UNIVERSITY OF GHANA

SUSTAINABLE SOLID WASTE MANAGEMENT IN GHANA: A CASE STUDY OF ACCRA METROPOLITAN ASSEMBLY

BY

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THIS LONG ESSAY IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF PUBLIC ADMINISTRATION DEGREE

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DECLARATION

I hereby declare this work is the result of my own research and has not been presented by anyone for any academic award in this or any other University. All references used in this work have been fully acknowledged. I bear sole responsibility for any shortcomings.

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CERTIFICATION

I hereby certify that this long essay was supervised in accordance with the procedures laid down by the University.

....

DR. ALBERT AHENKAN DATE

(SUPERVISOR)

DEDICATION

This work is dedicated to my supervisor, Dr. Albert Ahenkan who has been very patient, accommodating and above all instrumental in my journey as a student.

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It's been a pleasant ending, although coupled with mental stress and tough challenges. All glory to God almighty for this educative and experiential journey. It takes only the strength of God to accomplish this milestone. (Ataa kpapka Oyi wala don.).

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LIST OF ABBREVIATIONS

AMA	Accra Metropolitan Assembly
DA	District Assembly
GA	Greater Accra
KMA	Kumasi Metropolitan Assembly
ISWM	Integrated Solid Waste Management
IDO	International Development Organizations
MSWM	Models of Solid Waste Management
MMDAs	Metropolitan, Municipal and District Assemblies
MW	Municipal Waste
NAM	Nsawam-Adoagyiri Municipality
SWM	Solid Waste Management
SSA	Sub-Saharan African
WH	Waste Hierarch
WM	Waste Management
WMD	Waste Management Department
WB	World Bank
ZLGL	Zoom Lion Ghana Limited

ABSTRACT

The aim of the study is to investigate the challenges to sustainable solid waste management in Ghana using the Accra Metropolitan Assembly as a case study. Solid waste management has several functional elements, including waste generation, waste handling and collection, transfer and transport and final disposal. The role of private waste collection organization is generally believed to be central in managing solid waste in the AMA. The study employed a case study within the qualitative research paradigm. In all seventeen (17) .interviews were conducted for the research. The research findings show that solid waste management in the AMA has been bedeviled with many challenges. These challenges include limited knowledge on systems and technologies for waste management, inadequate funding, lack of equipment for collecting waste, inadequate dumping sites, and absence of decision makers interested in environmental issues. The research therefore, recommends an integrated approach to waste management in the AMA, where all stakeholders are given the opportunity to make inputs into strategies to manage solid waste in the AMA.

CHAPTER ONE

GENERAL INTRODUCTION

1.0 Introduction

The aim of the study is to investigate the challenges of sustainable solid waste management in Ghana using the Accra Metropolitan Assembly as a case study. This section of the research has been categorized under the following thematic areas: introduction, background to the study, research significance, research problem, research objectives, research questions, the scope and limitations of the study and the organization of the study.

1.1 Study Background

Waste is the most visible environmental challenge in urban regions in many Sub-Saharan African countries. Sub-Saharan African countries have been experiencing rapid urban growth in recent years (Nnorom & Osibanjo, 2008). Changing consumption patterns, economic development, increasing population, urbanization and industrialization have all contributed to waste generation in many Sub-Saharan African countries (Guerrero, Maas & Hogland, 2013). Moreover, the inadequacies of institutional capacity and financial constraints have led in the growth of waste generation without adequate facilities for the disposal of waste in these developing countries (Sharma & Reddy, 2004). These issues have subsequently contributed to many environmental challenges in many of these developing countries. As many developing countries including Ghana continue to follow the path of development the challenges of waste management will continue to increase enormously. The absence of effective waste management

facilities in many developing countries is not only a challenge to their social and economic development but also an environmental and health problem (Kiddee, Naidu & Wong, 2013). Without proper waste management facilities, such waste can pollute water bodies can attract disease causing organisms and spread harmful substances (Oliveira & Rosa, 2003).

There are various technologies which exist to channel solid waste such as compositing or organic waste, incineration with energy production, and material recovery through recycling (Sharma & Reddy, 2004). According to Marshall and Farahbakhsh (2013) all of these technologies for managing waste have the potential to be more sustainable in managing solid waste than the use of landfill sites. Nevertheless, with waste streams composing of greater organic matter in many developing countries especially in Africa, composting is being considered, especially in the agricultural and tourist areas as a strategy to manage and reduce waste meant for landfill sites (Henry, Yongsheng & Jun, 2006). Developing countries facing waste management challenges can explore recycling as a waste management method instead of incineration which can pose environmental and community health risk if misused and requires high capital investments (Oliveira & Rosa, 2003).

Waste cannot be dumped without proper facilities to prepare and manage it, because not only is it unhygienic but it can have dire consequences on the environment. Waste management has been a major challenge for the government of Ghana over the years in many urban areas of the country. Finding suitable landfill sites are becoming more difficult as a result of rapid urban expansion and Ghana is no exception. Many people is Ghana are not willing to accept the

development of new landfill sites near them because of litter, pollution, pest and the reduction in value of their homes and community. The cost of investment in providing environmentally friendly and convenient landfill facilities are enormously high (Sharma & Reddy, 2004). To address the challenge of waste management in Ghana the government of Ghana over the years have formulated and implemented various policies and programmes through the local governments with the aim of improving the sanitation challenge in most of the cities across the country with limited success.

Against this background the study seeks to explore the challenges to sustainable solid waste management in Ghana using the Accra Metropolitan Assembly as a case study.

1.2 Problem Statement

Solid waste generation is a natural cause of the activities of human beings. Management waste in societies has the potential to improve the quality of life of the people (Pires, Martinho & Chang, 2011). In previous years waste management strategies were aimed at primarily eliminating waste from societies than seen as a means of improving public health (Kiddee, Naidu & Wong, 2013). After studies have revealed the dilapidating and hazardous effects of uncontrolled disposal of waste, the rationale for waste management has been revised accordingly. This has consequently led to the development of various waste management technologies such as compositing or organic waste, incineration with energy production, and material recovery through recycling (Sharma & Reddy, 2004). Globally, countries are entreated to develop environmentally sustainable waste management policies and programmes to improve the environment and health of their citizens (Nnorom & Osibanjo, 2008). However, the level of attention given to the

sustainable aspect of waste management varies from country to country depending on the economic strength of the country (Guerrero, Maas & Hogland, 2013). It has become important to explore how countries are managing waste in their respective countries and develop frameworks that can help developing countries better manage waste development in the context of these countries (Marshal & Farahbakhsh, 2013).

Extant literature has focused on waste management in Asian countries include (Vij, 2012; Zhang, Tan & Gersberg, 2010; Zhen-Shen, Lei, Xiao-Yan, & Yu-Mei, 2009); Europe (Brunner & Rechberger, 2015; Pires, Martinho & Chang, 2011; Giusti, 2009); and America (Tirado-Soto & Zamberlan, 2013; Wilson, Rodic, Scheinberg, Velis, & Alabaster, 2012; Kahhat, Kim, Xu, Allenby, Williams & Zhang, 2008). The few studies that have contributed knowledge on Sub-Saharan Africa have examined other waste management strategies (Kiddee, Naidu & Wong, 2013; Nnorom & Osibanjo, 2008; Henry, Yongsheng & Jun, 2006) with limited focus on recycling. The dearth of studies on recycling as a waste management strategy in Sub-Saharan Africa requires attention. In view of the many benefits associated with recycling as a waste management strategy, a study that focuses on such an issue is relevant.

Ghana is such a large and heterogeneous country with well-planned cities and towns which are not well planned. For most part waste is generated in cities and managed by the respective local assemblies. These waste management services are provide in urban areas of Ghana, which is exploding very quickly. The rapid growth in urban population in Ghana which is mainly cause by rural-urban migration is increasing the rate at which waste is generated in most cities across

Ghana. For instance, according to the Accra Metropolitan Assembly, Greater Accra generates more than 3,000 metric tonnes of waste daily in 2016. To address the waste management challenges the local assembles are entering contractual agreements with private organizations to assist in addressing the waste menace. Recycling has been one of the strategies that have been used in addressing the solid waste management challenges in Accra. It would be appropriate to explore this strategy of recycling in addressing the waste issues is Accra and the possible challenges that the implementers are encountering. The underpinning research question is: what are the challenges to sustainable solid waste management in Ghana?

1.3 Research Objectives

The aim of the research is to explore the challenges to sustainable solid waste management in Ghana using the Accra Metropolitan Assembly as a case study. Specifically, the study seeks to:

1. Explore the various waste management organizations in the Assembly and their capacity in managing the solid waste in the AMA.
2. Investigate the challenges to sustainable waste management in the AMA.
3. Identify potential strategies that can help manage the solid waste in the AMA.

1.4 Research Questions

What are the challenges to sustainable solid waste management in the Accra Metropolitan Assembly? To seek answers to this question, the study questions that will be answered will include:

1. What are the various waste management organizations in the Assembly and their capacity in managing the solid waste in the AMA?
2. What are the challenges to sustainable waste management in the AMA?
3. What are the potential strategies that can help manage the solid waste in the AMA?

1.5 Significance of the study

The study findings have both theoretical and political relevance. The first significance of the study is, it would add to literature on solid waste management in a developing country context. Moreover, the study would provide information to policy makers and government institutions and agencies on some of the available strategies in managing municipal solid waste as well as the associated challenges to solid waste management in Ghana. The study would also unveil ways to manage the associated challenges that may arise in developing potential strategies to manage solid waste in Ghana. Findings from the study can be used by other Assembles with similar socio-cultural characteristics like the AMA. The study would also identify areas for future research to guide scholars.

1.6 Scope and Limitations of the study

The research was carried out within the Accra Metropolitan Assembly in the Greater Accra region, (hence all the research data was collected and analyzed pertain to no other assembly or organization but the Accra Metropolitan Assembly). The rationale for using the Accra Metropolitan Assembly is that, solid waste management in the assembly has been a major issue for the assembly over the years and this has also been a priority for most of the Mayors who have

managed the affairs of the Assembly over the years. However, the problem of solid waste management has continued to be a major issue in the Assembly even though various strategies have been employed over the years with most failing to address the challenge. The researcher decided to use the Accra Metropolitan Assembly to try and unearth the possible causes and reasons for the inability of the Assembly to address the solid waste management problem and make recommendations. Using the Accra Metropolitan Assembly will limit the ability of the research findings to be generalized across other assemblies. Nonetheless, the objectives of the study were achieved and the lessons from the case study could be beneficial to other local governments with similar characteristics like the Accra Metropolitan Assembly.

1.7 Organization of the Study

The research was organized in five main chapters. The introduction and background of the study, research problem statement, research objectives, research questions, and the significance of the study entailed the chapter one. The chapter two of the study included the literature review. This included concepts, processes, theories and methods of solid waste management. Chapter three comprised of the research methodology, which dealt mainly with the procedures and data collection strategies that were employed for the research. The presentation of the research findings and discussion of the findings were done in chapter four. The final chapter five constituted the summary, conclusion and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This section of the research reviewed literature on concepts related to the study. The chapter provided definition of the key concepts as well as empirical studies on the phenomenon of solid waste management in Ghana. The thematic areas included- the definition of waste; Solid Waste Management; Solid Waste Management in Ghana; Stakeholders and Laws for the Management of Solid Waste in Ghana; and Models of Solid Waste Management.

2.1 Defining Waste

According to Tsakona, Anagnostopoulou and Gidarakos (2007) waste refers to any material or item that organizations or people have no use for, which they plan to trash or have already trashed. On the contrary putting waste in the right place can also become a resource (Liao, Chen. Ma & Nakamura, 2015). For instance, throwing waste vegetables into a farm can decompose and fertilize the soil making it a resource to the farm land. Sewage sludge, waste from manufacturing activities, household rubbish, discarded electronic devices, discarded cars, garden waste and paint containers can all be described as waste. Therefore, human activities are responsible for generating the different varieties of waste across the world.

Generation of waste differ from country to country depending on the degree of industrialization, socio-economic development, the level of economic prosperity and the level of urban population (Guerrero, Maas & Hogland, 2013). For instance, according to the GreenCape Market

intelligence report for 2015 South Africa generated a total of about 108 million tons of waste in 2011 whereas according to the United States Environmental Protection Agency report for 2011 the United States of America generated about 250 million tons of waste. This differences can be attributed to the reasons stated earlier. However, according to Suthar and Singh (2015) determining the waste generation rate of different countries in many African countries is a major hurdle because there is very little or no information about the rate of rural waste generation. Research has also revealed that most rural areas generate very little waste due to the lower levels of economic activities and agricultural waste is the main waste generated in these rural areas (Oliveira & Rosa, 2003). However, rising economic activities and urbanization which lead to the use of more resources and subsequent rise in waste generation are the main factors causing the high rates of waste generation in urban areas (Liao, Chen. Ma & Nakamura, 2015).

The composition of waste is influenced by other external factors such as the population's standard of living, energy sources, geographical location and the weather (Tsakona, Anagnostopoulou & Gidarakos, 2007). In managing waste, (Oliveira & Rosa, 2003) recommended that it is important to quantify and qualify the various types of waste being generated. This will help in developing a system for segregating, analyzing and collecting the waste. This will also help in determining the quantities of waste generated, the sources of the wastes, the seasonal differences, the composition and features, and future developments of generations (Suthar & Singh, 2015). This is the best approach to manage waste since hazardous and toxic waste, agricultural waste, industrial waste and waste water all require different approaches in treating and managing them.

However, the perception and level of understanding of citizens can also make or unmake the efforts of waste management strategies. For instance, In their study to investigate the correlation between the ways to motivate environmental attitudes and environmental an action, the findings of Harvie and Jaques (2003) revealed that citizens of China are more willing to participate in activities of recycling and posse greater knowledge of environmental issues than United States citizens. In another study to explore the recycling behavior of the Wuhan area in China the findings of Li (2003) revealed that household income, age and gender are the three most influential factors to the activity of recycling in that region. More importantly, his findings pointed that elderly females who were responsible for domestic duties of low-income families were more interested in adopting recycling as a way of managing domestic waste. Hence, it is important for public managers to educate citizens on the need to manage waste to get their support and participation to enhance the success of waste management strategies.

2.2 Solid Waste Management

As the population and economic activities of many developing countries continue to increase solid waste management has also become a major issue on their development agenda. This problem of solid waste management is further aggravated with the high rates of rural-urban migration in these developing countries. According to the World Bank (2015) rate of urbanization in Africa is projected to grow from 36 percent in 2010 to 50 percent by 2030. The urbanization projection of Africa by the World Bank is a clear indication of the greater solid waste management challenges ahead for the whole continent if the necessary measures and policies are not put in place. Moreover, open dumping of solid waste is a major challenge in

many Sub-Saharan African countries. Research has also revealed that open dumps are a major source of environmental degradation (Hoormweg & Bhada-Tata, 2012).

There are two main models for managing waste. These models are the Integrated Solid Waste Management and the Waste Hierarch. The integrated solid waste management model concentrates on finding the most suitable solution for each waste situation whereas the waste reduction model focuses on waste reduction from to the source (Morrissey & Browne, 2004). The integrated solid waste management model is often referred to as the most appropriate model for managing solid waste in developing countries (Rathi, 2006). Since developing and developed countries have unique characteristics it is very important to identify their unique needs in solid waste management. Else, there is always a high risk of implementation failure when waste management strategies and models which have been successfully implemented in developed countries are transferred to developing countries without any modifications. When modernizing waste management models and strategies in developing countries, it is important to find appropriate and affordable solutions. According to Brunner and Rechberger (2015) the aim should always be to reduce the quantum of waste generated.

Many countries in Sub-Saharan Africa have been slow in developing and implementing systems and strategies to address the issue of open dumping of waste due to the limited financial resources and the lack of understanding of the threats open dumps pose to the environment and human health (Achankeng, 2003). According to Guerrero, Maas & Hogland (2013) solid waste management account for between 20 to 50 percent of the operational budgets of local governments in many developing countries. This is an indication of the enormous state of the

waste management challenge facing local governments responsible for managing waste in their respective cities. The high budgetary allocation by many of these African countries has been due to international pressure from development partners and international development organizations (Qdais, 2007). This also led to solid waste management becoming the number issue on the development agenda of developing countries after the issue of water quality (Hoormweg & Bhada-Tata, 2012).

In addition, other challenges that have been identified by studies to be impeding solid waste management in many Africa countries include inadequate educational programmes on waste separation and management, the lack of legislative framework for integrated management of solid waste, weak institutions, underfunded local governments and the lack of integrated management systems (Pires, Martinho & Chang, 2011; Achankeng, 2003). According to Guerrero, Maas & Hogland (2013) the challenges associated with managing solid waste in many developing countries are usually different from those found in developed economies. This is due to the fact that, the waste composition in developed countries differs from those from advanced economies and the average solid waste generation for Africa is 0.65 kg/person/day as compared to 1.10 for Europe (Hoormweg & Bhada-Tata, 2012). This clearly shows that developed countries because of their industrialization generate more waste. Hence, as Africa develops it will continue to generate more solid waste thus, the need to develop urgent waste management policies.

There are three main types of solid waste, namely municipal waste, hazardous waste and industrial waste.

1. Municipal waste:

The definition of municipal waste vary in practice as well as literature. However, municipal waste include waste from food, market waste, and farm waste. Municipal waste is generated from markets, households, schools, and government ministries and departments.

2. Hazardous waste:

Hazardous waste refers to waste that pose significant danger, either immediately, over a period of time to human, animal and plant life. A waste is classified as hazardous when it shows any of the following characteristics, reactivity, toxicity, corrosivity, and ignitability.

3. Industrial waste

Industrial waste are waste arising from activities from industries. They include process waste, ashes, demolition and construction waste, special waste, hazardous waste and rubbish associated with the support personnel.

Waste transcends borders but how the waste is managed is what differentiates between countries. Waste generation is higher in developed countries than in developing countries but due to the lack of waste segregation, waste generated in developing countries has low quality but with a higher density (Guisti, 2009).

The socio-economic status of an individual determines that person's view of waste (Hoornweg & Bhada-Tata, 2012). Waste management is not a priority in countries where the citizens are still struggling to meet the basic needs of life such as food, shelter and clothing (Wilson et al., 2012). This is very prevalent in many developing countries. However, in developed economies where most of the citizens are not struggling to meet the basic needs of life and the standard of living is

high, waste management is a priority for citizens to reduce the effects of waste on the environment (Wilson et al., 2012).

2.3 Solid Waste Management in Ghana

In the last few decades, the use of plastic products have been increasing steadily resulting in a steady rise in solid waste in many developing countries including Ghana (Fobil & Hogah, 2006). Because of the low bulk density of plastics which makes them convenient carrier materials they are mainly used in packaging many goods. The use of plastic bottles and sachets to package water have become widespread in Ghana. Low-density polyethylene commonly called polyethylene films and other plastics such as polystyrene, polypropylene and polyvinyl chloride are the prominent plastic materials used in many business sectors in Ghana. This has led to the share of plastic waste in municipal waste in Ghana to increase significantly over the years.

According to Fobil and Hogah (2006) the percentage of plastic waste in Ghana was 1.4% in 1979, this rose to 4% in 1993, by the year 2000 the proportion of plastic waste in Ghana was 8%. The per capita generation of plastic waste stands at 0.016-0.035 kg/person/day with plastics making up about 8% of the component materials in the waste (Owusu-Sekyere, Osumanu & Abdul-Kadri, 2013).

The demand for plastic waste is a major cause for the increase in the share of plastic waste in Ghana. This has consequently led many organizations to invest huge sums of their capital in the plastic business. There were about 20 plastic producing establishments in Ghana in 1996 and by the turn of the century that number has doubled to 40 plastic manufacturing companies in Ghana producing about 26000 metric tons of different plastic products annually with about 90% of these

companies in Accra and Kumasi Metropolitan Assemblies (Quartey, Tosefa, Danquah & Obrsalova, 2015). According to the Ghana Plastic Manufacturers Association of Ghana there are 93 registered plastic manufacturers in Ghana as at 2017. In addition to these plastic manufacturing organizations in Ghana, over 10,000 metric tons of finished plastic products are imported into Ghana annually (Owusu-Sekyere, Osumanu & Abdul-Kadri, 2013).

According to Tsiboe and Marbel (2004), there are three main method for collecting solid waste in Ghana.

1. Waste Management Department (WMD) curbside collection by trucks directly outside each home. According to them, this type of waste collection method was provided weekly in the high-income residential areas by compactor trucks. The households are billed monthly.
2. Waste Management Department (WMD) collected from communal containers to which people must bring their own waste. These are restricted to low-income areas and amounted to some 200 communal containers. Households that cannot afford the house to house collection services took their waste to any of these communal containers closer to them and from which the WMD collected the waste and disposed of it at the landfill site. In this case, the households are charged every time they deposit their waste in the communal container.
3. Door to door collection services by small waste collection firms in middle-income communities.

For the purposes of effective and efficient collection of the solid waste, the districts were demarcated into waste collection zones where private waste collection companies contracted by

the local governments collect the waste in the district and this was predominantly in Accra and Kumasi (Anomanyo, 2004). In the Accra Metropolitan Assembly fifteen waste collection companies were contracted. They include Vicma Waste Construction, Liberty Waste Servic Company, Ako Waste Management Limited, Daben Cleansing Construction Services Lmited, and Gee Waste Limited. Market places were also covered under this arrangements.

2.4 Waste Management Challenges

Solid waste management is a major challenge for many local government assemblies in many developing countries, where industrialization, urbanization, high population growth and economic growth have resulted in increased solid waste generation (Tukahirwa, Mol & Oosterveer, 2010; Oteng-Ababio, 2010). According to Zhang, Tan & Gersberg (2010) due to various issues the best and most appropriate strategies for managing waste are not being used. Waste management is affected by environmental, socio-cultural, technical, legal and institutional factors which are termed as the enabling factors that enable the performance of the waste management system (Pires, Martinho & Chang, 2011; Achankeng, 2003).

Empirical studies have revealed that collection, transfer and transportation practices for waste management are affected by poor bin collection systems, lack of information about waste collection schedules, poor route planning, insufficient waste management infrastructure, inadequate waste collection vehicles to be some of the challenges hindering the effective management of waste in many developing countries (Suthar & Singh, 2015; Owusu-Sekyere, Osumanu & Abdul-Kadri, 2013; Zhang, Tan & Gersberg, 2010). In exploring household waste disposal in Ethiopia, Tadesse, Ruijs & Hagos (2008) reported that the availability of waste

management facilities considerably affects waste disposal choice. According to them, inadequate supply of waste containers and long distance to waste containers increase the probability of waste dumping in open areas and roadsides relative to the use of communal containers. In addition, Henry, Yongsheng & Jun (2006) also reported of insufficient financial resources limiting the safe disposal of waste in well-equipped and engineered landfill sites and the absence of laws and regulations are a major challenge for waste management in many developing countries.

Waste management is generally regarded as the responsibility of local government authorities and that the public is not expected to make any contributing (Oteng-Ababio, 2010). However, research have revealed that the operational efficiency of solid waste management is dependent on the active involvement and participation of both the citizens and the local government officers (Hoornweg & Bhada-Tata, 2012). Therefore, public participation is crucial if waste management systems and programmes are to succeed in developing countries.

Developing a comprehensive waste management legal framework can contribute to enhancing the management of waste while an absence of laws, weak regulations and policies have been major challenges to waste management efforts (Tukahirwa, Mol & Oosterveer, 2010).

2.5 Stakeholders and Laws for the Management of Solid Waste in Ghana

The environmental and waste management challenges in many cities in developing countries can be addressed through interaction and collaboration of several stakeholders (Brunner & Rechberger, 2015) and Ghana is no exception. National, regional and local governments, the general public, private institutions, research institutions, and funding agencies will all have a role

to play to support in the management of waste. Stakeholders in this context are people and organizations with an interest in waste management and participate in programmes and activities that make the management of waste possible. According to Marshall and Farahbakhsh, (2013) stakeholders may function as service providers, waste generators, or even participate as regional or local government agencies, non-government organizations, and any other organization with an interest in waste management. Identifying these stakeholders and their respective interest is crucial in coordinating their respective roles in the waste management process (Rathi, 2006).

In Ghana, the Metropolitan, Municipal and District Assemblies are responsible for the management of waste in Ghana through their Waste Management Departments (WMD) and their Environmental Health and Sanitation Department (EHSD). These local governments are however supervised by the Ministry of Local Government and Rural Development (MLGRD). The policy framework guiding the management of solid, hazardous and radioactive waste includes the Local Government Act, (1994); the Environmental Assessment Regulations of 1999 (LI 1652); the Environmental Protection Agency Act, 1994 (Act, 490); and the Environmental Sanitation Policy of Ghana, 1999. All these Acts and Regulations aim at protecting and controlling how waste and the environment is managed in Ghana.

Table 2.1: Key actors and their roles for waste management

Actor	Examples in Ghana	Roles
Environmental Regulation	Environmental Protection Agency Ministry of Environment Science & Technology District Assemblies	Setting environmental regulations and standards, monitoring and Enforcement
Planning Agency	District Assemblies National Development Planning Commission	Integration of environment and waste management in developmental planning Demarcate space for waste management facilities with ideal buffer zones
Politicians	Parliament Executive	Policy guidelines with long term view in allocating resources Lead clean up campaigns and work in unison towards the interest of a clean city
Sector Agencies	Environmental Protection Agency	Cross-sectoral coordination and incorporation of environmental considerations in projects
Public	Citizens, Chiefs, Opinion Leaders etc	Participation in decision making, implementation and monitoring Segregate waste
NGOs	Volunteer Partnerships for West Africa	Mobilization
Private Sector	Zoomlion Ghana Limited Yafuru Waste Management	Searching and implementing Appropriate actions

	Limited	
Media	GTV, Joy FM, TV3, Daily Graphic, etc	Environmental awareness, with a focus on real local priorities
Scientific Community	Centre for Environmental Research and Policy Analysis Universities	Conduct research to reveal best practices in other regions and guide waste and environmental policy making processes Influence minds on the culture of waste management
Financial Institutions	Uni Bank, Eco Bank, GCB etc.	Financially supporting waste management programs

The whole process of generation, source reduction, storage, handling, collection, treatment, and disposal of solid waste is called waste management (Schmidt et al., 2007; Wilson, Velis & Cheeseman, 2006). This will require a consideration of the environmental, financial, technical, social and legal aspects of the whole waste management process to achieve sustainable waste management (Harvie & Jaques, 2003). This will also require the collective effort of all the stakeholders in the process.

The public forms the largest group of stakeholders in the waste management process (Harvie & Jaques, 2003). They have various roles at each stage of the waste management process- as waste generators, waste services clients, receivers of information, and involvement in mobilizing for waste management and sanitation in cities (Guerrero, Maas & Hogland, 2013). To support the public in the performance of these functions, it is very critical to identify that within a community there are various people with different levels of income, education, culture, religion,

gender and age (Guerrero, Maas & Hogland, 2013: Wilson, Velis & Cheeseman, 2006). Social and political leaders can help in this regard by stimulating desired behavior (Guerrero, Maas & Hogland, 2013).

2.6 Models of Solid Waste Management

2.6.1 Waste Hierarchy

The waste hierarchy model is a strategy for managing solid waste which emerged from the need for a healthy environment (Rathi, 2006). According to Morrissey and Browne (2004) this model aims to reduce the amount of waste generated and goes for final disposal. The premise of this model is to rank waste into six different levels. This levels include prevention; minimization; reuse; recycling; energy recover and disposal (Schmidt et al., 2007). This is displayed in figure 2.1 below.

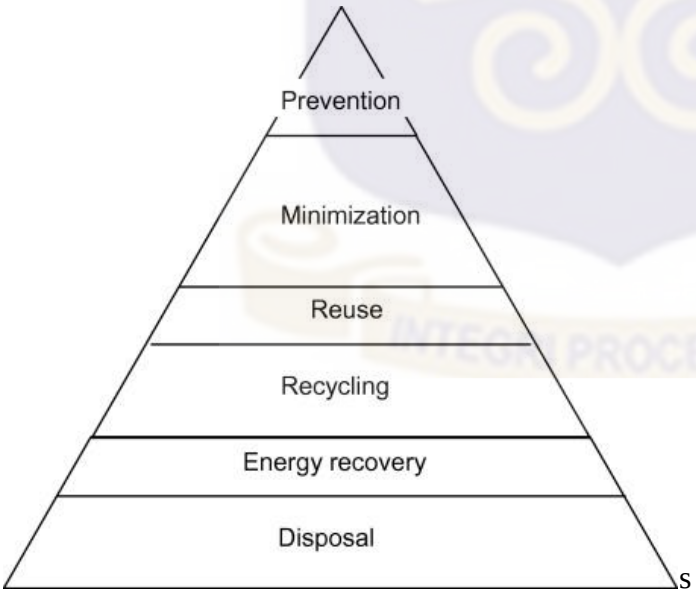

Figure 2.1: Waste Hierarchy (Schmidt et al., 2007)

The lowest position of the model is held by the least desirable components whereas the most preferred waste component occupies the top. The model aims to show how waste needs to be managed. Some scholars have argued that the model fails to consider the cost component of waste implementation, for instance recycling which makes it difficult to use in the developing countries due to their weak financial position (Morrissey & Browne, 2004).

2.6.2 Integrated Solid Waste Management

The Integrated Solid Waste Management does not define the levels of waste management but involves the process of assessing the contextual factors of a region and adapting a strategy with a combination of the most appropriate waste management strategies for that region or context (Marshall & Farahbakhsh, 2013). According to Morrissey and Browne (2004) this model sees waste as a resource that can be explored and only attaches a negative meaning to waste when it cannot be used as a resource. This model has been adopted in many developing countries of the years because of its flexibility (Marshall & Farahbakhsh, 2013). McDougall (2001) asserted that the implementation of integrated solid waste management systems in many developing countries has four main requirements.

1. Data collection on waste composition. Waste generation characteristics has a link with the social, political and cultural aspects in the environment in which the waste is generated. Therefore, it is very critical to collect data that will inform the formulation and development the most appropriate waste management strategies in the environment
2. The second requirement is to develop a simple environmentally friendly landfill site instead of the existing informal dumping sites.

3. The separation of solid waste from organic waste. This must be done as close to the source as possible to maintain the quality of the waste material to be used as a resource
4. The formal involvement of the informal sector in the waste management process. This can enhance the quality of waste collected at source. This will as require public education and participation in the planning and development of the waste management strategies which is equally important as the technical aspects of waste management.

According to Marshall and Farahbakhsh (2013) the integrated solid waste management model is an all involving strategy where all methods of waste management can be employed to enhance the process.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This section of the study outlined the methodological approach that was used in undertaking the entire research. It presented an explanation of the various activities that were done during the research. It presented the research design, sampling techniques, data collection techniques and data sources. In addition, it presented the techniques for data analysis, data management and the ethical considerations during the entire study.

3.1 Research Approach

According to Saunders, Lewis and Thornhill (2009) every research can be categorized into exploratory, descriptive and explanatory. Descriptive studies describe measures of an activity and usually involves hypothesis derived from theory to guide the process and what is measured. Exploratory research on the other hand is used when the research questions are not clear and ambiguous and helps in developing a better understanding of a phenomenon. Explanatory research is where the study aims to identify a causal relationship between variables (Saunders, Lewis & Thornhill, 2009). The purpose of this study is mainly exploratory and will aim to explore the challenges to sustainable solid waste management in Ghana using the Accra Metropolitan Assembly as a case study.

3.2 Research Design

The research used a qualitative approach in the conduct of the study. This approach was chosen because it provided a comprehensive understanding of the context within which the issue of waste management is occurring and the associated challenges that pertains to that specific context such as the Accra Metropolitan Assembly. Qualitative research is a multi-method focus approach to research that makes claim based on collecting open-ended emerging data with the primary aim of developing themes from data (Neuman, 2007). In addition, the approach also provides an opportunity for the study to get into the world view of the people (Cresswell, 2009) managing the waste in the Assembly and this presented an accurate representation and interpret the experiences of the people in the Assembly.

The case study approach of examining a social phenomenon was used to conduct the study. The case study provides an appropriate method to achieve the objectives of exploring the challenges to waste management in the Accra Metropolitan Assembly. Moreover, it becomes important and imperative to use a case study approach for a social research when the phenomenon is a contemporary and context specific to real life situation and the Researcher has little or minimal control over proceedings (Yin, 2003). The case study adopted for the research is the Accra Metropolitan Assembly. The AMA offers the relevant and appropriate context for the study especially with the challenges it is facing with waste management and filth.

3.3 Study Setting

3.3.1 Overview of Accra Metropolitan Assembly

The Accra Metropolitan Assembly (AMA) began as a Town Council and was first established by the Town Council Ordinance of 1894, after the introduction of the Native Authorities by the colonial government in 1878. Accra was declared a city on the 28th June 1961 and became Accra City Council. The Accra City Council was dissolved to become Accra Tema Council in August 1964. The PNDC law 207 established the Accra Metropolitan Assembly by an enabling Local Government Act 1993 (Act 462).

The AMA is one of the ten (10) district Assemblies that make the Greater Accra Region and one of the two hundred and sixteen (216) districts in Ghana. Accra covers an area of 173 sq km. The Southern boundary of AMA is the Gulf of Guinea stretching from Gbegbeyese to La. It shares boundaries with Ledzokuk-Krowor Assembly on the East. On the Northern and Western frontiers there are Ga East and the Ga South Districts. The AMA has a population of about 2.27 million people.

Structurally, the AMA is made up of the General Assembly at the zenith, followed by thirteen (13) Sub-Metropolitan District Councils which are subordinate bodies of the Assembly performing functions assigned to them by the instruments that sets up the Assembly or delegated to them by the Assembly. These Sub-Metros include:

1. Nungua
2. Teshie
3. La
4. Osu Klottey

5. Ashiedu Keteke
6. Ablekuma South
7. Ablekuma Central
8. Ablekuma North
9. Ayawaso West
10. Ayawaso Central
11. Ayawaso East
12. Okai Koi North
13. Okai Koi South

3.4 Sampling Technique

Probability and non-probability sampling methods are the two main research sampling techniques. Probability sampling involves a technique whereby the cases in the research being selected is known and is equal for all the other cases. Whilst the non-probability sampling technique refers to a method where the chances of selecting a case in the sample is unknown (Saunders et al., 2009). The research used the non-probability sampling of purposive sampling to select respondents for the study. This sampling method was employed to select respondents with the requisite knowledge about the phenomenon of waste management in the Assembly.

3.5 Sources of Data

The data for the research was collected from both primary and secondary sources. The data from the primary sources consisted mainly of data that collected from the study area through the use of an in-depth semi-structured interview guide. The semi-structured open ended interview gave the research participants the freedom to express their views and experiences about the phenomenon of waste management in the AMA without any restrictions. It also gave the researcher the opportunity to ask follow up questions if the need be.

The data from the secondary sources comprised of a review of already existing literature on the issue of sustainable waste management, official government publications, published and unpublished reports on waste management. Other sources included the internet, books, and peer reviewed journals. These various sources provided valuable insight into the phenomenon of waste management which guided the whole study.

3.6 Target Population and Sample Size

The target population for the study comprised of all the workers of the Accra Metropolitan Assembly and four private waste management organizations in Accra. That is Zoom Lion Ghana Limited, Rapid Waste Limited, Honest Waste and Yafuru Waste Limited. A total sample of seventeen (17) participants were interviewed for the study. The breakdown is as follows: Accra Metropolitan Assembly (4), Zoom Lion Ghana Limited (3), Rapid Waste Limited (3) and Yafuru Waste Limited (4), and Honest Waste (3). They were all purposively selected based on their knowledge and experiences about waste management in the Accra Metropolitan Assembly.

3.7 Data Collection Instrument

The data collection instrument for the study was an open ended semi-structured interview guide. Data was collected from all the workers of the Accra Metropolitan Assembly and the three waste collection organizations

3.8 Data Management and Analysis

This section of the study elaborated on how the entire research data was managed. This involved all the activities that happened on the field during the data collection process through the analysis stage to the final conclusion of the research. During the interviews with research participants, the participants refused to be voice recorded so the researchers had to resort to the use of field notes. The field data were then be transcribed and documented into notes and later categorized under the three main objectives of the research. The study data was transcribe using the approach of Miles and Huberman (1994). According to Miles and Huberman qualitative data analysis entails three concurrent flows of activities: data reduction, data display, and conclusion drawing and verification. A thematic content analysis approach was used to analyse the research data.

3.9 Ethical Considerations

It is very imperative for every researcher to adhere to some ethical standards in the conduct of research. This promotes and protects the interest of the research participants. According to Neuman (2007) the ability of a researcher to act ethically involves the researcher balancing the value of non-interference in the lives of the research participants and the value and importance of advancing knowledge. He further asserted that researchers have an obligation to secure prior

voluntary consent of research participants when possible, avoid causing irreversible or unnecessary harm to respondents or make public harmful information collected about an individual for research purposes.

The study adhered to these ethical standards and explained to research participants the potential benefits and risk as well as the objectives of the study prior to each interview. Research participants were given the opportunity to ask questions at any stage of the interview. They were also assured of their anonymity and confidentiality before and after the interview and any information given out will be treated as such.

CHAPTER FOUR

PRESENTATION OF FINDINGS AND DATA ANALYSIS

4.0 Introduction

This chapter of the research, presents the research findings from the field and also discusses the data gathered. The discussion was done under the three main themes which coincided with the research objectives. The study attempted to discuss the challenges to sustainable solid waste management in Ghana using the Accra Metropolitan Assembly as a case study

4.1 Waste management organizations and their capacity to manage solid waste in the AMA

Solid waste management has several functional elements, including waste generation, waste handling and collection, transfer and transport and final disposal. The role of private waste collection organization is generally believed to be central in managing solid waste in the AMA. Collection and transportation are a major cost in the waste management process. There are fifteen (15) private companies currently operating, that collect waste in the AMA the study revealed. For an organization to be awarded a contract to collect solid waste in the AMA, the process involves the submission of a proposal by the waste collecting organization and then the tender board of the AMA reviews the proposal. After the tender board approves the proposal it is now sent to the chief executive who signs for final approval before the contract is awarded.

The growth in solid waste generation in AMA has been rapid over the years the research revealed, while capacity to collect and safely dispose of the waste has been on a general decline leaving heaps of solid waste around market areas in the Metropolitan. The capacity of the AMA to provide dustbins at market centers for collecting solid waste has declined due to the inability of the AMA to keep up with population growth in the assembly and to continuously monitor and ensure that private waste collection organizations are performing. The findings revealed that the inability of the AMA to provide waste bins at market centers and also monitor private waste collection organizations is due to inadequate resources. The study also revealed that most of the trucks of the waste collecting organizations were out of service. Most of the trucks were old considering that they had been in use for more than ten years.

The research findings revealed that the waste collecting organizations collect waste from the commercial areas with frequencies that vary from 10 times a week to once a week. The collection in the households also varies from twice a week to once every two weeks. In the AMA solid waste generated is collected at fixed stations or door to door. The door to door collection is done by a variety of systems. They include trucks, tricycle, hand trolley, and motorcycle. The waste collecting organizations charge between GH₵ 14.00 Cedis to GH₵ 25.00 Cedis monthly depending on the area and the type of collection system the study revealed. However, in other areas in the Metropolis, residents pay on a daily basis and are charged between GH₵ 1.00 and GH₵ 2.00 depending on the size of solid waste the study revealed.

Figure 5.1: Solid waste collection systems

The AMA has been receiving some support from central government in managing the solid waste issue in the assembly. This support is in the form of contracting waste management organizations to support the efforts of the assembly. The government has also constructed a new landfill site which the assembly is currently using.

Commenting on this issue, an official of the AMA asserted that:

> *"Central government has been very supportive in helping the assembly address the waste issue. The central government was responsible for constructing the Nsumia waste disposable site which is located in the Nsawam-Adoagyiri which we are currently using. If not for central government support the AMA would not have been able to construct that facility because of the capital requirement".*

When quizzed about the waste composition of the solid waste generated in the AMA, the main components included food residues, plastics, paper, glass bottles, and metals. However, the

highest components of solid waste in the AMA were plastic and food residues. The waste generated has a heterogeneous composition comprising of both degradable and non-degradable materials, and it is collected without sorting. The bulk of the non-degradable waste is potentially recyclable materials, while the degradable materials could be composited. The main producers of plastics come from water and fruit juice bags and containers the study revealed.

4.2 Challenges to sustainable waste management in the AMA

The study identified a number challenges to sustainable solid waste management in the AMA. The study revealed limited knowledge on systems and technologies for waste management, inadequate funding, and lack of equipment for collecting waste as major challenges hampering sustainable solid waste management in the AMA. There are also inadequate human resources mainly due to an ageing workforce and the absence of trained staff. The lack of officers at the AMA to monitor and supervise the work of private waste collectors is leading to poor service delivery on the part of the waste collectors as well. Commenting on these challenges a respondent lamented that:

> *"When you look at the solid waste generated in Accra it's huge but we don't have many trucks to go round collecting them. Because of these we visits communities once a week and this is not enough but we don't have the trucks. Most of our refuse trucks have broken down".*

The study also revealed inadequate dumping sites as another challenge to sustain solid waste management in the AMA. Most of the respondents were of the opinion that the current dumping site, Nsumia waste disposable site which is located in the Nsawam-Adoagyiri Municipality is too far from the city and when they go and dump refuse it takes them they whole day. In addition

they also incur additional cost on fuel because of the distance. A respondent lamented about the situation:

> *"Even though the land fill site is good in helping address the sanitation challenges, it is too far from the city. By the time you finish one trip the day is over and this is affecting our operations to keep the city clean".*

Figure 5.2: solid waste container overflowing with waste in the AMA

The absence of decision makers interested in environmental issues, also militate against the campaign to create awareness about waste separation to address solid waste issues in the AMA. When people become aware of the relevance of separating their solid waste it can help create opportunities to recycle and reuse some of the solid waste which will rather become a resource.

It was revealed that the political will for this campaign has been very weak due to the poor allocation of funds to educate people in this direction. Even though the study shows that there are people who go round picking rubbers and polythene for recycling, separation of the solid waste would have also enhanced and improved the waste challenges in the Metropolitan.

Poor road infrastructure was also a major challenge for waste collecting organizations. It was revealed that during the rainy season uncollected solid waste in the AMA tend to increase when the road conditions are worsened. This is even worsen in the low income communities because of inappropriate disposal of solid waste. These poor communities are mainly occupied by the urban poor rural migrants and the jobless characterized by high population densities and unplanned residential structures which are hardly accessible. Moreover, with the limited dumpsites, most of the private waste collectors tend to concentrate their limited services mainly in the central business districts and the more affluent communities which have better access the study revealed.

People have poor attitude towards waste management. People who handle waste are regarded as dirty, poor and inferior. These mindset and attitude make people disrespect officials of waste management organizations. Even though government is trying to influence the attitude and thinking of people this has been very challenging. The findings further revealed that, people do not appreciate that environmental quality is not just the responsibility of the government and the waste collection organizations but citizens also have a role to play. An official of the AMA lamented that:

"Until we change how people see waste and those managing the waste this fight will never be won, Accra will continue to be filthy. People must learn to respect refuse collectors and also respect the environment".

With the limited landfill sites in Accra, the study revealed that the road networks to this landfill sites are in very bad conditions. Trucks get stuck in muds on their way to dispose waste and it sometimes takes them days to move the trucks. This affects their operations and makes it difficult for them to follow their schedule in collecting solid waste from homes.

4.3 Strategies for managing solid waste in the AMA

Waste management strategies vary across the AMA. Because of weak policy implementation, limited communal bins and lack of financial resources for efficient and effective services, people have resorted to adopting their own strategies for managing solid waste that best suit them. Within the AMA various solid waste management strategies were observed.

In exploring the strategies for managing solid waste in the AMA, the findings revealed that one of the strategies is where the waste is collected and dumped at a dumpsite. This primary solid waste management strategy is done in two ways. One is when households that can afford to pay private waste collectors on a monthly basis pay for their waste to be collected on their behalf twice a week. In other homes, children are assigned to transport solid waste to communal bin.

The study also revealed that another strategy for managing solid waste in the AMA is the use of solid waste as compost. This was due to the high percentage of organic material in the waste composition. In some communities within the assembly, solid wastes are composted at the backyard. The burning of solid waste is also widely practiced as a strategy for managing solid

waste. This practice of burning solid waste was prevalent in poor and middle class communities the study revealed. With these strategies typically used for managing solid waste, the overall conditions and availability of dump sites are still unsatisfactory.

Recycling was another strategy for managing solid waste the study revealed. Even though some recycling organizations are being establish in Accra they are very limited and not enough to recycle most of the plastic solid waste generated in the AMA. The informal sector waste pickers are those who collect plastic waste for these recycling organizations. Most plastics are non-degradable, they take a long time to breakdown. The study shows that plastic waste generation is on the increase and this is a major concern for the officials of the AMA. According to an official:

> *"The quantity of plastic waste in our environment is alarming and disturbing. We have to find a way to manage the pure water rubber menace, because that is the major cause of filth in the AMA. We have to start exploring the paper bag system to address this plastic waste challenge'.*

The local government Act gives Assemblies the power to set bye-laws. With reference to this power the AMA has set the first Sunday in every month to clean the assembly and its environs. Anybody who disobeys this order can be sent to court the study revealed. There is also a national sanitation day which is observed across the country and that day is used to clean the environment the research shows. The national sanitation day and the cleanup exercise organized on the first Sundays of every month are spearheaded by the Assemblymen. The assembly also uses the cleanup exercise as an opportunity to distribute dust bins to help keep the city clean. According to an official:

"In the quest of the assembly to keep the city clean we also distribute waste bins to households and situate some at strategic location in the market."

Selection and development of a landfill site to dispose of solid waste in the Greater Accra region was a major challenge for the Government of Ghana for many years. Now the government has developed a land fill site at Nsumia located in the Nsawam. The site is about 680, 000 cubic metres and will serve Accra and its surrounding areas. Waste from the AMA is currently dumped at the Kpone landfill site which receives about 2,500 tonnes of waste a day and is currently the only landfill site for the AMA and the surrounding areas. The Kpone landfill site has reached its maximum point and is currently full hence, the need for the new landfill site the research revealed.

4.4 Discussion of findings

Solid waste management is an important part of urban management because it is linked directly to human health, infrastructure and economic activities. The quantity of solid waste generation is mostly associated with the economic activities and population growth of a society. The study findings show that as economic activities and population in the AMA keep growing so is solid waste generation. The study shows that solid waste management in the AMA is still in its elementary stages. The solid waste in the assembly is a mixture of all sorts of materials. The practice of mixing both degradable and non-degradable materials was found to impede the proper management of solid waste in the AMA. People need to be educated to start separating their waste if the challenge will be addressed. The awareness campaigns will influence the behavior of citizens to separate waste due to the environmental concern and the need to

participate in the solution. In addition, there has been a big change in the percentage of plastics in the waste stream during the last two decades mainly due to a change in the living standards of residents in the AMA. For instance, increases in the consumption of bottled water and soft drinks, as well as fast foods, which have recently become more popular, have changed the solid waste of the AMA in recent years. This challenge of mixing both degradable and non-degradable materials in the management of solid waste concurs with the findings of Suthar and Singh (2015) and Oteng-Ababio (2010). The study revealed inadequate land fill sites as a major challenge to sustainable solid waste management in the AMA. Building more land fill sites and reducing the travel time from the cities to these land fill sites can have a significant impact on waste management in the AMA. But these investments represent a significant economic burden for the AMA hence the need for central government to support. Waste collection and transfer, and waste land fill construction are important components in sustainable solid waste management but are also expensive local government services (Pires, Martinho & Chang, 2011). Generally waste management constitute the largest percentage of the budget of local governments, therefore it forms the key component in determining the economics of the whole waste management system (Owusu-Sekyere, Osumanu & Abdul-Kadri, 2013). The financial support of the Central government appears to be a solution for the lack of financial resources for management solid waste in local assemblies.

Fees charged by waste collectors and the irregular collection of waste by waste management organizations led to waste piling up in homes, a situation which makes residents resort to other means of managing their solid waste. The inability of some residents to pay for the waste they generate in their homes can be attributed to the poverty levels in some of the communities in the

AMA. Because of the inability of these poor households to pay for their solid waste to be disposed, they resort to the use of sub-standard and dispose of their solid waste in environmentally unfriendly manner like dumping their solid waste on the street and in gutters. These findings have been confirmed in previous studies by Guerrero, Maas and Hogland (2013). Technically, the composition of solid waste is a critical issue to consider in deciding the type of disposal strategy to use. Since more of the solid waste generated in the AMA is of organic and plastic content, composting and recycling will be two of the best ways to manage solid waste in the assembly. Research has also shown that recycling and composting are environmentally friendly and are gaining international recognition over the traditional landfilling. Zhang, Tan and Gersberg (2010) reported on the enormous benefits of composting that it reduces greenhouse gas production rate and is also significantly less costly. The equipment and personnel at AMA to monitor and supervise the work of the private waste collectors were inadequate and the waste collectors also complained about the lack of trucks to collect the waste in the assembly. Tadesse, Ruijs & Hagos (2008) reported that the availability of waste management facilities considerably affects waste disposal choice. According to them, inadequate supply of waste containers and long distance to waste containers increase the probability of waste dumping in open areas and roadsides relative to the use of communal containers. The study confirms these findings. Even though central government is supporting the assembly to address the waste challenge, the involvement of central government must be intensified. Private organizations must also increase their fleet of trucks to improve their services.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This final chapter of the research presents a summary of the whole study. It is divided into three sections which include the summary of research findings, a conclusion to the entire study, and recommendations to improve solid waste management in the AMA.

5.1 Summary

Waste is the most visible environmental challenge in urban regions in many Sub-Saharan African countries. The aim of the research is to explore the challenges to sustainable solid waste management in Ghana using the Accra Metropolitan Assembly as a case study. The research adopted a qualitative approach in addressing the research objectives.

5.1.1 Main Findings

- **Waste management organizations and their capacity to manage solid waste in the AMA**

Solid waste management has several functional elements, including waste generation, waste handling and collection, transfer and transport and final disposal the study shows. The role of private waste collection organization is generally believed to be central in managing solid waste in the AMA. Collection and transportation are a major cost in the waste management process. There are fifteen (15) private companies currently operating, that collect waste in the AMA the

study revealed. For an organization to be awarded a contract to collect solid waste in the AMA, the process involves the submission of a proposal by the waste collecting organization and then the tender board of the AMA reviews the proposal. After the tender board approves the proposal it is now sent to the chief executive who signs for final approval before the contract is awarded.

The research findings revealed that the waste collecting organizations collect waste from the commercial areas with frequencies that vary from 10 times a week to once a week. The collection in the households also varies from twice a week to once every two weeks. In the AMA solid waste generated is collected at fixed stations or door to door. The door to door collection is done by a variety of systems. They include trucks, tricycle, hand trolley, and motorcycle. The AMA has been receiving some support from central government in managing the solid waste issue in the assembly. This support is in the form of contracting waste management organizations to support the efforts of the assembly. The government has also constructed a new landfill site which the assembly is currently using the research revealed.

- **Challenges to sustainable waste management in the AMA**

The study aimed at identifying the challenges to sustainable solid waste management in the AMA. The study revealed limited knowledge on systems and technologies for waste management, inadequate funding, and lack of equipment for collecting waste as major challenges hampering sustainable solid waste management in the AMA. There are also inadequate human resources mainly due to an ageing workforce and the absence of trained staff. The lack of officers at the AMA to monitor and supervise the work of private waste collectors is leading to poor service delivery on the part of the waste collectors as well. The study also revealed inadequate dumping sites as another challenge to sustain solid waste management in the AMA.

Most of the respondents were of the opinion that the current dumping site, Nsumia waste disposable site which is located in the Nsawam-Adoagyiri Municipality is too far from the city and when they go and dump refuse it takes them they whole day. In addition they also incur additional cost on fuel because of the distance. Poor road infrastructure was also a major challenge for waste collecting organizations. It was revealed that during the rainy season uncollected solid waste in the AMA tend to increase when the road conditions are worsened. This is even worsen in the low income communities because of inappropriate disposal of solid waste. People have poor attitude towards waste management. People who handle waste are regarded as dirty, poor and inferior. These mindset and attitude make people disrespect officials of waste management organizations. Even though government is trying to influence the attitude and thinking of people this has been very challenging. The findings further revealed that, people do not appreciate that environmental quality is not just the responsibility of the government and the waste collection organizations but citizens also have a role to play.

- **Strategies for managing solid waste in the AMA**

The findings revealed that one of the strategies is where the waste is collected and dumped at a dumpsite. This primary solid waste management strategy is done in two ways. One is when households that can afford to pay private waste collectors on a monthly basis pay for their waste to be collected on their behalf twice a week. In other homes, children are assigned to transport solid waste to communal bin. The study also revealed that another strategy for managing solid waste in the AMA is the use of solid waste as compost. This was due to the high percentage of organic material in the waste composition. In some communities within the assembly, solid wastes are composted at the backyard. The burning of solid waste is also widely practiced as a

strategy for managing solid waste. This practice of burning solid waste was prevalent in poor and middle class communities the study revealed. With these strategies typically used for managing solid waste, the overall conditions and availability of dump sites are still unsatisfactory. Recycling was another strategy for managing solid waste the study revealed. Even though some recycling organizations are being establish in Accra they are very limited and not enough to recycle most of the plastic solid waste generated in the AMA. The informal sector waste pickers are those who collect plastic waste for these recycling organizations. Most plastics are non-degradable, they take a long time to breakdown. The study shows that plastic waste generation is on the increase and is a major concern for the officials of the AMA.

5.2 Conclusion

Over the last two decades, as a result of rapid urbanization, economic development, and population growth in Accra, total waste generation has increased tremendously. The aim of the research is to explore the challenges to sustainable solid waste management in Ghana using the Accra Metropolitan Assembly as a case study. Solid waste management has several functional elements, including waste generation, waste handling and collection, transfer and transport and final disposal. The role of private waste collection organization is generally believed to be central in managing solid waste in the AMA. Collection and transportation are a major cost in the waste management process. The study revealed several challenges impeding solid waste management in the AMA. They include limited knowledge on systems and technologies for waste management, inadequate funding, lack of equipment for collecting waste, inadequate dumping sites, and absence of decision makers interested in environmental issues. The research therefore, recommends an integrated approach to waste management in the AMA, where all

stakeholders are given the opportunity to make inputs into strategies to manage solid waste in the AMA.

5.3 Recommendations

Based on the study findings, the following recommendations are made to improve solid waste management in the AMA. As the informal sector still plays a significant role in solid waste management in the metropolitan, the AMA should consider organization and managing this informal waste collectors so that they can be better regulated by the AMA. Not only would this improve efficiency of these collectors but would also provide opportunities for these informal waste collectors to receive some form of training to better protect their health.

Second, for any type of construction, either residential or commercial, basic requirements should be enforced to ensure that waste management infrastructure is put in place. This will help in the reduction and segregation of waste at the source. Local governments can also consider measures such as the inclusion of separate containers for waste before approving a construction permit for a new building.

In addition, there should be more public education and awareness creation about the environmental impacts of waste. As previously shown public education and awareness is a very crucial if people are going to change and become more responsible in managing waste.

Forth, there should be regular and continuous monitoring of private waste collectors to ensure that they are executing their roles. In addition to the monitoring strategy, local and central governments can also partner private organizations due to the limited financial resource to

manage waste. To avert possible challenges, there should be proper documentation of the roles of all stakeholders and the necessary policy measures must also be established.

Last, improving the waste charging system can help in providing financial support for existing waste collectors through financing programs as well as reducing the quantity of urban solid waste generated in the AMA. Raising waste collection and disposal fees can recover the cost and raise funds for the investment in new facilities.

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APPENDIX 1: INTERVIEW GUIDE FOR OFFICIALS OF AMA

INTERVIEW GUIDE FOR OFFICIALS OF AMA

Introduction

This interview guide is designed to solicit views on sustainable solid waste management challenges in Accra Metropolitan Assembly. The researcher is a master of Public Administration student of the University of Ghana Business School. This long essay is being conducted in partial fulfillment of the requirement for the award of Master of Public Administration.

This research is being conducted for academic purposes only and your responses will be treated with the strictest of confidence and anonymity. I would be glad if you would provide me with the following information for my study. Thank you.

RESEARCH OBJECTIVE: To explore the challenges to sustainable solid waste management in Ghana using the Accra Metropolitan Assembly as a case study.

A. DEMOGRAPHIC CHARACTERISTICS

1. Gender.....
2. Level of Education.....
3. Position.....

4. How long have you been working here.....
5. Core functions.....

SECTION B

1. Can you please explain what waste management is according to the AMA?
2. What are the processes for selecting waste management organizations to collect solid waste in the AMA?
3. How many waste collection institutions are in the AMA?
4. Can you please name them?
5. Are they adequate in collecting the quantity of solid waste generated daily in the AMA?
6. If no, why is the AMA not contracting more of them?
7. How many times do the waste collection organizations collect waste a week?
8. Do you get any support from central government in managing the solid waste in the AMA?
9. If yes, what is the form of the support?
10. How would you describe the Assembly's monitoring of waste collectors in the AMA?
11. What are the challenges to effective waste management in the Assembly?
12. Over the years what have been some of the strategies the AMA has used in managing the solid waste situation?
13. Were those strategies effective in addressing the solid waste situation in the Assembly?
14. If no, what were the challenges that impeded those strategies?
15. How many landfill sites are in Accra?
16. Are they adequate to handle the amount of waste generated in Accra every day?

17. What have been some of the benefits when the AMA is able to address the filth issue in the Assembly?
18. In your opinion, what would you recommend to enhance solid waste management in the AMA?

THANK YOU

APPENDIX II: INTERVIEW GUIDE FOR WASTE COLLECTORS IN AMA

UGBS
University of Ghana Business School

INTERVIEW GUIDE FOR WASTE COLLECTORS IN AMA

This research is conducted for academic purposes only and your responses will be treated with the strictest of confidence and anonymity. I would be glad if you would provide me with the following information for my study. Thank you.

RESEARCH OBJECTIVE: To explore the challenges to sustainable solid waste management in Ghana using the Accra Metropolitan Assembly as a case study.

SECTION A: DEMOGRAPHIC CHARACTERISTICS

1. Gender.....
2. Level of Education.....
3. Position.....
4. How long have you been working here.....
5. Core functions.....

SECTION B:

6. How many times do you collect waste a week?
7. How would you describe the Assembly's monitoring of waste collectors in the AMA?
8. Do people pay for the cost of collection?
9. If yes, how much do they pay?
10. What is the mode of payment?
11. Are the people able to pay?
12. What are the challenges to effective waste management in the municipality?
13. How many landfill sites are in Accra?
14. Are they adequate to handle the amount of waste generated in Accra every day?
15. Where do you dump the waste after collecting them?
16. How much do you pay for dumping the waste at the landfill site?
17. In your opinion, what would you recommend to enhance solid waste management in the AMA?