitan, Municipal and District Assemblies;
- Household solid waste has great economic value. Separation, reuse and recycling of waste at the household level or point of generation can help in salvaging valuable materials that can serve as raw materials for the production of recyclables. Championing schemes that support these activities will require a holistic integration of all relevant stakeholders and the strengthening of private and public partnerships;

and doing all these in a bid to reduce the volume of waste that is finally disposed of specifically by households and waste management authorities in general.

Change in attitudes

The impact of attitude and behaviours on municipal solid waste management is undoubtedly significant. Any effort thus targeted at altering perceptions and attitudes in general with respect to waste generation and safe

disposal would be a step in the direction. This effort should adopt a holistic approach and its success will further be enhanced if it incorporates social marketing strategies that would eventually promote the adoption of good environmental attitudes whiles at the same time providing incentives for the practice of safe environmental attitudes. NGOs and the local government can spearhead this in the short term whiles provisions are made by the Ghana Education Service and the Ministry of Education for its infusion into the teaching curricula of schools as a long term measure.

Ensure and regularise swift collection and disposal systems

Owing to the high cost of financing collection and disposal services, waste management authorities cannot afford to relent on introducing mechanisms that will improve this particular function — especially when this is a key determinant of residents' willingness to pay. A swift and an efficient collection and disposal system can be achieved in a number of ways including;

- Refresher courses for field officers from waste management companies and other stakeholders (e.g. EPA) in the industry
- Waste management companies shifting more collection and disposal activities into the nights when off-peak road traffic is usually recorded
- Development partners, civil societies, and the waste management companies providing and equipping field officers with adequate logistics to reduce drudgery and fatigue.

Regularisation of collection will go a long way to avoid heaping of wastes and over flowing of containers, thus avoiding the entire nuisance that

come with these phenomena—preventing any possible outbreak of communicable diseases such as cholera and typhoid. Regularisation of collection and disposal requires the intensification of the Metropolitan Assembly's monitoring processes.

Ensuring adequate provision of communal containers

The unavailability of adequate communal containers affects accessibility. One factor that can also ensure significant improvement is the adequate provision of these containers and properly siting them to ensure easy accessibility by majority particularly for communities where roadside collection and disposal are practically hard to run — especially as this study has established that the longer the distance respondents cover to dispose of waste, the easier it is for them to adopt unsafe disposal practices. Accessibility will afford residents less time to dispose of their domestic waste which can have significant impact on disposal. This can be achieved through a joint collaboration between the private waste management companies and the Waste Management Department of the Accra Metropolitan Assembly.

REFERENCES

Abel, A. (2007). An analysis of solid waste generation in a traditional African city: the example of Ogbomoso, Nigeria. *Environment and Urbanization*, *19*(2), 527-537.

Achankeng, E. (2003). Globalization, urbanization and municipal solid waste management in Africa. *African on a global stage*. African Studies Association of Australasia and the Pacific

Acheampong, A. A. (n.d.). Improving sanitation in poor urban settlements: Exploring the option of community led sanitation approach in Ashaiman Municipality, Ghana. Retrieved June 21, 2011 from http://www.hdm.lth.se/fileadmin/hdm/alumni/papers/SDD_2009_242b/Abena_Korang_Acheampong_-_Ghana.pdf

Addai, F. K. (n.d.). The plastic waste menace in Ghana: A systematic analysis of the problem and its solutions. Retrieved September 20, 2010, from http://www.hfghana.org/hfg_publication_details.cfm?tblNewsCatID=2&prodcatID=16&tblNewsID=23

Addo-Yobo, F. N., & Ali, M. (2003). Households: passive users or active managers?: The case of solid waste management in Accra, Ghana.*International Development Planning Review*, *25*(4), 373-389.

Afroz, R., Hanaki, K., Tuddin, R. & Ayup, K. (2010). A survey of recycling behaviour in households in Dhaka, Bangladesh. *Waste Management and Resesarch*, *28*, 552 – 560. Retrieved September, 18, 2011, from http://wmr.sagepub.com/content/28/6/552.full.pdf

Afroz, R., Tuddin, R., Hanaki, K. & Masud, M. M. (2011). Selected socio-economic factors affecting the willingness to minimise solid waste in Dhaka city, Bangladesh. *Journal of Environmental Planning and Management, 54*(6), 711-731.

Agyepong, J. S. (2011). Barriers to private sector participation in sustainable waste management: Experiences of private operators and waste service providers in Ghana. Retrieved April 13, 2012 from http://www.uncrd.or.jp/env/spc/docs/plenary3/PS3-e_Ghana_JOSEPH%20SIAW%20AGYPONG.pdf

Anomanyo, D. E. (2004). Integration of municipal solid waste management in Accra, Ghana: Biofactor treatment technology as an integral part of the management process. Presented to Lund University, Sweden

Antwi, E. (2008). Seeing the house from the environment: Environmental concerns of informal/slum settlement in Accra, Ghana. Retrieved June 11, 2011 from http://projekter.aau.dk/projekter/files/14658588/Edward_Antwi_-_final_report.pdf

Appasamy, P., & Lundqvist, J. (1993). Water supply and waste disposal strategies for Madras. *Ambio, 18*(4), 442-448.

Asase, M., Yanful, E. K., Mensah, M., Stanford, J., & Amponsah, S. (2009). Comparison of municipal solid waste management systems in Canada and Ghana: A case study of the cities of London, Ontario, and Kumasi, Ghana. *Waste Management, 29*(10), 2779-2786.

Banjo, A. D., Adebambo, A. A. R. & Dairo, O. S. (2009). Inhabitants' perception on domestic waste disposal in Ijebu Ode, Southwest Nigeria. *African Journal of Basic & Applied Sciences, 1*(3-4), 62-66.

Barlow, D. H., & Durand, V. M. (1995). Abnormal psychology- an integrative approach. Brooks/Cole Publishing Company, Pacific Grove.

Barr, S. (2007). Factors Influencing Environmental Attitudes and Behaviors A UK Case Study of Household Waste Management. *Environment and Behavior*, *39*(4), 435-473.

Baud, I. S. A., Grafakos, S., Hordijk, M., & Post, J. (2001). Quality of life and alliances in solid waste management: contributions to urban sustainable development. *Cities*, *18*(1), 3-12.

Begum, R. A., Siwar, C., Pereira, J. J., & Jaafar, A. H. (2009). Attitude and behavioral factors in waste management in the construction industry of Malaysia. *Resources, Conservation and Recycling*, *53*(6), 321-328.

Benneh, G., Songsore, J., Nabila, J.S, Amuzu, A.T, Tutu, K.A, Yangyuoru, Y. & McGranahan, G. (1993). Environmental problems and the urban household in the Greater Accra Metropolitan Area (GAMA) – Ghana. Stockholm Environment Institute, Stockholm, Sweden.

Boadi, K. O. & Kuitunen, M. (2002). Urban waste pollution in the Korle lagoon, Accra, Ghana. *The Environmentalist*, *22*(4), 301-309.

Boadi, K. O. & Kuitunen, M. (2004). Municipal solid waste management in the Accra metropolitan area, Ghana. *The Environmentalist, 23*(3), 211-218.

Boateng, C. & Nkrumah, D. (2006). Managing waste: The attitudinal change. Daily Graphic, 16th December. Page 20.

Boldero J. (1995). The prediction of household recycling of newspapers: the role of attitudes, intentions and situational factors. *Journal of Applied Social Psychology, 25*(5), 44–62.

Chandra, R. (n.d.). Solid waste management: Need, Innovations and Strategies: A case Study of Bhopal Municipal Corporation. Retrieved October 24, 2010, from http://kitakyushu.iges.or.jp/docs/mtgs/seminars/theme/swm/presentation/3 Bhopal (Paper).pdf

Charuvichaipong, C. & Sajor, E. (2006). Promoting waste separation for recycling and local governance in Thailand. *Habitat International, 30*(3), 579-594.

Cointreau-Levine, S. (2000). Occupational and environmental issues of solid waste management: Special emphasis on developing countries. Retrieved September 22, 2011, from http://www.integracionxxi.net.uy/medioambiente/Cointreau2.doc

Colan Consult. (1998). Project-wide capacity building and training: Urban environmental sanitation project. Accra Metropolitan Assembly, Accra, Ghana.

Daily Graphic. (2009). Tema Traditional Council, Zoomlion, clean beach. *Daily Graphic*, June 16, 2009, No. 17843, Accra, Ghana: p. 42

Davis, G. & Morgan, A. (2008). Using the Theory of Planned Behaviour to determine recycling and waste minimisation behaviours: A case study of Bristol City, UK. *The Australian Community Psychologist, 20*(1), 105 – 117.

Dernbach, J.C. (2007). Harnessing individual behaviour to address climate change: Options for congress. *Virginia Environmental Law Journal*, *26*, 107–157.

Dillon, P. J., & Gayford, C. G. (1997). A psychometric approach to investigating the environmental beliefs, intentions and behaviours of pre-service teachers. *Environmental Education Research*, *3*(3), 283-297.

EPA (2009). Municipal solid waste generation, recycling and disposal in the United States: Facts and figures for 2008. Retrieved April 28, 2011 from http://www.epa.gov/osw/nonhaz/municipal/pubs/msw2008rpt.pdf

Fazio, R. H. (1995). Attitudes as object-evaluation associations: Determinants, consequences, and correlates of attitude accessibility.

Fei-Baffoe, B. (2006). Double stage dry-wet fermentation of unsorted municipal solid waste. (Doctoral Thesis, Brandenburg University of Technology, Cottbus). Retrieved April 24, 2011 from http://opus.kobv.de/btu/volltexte/2006/24/pdf/Dissertation_final_for_the_library_final.pdf

Firdaus, G., & Ahmad, A. (2010). Management of Urban Solid Waste Pollution in Developing Countries. *International Journal of Environmental Research*, *4*(4), 795-806.

Fobil, J. N., & Hogarh, J. N. (n.d.). The dilemmas of plastic wastes in a developing economy: Proposals for a sustainable management approach for Ghana. Retrieved March 20, 2011 from http://www.ajol.info/index.php/wajae/article/viewFile/45716/29194

Fobil, J. N., Armah, N. A., Hogarh, J. N. & Carboo, D. (2008). The influence of institutions and organizations on urban waste collection systems: An analysis of waste collection system in Accra, Ghana (1985–2000). *Journal of Environmental Management, 86*(1), 262 – 271.

Freduah, G. (2007). Problems of solid waste management in Nima, Accra. *Undergraduate Research Journal for the Human Sciences, 6.* Retrieved January 18, 2011 from http://www.kon.org/urc/v6/george.html

GSS (2005). 2000 population and housing census, Greater Accra Region: Analysis of district data and implications for planning.

GSS (2010). 2010 population and housing census: Final results. Retrieved September 18, 2012 from http://www.statsghana.gov.gh/docfiles/2010phc/2010_POPULATION_AND_HOUSING_CENSUS_FINAL_RESULTS.pdf

Guerreroa, L. A., Maasa, G., & Hoglandb, W. (2013). Solid waste management challenges for cities in developing countries. *Waste Management, 33*(1), 220 – 232.

Hamdu, I. (2009). Improving waste logistics in Kumasi Metropolitan Area. Retrieved April 11, 2012 from http://dspace.knust.edu.gh:8080/jspui/bitstream/123456789/495/1/IBRAHIM%20HAMDU.pdf

Hormenu, M. C. (2011). Municipal organic waste composting as management option for urban agriculture: A case of Accra Metropolis-Ghana. Trita LWR Degree Project 11:17, 97p.

Ita, M. (2003). Waste: Is the developing world ready? *Science in Africa.* Africa's First On-line Science Magazine. Science Magazine for Africa. MERCK.

Ivens, U. I., Breum, N. O., Ebbehøj, N., Nielsen, B. H., Poulsen, O. M., & Würtz, H. (1999). Exposure-response relationship between gastrointestinal problems among waste collectors and bioaerosol exposure. *Scandinavian Journal of Work, Environment & Health, 11*, 238-245.

Joseph, K. (2002). Solid waste dump sites to sustainable landfills. *EnviroVision, 1*, 1-14.

KAB (2009). *Litter prevention.* Retrieved on April 24, 2010 from http://www.kab.org/site/PageServer?Pagename=Focus_litter_prevention

Kalbermatten, J. R., Middleton, R. & Schertenleib, R. (1999). *Household-centred environmental sanitation*. Duebendorf, Switzerland, Water and Sanitation in Developing Countries (SANDEC). Retrieved May 12, 2011 from http://www.novaquatis.eawag.ch/organisation/abteilungen/sandec/publikationen/publications_sesp/downloads_sesp/Paper_Description_HCES_July99.pdf

Kendie S. (1999). Do attitudes matter? Waste disposal and wetland degradation in the Cape Coast Municipality. *Journal of Tropical Geography. 29*(2), 69 – 81.

Kennedy, A. L. (2010). Using community-based social marketing techniques to enhance environmental regulation. *Sustainability, 2*, 1138-1160.

Klein, E. S. & Merritt, E. (1994). Environment education as a model for constructivist teaching. *Journal of Environmental Education 25*(3), 14 – 21.

Kofoworola, O. F. (2007). Recovery and recycling practices in municipal solid waste management in Lagos, Nigeria. *Waste Management*, *27*(9), 1139 – 1143.

Korfmacher, K. S. (1997). Solid waste collection systems in developing urban areas of South Africa: an overview and case study. *Waste Management & Research*, *15*(5), 477 – 494.

Kumar, S. & Chakrabarti, T. (2010). Effective Municipal Solid Waste Management in India. Retrieved April 11, 2012 from http://cdn.intechopen.com/pdfs/9676/InTech-Effective_municipal_solid_waste_management_in_india.pdf

Kungskulniti, N., Pulket, C., Miller, F. D. & Smith, K. R. (1991). Solid waste scavenger community: An investigation in Bangkok, Thailand. *Asia-Pacific Journal of Public Health*, *5*(1), 54 – 65.

LaPiere, R. T. (1934). Attitudes vs. actions. *Social Forces*, *13*(2), 230 – 237.

Laryea J. A. (1997). Urban waste management techniques: The case of Ghana. In: E. K. Boon and L. Hens (Eds), Environmental Management in West Africa. Brussels: Free University of Brussels, 289-295.

Longe, E. O., Longe, O. O., & Ukpebor, E. F. (2009). People's perception on household solid waste management in Ojo Local Government Area in Nigeria. *Iranian Journal of Environmental Health Science and Engineering, 6*(3), 209-216.

Macawile, J. & Su, G. S. (2009). Local government officials perceptions and attitudes towards solid waste management in Dasmariñas, Cavite, Philippines. *Journal of Applied Sciences in Environmental Sanitation, 4*(1), 63 – 69.

Majumder, S. C. & Karim, M. R. (2012). Urban solid waste management: A study on the Comilla City Corporation. *Journal of Economics and Sustainable Development, 3*(6), 53 – 61.

Mariwah, S., Kendie, S. B., & Dei, A. L. (2010). Residents' perception of the solid waste problem in the Shama-Ahanta East Metropolitan Area, Ghana. *Oguaa Journal of Social Sciences, 5*(1), 21 – 43.

Mayowa, I. K. & Aribisala, G. (2012). Assessment of solid waste management problems in college of education, Ikere–Ekiti, Ekiti State, South West Nigeria. *Scholarly Journal of Education, 1*(4), 42 – 45.

McKenzie-Mohr, D. (2000). Fostering sustainable behaviour through community-based social marketing. *American Psychologist, 55*(5), 531–537.

Mensah, A., & Larbi, E. (2005). *Solid waste disposal in Ghana*. Retrieved October 29, 2010, from http://www.lboro.ac.uk/well/resources/fact-sheets/fact-sheets-htm/RSA Solid waste.htm

Mwiganga, M. & Kansiime, F. (2005). The impact of Mpererwe landfill in Kampala-Uganda, on the surrounding environment. *Physics and Chemistry of the Earth*, *30*(11-16), 744 – 750.

Ogbonna, D. N., Amangabara, G. T., & Ekere, T. O. (2007). Urban solid waste generation in Port Harcourt metropolis and its implications for waste management. *Management of Environmental Quality: An International Journal*, *18*(1), 71 – 88.

Omran, A., Mahmood, A., Abdul Aziz, H. & Robinson, G. M. (2009). Investigating households attitude towards recycling of solid waste in Malaysia: A case study. *International Journal of Environmental Research*, *3*(2), 275 – 288.

Osei, J., Osae, S. K., Fianko, J. R., Adomako, D., Laar, C., Anim, A. K., ... & Nyarko, E. S. (2011). The Impact of Oblogo landfill site in Accra-Ghana on the surrounding environment. *Research Journal of Environmental and Earth Sciences*, *3*(6), 633 – 636.

Oteng-Ababio, M. (2010). Private sector involvement in solid waste management in the Greater Accra Metropolitan Area in Ghana. *Waste Management & Research 28*, 322 – 329.

Pacey, A. (1990). Hygiene and literacy. In: C. Inkerr (Ed), Community Health and Sanitation. *Intermediate Technology Publication, Nigeria*, *11*, 26-29.

Pieters, R. G. M. (1991). Changing garbage disposal patterns of consumers: Motivation, ability and performance. *Journal of Public Policy and Marketing*, *10*(2), 59 – 76.

Pipatti, R., Sharma, C. & Yamada, M. (2006). Waste generation, composition and management data. *Waste, 5,* 1 – 23.

Pokhrel, D., & Viraraghavan, T. (2005). Municipal solid waste management in Nepal: practices and challenges. *Waste Management, 25*(5), 555-562.

Post, J. (1999). The problems and potentials of privatising solid waste management in Kumasi, Ghana. *Habitat International*, *23*(2), 201 – 215.

Post, J. (2002). New partnerships in the collection of urban solid waste in developing world. In: I. S. A. Baud, J. Post & C. Furedy (Eds), *Urban Management, Markets and Sustainable Development, Urban Solid Waste Management in Hyderabad and Nairobi*. London: Earthscan Publication.

Puopiel, F. (2010). Solid waste management in Ghana: The case of Tamale Metropolitan Area. Retrieved April 11, 2012 from http://dspace.knust.edu.gh:8080/jspui/bitstream/123456789/146/1/Felix%20Puopiel%20thesis.pdf

Qian, W., Burritt, R. & Monroe, G. (2011). Environmental management accounting in local government: A case of waste management. *Accounting, Auditing and Accountability Journal, 24*(1), 93 – 128.

Rosqvist, H., & Destouni, G. (2000). Solute transport through preferential pathways in municipal solid waste. *Journal of Contaminant Hydrology*, *46*(1), 39 – 60.

Seik, F. (1997). Recycling of domestic waste: Early experiences in Singapore. *Habitat International*, *21*, 277 – 289.

Shafiul, A. A. & Mansoor, A. (2004). Partnerships for solid waste management in developing countries: Linking theories to realities. *Habitat International, 28*(2004) 467–479.

Sharholy, M., Ahmad, K., Mahmood, G., & Trivedi, R. C. (2008). Municipal solid waste management in Indian cities: A review. *Waste Management, 28*(2), 459 – 467.

SPREP. (2006). *Solid waste management strategy for the Pacific region, 8.* (G. S. Percival, Ed.) Apia, Samoa: Commercial Printers Ltd.

Tonglet, M., Phillips, P. S., & Bates, M. P. (2004). Determining the drivers for householder pro-environmental behaviour: Waste minimisation compared to recycling. *Resources, Conservation and Recycling*, *42*(1), 27 – 48.

Tsiboe, I. A., & Marbell, E. (2004). A look at urban waste disposal system in Accra, Ghana. Retrieved October 28, 2010, from http://rudar.ruc.dk/bitstream/1800/322/1/A_Look_at.pdf

Tucker, P. & Speirs, D. (2001). Understanding home composting behaviour. Retrieved February 16, 2012, from http://www.uws.ac.uk/schoolsdepts/science/environment/documents/Und_Home_Comp_Beh.PDF

Uitto, A., Juuti, K., Lavonen, J. & Meisalo, V. (2004). Who is responsible for sustainable development? Attitudes to environmental challenges: A survey of Finnish 9th grade comprehensive school students. Retrieved February 13, 2012 from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.138.7724&rep=rep1&type=pdf#page=80

UNEP (1996). International Source Book on Environmentally Sound Technologies for Municipal Solid Management. UNEP-IETC, Osaka, Japan.

UNEP (2009). Developing integrated solid waste management plan training manual: Assessment of current waste management systems and gaps therein. Retrieved October 22, 2011 from http://www.unep.or.jp/ietc/Publications/spc/ISWMPlan_Vol2.pdf

UN-Habitat (2009). Ghana: Accra urban profile. Retrieved October 22, 2011 from http://urbanhealthupdates.files.wordpress.com/2009/10/habitat-ghana_urban_profile2009.pdf

UNICEF (2006). Solid and liquid waste management in rural areas. Retrieved October, 22, 2011, from http://hptsc.nic.in/SLWM/SLWM_2.pdf

Vicente, P. & Reis, E. (2008). Factors influencing households' participation in recycling. *Waste Management and Research, 26,* 140 – 146. Retrieved September 18, 2011. DOI: 10.1177/0734242X07077371.

Whittington, D., Lauria, D. T., Choe, K., Hughes, J. A., Swarna, V., & Wright, A. M. (1993). Household sanitation in Kumasi, Ghana: A description of current practices, attitudes, and perceptions. *World Development*, *21*(5), 733-748.

World Bank. (1999). What a waste: Solid waste management in Asia. Retrieved September 18, 2011, from http://web.mit.edu/urbanupgrading/urbanenvironment/resources/references/pdfs/WhatAWasteAsia.pdf

Zerbock, O. (2003). Urban solid waste management: Waste reduction in developing countries. Retrieved October, 22, 2011, from http://www.mtu.edu/peacecorps

Zhou, Y. (2010). Determining sustainable waste management practices in college and university dining services using the Theory of Planned Behaviour. Retrieved February 26, 2012 from http://krex.k-state.edu/dspace/bitstream/handle/2097/4153/yingzhou2010.PDF.pdf?sequence=1

APPENDIX

A. Householders' perceptions about existing SW management system

All cases presented under appendices I, II and III, *n* = 156 and are results of the analysis of data gathered during the field exercise in 2012.

i. There is a well organised solid waste disposal programme in my area

	F	% of cases	SI
SA	20	12.8	
A	26	16.7	
N	11	7.1	69.4
D	59	37.8	
SD	40	25.6	

ii. The services of the solid waste service provider operating in my area are adequate

	F	% of cases	SI
SA	3	1.9	
A	13	8.3	
N	17	10.9	80.8
D	65	41.7	
SD	58	37.2	

iii. Waste bins should be provided without charge

	F	% of cases	SI
SA	45	28.8	
A	47	30.1	
N	22	14.1	49.7
D	27	17.3	
SD	15	9.6	

iv. I am aware of the waste management company responsible for my community

	F	% of cases	SI
SA	42	26.9	
A	55	35.3	
N	13	8.3	51.3
D	21	13.5	
SD	25	16.0	

v. The private waste management firm operating in my area are reliable and efficient in carrying out their duty

	F	% of cases	SI
SA	45	28.8	
A	10	6.4	
N	3	1.9	67.1
D	41	26.3	
SD	57	16.0	

vi. I patronise the solid waste collection and disposal services of the private waste management firm in my locality

	F	% of cases	SI
SA	25	16.0	
A	41	26.3	
N	2	1.3	67.8
D	24	15.4	
SD	64	41.0	

vii. Lack of access roads to many households in my locality makes waste collection and disposal quite difficult

	F	% of cases	SI
SA	42	26.9	
A	40	25.6	
N	17	10.9	55.3
D	27	17.3	
SD	30	19.2	

B. The perception and attitude of households with regards to payment for SWM services

i. I am okay with the amount of money I pay currently to have my waste collected

	F	% of cases	SI
SA	47	30.1	
A	57	36.5	
N	15	9.6	48.5
D	13	8.3	
SD	24	15.4	

ii. I am willing and ready to pay for the disposal of the waste that I generate

	F	% of cases	SI
SA	46	29.5	
A	49	31.4	
N	17	10.9	50.4
D	22	14.1	
SD	22	14.1	

iii. I am willing to pay extra if that would help improve the efficiency in household collection services

	F	% of cases	SI
SA	35	22.4	
A	39	25.0	
N	15	9.6	58.7
D	29	18.6	
SD	35	24.4	

iv. I don't see the need in paying extra for my household waste to be collected more efficiently

	F	% of cases	SI
SA	35	22.4	
A	44	28.2	
N	42	26.9	52.2
D	17	10.9	
SD	18	11.5	

v. The current state of service delivery is poor, thus there's no need to pay extra for household waste disposal

	F	% of cases	SI
SA	40	25.6	
A	61	39.1	
N	27	17.3	45.9
D	25	16.0	
SD	3	1.9	

vi. I don't want to pay extra because my monthly income is low

	F	% of cases	SI
SA	22	14.1	
A	16	10.3	
N	21	13.5	70.6
D	51	32.7	
SD	46	29.5	

C. Householders' perceptions about how to improve solid waste management in the metropolis

i. If my community is educated, sensitised and provided with adequate resources, we can undertake waste separation activities and reduce indiscriminate littering

	F	% of cases	SI
SA	66	42.3	
A	72	46.2	
N	5	3.2	36.7
D	4	2.6	
SD	9	5.8	

ii. Providing communities and households in particular with different waste bins or containers for different components of household solid waste will promote waste separation activities

	F	% of cases	SI
SA	97	62.2	
A	29	18.6	
N	6	3.8	36.2
D	11	7.1	
SD	13	8.3	

iii. If households are made to pay more for their waste to be collected, there would be an improvement in the collection and disposal activities of waste management firms in my locality

	F	% of cases	SI
SA	21	13.5	
A	40	25.6	
N	32	20.5	61.3
D	34	21.8	
SD	29	18.6	

iv. Making waste containers readily available and enhancing collection services will curtail indiscriminate littering and dumping of refuse at inappropriate places

	F	% of cases	SI
SA	52	33.3	
A	69	44.2	
N	8	5.1	42.8
D	15	9.6	
SD	12	7.7	

v. No matter the level of sensitisation or education, people will never change their behaviour

	F	% of cases	SI
SA	5	3.2	
A	7	4.5	
N	14	9.0	83.3
D	61	39.1	
SD	69	44.2	

vi. The ill performance of the current waste system is because waste management policies lack adequate stakeholder involvement

	F	% of cases	SI
SA	59	37.8	
A	66	42.3	
N	8	5.1	40.8
D	12	7.7	
SD	11	7.1	

vii. Waste management activities are the sole responsibilities of the metropolitan assembly and other waste management firms. I have no role to play in it

	F	% of cases	SI
SA	24	15.4	
A	19	12.2	
N	14	9.0	71.3
D	43	27.6	
SD	56	35.9	

D. Data collection instrument

a) Basic characteristics of respondent & household

1. Sex: ☐ Male ☐ Female
2. Age (in years):

☐ 20 and below ☐ 21-30 ☐ 31-40 ☐ 41-50 ☐ 51+

3. Marital status: ☐ Single ☐ Married ☐ Divorced ☐ Widowed
4. Educational status:

☐ No formal Education ☐ Primary ☐ Secondary/vocational ☐ Post-secondary/training college ☐ Tertiary

5. Please describe your present occupational status:

☐ Self-employed

☐ Privately-employed

☐ Public/Civil servant

☐ Other _____
(Please specify)

6. How much do you earn averagely on a monthly basis?

☐ Below GHC 100 ☐ GHC 501 – 700

☐ GHC 101 – 300 ☐ GHC 701 - 900

☐ GHC 301 – 500 ☐ Above GHC 900

7. How many people live within your household?

☐ Less than 4 ☐ 4 – 6 ☐ 7 – 9 ☐ more than 10

8. Indicate the number of adults and children in the household

_____: Adults (18+ years)

_____: Children (less than 18 years)

9. What is the highest level of education that any member of the household has attained? (**Please tick only one**)

☐ Primary ☐ Post-secondary/training college

☐ Secondary/vocational ☐ Tertiary

b) Household waste management activities

10. Which of the following options indicate the various strategies you sometimes adopt to dispose of your household waste? (**Tick all that apply**)

☐ Burning

☐ Dumping into gutter

☐ Dumping on undeveloped land

☐ Roadside collection

☐ Dumping at communal dumpsite/containers

☐ Burying

11. (a) Which one of the above do you employ most frequently? (**Tick only one**)

☐ Burning ☐ Dumping into gutter

☐ Dumping on undeveloped land ☐ Roadside collection

☐ Dumping at communal dumpsite/containers

☐ Burying

(b) Why? _____

12. What are the major compositions of your household solid waste that you often get rid of? (**Tick all that apply**)

☐ Garden trimmings, grass, kitchen waste and other vegetative materials

☐ Left over foods

☐ Wood pieces, paper cards and cartons

☐ Broken glass pieces, metallic materials

☐ Plastic and rubber products

13. How often do you dispose of your household waste? (**Please tick the one that most applies**)

☐ Every morning ☐ Twice a we ☐ Every evening

☐ Only when the bin is full ☐ Once a week

☐ Reliance on door-to-door collection services

14. What containers do you store your household solid waste in before disposal?

☐ Refuse bin with lid ☐ Old box/carton ☐ Basket

☐ Old bucket/pan ☐ Nylon/polythene bags

☐ Sack bags/cement bags

15. Who in your household is responsible for disposing of waste?

☐ Father ☐ Any of the children ☐ Mother

☐ Domestic/house help

16. How long does it take to transport your household waste to the point of collection or disposal?

☐ Less than 5 minutes' walk

☐ Between 5 and 10 minutes' walk

☐ Between 10 and 15 minutes' walk

☐ More than 15 minutes' walk

17. As a solid waste management practice, do you separate your household waste into different components before disposal?

☐ Yes ☐ No

18. If **YES**, indicate the various components into which your household wastes are separated.

☐ Biodegradable & non-biodegradable

☐ Sachet water pack (polythene materials) & other waste household waste

19. Do you have containers for each of these components?

☐ Yes ☐ No

20. Please take the time to indicate how you handle these components before collection or disposal? _____

_____

NB: *Please note, the response for Q. 21 is based on the following interpretation for the five place-scale where*

*1 = Al**most always**; 2 = **Not all the times**; 3= **Never at all***

21. How often do you carry out your household waste separation activities?

[**Always** : __ 1 __ : __ 2 __ : __ 3 __ : **Never**]

22. Do you find your solid waste separation activity difficult to carry out? If **YES**, please indicate the reason(s) for the difficulty. (**Tick all that apply**)

I don't have containers to handle the various components before they are

☐ disposed of

☐ I don't see the need for separating my household waste

☐ I don't have time to separate my waste

☐ Other _____
(Please specify)

c) Measure of householder perceptions about waste management

23. I am aware of the solid waste situation in my community and the entire city and I think it is;

☐ Extremely serious

☐ Slightly serious

☐ Normal

24. Describe in your own words what this waste situation is

_____

_____

25. What in your opinion are the factors responsible for this current waste situation? (**Tick all that apply**)

☐ Inadequate waste collection

☐ Indiscriminate dumping & littering

☐ Unsafe waste disposal

☐ Ineffective laws on sanitation

☐ Institutional weakness or ineffectiveness

☐ Insufficient revenues

☐ Waste management not a government priority

☐ Lack of access roads to many houses in my locality

Householders' perception on the existing solid waste management system

*Please indicate your perception by **circling** the options that apply i.e.* **1** *= Strongly agree,* **2** *= Agree,* **3** *= Neutral,* **4** *= Agree; &* **5** *= Strongly agree*

26. Dumping household waste at appropriate places e.g. communal dumpsites, kerb side waste bins, community waste containers, etc. would be

    [**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

27. I carry out my household waste separation activities

    [**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

28. Most people in my neighbourhood separate their solid waste into different components before they dispose it of

    [**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

29. Most people in my neighbourhood have difficulty undertaking household solid waste separation before disposal.

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

30. Most people in my neighbourhood throw their rubbish away without sorting or separating them into different components.

    [**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

31. Most people in my community dump their waste indiscriminately.

    [**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

32. Most people understand the need to separate their household solid waste before disposing them of.

    [**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

33. Are you satisfied with the services of the waste management firm operating within your locality?

☐ Yes ☐ No

34. If you answered **NO** to Q. 34, kindly indicate the reasons for your dissatisfaction.

☐ Inadequate storage facilities for household waste

☐ The cost of collection and disposal is high

☐ The distance from my house to the point of collection is great

☐ The sanitation workers employed to work here do not come regularly leaving our waste in unpleasant conditions

Please indicate your perception by ticking the options that apply i.e. **SD** *= strongly disagree,* **D** *= Disagree,* **N** *= Neutral,* **A** *= Agree; &* **SA** *= Strongly agree*

35. What are your perceptions on the existing solid waste management system within your locality?

i. *There is a well organised solid waste disposal programme in my area*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

ii. *The services of the solid waste service provider operating in my area are adequate*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

iii. *Waste bins provided for the collection of household waste should be provided freely to households by the private waste management firms*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

iv. *I am aware of the private waste management firm that is tasked to collect and dispose of municipal solid waste from my community and its surroundings*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

v. *The private waste management firm operating in my area are reliable and efficient in carrying out their duty*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

vi. *I think the waste management firm operating in my area is responsive to my needs*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

vii. *I patronise the solid waste collection and disposal services of the private waste management firm in my locality*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

viii. *Lack of access roads to many households in my locality makes waste collection and disposal quite difficult*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

The perception of respondents with regards to payment for SWM services

36. How much does it cost you to have your waste collected or disposed of on monthly basis?

☐ Less than GHC 5 ☐ GHC 5 – 10 ☐ GHC 10 – 15

☐ More than GHC 15

37. What do you perceive of paying for your household waste before collection and disposal?

i. *I am okay with the amount of money I pay currently to have my waste collected*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

ii. *I am willing and ready to pay for the disposal of the waste that I generate*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

iii. *I am willing to pay extra if that would help improve the efficiency in household collection services*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

iv. *I don't see the need in paying extra for my household waste to be collected more efficiently*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

v. *I don't see the need to pay extra for my household waste to be collected because the current state of service delivery is poor*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

vi. *I don't want to pay more because my monthly income is low*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

d) Residents' perception of how to improve solid waste management in the Metropolis

38. I think the reasons for which most people have difficulty in separating their household solid waste before disposing it of is because:

i. *They do not understand the need for that activity*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

ii. *They do not have enough education on how to separate their waste*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

iii. *There are no laws to enforce this behaviour*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

iv. *There are not enough appropriate places or receptacles to dump or dispose of the waste that has been separated into various components*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

v. *It is not our duty but that of the metropolitan assembly (AMA) or other private waste management firms*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

39. I am confident that:

i. *If my community is educated, sensitised and provided with adequate resources, we can undertake waste separation activities and reduce indiscriminate littering.*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

ii. *Providing communities and households in particular with different waste bins or containers for different components of household solid waste will promote waste separation activities*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

iii. *If households are made to pay more for their waste to be collected, there would be an improvement in the collection and disposal activities of waste management firms in my locality.*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

iv. *Making waste containers readily available and enhancing collection services will curtail indiscriminate littering and dumping of refuse at inappropriate places.*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

v. *No matter the level of sensitisation or education, people will never change their behaviour.*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

vi. *The ill performance of the current waste system is because waste management policies lack adequate stakeholder involvement*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

vii. *Waste management activities are the sole responsibilities of the metropolitan assembly and other waste management firms. I have no role to play in it.*

[**Strongly Agree** : _1_:_2_ :_3_:_4_:_5_: **Strongly disagree**]

Thank you for your time