UNIVERSITY OF GHANA

DEPARTMENT OF PUBLIC ADMINISTRATION AND HEALTH SERVICE MANAGEMENT

ENHANCING SOLID WASTE MANAGEMENT IN THE ACCRA METROPOLITAN ASSEMBLY: CASE STUDY OF AYAWASO CENTRAL SUB METROPOLITAN DISTRICT COUNCIL

BY

MILDRED ROSE FRIMPONG

(10167245)

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DECLARATION

I declare that except for other people's investigations which have been duly acknowledged, this work is the result of my own research. This work has not been presented to any University for similar or any other degree.

……..…… ……..

MILDRED ROSE FRIMPONG **DATE**
(10167245)

CERTIFICATION

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

…….. ……..

DR. RICHARDSON AZUNU **DATE**
SUPERVISOR

DEDICATION

This research work is dedicated to my mother (Rita Frimpong) and my daughter (Mildred Nti).

May Almighty God bless and grant you all long life.

ACKNOWLEDGEMENT

I am very grateful to the Almighty God for the strength and wisdom to complete this work. I am also grateful to my supervisor, Dr. Richardson Azunu, whose unrelenting support was crucial to the successful completion of this work

I really cherish the support and encouragement from my mum, children and sisters.

Last but not the least, to all my colleagues especially Sarah and Portia and staff of Ayawaso central sub metro for their cooperation during the data collection and to all who helped in diverse ways of whom I have not specifically made mention of, I am sincerely grateful.

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ABSTRACT

Waste management has been a problem for most city management authorities in Ghana. It has also attracted worldwide attention due to the fact that a clean environment is a condition for healthy living. People living within the communities have different attitudes towards the disposal of waste. In this regard attitude towards waste disposal has been identified as a crucial element in relations to successful implementation of any waste management policy. This study examines how waste management can be enhanced within the Accra Metropolitan Assembly, specifically the Ayawaso Central Sub metro. Employing qualitative and quantitative methodology with in-depth interviews (using a semi-structure questionnaire) and observation as the specific data gathering techniques, this study investigates the challenges facing local public authorities in solid waste management as a result of people's attitude. The major finding of study is that, generally, the attitude of residents within the sub metro community towards solid waste management is negative. This is because, though, respondents know the harmful effects of solid waste, they emphasized that its management laid with the government and not the individuals. An analysis of the narratives of respondents in this study suggests that solid waste management is the responsibility of the Government and the District Assembly and not individual residents. Based on these findings, this study has recommended that sensitization efforts on solid waste management should be done by government. Again Assemblies must invest in technology and invest in other methods of solid waste treatment in order to enhance solid waste management in the metropolis.

CHAPTER ONE

INTRODUCTION

1.1BACKGROUND OF THE STUDY

Environmental Sanitation and Waste management is one out of the many functions of the Sub-Metropolitan District Councils and Municipal/District Assemblies since time immemorial. Provision of these services are directed by an Act of Parliament, (Act 462), and implemented through various bye-laws of the Assembly. Efficient environmental sanitation and waste management within Sub-Metros in Accra continue to be a major challenge of the Assembly due to several factors, some of which are; rapid urbanization, poor physical planning and ineffective layout system, cosmopolitan nature of the city of Accra, high illiteracy rate inadequate infrastructure facilities, low revenue in-flow, inadequate skilled manpower, rampant political interference in the functions of sub-metros and the Assembly. Waste management in Ghana was a challenge even before independence. Addae (1997) noted that before 1880, the towns along the coast of the Gold Coast (Ghana) were notorious for their unsanitary state. All had similar unhealthy features: they all contained lagoons which bred mosquitoes and gave off pungent disagreeable odour. No public or private latrine existed. Excreta and garbage were similarly deposited anywhere and everywhere. Besides, there was no organized collection of waste and garbage.

Consequently, the colonial government took certain measures by propagating the knowledge of sanitation and hygiene. In spite of all these reforms the Africans, the huge majority who lived in the rural areas, remained totally ignorant of the linkage between the endemic diseases from

which they suffered on one hand, and the insanitary conditions under which they lived. After independence it appeared successive governments had been battling with sanitation in Ghana Since environmental sanitation and waste management are influenced greatly through human activities, it then requires adequate resources to manage it efficiently so as not to impact negatively on the health of the people. Waste can be seen as something which is no longer useful to its owner. Again when something fails to fulfill its purpose it is seen as waste (Gourlay, 1992) Two kinds of waste are generated in the Ayawaso Central sub metro.They include solid waste and liquid waste. Miller (1988) defines "solid waste as any useless unwanted or discarded material that is not liquid or gas". Solid waste can be defined as a "great mixture of substances including fine dust, cinder, metal, glass, paper, cardboard, textiles, putrescible materials and plastics" (Simmens, 1981). "In a recent citywide survey conducted by the World Bank and the Accra Metropolitan Assembly (AMA), solid waste management was seen by residents as the third-most important urban service, behind sanitation (including toilets) and drainage" (World Bank, 2010). "A well-functioning system for proper municipal solid waste management (MSWM) is key both to ensuring the public health of all citizens and to achieving Millennium Development Goal #7, environmental sustainability". Waste generation in Accra is estimated to have increased three-fold over the last two decades, due to factors "including population growth, increased urbanization, and lifestyle changes among others (WaterAid & EU, 2008).The public relations officer of the Waste Management Department of Accra Metropolitan Assembly (AMA) indicated that one of the critical challenges faced in the Accra Metropolis is the negative attitude of people towards waste disposal". As a result political leaders, the mass media and the general public have raised concerns about the need for people to change their attitude towards waste management in Ghana. In the Accra metropolis, it is common to see mountains of garbage close

to human habitation. Items including food are sold close to piles of solid waste as well as choked gutters. To make matters worse traders of various items find their own means of disposing garbage indiscriminately without regard for the law on sanitation.

The Ayawaso Central Sub-Metro has grown in leaps and bounds, so also has the generation of waste. Currently, the estimated population of Ayawaso Central is about Seven Hundred and Thirty Thousand, Five Hundred and Eighty-Six (730,586) people with a floating population of over fifty thousand a day. These people all together generate about Two Hundred (200) tons of garbage within a day which must be evacuated. With this amount, roughly 100-120 tons is collected on daily basis leaving a backlog of between 80 - 100 tons. The huge backlog is seen in choked drains, overflowing garbage heaps, littered pavements etc. The communities that form the District Council are: Alajo, Kokomlemle east and west, Kotobabi and Ayidiki. The Ayawaso Central Sub-Metro District Council also has over 2,300 kilometers of drain network and about 2,000 kilometers of roads. Cleaning of these two service areas daily requires enormous resources in terms of labour and equipment. However, in spite of the limited logistics and inadequate funding, the level of sanitation and waste management services in the Sub-Metro is between 50-60%.

The current strategy for handling waste in the Sub-Metro is through privatization. The Sub-Metro has engaged a private company to collect waste from the community on a polluter pay system. The House-to-House Collection is in the high-class residential areas such as Kokomlemle east and west, and Central Container Collection in the middle to low-income areas such as Alajo and Kotobabi.

1.2 STATEMENT OF PROBLEM

Ayawaso central like all other sub metros in A.M.A is engulfed with filth in both seen and unseen places.All the drains are silted .Plastic bags ,bottles and paper are seen almost everywhere in the sub metro.the residents have the perception that the sub metro is solely responsible for the collection of waste and therefore show a lackadaisical attitude towards the management of waste.The Sub Metro District Council is supposed to provide the following sanitation services: street sweeping, cleaning of open spaces and drains cleansing.

In the area of drain cleansing, over 80% of all drains constructed in the Metropolis are 'open' drains and therefore liable to abuse by the public. Most people dump solid waste into the drains and due to inadequate pavements within the communities, silt from erosion and other debris are carried by rain into these drains. Cleaning of these drains therefore is labour intensive and must be done daily. This requires a huge labor and light tools to clean them regularly. The same goes with street cleaning and open spaces. However, inadequate labour coupled with inadequate tools and the uncooperative attitude of most residents littering the streets make it difficult for the maintenance of good waste management in this Sub Metro .This study therefore seeks to examine the problems faced by the sub metro in managing solid waste and recommend ways that can be used to resolve them.

1.3RESEARCH OBJECTIVES

The general objective of the study is to examine how solid waste management can be enhanced in the Ayawaso central sub metropolitan district Council in Accra Metropolitan Assembly. The study specifically seeks to:

- Ascertain the attitudes and perceptions of the residents towards solid waste management in Ayawaso central sub metro.

- Identify the various challenges in the solid waste management at the Ayawaso central sub metro.

1.4 RESEARCH QUESTIONS

The following questions were posed;

1. What are the attitudes and perceptions of the residents towards waste management in Ayawaso central sub metro

2. What are the challenges of solid waste management in Ayawaso central sub metro

3. How can we improve solid waste management in the Ayawaso central sub metro

1.5 SCOPE OF THE STUDY

The study looked at how solid waste is managed at the Ayawaso central sub metro. Geograghically, all the five electoral areas namely, Kokomlemle East and West,Kotobabi,Alajo and Ayidiki were used in the study.

1.6 SIGNIFICANCE OF THE STUDY

The study seeks to afford policy makers and analysts, academicians, District Assemblies and every citizen in the country an opportunity to identify, understand and appreciate better the how developments of solid waste management has been and the processes it has gone through. Also

the current state of solid waste management at the sub metro district Council level, the challenges as well as the way forward.

The study may also give policy makers an opportunity to offer appropriate corrective measures to ensure the success of the waste management policies. Further to this the study will serve as a useful guide to other Assemblies in the country. The Ministry of Local Government and Rural Development (MLGRD), which is responsible for making policies for district assemblies may also use the findings to improve some of their policy reforms. The study finally seeks to propose sound measures which could be taken to support the sub metro Councils to manage solid waste as expected and to enhance full participation of the citizenry in waste management in Ghana. The study will ultimately enable us to better comprehend the implementation of effective and efficient solid waste management at the sub metro level.

1.7 LIMITATION OF THE STUDY

There were several challenges in conducting the research. However the challenges did not affect the outcome of this study. Time was the major constraint since I had to combine academic work and other commitments with the research work. Financial constraints also affected the number of respondents to be covered for the study. Further to this most of the respondents refused to respond to the questionnaires. Some also misplaced the answered questionaires.The sub metro staff who I had to interview had their own commitments and other things to attend to and hence were not mostly available to be interviewed. In spite of all these challenges, I managed to gather the needed data for the research work.

1.8 ORGANIZATION OF THE STUDY

The study has been organized into five chapters. It starts with an introduction, which gives a brief background to the study. Chapter two covers a review of relevant literature on the topic which includes waste management, in Accra Metropolitan Assembly, Ghana as well as other parts of the world. The next chapter deals with the methodology used in carrying out the research. The last chapter has summary of findings, conclusions as well as recommendations made to the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

Management of waste is one of the most critical issues in every human society. Bad` management of solid waste poses both health and environmental hazards to human life. The attention of both the developed and developing world has been attracted to this issue of proper management of waste. Scholars have written so much about it and this chapter will be discussing some of the relevant literature on solid waste management from around the world as well as Ghana.

2.2 Solid Waste Management (SWM)

The management of waste has become one of a major concern in environmental issues be it solid or liquid.(Mazzanti & Zoboli, 2008). "This can be seen in urban areas where the population is growing at a rapid rate and the amount of waste generated is ever increasing like never before" (Kathiravale & Mohd Yunus, 2008). "Currently the earth's population is about 6.8 billion and it is estimated that almost half of this population lives in urban areas (Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, 2009). This increase in waste generation is proportional to the population and income and has created the need for effective management" (Mazzanti & Zoboli, 2008). "Rapid urbanization and industrialization leads to new ways and behavior which affects waste composition from mainly organic to synthetic material which last longer such as plastics and other packaging material" Idris et al., (2004). "Electronic waste barely existed before. It now generated as much as 20-50 metric tons a year (UNEP, 2006).Waste management has become very complex and the equipment and facilities provided cannot cope with the increasing demand and needs. Good measures need to be implemented immediately while considering environmental, social and

economic aspects" (Aye & Widjaya, 2006). It can be said that the drivers of sustainable waste management were clarified by Agamuthu et al. (2009), and they include human, economic, institutional and environment aspect. "Their study suggests that each driving group should be considered in local context as managing solid waste for a particular society may differ from the others. "Again it is worthy to note that waste managers in Africa need to tackle some issues including, lack of data, insignificant financial resources, vast different amount and waste types between urban and rural area, lack of technical and human resources, low level of awareness and cultural aversion towards waste" (Couth & Trois, 2010)."Certain countries are having specific national policy on solid waste management, some others experience problems such as increasing urban population, scarcity of land, services coverage area, inadequate resources and technology, and so on" (Shekdar, 2009). Most countries in the developed world experience high waste generation whereas developing countries always have problems with the implementation of the management system. (Hazra & Goel,2009; Bai & Sutanto, 2002). "This involves weak enforcement, lack of technology and ineffective policy implementation" (Agamuthu et al., 2009). "These countries experience low and irregular collection of waste, uncontrolled air and water pollution in open dumping area, the breeding of flies and vermin, and the mismanagement of scavenging activities" (Latifah et al., 2009).

The differences in managing solid waste not only vary between countries but also among areas in within the same country. For example, "while Istanbul is having big improvement in their solid waste management with the establishment of transfer stations, sanitary landfills and methane recovery system, it does not reduce the problem in the Black Sea coast in Turkey". This can be attributed to the cumbersome nature of the topography, administrative structures that are weak and the low income of local's (Berkun et al., 2005).Integrated Sustainable Waste Management

(ISWM) system was then introduced in 1995 to improve earlier system that neglect unique characteristics of a given society, economy and environment (Van de Klundert, 1999). For example, "European countries had applied various system assessment tools and engineering models to create sustainable communities, manage resources efficiently, tapping innovation potential of the economy,ensuring prosperity, environmental protection and social cohesion in their SWM system" (Pires et al., 2011). "Asian countries had also given attention in building the national legal frameworks, managing institutional, technology, operational and financial aspects, and creating public awareness and participation". (Shekdar, 2009).The waste management system must be dynamic and continuous based on new experiences and insights (Van de Klundert, 1999). "For example, continuous assessment of current policy and regulatory framework of New Zealand indicated the lack of policies coordination, hazardous waste management, consistency, incentives and markets for recycled material, and cleaner production effort" (Boyle, 2000). "Thus, the improvement in policy is needed while it will also benefit the country. As an example, based from EU25 group, it was found that the generation of waste is increasing and is expected to continue for many years ahead. After the implementation of the new EU's policy in waste recovery and incineration, the amount of waste landfilled has been decreasing slowly" (Mazzanti &Zoboli, 2008).In much the same way ,based on the data from developed countries, the actual amount of waste been landfilled is actually decreasing as more waste are being incinerated, composted or recycled.Looking at the positive angle, Lomborg (1998) "believed that, what that area needed is sufficient to cater for the total amount of waste generated by the world, but the problem is the location since nobody wants to stay near landfills". "He also reported that air from incinerators and ground water near landfills today are

cleaner and safer. Therefore, solid waste generation can be considered more of a political or social issue than others" (Lomborg, 1998).

Other literature discussed are "those for India (Hazra & Goel, 2009), Portugal (Magrinho et al.,2006), Canada (Wagner & Arnold, 2008) and Malaysia (Agamuthu et al., 2009). These studies allow comparison to adopt the best practice wherever applicable".

2.3 Solid Waste Generation

Generation of waste is one of the vital aspects to consider at in order to have effective solid waste management system. "The generation of waste varies considerably between countries based on the culture, public awareness and management" (Hazra & Goel, 2009; Wagner & Arnold, 2008; Magrinho et al., 2006).Developed countries generate more waste than developing countries (Kathiravale & Mohd Yunus, 2008). "Countries in Asian and African region produce waste in the range of 0.21-0.37 tons/ capita/ year, while European countries generate higher amount of waste with 0.38-0.64 tons/ capita/ year (Intergovernmental Panel on Climate Change [IPCC], 2006)". ''The generation of waste is also reported to be associated with the economic status of a country. In Asia, countries with higher GDP, namely Hong Kong and Japan were reported to generate more waste compared to developing countries such as India, Vietnam and Nepal''.(Shekdar, 2009). "Waste composition from these countries also differs where rural areas often produce more organic waste and fewer recyclable items" (Idris et al., 2004). Beede and Bloom (1995) examined the generation and management of solid waste through the lenses of economics. They estimated that the global burden of municipal solid waste amounted to 1.3 billion metric tons in 1990. "Additionally, they found that across countries and over time the generation of municipal solid wastes are positively related to variation in per capita income and that the generation of municipal solid waste per capita does not vary with population

size among countries with comparable per capita income". This, therefore, suggests that the generation of solid waste with regard to industrialized countries is determined by their share of population while developing countries account for a disproportionately high share of the world waste relative to their share of income.To add to this view, Rand et al. (2000) "note that industrial growth and per capita income generate more waste which if not properly controlled causes environmental degradation".In addition, they observed that high income areas generate more waste than low or middle income areas. This, therefore, suggests that waste generation and composition may differ greatly even within the same metropolis.McGranahan et al. (2001) "on the other hand, note that health threat of household solid waste is less acute than feacal waste, but it is often mixed with feacal material where sanitary facilities are lacking and can also provide a breeding ground for vectors of diseases, such as flies and rodents". McGrahana et al. (2001) further observed that large quantities of urban waste represent a disposal problem for the city. However, they noted that affluent urban centers can solve their immediate waste disposal problem. McGranahan et al. (2001) on the other hand, note that health threat of household solidwaste is less acute than feacal waste, but it is often mixed with feacal material where sanitary facilities are lacking and can also provide a breeding ground for vectors of diseases, such as flies and rodents. Zerbock (2003) is of the view that the management of solid waste is one of the challenges facing any urban area in the world. The problem of municipal solid waste management is compounded as many nations continue to urbanize rapidly. It is estimated that between 30-50% of populations of many developing countries is urban. Tracing the outcome of a study by WHO in Africa, Zerbock (2003) "notes that when the governments of Africa were asked to prioritize their environmental health concerns, the result revealed that solid waste was identified as the second most important problem (after water quality)". Only about less than

30% of urban population in Africa have access to "proper and regular garbage removal" (Senkoro 2003 cited in Zerbock 2003:2). The above analysis, therefore, suggests that solid waste management in Africa presents a challenge and this is a call for serious attention by governments of Africa and all the various other stakeholders. In a study on municipal solid waste management in Kenya, Henry et al. (2005) "established that the growth in municipal solid waste (MSW) generation has been rapid, while the capacity to collect and safely dispose of the material has been on a general decline". Besides, the capacity to provide disposal services by the Nairobi city authorities declined due to the fact that they were unable to keep all MSW collection trucks at full operational capacity. Additionally, the study revealed that uncollected MSW in the upper and middle income zones tends to increase in the rainy season when road conditions are worsened by rains.

2.4 Solid Waste Disposal

Solid waste generation is very important to determine the most suitable solid waste disposal options. Improper solid waste disposal may likely cause pollution. The reasons for implementing best practice for solid waste management is essentially to prevent pollution. Pollution threatens the life of humans as well as other living organism (Morra et al., 2009; Liu & Morton, 1998).' It may also damage the ecosystem and disrupt the natural cycle and climate on earth' (Raga et al., 2001). Several disposal options are available to suit the nature of waste and a country's preference and interest. "Economics and environmental aspects of waste disposal option are always the main issue in choosing the right technology" (Aye & Widjaya, 2006; Daskalopoulos et al., 1997). "Developed Asian countries such as Japan, South Korea and Singapore are on their way to eliminating landfilling while some other Asian countries still have problems with open dumping" (Agamuthu & Fauziah, 2010; Shekdar, 2009; Bai & Sutanto, 2002).Despite the

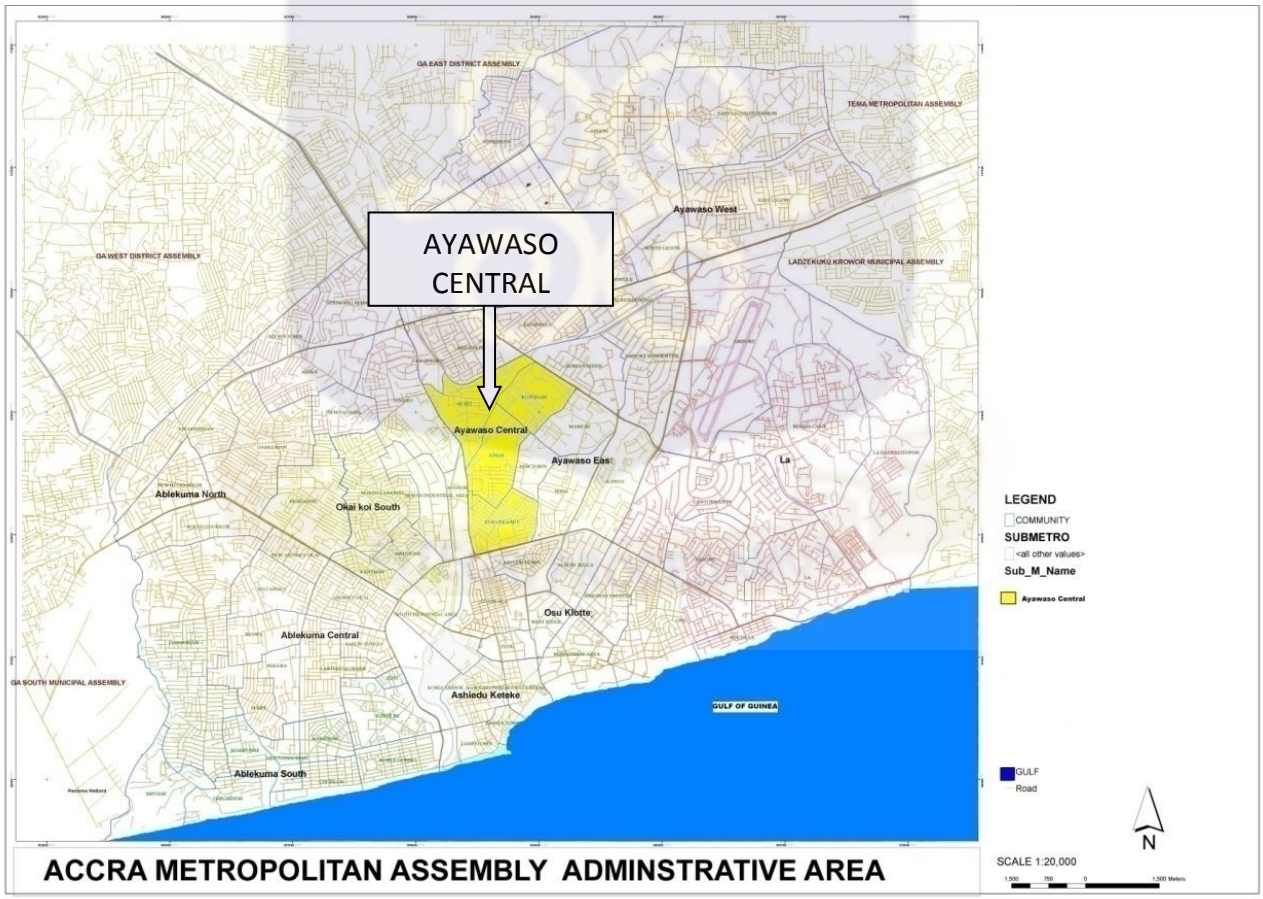
development of many waste disposal option, landfills remain the most prominent system applied worldwide (Shekdar, 2009; Hamer, 2003). "Even though a lot of improvement had been possible in the landfilling system and the regulation on the type of waste that can be treated at landfill is stringent, most of landfills operated remain primitive" (Hamer, 2003).Ayomoh et al. (2008) "had listed few problems related to 'improper landfill operation including, health deterioration, accidents, flood occurrences, pollution of surface and underground waters, unpleasant odor, pest infestation and gas explosion". "Although the impacts from landfills are known, impacts from others also remain unanswered thus subject to critics" (Hamer, 2003). "Incineration has been the choice for developed countries as they have sufficient financial input and are looking into energy recovery from waste" (Papageorgiou et al., 2009; Kleiss & Imura, 2006). "A small country such as Singapore adopts incineration as their waste disposal option due to scarcity of land" (Bai & Sutanto, 2002). "This includes the generation of carcinogenic and toxic compound. It will also produce end products which may need further treatment where it is highly toxic, collectively known as dioxin" (Hamer, 2003).Some reported that the impacts from incineration were over-emphasized and "the advancing technology had highly reduced the environmental impacts" (Morselli et al., 2008; Hamer,2003). However, many of the countries prefer waste minimization compared to waste treatment such as landfill or incineration (Bai & Sutanto, 2002; Boyle, 2000). "Technology is advancing and hence chemical recycling of plastic wastes has also been made possible in these developed countries" (Al-Salem et al., 2009). "Regardless of the technology chosen, each has its pros and cons. The information on the disposal option needs to be clarified to determine the suitable option for each particular country". Certain tools had been used in the environmental evaluation including in determining best waste disposal options. For example, "Life Cycle Assessment determined that the most economically feasible option for traditional

market waste management in Indonesia is composting at a centralized plant, while biogas production option has the lowest environmental impact" (Aye &Widjaya, 2006).Other tools used to determine best waste disposal option includes multiple criteria analysis (MCA) and Cost-Benefit Analysis (CBA) (Chung and Poon, 1996).

2.5 PROFILE OF AYAWASO CENTRAL SUB METRO

The Ayawaso Central Sub Metropolitan District Council is one of the ten (10) Sub Metro District Councils of Accra Metropolitan Assembly (AMA). It is bounded in the North by Ayawaso West Sub Metro, in the West by Okaikoi South Sub Metro, South by Osu Klottey Sub-Metro and in the East by Ayawaso East Sub-Metro. Ayawaso Central Sub Metro covers the following electoral areas; Ayidiki,Kotobabi,Alajo,Kokomlemle East and West. These electoral areas are also represented in the Assembly by five Assembly Members.

Figure 1: Map of Ayawaso Central Sub Metro Area



Geology

"The Ayawaso Central Sub Metro is part of the Accra Metropolitan Assembly (AMA) and has the same geology with the AMA which consists of Precambrian Dahomeyan Schists, Granodiorites, Granites Gneiss and Amphibolites to late Precambrian Togo Series comprising mainly Quartzite, Phillites, Phylitones and Quartz Breccias. Other formations found are the Palaeozoic Accraian Sediments - Sandstone, Shales and Interbedded Sandstone-Shale with Gypsum Lenses.The soils in the metropolitan area can be divided into four main groups: drift materials resulting from deposits by windblown erosion; alluvial and marine motted clays of comparatively recent origin derived from underlying shales; residual clays and gravels derived from weathered quartzites, gneiss and schist rocks, and lateritic sandy clay soils derived from weathered Accraian sandstone bedrock formations."

"In many low lying poorly drained areas, pockets of alluvial 'black cotton' soils are found. These soil have a heavy organic content, expand, and contract readily causing major problems with foundations and footings. In some areas, lateritic soils are strongly acidic and when saturated are prone to attack concrete foundations causing honeycombing. Near the foothills are the large areas of alluvial laterite gravels and sands. Many of these deposits are being exploited in an uncontrolled manner for constructional purposes".

Climatic Conditions

There are two rainy seasons. Average annual rainfall is about 730mm, which falls primarily during the two rainy seasons. The first begins in May and ends in mid-July. The second season starts in mid-August and ends in October.

"There is very little variation in temperature throughout the year. The mean monthly temperature ranges from 24.7°c in August (the coolest) to 28°c in March (the hottest) with annual average of 26.8°c. As the area is close to the equator, the daylight hours are practically uniform during the year. Relative humidity is generally high varying from 65% in the mid-afternoon to 95% at night.The predominant wind direction in the Sub Metro is from the WSW to NNE sectors". Speed of wind normally range between 8 to 16 km/hr. High wind gusts occur with thunderstorm activity, which pass in squall along the coast. Maximum wind speed in Accra

is 107.4 km/hr (58 knots). Strong winds associated with thunderstorm activity often cause damage to property by removing roofing material.

2.6SOCIO - CULTURAL CHARACTERISTICS

Characteristics of Housing and Population

"With an estimated 2008 population of about 200,208 projected from 2000 National Population and Housing Census by the Ghana Statistical Service, Ayawaso Central Sub Metro forms 20.22% of the entire population of Accra, which has also contributed to the fast growing population of the Accra Metropolis".

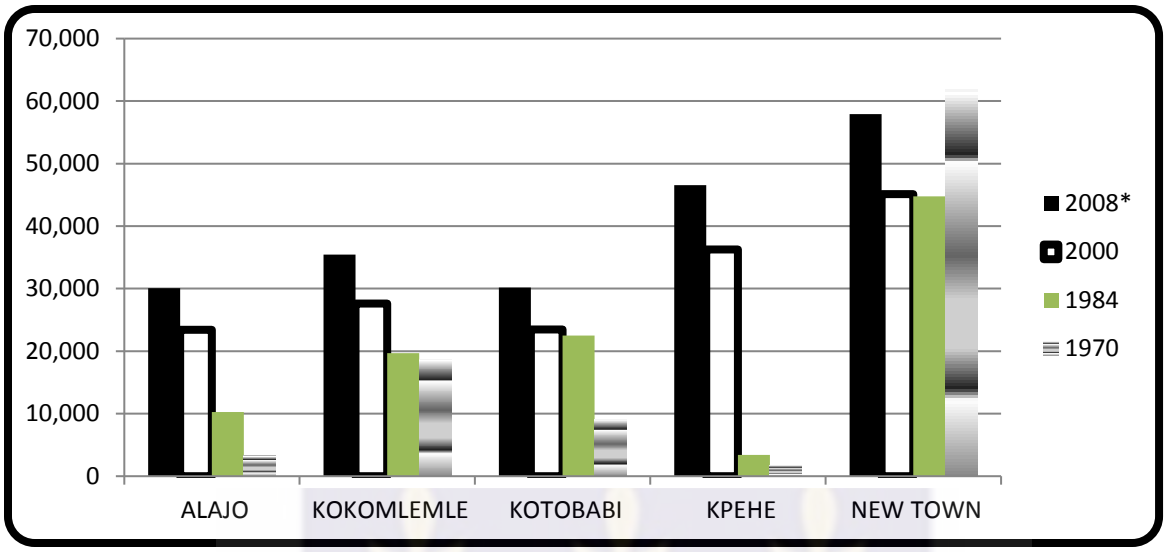
"The census population figures of the various communities in Ayawaso Central as shown in the table below explains the above mentioned population situation in the Ayawaso Central Sub-Metropolitan District Council."

Table 1: Localities Population Trends of Ayawaso Central Sub-Metropolitan District Council

AYAWASO CENTRAL SUB-METROPOLITAN DISTRICT LOCALITY POPULATION TRENDS							
LOCALITY NAME	**POPULATION**					**2000**	**2000**
	2008*	**%**	**2000**	**1984**	**1970**	**HOUSES**	**NO: HH**
ALAJO	30,091		23,439	10,247	3,247	1,534	4,835
KOKOMLEMLE	35,454		27,616	19,696	18,695	1,620	5,839
KOTOBABI	30,151		23,485	22,491	9,134	1,323	5,625
KPEHE	46,573		36,277	3,418	1,779	1,930	7,936
NEW TOWN	57,939		45,130	44,762	61,850	1,738	10,184
TOTAL	**200,208**		155,947	100,614	94,705	8,145	34,419

Source: 2000 Population and Housing Census. * Projected

Fig 2: Localities Population Trends of Ayawaso Central Sub-Metropolitan District Council



The Sub-Metro housing landscape is characterized by an area comprising a mixture of low-density development with under-utilized service infrastructure: low class on one hand, and high-density development with depressed conditions on the other. According to the 2000 population and housing census, the total number of houses in the Sub-Metro is 8,145.

"The average house size is approximately 25 persons per house or approximately 4 households per house. The average household size is 6 persons per household.

Housing can also be grouped in 3 broad categories: the low income, middle income and high income areas". The low-income housing zones may comprise of indigenous and non-indigenous (dominantly migrant) areas. "The Ayawaso Central Sub-Metro is mostly occupied by non-indigenous (dominantly migrant). Most of the informal businesses are located in low-income areas and they are the first place of abode for any new job-seeking migrant".

2.7 Age and Sex Composition

Ayawaso Central Sub-Metro's population like that of other Sub-Metro's "is a very youthful with 54.72% of the population under the age of 24 years. It will be realised from the age sex ratio that 49.91% of the population are females and the rest 50.09% males". This gives a sex ratio of 1:0.99 males to females. "The dominance of males over females is not a reflection of the nationwide trend where the estimated ratio is 1:1.03. The need to target women in any development programme in the metropolis can therefore not be overemphasised. Age dependency ratio has been calculated to be at approximately 33.78% of residents of Ayawaso

Sub-Metro relying on the other 66.22% for their livelihood. The above also indicates that about 66% of the population constitutes the working force."

Table 2: Age Structure of the Ayawaso Central Sub-Metro (2000)

5 YEAR AGE GROUP	PERCENTAGE %
0 -4	9.52
5 – 9	10.12
10 -14	10.16
15 – 19	11.87
20 – 24	13.05
25 – 29	10.98
30 – 34	7.51
35 – 39	6.11
40 – 44	5.12
45 – 49	4.32
50 – 54	3.32
55 – 59	2.18
60 – 64	1.77
65 – 69	1.18
70 – 74	0.82
75 – 79	0.55
80 – 84	0.50
85+	0.93
Total	100.00

Source: 2000 Population & Housing Census

2.8 Religious Characteristics

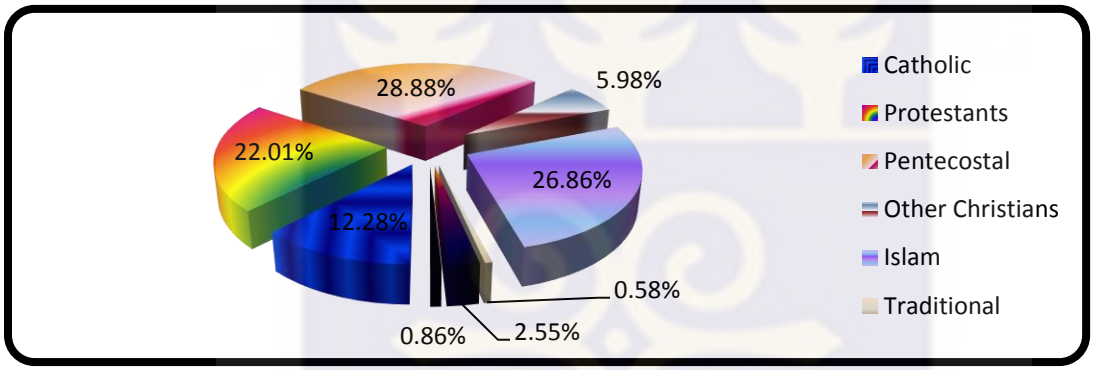
"The percentage distribution of religious groups in the table below shows the predominance of Christians (69.15%) in the Sub-Metro, compared with the second major religion, Islam (26.86%)." "Among the Christian group, adherents of Pentecostal and Charismatic churches constitute the largest religious denomination (28.88%) followed by Protestants (22.01%) Catholics (12.28%) and other Christians (5.98%) in that order". With the exception of the predominance of females in the Pentecostal and Charismatic churches, the distribution has almost been similar for both sexes. Male Muslim dominance has now been evident, conforming to the national pattern.

Table 4: Population by Religion

RELIGION	PERCENTAGE (%)
Catholic	12.28
Protestants	22.01
Pentecostal	28.88
Other Christians	5.98
Islam	26.86
Traditional	0.58
No Religion	2.55
Other	0.86
Total	**100.00**

Source: Ghana Statistical Service 2000

Fig 4: Population by Religion and Sex



2.9 ECONOMIC CHARACTERISTICS

Industry of Employment

The table below indicates the industrial sector of employment of Ayawaso Central Sub-Metro. As shown in the table, 33.93% of the people are involved in wholesale and retail trade with 17.58% engaged in manufacturing. 6.66% work in the transportation sector, with 6.18% in other community, social and personal services while 5.39% do construction activities and others as presented in the table above. Of all this 60% are in the private informal sector while 47% are also self-employed without employees.

There is therefore the need for required assistance in different ways especially business development skills and financial support through the provision of credit facilities to small-scale enterprises.

Table 5: Industry of Employment

INDUSTRY	SEX		
	Male	Female	Total
Agriculture, hunting and forestry	2.37%	1.54%	3.91. %
Fishing	0.77%	0.83%	1.60. %
Mining and quarrying	0.90%	0.78 %	1.68. %
Manufacturing	9.28%	8.30 %	17.58. %
Gas, electricity and water supply	0.40%	0.14 %	0.54 %
Construction	4.32%	1.07%	5.39. %
Wholesale and retail trade	13.62%	20.30 %	33.92. %
Hotels and restaurants	1.52%	3.76 %	5.28. %
Transport, storage and communication	5.46%	1.20 %	6.66. %
Financial intimidation	0.86%	0.43%	1.29. %
Real estate, renting and business activities	1.81%	0.83 %	2.64. %
Public administration and defence	3.18 %	1.06 %	4.24. %
Education	2.11%	1.62%	3.73. %
Health and social work	0.86%	0.70 %	1.56. %
Other community, social and personal service	2.60%	3.58. %	6.18. %
Private households with employed persons	1.35%	1.64. %	2.99. %
Extra-territorial organisation and bodies	0.13%	0.07. %	0.20. %
New workers seeking employment	1.35%	0.25. %	1.60. %
Total	51.90. %	48.10. %	100.00. %

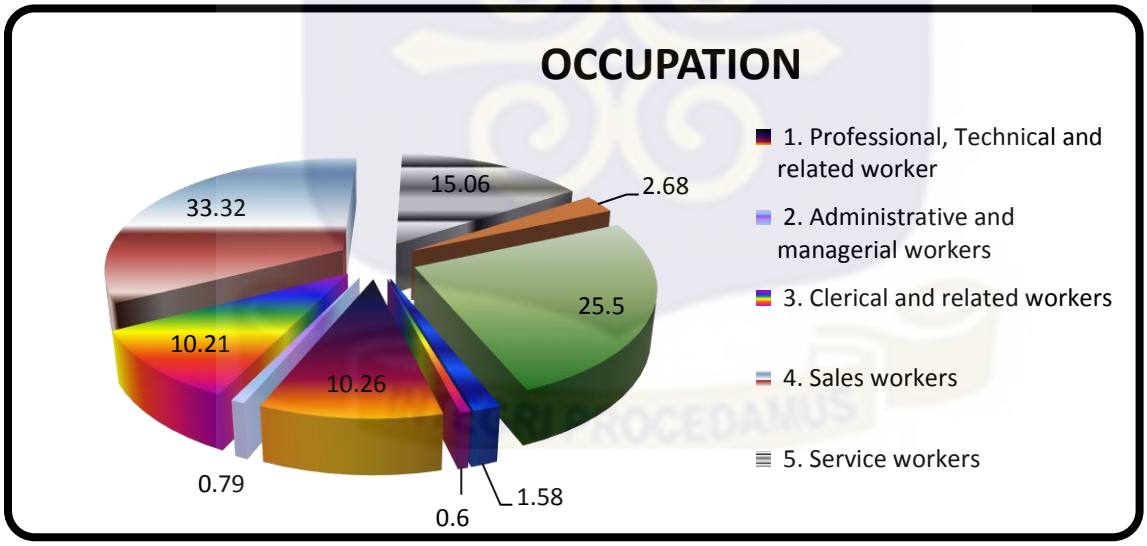
Occupational Status at Ayawaso Central Sub Metro

Some major activities carried out in the Ayawaso Central Sub Metropolitan District Councils are captured in the table below.

Table 6 Occupational Status at Ayawaso Central Sub-Metro

OCCUPATION	SEX		
	MALE	FEMALE	TOTAL
Professional, Technical and related worker	6.79 %	3.47 %	10.26 %
Administrative and managerial workers	0.5.%	0.25 %	0.79 %
Clerical and related workers	7.45 %	2.75 %	10.21 %
Sales workers	11.43 %	21.89 %	33.32 %
Service workers	6.89 %	8.17 %	15.06 %
Agriculture, animal husbandary and hunters	1.66 %	1.03 %	2.68 %
Production and related workers	15.59 %	9.91 %	25.50 %
Labours not elsewhere clasified	1.21 %	0.37 %	1.58 %
New workers seeking employment	0.35 %	0.25 %	0.60 %
Total	51.91 %	48.09 %	100.00 %

Fig 6: Occupational Status



The table above indicates the occupational status in the Ayawaso Central Sub-Metro. As shown in the table, 33.32% of the people are sales workers with 25.50% engaged in production and related workers. 15.06% are service workers, with 10.21% as clerical workers, while 5.39% are professionals, technical and related workers as presented in the table above.

2.3 ECOLOGICAL INFORMATION

The Ecological characteristic of the Accra Metropolitan Assembly has three broad vegetation zones comprising of shrub land, grassland and coastal lands. Ayawaso Central Sub - Metro, being part of the Assembly has the same characteristic of the coastal zone.

The dune lands have been formed by a combination of wave action and wind. They are most unstable but stretch back several hundred metres in places. "There are several shrub and grassland species, which grow and play an important role in stabilising dunes. In addition to the natural vegetation zones, a number of introduced trees and shrubs thrive in the Ayawaso Central Sub Metropolitan area. Nims, mangoes, cassias, avocados, and palms are prominent trees on the landscape. Introduced shrubs like bougainvillea are also very prominen"t.

"During the months of December to February, the effect of the Harmattan (fine windblown dust from the Sahara region) causes loss of visibility and some health problems. These are seldom prolonged. Odour levels arising from decomposing rubbish and sanitary wastes are high in inner city areas, especially, along the drainage system."

2.10 Literature on solid waste management in Ghana.

The difficulties of Ghana's waste management are often stretched from the state to the metropolitan, municipals and districts. "There are refuse of all shapes and sizes seen in both the urban and rural areas. These difficulties are concentrated and complicated by population pressures in the few heavily populated cities of which Accra is the most prominent. For the past two decades this city of roughly 4 million inhabitants has had an annual growth rate of 4% making it one of the fastest growing metropolises in Africa". The phenomenal growth has contributed to municipal waste production that far out numbers the city's capacity for containment and processing. 80 % of the city population lives in low income, high density population areas. The middle class is also made up of 17% of the entire population (Boadi and Kuitenen,2014). It can be said that only 3% of people in Accra live in high income and low density residential areas. The sanitary infrastructure of Accra is reflective of its income divisions. According to Boadi and Kuitenen (2014) "visitors to Accra nowadays are confronted by two narratives". In one of them, Accra is the posh clean "gateway to Africa". Ceremonial Streets are

well manicured, roundabouts are "coiffed and well painted. The other version has city residents contending with congestion, illegal settlements, substandard housing, and poor sanitation. This environment is the predominant experience of most city residents and is reflective of growing inequality that that has come to represent Accra". The combination of human factors coupled with poor governance, has resulted in the environment been characterized by clogged gutters, choked drains and garbage piles which has been left in the open.

In Ghana, according to Benneh et al. (1993) solid waste problems are not the priority health concern for the government or local authorities and the capacity for collection and disposal still remains weak. Again, domestic waste makes up the bulk of all sources of solid waste produced in urban areas in Ghana. The writers again observed that the collection and disposal of solid waste and night soil deteriorated progressively from 1979, reaching a crisis in 1985. They attributed these problems to economic crisis in the mid-1970s and early 1980s as the public collection services declined due to lack of funds for the acquisition of capital equipment and the operation of the services among others. Benneh and others also were of the view that, the establishment of the Waste Management Department in 1985 (equipped and funded with German assistance), marked a notable way of addressing the problem of waste management. They observed however that the Department was only capable of collecting 60 percent of the 900 tons. Also in another study on management of solid waste in Accra, Domfeh (1996) sought to appraise the economic and social dimensions of solid waste management. He was of the view that the collection and disposal of solid waste was a persistent problem for the city authorities. Almost about thirty percent (30%) of residents benefited from house- to- house collection services and hence substantial quantity of solid waste ended up in open drainage systems. Another study undertaken in (2001) saw "privatization" as a viable solution to governments' inefficiency and

ineffectiveness in managing waste.A study on solid waste management in Accra by Obirih-Opareh (2002) "noted that solid waste management practices entail a coherent system for generation, gathering, storage, collection, transportation, recycling, energy recovery, treatment and disposal". Dealing with dimensions of solid waste collection problems in Accra, he again noted a relationship between the waste management practices and cleanliness in various residential areas of Accra. Additionally the greater part of the city is fairly clean, particularly the middle-income areas. However, he observed that "some parts of the poor-income areas and market places are filthy, littered with plastic bags and most gutters were often blocked by all manner of waste due to poor waste practices". These problems identified in Accra stems from negative attitude of residents, a view Domfeh (2001) supports. In the words of Obirih-Opareh, "solid waste collection in Accra has bedeviled not only the city authorities, but also service consumers and providers alike". The reasons that have reinforced the problems include: (a) the volume of waste generation is huge compared to the available capacity for its collection. (b) the attitude of residents towards waste in general. (c) inaccessible road, making it difficult to remove garbage from deprived areas. (d) enforcement procedure for offenders of bye-laws for waste and sanitation are weak among others. Songsore (2003) "observed that the capacity to handle household and municipal waste is unsatisfactory in urban areas in Ghana". He notes that dumping either at official collection point or unofficial sites, is the predominant mode of garbage disposal in most parts of the country . Further to this, he identified poor performance of the waste disposal sector to poor infrastructure and funding. For instance, he was of the view that it required commitment from government.As required by the Local Government Act 462 Section 10(3), the district assemblies are responsible for development, management and improvement of human settlement and the environment in the district. In assessing the performance of public-

private collaboration in solid waste management in Accra, Post and Obirih-Opareh (2002) "have noted that through trial and error, the Ministry of Local government, Rural Development and Environment has gradually transferred this service to the private sector". It appears that privatization has rather benefited consumers in terms of wider coverage, high reliable services etc. A number of challenges such as negative environmental impacts, worsened labour conditions, and lack of financial sustainability has been associated to this phenomenon. It can be said that the current situation is not tenable. "The advent of e-waste imports old TV sets, radios, and computers from developed nations threaten to further destabilize an environmental approach that is not keeping pace with emerging health risks. One can say that in the near future Accra will have to improve its waste management. Looking at Ghana, the implementation of the national environmental sanitation policy is not receiving the necessary attention and therefore influences the quality of solid waste service" (Awortwi, 2003). "The Accra Metropolitan Assembly (AMA) has powers conferred on it by the Local Government Act 1993 (Act 462) to promulgate and enforce by-laws to regulate solid waste management, sanitation, cleansing and abatement of nuisance in the Metropolis. Companies cannot operate without the approval of or license from the Assembly" (Van Dijki & Oduro-Kwarteng, 2007).

The Republic of Ghana is home to more than 22 million residents. "Accra, the nation's capital serves as the economic, administrative, and cultural centre of the country. Its geographical position has allowed it to function as a natural port to the Atlantic Ocean, which has in turn made it an important destination point for number of Ghanaian trading industries. It covers an area of approximately 65 square miles. It houses a full 18 % of the total Ghanaian population and 30 % of the country's urban population. Unlike the towns and villages spread throughout the majority of the countryside, Accra is a veritable haven for labour-seeking residents from all over Ghana.

Half of Accra lives below the World Bank's absolute poverty threshold of little less than a dollar a day. The past two decades has seen the city of roughly four million inhabitants have an annual growth rate of 4 % making it one of the fastest growing metropolis in Africa". Thompson (1995) "further indicates that Ghana has waste management difficulties that extend from the state to the local municipalities, and refuse of all shapes and sizes is a common site in both urban and rural areas". These difficulties are concentrated and complicated by population pressures in the few heavily populated cities, of which Accra is the most prominent. Inequality features heavily in the capital, with statistic showing about 80% of the population being low income earners and living in high density populated areas. It also shows that only 30% of all houses have modern toilets. Public latrines which were built by the Assembly to accommodate these challenges were seen to be overused.

It can be seen in the literature that "Accra is currently divided into 16 waste collection zones each contracted to different waste management firm or company responsible for collecting and disposing solid waste". Collection of solid waste from these zones has been delegated to the private waste contractors. "The AMA currently concentrates on supervision of waste collection, monitoring of the public-private partnership, and management of final disposal points. The private local firms are the ones in charge of actual collection and provide their services for a fee according to specific contractual agreements that each company makes with the city authority which is the AMA". Those companies are paid by the AMA, from internally generated funds. Benneh *et al*., 1993 indicated that "half of Accra households perceive local accumulations of solid waste to be a problem, and more than one third mention open dumpsites in their neighbourhood where waste goes uncollected for a week or more" as a very big challenge. The current situation is not tenable. "The advent of e-waste imports—old TV sets, radios, and

computers from developed nations-- threaten to further destabilize an environmental approach that is not keeping pace with emerging health risks".

The domestic waste in "Accra is primarily made of organic material (65 %). The remainder of the disposed waste consists of paper, plastics, glass, metals and textiles. The organic material is typically a mixture of kitchen waste (vegetables, rotten fruits, crop residues, and leaves) and animal excreta". "None of the organic material is in and of itself toxic to humans or the environment. Frequently it is the manner in which the waste is kept that dictates the exposure to health risks. The largest risk to humans comes in the form of diseases associated with insanitary conditions. It can be seen that infectious diseases are caused by poor sanitation which causes the most common diseases affecting the residents of Accra" (Thompson, 1995).

"In the Accra households it is not uncommon to find open waste containers. Many households store their waste in baskets and plastic bags. The hot and humid weather conditions favour accelerated fermentation of organic matter. The lack of substantive toilet infrastructure means that citizens at times resort to defecating outside. Various studies have found more than two-fold increase in childhood diarrhoea prevalence due to neighbourhood outdoor defecation".

Statistics further shows that many households in Accra (18%) burn their waste. This burning of waste is seen as a major contributor to air pollution. As a results of this, the residues from the burnt refuse also enters into the groundwater. Eventhough the burning of waste has been associated with respiratory illness, the waste of some households that are inconsistently serviced by waste collection companies still burn their waste. Hence, in these households, respiratory diseases are more common in mothers and children. Pollution of water is another important potential outcome of inappropriately managed waste. For example, the unregulated leachants from refuse near waterways increase the technical difficulty of providing clean water and subject

city residents to urban flooding risk. Urban floods occur when drainage systems and other storm control devices overflow because of blocked water ways. The poorer population of Accra bears a disproportionate amount of the environmental health risk burden". The most vulnerable populations are sanitation workers and the migrant workers from the North. "Migrant workers mostly resort to scavenging to provide their daily income. Scavengers can be seen in broad daylight searching through refuse at open dump sites for materials such as plastic silvers and metals that can be sold back to processing factories. Sanitation workers are hired by private companies and they receive little or no protective clothing from those waste management companies that employ them. These workers also earn very low wages, and thus are not able to purchase appropriate clothing for their personal protection. Thus, they suffer more exposure, and as a consequence have a higher turnover rate, higher incidences of sick days and work-related accidents, and higher mortality rates".

2.11 Approaches to solid waste management in the Accra Metropolitan Assembly

"Solid waste in Accra is managed through economic instruments, landfills, incineration, recycling or reuse. A thorough discussion of Accra's governance would necessitate a detailed retelling of Ghana's political history". Just like most developing countries, Ghana and consequently Accra has an established set of comprehensive environmental laws. However the means to enforce those laws is what is lacking.

2.12 Economic Instruments: Privatisation

"Economic instruments can be grouped into two categories: revenue- raising instruments (licenses, user charges), and non-revenue instruments (performance-based management contracting, clean neighbourhood competitions, privatisation). The problem of waste collection

is structurally dissimilar from the problem of waste disposal".(AMA report document on solid waste: 16)

"The AMA's main economic tool is privatisation. Advocates of privatisation believe that for-profit competitive systems increase efficiency and better calibrate supply and demand. Opening the waste management market to competition can stimulate development of better pollution control technology and expertise". Previously ,that is before 1995 solid waste management was run purely as a government monopoly. However the government was failing to adequately address the sanitary needs of its citizens" .Thomson,(1995). "Privatisation has permitted waste collection services to be allocated to the parties who value them the most. Opponents to Accra's privatisation program rather acknowledge that the living standard in higher social economic classes has increased, but they argue that the benefits of privatisation are not experienced equally by residents of Accra". (AMA report on solid waste: p 16) Poorer socioeconomic classes will only receive marginal benefits.

It is believed that "Low-income residential areas (which make up the majority of Accra) are still under serviced. Critiques of privatisation point out that waste collection relies on the government management of infrastructure (ensuring streets are paved and accessible, enforcement of zoning laws against squatters) independent of public or private servicing. Private firms will only be as good as the infrastructure that supports them". "Private firms have little incentive (and virtually zero technical capacity) to repair and maintain roads". "Privatisation depends on fees hence in high-income neighborhoods; each household pays a fee for the privilege of waste collection". "Houses are sufficiently spread that if a household determines not to pay the fee and waste accumulates, that action does not immediately offend the aesthetic environment of neighbouring households" Thompson(1995). "In low-income neighbourhoods, the opposite is true, waste is

accumulated at central collection points". When payment schemes have been instituted (such as requiring residents to pay a specific fee before the central container units are collected), residents simply free-ride.

"The population is too dense and municipal workforce too sparse for effective policing of environmental by-laws. Thus paying households in poor neighborhoods receive little tangible aesthetic benefit as their immediate surroundings are still polluted by other resident"s. Cities are permitted to appoint designated landfill sites, but these sites are more accurately designated as open dumps. "Sanitary or engineered terminal end sites for Accra's waste deposition are non-existent. Accra's landfills mostly consist of abandoned stone quarry sites, gouged natural depressions in the earth, old mining areas, or man-made holes in the ground". Thomson (1995). "Many of these sites are at the outskirts of the city where the poorly maintained roads present significant risks to waste transport". "The Ghanaian Environmental Protection Agency has recognized the need to have the municipal dumps of Accra replaced or upgraded to engineered landfills and has set a 2020 target for the conversion of all these sites". "Waste manage disposal is underdeveloped. Most of these landfills operate near or beyond maximum capacity. Waste is not subject to compaction. Volume remains expanded, and as a result these dumps are frequently infested by roaches, rodents, and flies". Thomson (1995, p:15).

2.13 Composting

"Composting is a minimally used form of waste disposal in Accra and does not contribute to the danger of food pollution. Of the 1250 tons of garbage collected per day – about 10 – 15 % is composted". In theory composting could "reduce environmental pollution and provide job opportunities. Compost fertilizer also could help improve agricultural production and improve soil structure – which means it offers a longer term advantage over other non-compost mineral-

based fertilizers. The high percentage of organic material that is disposed as trash suggests that composting could be a viable municipal solid waste technology". (AMA report on waste, p: 16)

"In practice, composting is not a widely employed technology. Greater use of composting requires analysis of the different levels of technical sophistication and the potential transport capacity of Accra's waste collection system. Profitability and investment analysis for constructing and operating compost facilities in Accra would have to be undertaken. Such forms of analysis have actually been done as at 2004". Literature has it that the overall cost of building and operating composting facilities in the Accra-Tema Metropolitan area cost lesser than for incineration and land filling. "There are two active compost plants active near Accra. These plants are capital intensive and require very few men for efficient production. It is not fully clear why composting plants are not used and encouraged more".

"The price of compost is also sensitive to transport costs. As Accra has grown and expanded, agricultural end destinations for compost have become further and further removed from the site of compost production adding to the expense of compost purchasing. The current preference of non-composting waste management technology may be difficult to adjust considering these circumstances, which is a shame as many urban farmers (inexperienced and experienced) have positive perceptions and are willing to use compost". A way of solving this issue is using associations that are into farming (already in existence) to buy the compost in bulk to reduce transport costs. "Until transport costs are reduced, composting will likely remain low on the priority list of technological processes expected to ameliorate the waste management burden in the future".

2.14 Recycling

Recycling which is practiced informally in Ghana occurs in households which have low income .They do not dispose of plastics, bottles, paper, cardboards and cans readily which they have used. "Recyclable materials are used and reused for domestic purposes and only thrown away when they are no longer of any use to the owners". Domestic servants who work for the rich sell these materials to middlemen to supplement income instead of disposing them along with the other refuse. Accra has two main recycling plants in operation. The government could encourage the waste pickers in the labour market as well as other participants in the informal recycling sector to help extend the lifespan of the cities landfills through waste diversion" (AMA report on waste, p:16).

2.15 Incineration

Incineration is another way of disposing waste.It is used basically as a way of disposing biological waste associated with medical care. Policies that work on the appropriate use of incineration in Ghana has been formulated . In Accra the incinerators are mostly made up of ovens as well as open pits used to burn bandages and blood products. "After burning, the ash is usually moved straight to an adjacent landfill, where it takes up only a tenth of the volume of the original waste. Ghana's national policy recommends small scale incineration plants, but primarily as a disposal option for health care wastes".

"Public apathy to environmental issues prevents residents from making meaningful contributions to the difficult decisions that are required to prioritize environmental health". "Historically, community participation in Accra municipal decisions has been low. Accra lacks the resources to organise dialogue sessions, and rarely employs facilitators to involve people in decision making.

Labour is one of the most available inputs in Ghana's waste management sector" (AMA report on waste p: 15). It is certainly more readily available than capital stock and imported

technologies. But no institute has responsibility for research into Accra's major resource, its people. "A major research effort on the economics of the waste management labour market is needed to determine if substantial gains in output, employment, and services can be had from the introduction of labor-intensive methods of waste collection and disposal. It is possible that short-term efficiency gains could be had if waste companies used a higher ratio of labour to capital. Community participation is vital for all these proposed plans of action. The literature is replete with examples of projects that have yielded sustainable results from community organizing efforts". One of the most successful examples is the "Orangi Pilot Project in which residents of Karachi Pakistan slums were given the capacity to participate effectively in the creation (purely community financed and constructed) of their own sewage system". It is crucial to create and access a self-referential body of research (through focus groups, small scale pilot projects, and published studies) to help determine if similar initiatives are applicable to the environmental conditions in Accra. "These research demonstrations can help guide citywide policy and highlight how best to engage with the city's poor communities".

Having reviewed the above literature, it is obvious that the articles and studies conducted did not focus on attitude of the residents and the staff of the assembly towards solid management. Some of the writers identified problems contributing to solid waste management as, "lack of funds, lack of equipment, technology and so on. Ayawaso Central is densely populated and a low-income area. They also do not have adequate sanitary facilities. These inadequacies lead to indiscriminate disposal of refuse into drains, gutters, and waterways, and to open defecation in these areas"(AMA report 2014 p:16). Benneh et al (2004) proposed the involvement of local groups in solid waste management side by side the operations of governmental agencies urbanization, industrialization, migration, lack of transport and equipment among others. The

review suggests a gap in the current literature in relation to attitude of the residents of Ayawaso central towards solid waste management in Accra. This is the reason for this study

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter presents an overview of the various methods employed in the collection and analysis of data. This chapter is a very pivotal aspect of the study, which identifies the procedures followed by the researcher to arrive at valid conclusions. The methodology comprised of the research design, population of the study, sample and sampling procedure, research instrument, as well as approach to data analysis.

3.1 Research Design

The pattern adopted in the collection, unionizing as well as integrating a research data with the purpose of revealing research findings to answer a set of research objectives in popular known as the research design (Johnson & Onwuegbuzie, 2004). A study by Creswell & Clark, (2010) also posited that, a research design involves following some typical four steps leading to the answering of the questions of, "what questions are to be answered, the relevant data needed, process involved in the collection of the data and how can the data be analyzed". For the purpose and nature of this study, the descriptive survey research design was adopted. The choice of this design is that, descriptive studies allow the researcher to investigate how solid waste management could be enhanced. Furthermore, a descriptive research design enabled the researcher to explore the level of knowledge, attitude and perception, the management of solid waste, challenges and factors that improves/enhances solid waste management.

Creswell, (2013) defined descriptive researches as those researches that help to explain the existing situation instead of interpreting and making judgment. Descriptive research design also

allows the researcher to gain a better understanding of the subject matter (Creswell, 2013) and this case; descriptive research enabled the research to gain better understanding on solid waste management enhancement

3.2 Research Approach

There are three main types of research approach, namely qualitative research approach, quantitative research approach and mixed method (qualitative and quantitative) (Creswell, 2013).

A study by Johnson & Onwuegbuzie, (2004) posited that, mainly there are two-broad category of research methods which are widely used and these are quantitative and qualitative methods. However, the study added that, there are instances where both research approaches complement each other and must be used together. In those instances, the researcher adopts the mixed method (quantitative and qualitative research methods). Furthermore, the study described quantitative research as one that is based on how the quantity or amount is measured. It's applicability to the phenomena that can be expressed in terms of quantity. Additionally, the research is concerned with the qualitative phenomenon, which relates to or involve quality or kind. This method is normally used to investigate and understand the behaviors of people and their reasons for such behaviors. Kaplan and Maxwell (1994) are of the view that the goal of understanding a phenomenon from the point of view of the participants and its particular social and institutional context is largely lost when textual data are quantified.

Considering the nature of the objectives and research questions of this study, the study adopted the mixed method (qualitative and quantitative) research approach. The choice of a quantitative research approach lies with the fact that, the researcher seeks to know the level of knowledge, attitude and perception of residents with regards to solid waste management. According to

(Bhattacherjee, 2012), quantitative research is associated with the measuring of numerical data, testing of hypothesis and generalization of data. Furthermore, a study by Burns and Grooves, (2005) reported that, a quantitative research approach or strategy is a formal approach as well as an objective and systematic process by which a researcher uses numerical data to obtain information about a subject matter.

The choice of a qualitative approach is that, it allows the researcher to explore while describing how solid waste management could be enhanced by looking at the management of solid waste, the challenges hindering effective solid waste management and factors that enhance solid waste management.

3.3 Study Population

Population has been popularly defined by Fowler, (2013) as the entire group of persons or objects within a specific location or to which the researcher may be interested in generalizing their findings on a subject matter. The population for this study consists of the residents of Ayawaso central sub metro and selected staff of the sub metro office

3.4 Sample Size

Sample size according to the Fowler, (2013) refers to a subset of the total population under consideration by the researcher from which data will be collected and analyzed. Fowler further posited that, responses and findings of the sample size is usually projected to reflect the entire population as such the sample size should be representative of the population. This is to ensure the accuracy of the findings especially within a quantitative research perspective. Therefore, the sample size for this study was made up of 20 respondents; consisting of 10 Staff of AMA and 10 residents.

3.5 Sampling Technique

The study adopted the purposive and random sampling techniques to select participants from whom data was collected. Purposive sampling according to Ritchie, Lewis, Nicholls & Ormston (2013), involves selecting participants who had the key characteristics or elements with the potential of giving out the right information available for the study.The choice of a purposive sampling technique is that, it allowed the researcher to target key participants who deal directly with issues of solid waste management at the AMA. It is believed that, these participants have all the necessary key information needed with regards to how solid waste management is carried out, the challenges and factors that could enhance it.

The random sampling method was used to select residents in the various communities included in this study. The choice of the random sampling technique is to ensure that, each resident has an equal chance of being part of the study thereby avoiding issues of biasness.

3.6 Source of Data and Instrumentation

The main source of data for this study was a primary source which was obtained through the use of questionnaire and interview guide.

The instrumentation used to collect data from the field were interview guide and questionnaire. The questionnaire contained both opened and closed-ended questions. This is to ensure that, respondents are able to express themselves on the issues on the questionnaire. The interview guide allowed the respondents to express themselves or opinions on the subject matter.

3.7 Data Collection Procedure

Data was collected over a two-weeks period. The choice of a two-week period was due to the busy schedules of participants of the various communities included in this study. Data was mainly collected during the break periods where participants were on break, thereby becoming less busy to be engaged. Staff of AMA were most engaged and interviewed during their lunch breaks. The residents were contacted in their homes and questionnaire distributed to them to fill. Those who were busy were given two weeks to finish up after which the researcher went to collect the answered questionnaire.

3.8 Data Analysis

Due to the nature of the study, data obtained from the field through questionnaire was analysed quantitatively. Data obtained was analysed using Statistical Package for the Social Sciences (SPSS) v 20. This tool is adequate and efficient in analysing data quantitatively. Based on the objectives and research questions for this study, some of the analyses conducted included descriptive analysis and frequency analysis

Furthermore, results obtained from the data analysis were presented in tables and chart formats. Charts and tables helped the researcher summarize the findings into meaningful formats for easy understanding.

3.9 Ethical Consideration

This part focuses on the respect of intellectual property and integrity in relation to this research. It also talks about how to ensure quality, confidentiality, honesty, and respect. This starts with general ethical considerations, the right to the analysis of the moral principles adopted to provide anonymity to the respondents.

To satisfy the ethical consideration of the study, the researcher obtained an introductory letter from the Department of Public Administration and Health Services Management, of the University of Ghana Business School. This letter was later given to the management of the AMA, as a form of formal introduction, stating the purpose of conducting this study. The researcher again sought permission from the staffs of the institutions to be included in this study. During this period, each respondent was made fully aware of the fact that, they can volunteer to participate in the research without any form of cohesion. They were further assured of their confidentiality and privacy as every response obtained from the study will be treated purely for academic purposes and nothing more. AMA was also assured of getting copies of the findings from the study so as to help them put in measures that will enable them to enhance solid waste management within the Accra Metropolis.

CHAPTER FOUR

ANALYSIS OF DATA

4.1 Introduction

This chapter presents the analysis of the data obtained from the field. Due to the nature of the study, data obtained from the field was quantitatively analyzed using SPSS v.20. Results were presented in tables and charts format. Some of the analyses conducted in this chapter include descriptive and frequencies. The chapter is further divided into four (4) sub-topics namely, demographic data, attitudes and perceptions on solid waste management, challenges hindering solid waste management and factors that improve solid waste management.

4.2 Demographic Data

This section presents the demographic characteristics of the participants included in this study. The demographic data obtained include gender and educational background.

Figure 1 shows the gender status of the participants included in this study. The study ensured that equal numbers of male and female participants were included in the study; therefore, as shown on the figure, the male participants were 50% as were the female participants.

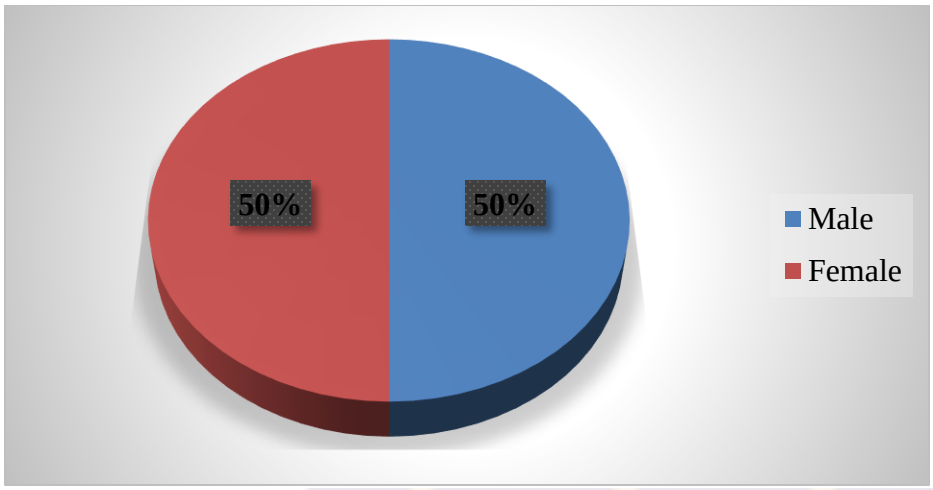


Figure 1: Gender Status of Participants

Source: Field Data, 2018

Further investigation into the educational background of the participants also revealed that, majority of the respondents living in the areas of study had attained SHS/Ordinary Level as their highest educational qualification and this was confirmed by 50% as shown on Figure 2. The chart also showed that, 30% had attained JHS education as their highest education with only 20% having attained tertiary education as their highest educational qualification.

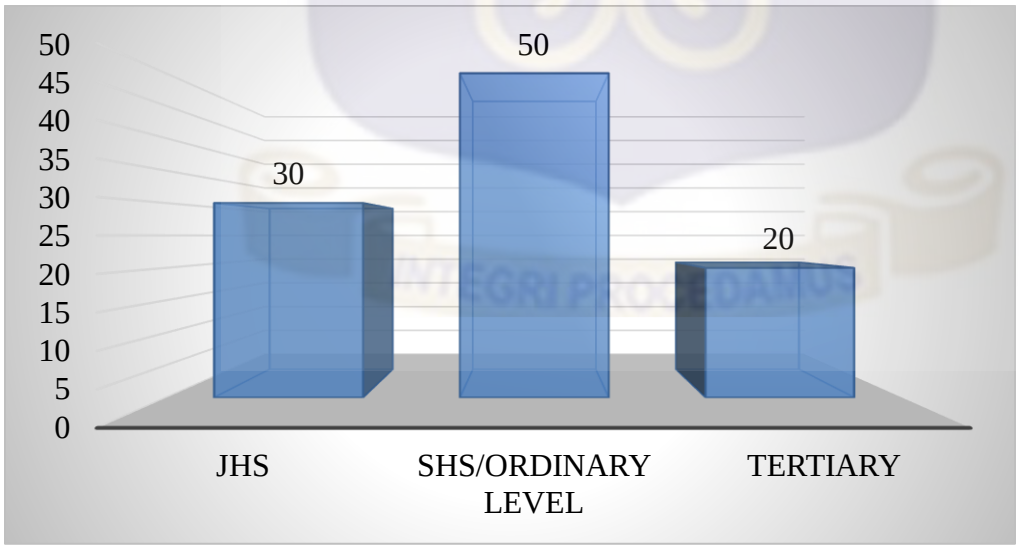


Figure 2: Educational Qualification of Residents

Source: Field Data, 2018

4.3 Knowledge of Sanitation

This section investigated the level of knowledge on sanitation among residents within the selected areas included in this study. To achieve this, each was subjected to a series of questions and their responses were used to answer the objectives of the study.

Interacting with the residents, it was found that the level of knowledge on what sanitation was was high as most of them were able to state clearly that, it involves cleaning one's surroundings. They further added that, it includes the cleaning exercises such as cleaning of gutters, cleaning the surroundings, clearing weeds and so on. However, there were some who exhibited an average knowledge of sanitation.

Further interaction also revealed that, the main source of information on sanitation among the residents included in this study included school, friends and relatives who educated them, advised them and trained them on keeping their surroundings and homes clean.

4.4 Attitudes and Perception on Solid Waste Management

This section investigates the perception and attitudes of residents living in the study area with regards to solid waste management. To achieve this, each resident was subjected to a series of questions and their responses used to realize the objectives of the study.

Interacting with the residents to find out their opinion on who they believe is responsible for the cleaning of the surroundings in which they live revealed that, majority of them as shown on Table 1 were of the belief that, it is the sole responsibility of the Accra Metropolitan Assembly (AMA) to clean their surroundings for them. This was confirmed by 50% who responded

"AMA" as shown on Table 1. Furthermore, the Table also showed 40% believed it was the responsibility of both individuals living in the surroundings and the AMA, while only 10% were of the belief it was the responsibility of the individuals living in the surroundings to clean their surroundings.

Table 1: Persons Responsible for Cleaning Surroundings

	Frequency	Percent
Individual	1	10
AMA	5	50
Both	4	40
total	10	100

Source: Field Data, 2018

The study further sought the opinion of the residents on whether it was appropriate for them to clean their own surroundings. Interacting with them, it was revealed that, 60% responded "Yes" to give the indication that, it was appropriate for them to clean their own surroundings while another 40% believed otherwise, thereby responding "No".

A follow up question requiring those who responded "No" to give the reasons for their assertion revealed that, most of them were of the belief that, the AMA collects taxes from the residents, therefore, it is a form of payment for them to clean the surroundings of the residents. Some other reasons given by the respondents include the fact that, residents do not have the necessary sanitation equipment and tools (such as, waste bins, trucks, etc.) to enable them clean their surroundings and since the AMA has these tools at their disposal, it is appropriate for them to clean these surroundings. Some of the responses include

"They may need sanitation equipment and tools to enable them to do the cleaning (such as waste bins, trucks, etc) to convey the refuse collected"

Respondent 5

"AMA collects borla money and taxes from the residents, therefore, they should be the ones to clean the surroundings"

Respondent 3

The study further sought the opinion of the residents on whether they had any chance of educating their households on keeping a proper sanitation in their surroundings. From their responses it can be concluded that, majority of them representing 70% responded "No" to give the indication that, they do not get the chance of educating their households on the need to keep their surroundings clean. However, 30% responded "Yes" to give the implication that, they at least try to education their household members.

Further interaction with those who had the chance to educate their household revealed that, some of the education they give to their family members include

"Not littering around and open defecation"

Respondent 4

"not throwing rubbish in the gutters"

Respondent 5

The study again investigated the mode of disposal of rubbish practiced by the residents of the selected areas. To achieve this, each resident was asked to state how they disposed their rubbish. As shown on Figure 3 below, it can be concluded that most of them patronized the services of

private contractors such as Zoomlion to dispose their rubbish. This was confirmed by 60% while 40% patronized AMA facilities and Services

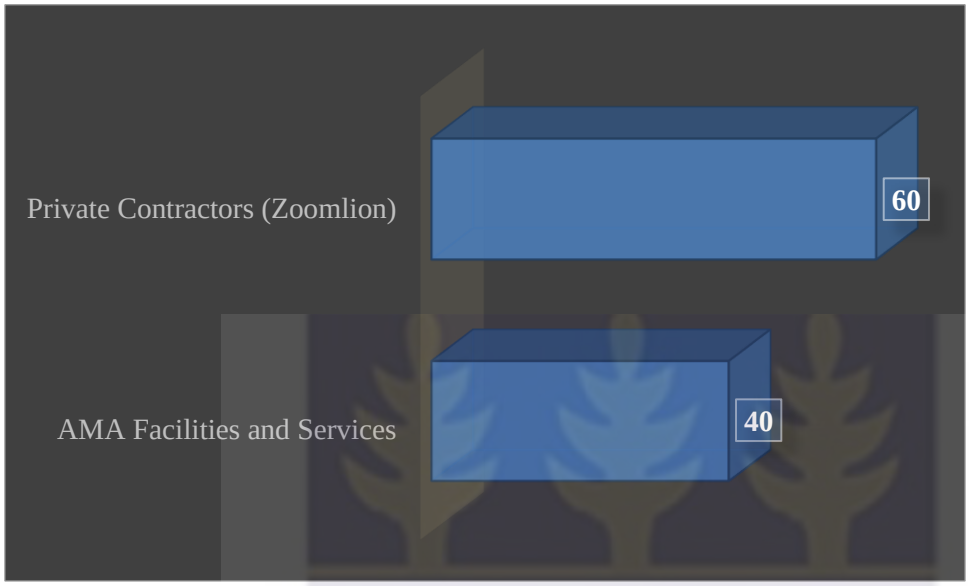


Figure 3: Mode of Refuse Disposal

Finally, investigating the kind of toilet facilities used by the residents revealed that, most of them representing 70% had toilet facilities in their homes while 20% patronized public toilets. However, 10% of the residents said they are usually forced to use the nearby bushes whenever they need to ease themselves.

In summary, it can be concluded that, generally despite the level of knowledge of sanitation was high among residents of the communities included in this study and also being aware of the environmental problems associated with indiscriminate dumping of rubbish anywhere, most of them did not care where their wastes were illegally dumped or taken to an approved site for disposal. Generally, the attitude and perceptions towards dumping of rubbish and who is responsible for cleaning their own surroundings was not good as most of them believed it was

the responsibility of the AMA to come and collect rubbish they had dumped in their own surroundings.

The results show that 57.4% of the respondents were aware about the environmental problems associated with indiscriminate dumping but do not care whether their wastes are dumped illegally or taken to an approved disposal site, provided that it is taken out of their immediate neighbourhood . Finally the results show that policies influence effective solid waste management, however there are shortfalls in the legislation which have led to limited human and financial capacity to enforce legislation and an uncoordinated enforcement by NEMA and the Council without clear defined roles and responsibilities.

4.5 Management of Solid Waste

This section investigates the management of solid waste by the AMA. Interacting with the officials at the Assembly, it was revealed that land sites were main disposal areas used by the Assembly in disposing any form of refuse collected from the communities in Accra.

> *"We mostly use land sites for disposing rubbish collected from the communities".*

> *"the final stage of solid waste disposal is usually done at land sites"*

Further interaction also revealed that, when solid wastes are acquired or collected from the communities, the main treatment given to it is compositing or land refill. This was confirmed by all the staff of AMA included in this study.

The study also revealed that, most of the staff claimed compositing or land refills was done every day as and when refuse was collected from the community. According to them, refuse is collected 5 times in a week and every community is given a day to collect their rubbish. After the collection of the refuse, it is sent to the dumping sites for compositing.

4.6 Challenges Hindering Solid Waste Management

This section investigated the challenges hindering the proper management of solid waste. To achieve this, the study sought the opinion of Staff of the AMA who are responsible for the management of solid wastes within the Accra metropolis.

Interacting with the officials, it was revealed using land site method of waste disposal attracted a number of challenges. Most critical of these challenges was shortage of land site for disposal of refuse. Interacting with the officials, majority of them recounted several instances where as a result of shortage of land sites to dispose their refuse, they failed to collect refuse from the community for a number of weeks and this caused a stir among the residents of these communities. Some of the responses made include

> *"Yeah, the AMA uses land sites as the main site of disposing our solid waste, but this brings a lot of problems to us especially in instances where there is shortage of land sites to dispose refuse"*
>
> Respondent: Staff 2

"As a result of shortage of land sites, we couldn't collect rubbish or refuse from the community for about three weeks and this caused a lot of complaints among the residents of these communities"

Respondent: Staff 1

Interacting further, it was also revealed that, aside the shortage of land sites, the AMA does have adequate equipment and tools to enable them work effectively. Others also recounted that, some of the equipment are rusted or outmoded and were not in good conditions for work and this hinders the AMA from managing solid waste effectively. In effect, it can be concluded, the main challenges hindering AMA were shortage of land sites and lack of logistics to effectively manage solid wastes.

4.7 Factors to Improve Solid Waste Management

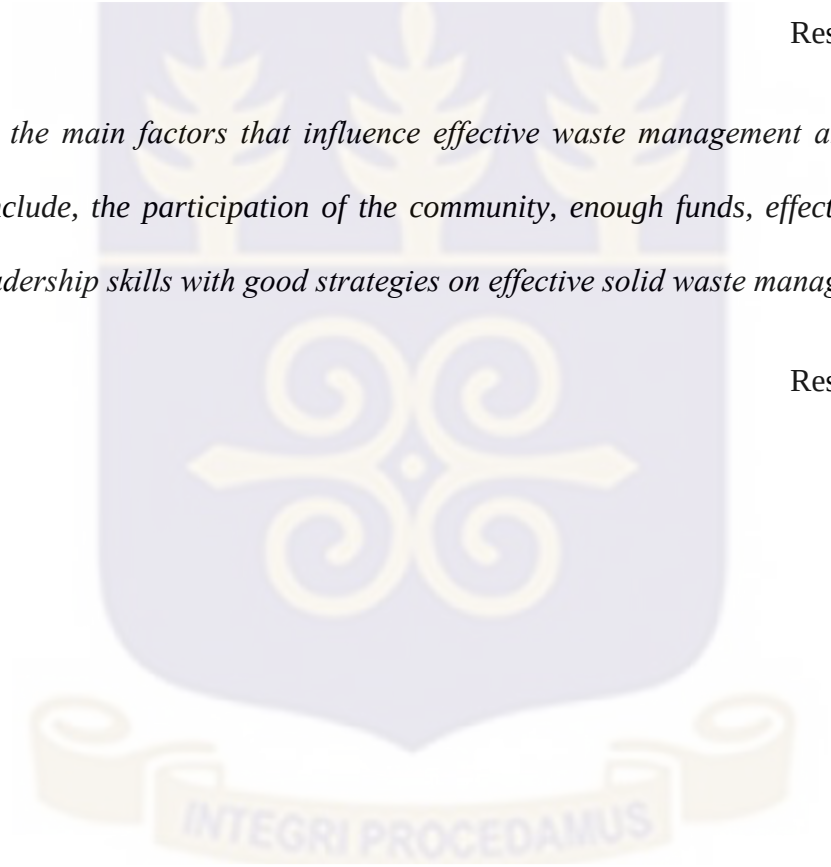
Interacting with the officials, it was revealed that, the main factor that influenced solid waste management at the department negatively, was lack of understanding of the managerial aspect with regards to solid waste management. According to them, the strategies adopted by managers were not effective in managing solid waste collected from the communities. Therefore, there is the need to look at the improvement in strategies used in solid waste management and this includes the looking at the managerial aspect.

Another factor which according to the officials could help to enhance solid waste management was the use of technology. According to them, technology was critical especially since it has been tried and tested in developed countries and now working perfectly. They were of the belief that, adopting technology will aid in enhancing solid waste management. Other critical factor

that could enhance solid waste management was availability of adequate funds, community participations and effective policies affecting solid waste management. some of the responses made by the officials include

> *"I think we need to adopt technology for managing solid waste, after all, many developing countries like the USA have adopted it and it is now working perfectly for them"*
>
> Respondent: Staff 9

> *"I think the main factors that influence effective waste management and I mean solid waste include, the participation of the community, enough funds, effective policies and good leadership skills with good strategies on effective solid waste management"*
>
> Respondent: Staff 7



CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1Introduction

This chapter presents the summary of the study and the conclusion of the study which was based on the findings and discussion of the study. It also presents the recommendations of the study which was also based on findings and conclusion of the study.

5.2Summary of the study

The findings revealed that the level of knowledge in sanitation was generally high among residents as most believed it involved cleaning one's surroundings and home and it also includes every member in the community taking part in the cleaning exercise. The finding also revealed that, the main source of information with regards to sanitation or cleanliness being from school, friends and relatives who advised them to keep their surroundings clean always to avoid environmental problems such as sickness and so on.

The findings also revealed that, perception and attitudes of residents was generally bad as most of them did not consider themselves as the people responsible for collecting or cleaning their own surroundings. Additionally, the study also revealed that, the reason for this assertion by the residents included the fact that, AMA collects "borla" fees and taxes from them and therefore, it become their responsibility to ensure the surroundings of the residents or community is always clean.

The study again revealed that, aside the AMA who were responsible for the collection of rubbish in the community, other residents also patronized the services of private contractors such as Zoomlion to get their rubbish collected. It was also revealed that, at least toilet facilities were in the houses of the residents, however, there only a few who patronized public toilets while

another handful also preferred to use nearby bushes to ease themselves and this is as a result of lack of toilet facilities in their homes.

It also revealed that, management of solid waste was done by AMA on behalf of the various communities included in this study. Landfill sites was the main site for refuse disposal with compositing or land refill being the main treatment given to solid wastes collected from the communities.

The use of landfill sites and compositing or land refills posed a number of challenges including shortage of land sites for disposals of refuse and this usually leads to AMA refusing to collect refuse from the communities for a number of weeks until they have a place for disposal of their refuses. It also revealed that, other challenges that hindered the effective solid waste management was lack of logistics such as tricycles and other equipment necessary for collecting and dumping rubbish.

Finally, the findings revealed that, in as much as these challenges abound and hinders effective solid waste managements within the Accra metropolis, there are some factors that could enhance effective management of solid waste in the system. Factors such as management style, effective strategies and policies, adequate logistics, adequate funds and the use of technology were critical to enhancing solid waste management.

5.3 CONCLUSION

Based on the findings, it can be concluded that, generally, people have the wrong perception and attitude towards sanitation. They may be aware of the consequences but did not care and also did not believe they were responsible for their own mess. It can also be concluded that, as a result of lack of proper solid waste management, there is constant shortage of land sites for disposal of

refuse and this affects the communities as most residents do not get their rubbish collected for weeks.

It can again be concluded that, the AMA works with outmoded equipment and also lack all the necessary logistics to ensure effective management of solid waste. Based on the findings, it can be concluded that, AMA prefers to decompose its solid waste instead of recycling.

Finally, it can be concluded that, factors such as technology, adequate funds, logistics such as equipment, strategies, policies were all critical factors to enhancing solid waste management.

5.4 RECOMMENDATIONS

Based on the findings and conclusion, the study suggests the following recommendations;

1. There is the need for government support fully to ensure effective solid waste management in the country. The government needs to show commitment to waste management by providing adequate funds and strategies of disposing refuses at various landfill sites.
2. There is the need for government and the Assembly to invest in technology to enhance solid waste management in the country.
3. There is the need for the Assembly to invest in other methods of solid waste treatment. That is, instead of investing in compositing, they should invest in recycling of solid waste and compositing or decomposition of liquid and other forms of waste.