UNIVERSITY OF EDUCATION, WINNEBA

CATEGORIES, GENERATION PRACTICES AND BARRIERS TO SOLID WASTE MANAGEMENT IN KOMENDA EDINA EGUAFO ABIREM MUNICIPALITY IN THE CENTRAL REGION OF GHANA

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DECLARATION

Student's Declaration

I, Bassaw Theophilus Kweku, hereby declare that this thesis with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original research and has not been submitted, either in parts or in whole for another degree in this University or elsewhere.

Signature: …………………………..

Date: …………...................………

Supervisor's Declaration

I hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of dissertation laid down by the University of Education, Winneba.

Name of Supervisor: Dr. Isaac Eshun

Signature: …………………………..

Date: …………...................………

DEDICATION

To my wife, Regina Bassaw; and daughter, Keziah Bassaw

ACKNOWLEDGMENTS

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ABSTRACT

This study examined the generation practices and barriers to solid waste management in the Central Region of Ghana. The case study research design was adopted for the study. Using the simple random sampling procedure, 425 respondents comprising of 380 residents and 45 Zoomlion staff were involved in the study. The data were analysed through the computation of frequencies, percentages, as well as means and standard deviations. The study found out that, rubbish, food waste, and trash were the forms of solid wastes that were generated in the Komenda-Edina-Eguafo-Abrem Municipality. Also, it was realized that, both residents and Zoomlion staff observed a number of solid waste management practices. Again, there were a number of barriers to the effective solid waste management practices. These included inadequate environmental education; inadequate logistics and funds; inadequate depots, skips and dustbins; and apathetic attitude/inertia on the part of some of the residents. The study recommended that the Environmental Protection Agency (EPA), and the Assembly should ensure that, the various households provide separate bins to sort out the types of solid waste (e.g. glass, paper, plastic, and rubber). Also, it is recommended that, the Environmental Protection Agency (EPA) and the Assembly should organize education/training programmes on solid waste management on the need to reduce, reuse and recycle solid waste so that they can appreciate the need for sustainable development practices. Again, the Assembly should conduct regular monitoring system in order to ensure that residents adhere to the solid waste management practices. The Assembly should also make available a reliable data on solid waste generation for households in the Municipality.

CHAPTER ONE

INTRODUCTION

This chapter presents the introductory part of the entire project work. Issues relating to waste, solid wastes, and solid waste management including the categories, generation practices and barriers to solid waste management have been discussed. The chapter also presents subsections like the background to the study, statement of the problem, purpose of the study, research questions, significance of the study, delimitations, limitations as well as organisation of the study.

1.1   Background to the Study

Waste is any unwanted and economically unusable by-products or residuals at any given place and time, and any other matter that may be discarded accidentally or otherwise into the environment (Gilpin, 2016). It has also been referred to as the unwanted materials arising entirely from human activities which are discarded into the environment (Palmer, 2014). This understanding of what waste is led to the disposal of all materials considered unwanted. This therefore warranted for another definition of waste which emphasized the resource value of such by-products. Davies (2018) describes wastes as unwanted or unusable materials that emanate from numerous sources from industry and agriculture as well as businesses and households and can be liquid, solid or gaseous in nature, and hazardous or non-hazardous depending on its location and concentration. Davies (2018) explained that what some people consider to be waste materials or substances are considered a source of value by others.

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A number of criteria are usually employed to classify wastes into types. Such classification of waste provides the basis for the development of appropriate management practices. Waste can be classified by physical state (solid, liquid, gaseous). Other ways in which waste is classified is by its primary use (packaging waste, food waste, etc); by material (glass, paper, etc); by physical properties (combustible, compostable, recyclable); by origin (household, commercial, agricultural, industrial, etc.) or by safety level (hazardous, non-hazardous) (White, Scubeler, Wehrle & Christen, 1995). However, this study considers solid waste and solid waste management.

Solid waste has been defined by Zerbeck (2013) as a non-hazardous industrial, commercial and domestic waste including household organic trash, street sweepings, institutional garbage and construction wastes. Enger and Smith (2010) also defined solid waste as all the waste emanating from human and animal activities and are mostly solid but at times liquid that are discarded as unwanted . Charas (2018) on other hand defines solid waste as discarded paper, metals, leftover food, other items that come from business, hospital, airports schools, stores and homes. In a nutshell, solid waste may be defined as any solid material that arises from human activities such as domestic, industrial, commercial, agricultural and others, as well as animal activities that are normally regarded as unwanted.

Growth of population, increasing urbanization, and rising standards of living due to technological innovations have contributed to an increase both in the quantity and variety of solid wastes generated by industrial, mining, domestic and agricultural activities (Yoshizawa, Wu & Liang, 2014). Enger and Smith (2010) observed that the solid waste problem facing the world today is the results of the economic boom that followed World War II. Countries such as the United Kingdom, France and the

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United States of America generated a lot of solid waste in the form of pollution in their respective countries. They observed that United States of America alone produces about 220 million tons of municipal solid waste each year per person per day or 0.73 tons per person per year. Globally, the estimated quantity of solid waste generation was 11 billion tonnes as at year 2010 and about 19 billion tonnes of solid wastes are expected to be generated by the year 2025 (Yoshizawa, Wu & Liang, 2014). A World Bank report on the state of municipal solid waste in 2012 titled ―What a Waste: A Global Review of Solid Waste Management", projected a sharp rise in the amount of garbage generated from urban residents between 2012 and 2025 (World Bank, 2012). The report revealed that the amount of municipal solid waste (MSW) will rise from the current 1.3 billion tons per year to 2.2 billion tons per year by 2025, with much of the increase coming from rapidly growing cities in developing countries. The persistent increase both in the quantity and variety of solid waste necessitated the need for their effective utilization by some countries as one of the ways of managing their solid waste (Asokan, Saxena & Asokeler, 2014), rather than relying on traditional forms such as collection, transportation and disposal.

Solid waste management refers to source separation, storage, collection, transportation and final disposal of waste in an environmentally sustainable manner. In the light of this, solid waste management is an important environmental health service, and an integral part of basic urban services. This is because, poor waste management can have negative consequences on the health conditions of people who are exposed to these unsanitary conditions. Diseases such as cholera, typhoid, dysentery and malaria are all related to the practice of poor waste management (Chen, 2015). This can result in the loss of human resources needed in the development of the country. For instance, the high demand for plastic and/or rubber products, which

are mostly non-biodegradable, have a negative impact on the environment. Such waste could be recycled. However, inadequate knowledge on the impact of such activities on the environment and lack of willingness to pay for Solid Waste Management (SWM) are factors that make recycling a big hurdle to surmount. Waste, especially solid waste is increasingly becoming a menace to society (Caboni & Giudici, 2012).

World Economic Forum (2016) report states that, 32% of global waste, of which 40% is plastic packaging, does not reach, or escapes from, collection systems (UNEP & GRID-Arendal 2016; WEF, 2016). Using South Africa as an example, an estimated 56% of waste is mismanaged, does not enter formal disposal schemes (Jambeck et al. 2015), and can end up on beaches and in the ocean, where it breaks down to form tiny particles of micro-plastics, which are ingested by marine life. The prevailing global methods of production and consumption patterns, as well as waste management and disposal systems drive growing levels of plastic debris (Chen, 2015). In South Africa, as in other African countries, there are high levels of noncompliance at many waste dumps or open and uncontrolled landfills (Jambeck et al. 2015). This results in wind and water-borne waste that can pollute land and water ecosystems. In addition, the cost in many African countries to procuring environmentally friendly products and for disposing effectively of waste, particularly plastics, is prohibitive.

The management of solid waste in our urban communities has become a significant policy issue in the world over. However, some of the greatest challenges to solid waste management are felt most keenly in the developing countries. This irony is based on the gap between the patterns of growth and modernization in the developing world on the one hand, and the capacity to pay for, plan for and

effectively manage solid waste as part of an integrated national system on the other (Thomas–Hope, 2018). Third world countries therefore face particular challenges in the management of solid waste, as in other aspects of environmental management of waste. Thus it is important that greater attention is focused on solid waste management within the wider context of environmental management.

According to Thomas-Hope (2018), thirty to fifty percent of the population of developing countries is urban and produces a disproportionately high volume of waste. Thousands of tons of solid waste are generated daily in Africa. Most of it ends up in open dumps and wetlands, contaminating surface and ground water and posing major health hazards. Generation rates, available only for select cities and regions, are approximately 0.5 kilograms per person per day, and in some cases reaching as high as 0.8 kilograms per person per day. While this may seem modest compared to the 1-2 kg per person per day generated in developed countries, most waste in Africa is not collected by municipal collection systems because of poor management, fiscal irresponsibility or malfeasance, equipment failure, or inadequate waste management and budgets. Throughout most of sub-Saharan Africa solid waste generation exceeds collection capacity. This is in part due to rapid urban population growth: while only 35 percent of the sub-Saharan population lives in urban areas, the urban population grew by 150 percent between 1970 and 1990. But the problem of growing demand is compounded by broken-down collection trucks and poor program management and design. In West African cities, about 70 percent of refuse trucks are always out of service at any one time, and in 1999 the City of Harare failed to collect refuse from nearly all of its residents because only 7 of its 90 trucks were operational.

Ghana, like most developing countries faces the continuing challenge of increased solid waste generation due to population growth, rising incomes and increasing urbanization. Currently, Ghana has an estimated population of 30 million and generates about 4.5million metric tons of solid waste a year. This was made clear by Zoomlion Ghana Limited during a presentation at the UN conference on building partnerships for moving towards zero waste (Agyapong, 2016). The presentation further highlighted the fact that both amount and complexity of waste are increasing in Ghana. The emergence of plastics, polyethylene and Styrofoam products in domestic and commercial waste has given a new dimension to the waste management problem. The rising standard of living in Ghana for example has moved people from the use of environmentally friendly and biodegradable materials such as straw mattresses, paper carrier bags, _leave wrappers', cane settees and stools to more sophisticated substitutes. Form mattresses, plastic chairs, polyethylene materials are widely in use. The extent of their usage and the indiscriminate and irresponsible disposal of these non-degradable materials has contributed immensely to the environmental hazards for mosquitoes and other vermins.

The Environmental Protection Agency and the World Bank (as cited in Agyapong, 2016) noted that in the city of Accra alone, an estimated 89 per cent of the population have no home garbage collection. Similar conditions exist in many other cities including Komenda and Elmina. Ngnikam (as cited in Mensah, 2016) noted that only 11 percent of the 1.4 million people benefit from home collection of solid waste in Accra, the capital of Ghana. Here, as in many other cities, the uncollected waste is illegally dumped in open spaces, water bodies, storm-drainage channels, buried, burnt or deposited along the streets or roadsides. A survey carried out in low income high density population areas in 365,550 households in Accra revealed only 41 per cent of

these households have solid waste disposal facilities provided in or around their houses (Ghana Statistical Service, 2014). Residents at Chorkor for instance, with a population of 45,379 (Ghana Statistical Service, 2014) have only two collection points where each of these points has two old containers. These are filled to the brim in the early hours of the morning. In the absence of attendants, garbage is left there and accumulates on the ground. One cannot help but be overcome by the strong stenches emanating from the open gutters and heaps of garbage, visible along drains and streets, in the neighbourhoods, schools and commercial places. Similar situation exists in Komenda-Edina –Eguafo-Abrem Municipality. These issues led to the identification and formulation of the problem statement for this research.

1.2   Statement of the Problem

In an era of sustainable development with fast growing concern about threats to environmental quality and increasing pressures on natural resources, there is the need to minimize waste generation. Generation of solid waste is not a new phenomenon. The major constituents of solid waste were domestic wastes and agricultural residues which are both biodegradable. Solid waste could be conveniently disposed of on ground or in pits covered with layers of earth. However, since 1960s, not only has the quantity of solid waste increased but its quality has also changed globally as a result of rapid urbanization, increasing industrialization and rising incomes (World Bank, 2012). Though rural wastes continue to be mainly agricultural wastes, those from urban areas and the industrial units contain diverse types of materials which include toxic and hazardous materials. Solid waste management is therefore a critical challenge facing all of the world's cities. The solid waste includes glass, paper, plastic, metal and other organic materials.

In Ghana, the increasingly growing population and its associated increase in urbanization and economic activities have made the impact of the municipal solid waste very noticeable. The urban areas of Accra produce about 760,000 tons of municipal solid waste (MSW) per year or approximately 2000 metric tons per day (Government of Ghana, 2016). EPA report, by 2025, this figure is expected to double. Solid waste disposal is becoming problematic. This situation therefore leads to worsening solid waste management problems in urban settlements in particular. Municipal and Metropolitan authorities as well as institutions and households seem unable to organize adequate collection and safe disposal of solid waste. Hence, wastes are left uncollected and posing threats to public health and the environment (Oteng-Ababio, 2010). A walk within town reveals visible solid waste problems such as garbage accumulation, littering and open burning. The situation in the Central Region of Ghana is not any different as Municipal Solid Waste generated from commercial and domestic sources has been increasing steadily. Yet, literature on the amount of solid waste generated and its management in the Central Region of Ghana is virtually in extinct, and this study seeks to unravel this phenomenon and fill this gap.

Also, several studies have been conducted on residential waste management. For instance, Donkoh (2016) conducted an assessment of solid waste recycling as a means of improving environmental quality in Accra Metropolitan area; Korley and Fianko (2017) examined solid waste management in households in the Sekondi-Takoradi Metropolis of Ghana; and Puopiel (2010) worked on solid waste management in Ghana and focused on the Tamale Metropolitan area. In addition, Baidoo (2017) assessed municipal solid waste management in Mankessim in the Mfantseman municipality; Songsore and McGranahan's (1996) worked on Women and Household Environmental Care in the Greater Accra Metropolitan Area and

Oteng-Ababio (2010) worked on Solid Waste Management in Ghana -Beneficiaries Willingness to Pay for Improved Services. This study was conducted in order to find out if indeed the findings of some of these studies are still relevant.

While institutions in the developed countries have put in place waste recovery system which enable them to gain economically from adding value to waste resources, institutions in most developing countries continue to incur cost in the collection and disposal of waste. For instance, in 2012, Washington State University (WSU) was able to divert 98% of the waste generated and in 2015, 99.9% of waste generated was diverted from landfills through its recycling programs (WRAP, 2013). Hence, institutions in developing countries not only lose the benefits that come from adding value to these waste resources, they pollute the environment and incur cost in the areas of collection and disposal. This backs Johannessen and Boyer's (2009) observation that, SWM practices that aim at maximizing the yield of valuable products from waste, as well as minimizing the environmental effects have had little or no consideration in Africa. These observations are not different in Ghana. At the national, municipal or institutional levels, steps are not taken to separate waste from source for value addition.

The management of solid waste has evolved over time. It has gone through many transitions as technology continues to evolve. Even in recent times, new methods and approaches are emerging as best practices of managing solid waste. Earlier, some of the common practices used in managing the final disposal of solid waste were dumping in water, on land, gullies and mining pits; ploughing into the soil; reduction and incineration (Tchobanoglous et al., 2013). This implies that when waste is produced it is first stored. Then it is collected and finally transported to landfill sites for disposal. Also, when waste is collected it can be transferred from

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small collection equipment like the tricycle to a bigger truck for final disposal. There were many hazards that were associated with these forms of practices and there was a paradigm shift to other best practices. However, in modern times, there are a number of existing strategies, technologies and procedures employed in different parts of the world for waste management. Puopiel (2010) affirms that waste generated can be processed and recovered for materials to be reused.

Developing countries including Ghana are lagging behind in terms of best solid waste management practices. For instance, Momoh and Oladebeye (2010) found that some of the common practices of solid waste disposal of some hotels in Nigeria included burning of solid waste and dumping of waste at unauthorized refuse sites. The Government of Ghana has collaborated with various recycling companies such as Zoomlion Ghana Limited, Blowplast and Jospong Group of Companies to collect, sort, process and recycle solid and liquid waste (Puopiel, 2010). The essence is to use them in the production of recycled products such as: organic manure, rubber sandals and polythene bags. But what is unknown is how the people of Central Region and for that matter Komenda-Edina-Eguafo-Abrem (KEEA) Municipality manage their solid wastes. Do they patronize the services of the waste management companies listed earlier? Do they resort to burning, storage and dumping of solid waste at refuse sites? What waste management plan is being implemented in the Central Region, specifically, KEEA Municipality of Ghana? These questions have necessitated this study to be carried out in order to investigate solid waste management practices in the Central Region of Ghana.

1.3 Purpose of the Study

The main objective of the study was to examine generation practices and barriers to solid waste management in the Central Region of Ghana.

1.4 Objectives of the Study

The study was guided by the following specific objectives:

1. Examine the categories of solid waste generated in the Komenda-Edina-Eguafo-Abrem Municipality.

2. Determine the solid waste management practices in the Komenda-Edina-Eguafo-Abrem Municipality.

3. Identify the barriers to effective solid waste management in the Komenda-Edina-Eguafo-Abrem Municipality.

4. Examine solid waste management action plan for sustainable development in the Komenda-Edina-Eguafo-Abrem Municipality.

5. Evaluate the effectiveness of environmental management policies and practices of solid waste management in the Komenda-Edina-Eguafo-Abrem Municipality.

1.5 Research Questions

The study is guided by the following research questions:

1. What categories of solid wastes are generated in the Komenda-Edina-Eguafo-Abrem Municipality?

2. What are the solid waste management practices in the Komenda-Edina-Eguafo-Abrem Municipality?

3. What are the barriers to effective solid waste management in the Komenda-Edina-Eguafo-Abrem Municipality?

4. What is the waste management action plan for sustainable development in the Komenda-Edina-Eguafo-Abrem Municipality?

5. What are the effectiveness of the environmental management policies and practices of solid waste management in the Komenda-Edina-Eguafo-Abrem Municipality?

1.6   Significance of the Study

This study would be of importance to stakeholders in numerous ways. Firstly, the findings of this study will save individuals, institutions and the nation at large from the cost involved in waste management as well as the huge sums of money that is spent on health problems associated with improper management of waste. This is because; the poor management of municipal solid waste has been shown to have negative effects on human health and the environment. For instance, an outbreak in cholera in Ghana in 2014 claimed 128 lives (Dotse, 2014) and improper waste management has been identified as a major cause. All efforts to avert such out-break and ensure proper waste management are therefore important. In addition, substantial amounts of scarce resources are spent on waste management. In these circumstances, there is the need to assess the current waste management system for the purposes of proposing ways to improve the current systems to meet the needs of the ever increasing rates of waste generation which accompanies population growth.

The study will also make an important contribution to knowledge by providing information on the current state of solid waste management systems. It will also provide information on challenges facing various stakeholders involved in the waste management chain and ways of addressing those challenges. The study will also serve as a useful reference material for the management of solid waste, to the authorities of waste management such as: Ministry of Environment, Science and Technology;

Metropolitan Municipal and District Assemblies (MMDAs) and private sector establishments such as Zoomlion Company Ltd to adopt pragmatic approaches in waste management. Additionally, to future researchers, the study will contribute to existing body of knowledge on solid waste management and also stimulate further research on the subject in other Metropolitan Areas and Municipalities.

1.7   Delimitation of the Study

Geographically, the study was conducted in Komenda-Edina-Eguafo-Abrem Municipality in the Central Region of Ghana. The study sought to examine the generation practices and barriers to solid waste management in the Komenda-Edina-Eguafo-Abrem Municipality. Specifically, the study sought to examine the categories of solid waste generated; determine the solid waste management practices in the KEEA Municipality; identify the barriers to effective solid waste management; examine solid waste management action plan for sustainable development; and evaluate the effectiveness of environmental management policies and practices of solid waste management in the Komenda-Edina-Eguafo-Abrem Municipality. The behavioural change model, environmentally responsible behavior (ERB), and strategic choice theory constituted the theoretical bases for the study.

1.8   Limitations of the Study

Every study is bound to be faced with imposed restrictions and this study was not an exception. First and foremost, this study adopted the questionnaire and challenges emanated from this source. For instance, some of the items were not answered and even some of the questionnaires were not returned. Also, the questionnaire limited the responses that respondents provided compared with that of interview which is more flexible. Again, some of the respondents were reluctant to

involve themselves in the study. However, the researcher assured them of their confidentiality and anonymity. With this, the questionnaires were coded and the names of the respondents were not used in any part of the study. Again, the case study research design was adopted and this hindered the study from being generalized to other areas in the country.

1.9   Organisation of the Study

The study was organised into five chapters. Chapter One considers the background to the study, statement of the problem, purpose of the study, research questions, significance of the study, delimitations of the study, limitations of the study, and organisation of the study. Chapter Two presents an in-depth review of relevant literature. Chapter Three discusses the methodology. This includes the study design, population, sampling technique, research instruments, data collection procedure as well as data analysis. Chapter Four focuses on the discussion of field data and findings. The implications of results are discussed in relation to the research questions stated in the study. Chapter Five, the final chapter presents a summary of the findings of the research and conclusions. It further provides recommendations for improvement and suggests areas for further research.

CHAPTER TWO

LITERATURE REVIEW

2.0   Introduction

This chapter considered the theoretical and conceptual components of research related to the study. Works were reviewed from secondary sources such as the internet, journals and other related research works. Theoretically, the behavioural change model constituted the theoretical basis for the study. Also, the concept of waste and solid waste, sources and types of solid waste, the concept of solid waste management, solid waste management processes, solid waste management practices, early practices of solid waste management, contemporary solid waste management practices, environmental management policies and practices, problems of managing solid waste, impact of solid waste management were considered under the conceptual review. The Chapter concludes with an empirical review.

2.1   Theoretical Review

2.1.1   Behavioural change model

This reasoning was directly associated with the supposition that if people were better informed, they would become more aware of environmental problems and consequently, would be motivated to behave in an environmentally responsible manner. Many other similar models, as will be discussed subsequently, linked knowledge to attitudes and attitudes to behaviour. Thus, as evident in Figure 1, when knowledge increases, environmentally favourable attitudes that lead to responsible environmental actions are developed (Hungerford, 1990). Figure 1 illustrates the relationships emanating from the models proposed at that time (Boudreau, 2010).

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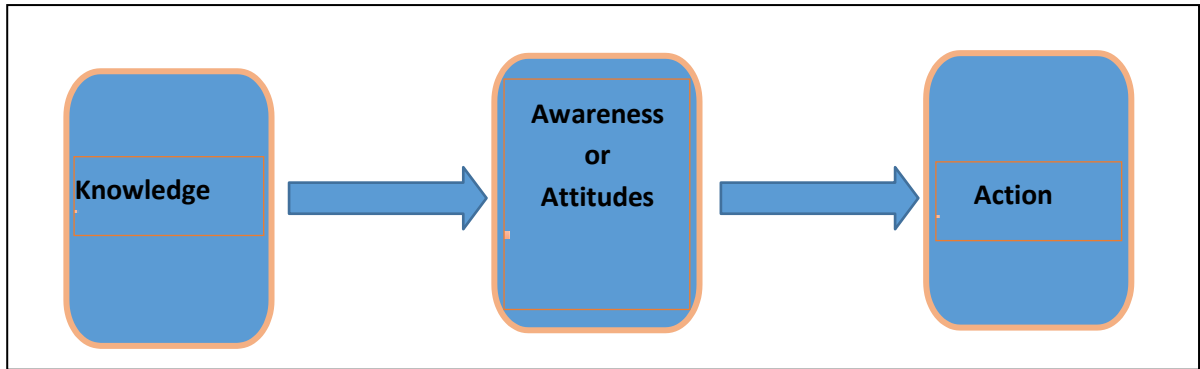
Figure 2.1: Behavioural change model (Hungerford, 1990).

Nevertheless, ulterior research refuted the arguments of those that saw the principles of human behavioural change in this model. As a result of this, the legitimacy of such simplistic linear model was not recognized or supported for a long time (Hungerford, 1990). Researchers then focused their attention on a hypothesis that they would quickly verify and accept over the course of the following years: that a multitude of variables interact in different degrees to influence the embracing of environmentally responsible behaviour.

The behavioural model, though very simplistic, provides a base for the consideration of possible relationship existing between environmental knowledge, environmental awareness and attitude and how these can translate to action or inaction. A good knowledge of environmental variables may not necessarily imply good and sustainable environmental behavior. On the other hand, lack of environmental knowledge or awareness may also not necessarily imply a poor environmental practice. Therefore other intervening factors like the Locus of control, intention to act and personal responsibility need to be considered. While a line of possible relationship can be deciphered through this model, reality is far more complex than this linear trend, hence a more advanced model, incorporating this line of relationship is needed to offer a succinct explanation of the

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interacting variables of human behavior in environmental preservation.

2.2 The Concept of Waste

Waste is more easily recognised than defined. Key issues in the definition of waste are unwanted or surplus substances and that cause environmental and health impacts. Gourlay (1992) cited in Freduah (2014) explains that something can become waste when it is no longer useful to the owner or it is used and fails to perform its purpose. Read (2009), defines waste as any substance, which constitutes scrap material or an effluent, or other unwanted surplus substances arising from the application of a process, or any substance or article, which requires to be disposed of as being broken, worn out, contaminated or otherwise spoiled. Waste can be liquid, gaseous or solid.

According to the European Environmental Protection Act (1990), waste is any substance, which constitutes scrap material or any effluent or other unwanted surplus substance arising from the application of a process, or any substance or article, which requires to be disposed of as being broken, worn out, contaminated or otherwise spoiled. Gilpin (2016) provides a more concise definition of the term waste. According to him, the concept of waste is defined as all unwanted and economically unusable by- products or residuals at any given place and time, and any other matter that may be discarded accidentally or otherwise into the environment. Palmer (2014) argues that an item becomes waste when the owner does not wish to take further responsibility for it. Palmer (2014) further suggests that any substance that is without an owner is waste. Gilpin (2016) also suggests that what constitutes waste must occur in such a volume, concentration, constituency or manner as to cause a significant alteration in the environment. Davies (2018) explains waste as an unwanted or

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unusable material that emanates from numerous sources from industry and agriculture as well as business and households and can be liquid, solid or gaseous in nature, and hazardous or non-hazardous depending on its location and concentration. Thus, apart from waste being an unwanted substance that is discarded, its impact on the environment as well as the health risk should be taken into consideration in the definition of waste.

According to the United Nations Environmental Programme (2015), wastes are materials that are not prime products (that is products produced for the market) for which the generator has no further use in terms of his/her own purposes of production, transformation or consumption, and of which he/she wants to dispose (UNEP). Waste is classified into categories such as industrial waste, household waste, municipal waste and liquid waste. Household waste is waste generated through the activities of production and consumption in the home. Household waste is a constituent of municipal waste. Municipal solid waste (MSW) is a term usually applied to a heterogeneous collection of wastes produced in urban areas, the nature of which varies from region to region (UNEP, 2015).

Tsiboe and Marbell (2014) indicate that waste in whatever form or classification-solid, liquid or toxic have become a major consequence of modernization and economic development. Westernization and the western style of living failed to budget for the problems related to the management of waste in general. For the purposes of this study my focus is on solid waste and this will be vividly discussed in the next section of the review.

2.3   The Concept of Solid Waste

The concept under study has varied definitions by various scholars. The United States Environmental Protection Agency (US EPA, 2008) defines it as something composed of garbage and rubbish, which normally originates in a private home or apartment house... may contain a significant amount of toxic or hazardous waste. According to the US EPA (2008), hazardous wastes can be liquids, solids, contained gases, or sludge and can be the by-products of manufacturing processes or simply discarded commercial products like cleaning fluids or pesticides. In the ―Environmental Sanitation Policy" document (1999) the EPA opined that solid wastes comprise all solid waste material generated by households, institutions, commercial establishments and industries, and discharged from their premises for collection; all litter and clandestine piles of such wastes; street sweepings, drain cleaning, construction/demolition waste, dead animals and other waste materials. The EPA added toxic, flammable, corrosive, radioactive, explosive and other dangerous materials as hazardous waste. Because of their potential pollution danger, hazardous waste materials require rigorous and cautions means of disposal (DELM, 2013). According to Tchobanoglous, Theisen and Vigil (2013), solid waste is any material that arises from human and animal activities that are normally discarded as useless or unwanted. Zerbock (2013) define solid waste to include domestic waste, industrial waste, non- hazardous waste, household institutional garbage, hospital waste and constructional waste.

Solid wastes are materials with less liquid content, characterised by a reactive and unstable nature when exposed to heat, some include acids or bases that can corrode metal containers (OECD, 2005). Some solid wastes are toxic and are harmful

when ingested or absorbed. Some can also cause fire and explosion when found under certain conditions (Alam & Ahmade, 2013).

A United Nations Environmental Programme report, explains that waste composition varies across and within countries and this is as a result of the size of population, urbanization and affluence (UNEP, 2015). A study by Oteng-Ababio (2010) on the governance crisis and attitudinal change looks at the composition of solid waste as an aspect. The components are organic (food particles), paper, textile, plastics, metal, glass and others. In this study, he identified a significant aspect of solid waste, which involved the changing complexities in the waste stream. Organic waste constituted a major proportion of the solid waste stream as compared to other countries with specific emphasis on London. The vast amount of food particles that goes to the landfills makes a significant contribution to global green house gas emissions. Over the last few decades there has been a steady increase in the use of plastic products resulting in a proportionate rise in plastic waste in the municipal solid waste streams across the nation (Fobil & Hogarh, 2012). These components including the others have tremendous effects on the environment when left uncollected.

The composition of solid waste varies from place to place. Factors that influence the composition are the average income level, the sources, the population, social behaviour, climate, industrial production and the market for waste materials (Yadav& Devi, 2009). Babayemi and Dauda (2009) view solid waste as non-liquid and non-gaseous products of human activities which are regarded as being useless. It could take the form of refuse, garbage and sludge. Solid waste has also been defined as all domestic refuse and non-hazardous wastes including commercial and industrial wastes, street sweepings and construction debris as well as human wastes (UNEP, 2011).

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Drawing from the scholarly expressions above, the definition of waste to be used in this study is any substance (solid, liquid, gaseous and radioactive) thrown into the environment because it is no longer of use and also impact negatively on the environment. Operationalising the concept, it can therefore be said that, solid waste is any material which comes from commercial and industrial sources arising from human activities. From the above analysis; the next section will look at the types and sources of solid waste.

2.4   Sources and Classification of Solid Waste

Classification of solid waste gives the direction to a more appropriate waste management practice. The source classification of solid waste is based on the fact that waste comes from different sectors such as residential, commercial, open areas, agricultural activities such as marketing of agricultural produce and industrial sources. A good example of the source classification was provided by the World Bank (2012) in a study in Asia which identified the sources of waste as residential, commercial, industrial, municipal services, construction and demolition, processing and agricultural sources. Brennan and Withgott (2015) posit the types of solid waste to be "municipal solid waste, industrial solid waste, hazardous solid waste and wastewater. They further added that, the generation of waste can degrade water quality, soil quality, and air quality, and can thereby affect human health while causing ecological harm. Tchobanoglous *et al.* (2013) added and explained the types of solid waste which are; rubbish, ashes, food waste, residue and special waste. Special waste includes street waste, dead animals and abandoned vehicles, litter from roadside, litter from municipal containers and bin debris. Tchobanoglous *et al.* (2013) classify types of solid waste in relation to the sources, generation facilities, activities, or location with the types. He further explained solid waste types to be

rubbish, food waste (garbage), paper of all kind, plastic of all types, ashes and residue and other special waste components.

2.4.1 Rubbish

Rubbish consists of combustible and non- combustible solid wastes of households, institutions and commercial activities. This excludes food wastes or other highly putrescible materials. Typically, combustible rubbish consists of materials such as paper, cardboard, plastics, textiles, rubber, leather, wood, furniture, and garden trimmings. Non-combustible rubbish consists of glass, tin cans, aluminium cans, ferrous and other non-ferrous metals, and dirt (Tchobanoglous, Theisen, & Vigil., 2013).

2.4.2 Trash

Trash is defined as all non-putrescible waste that would normally be in a residential household including brush and waste from minor household repairs that is burnable. Specifically excluded is inherently dangerous, toxic, and hazardous wastes which shall from time to time be designated as "hazardous wastes" by State and/or Federal regulatory authorities having appropriate jurisdiction as well as significant liquid waste and any agricultural waste, excavated earth, stones, brick, rubble concrete and waste parts occasioned by major demolitions, installations and repairs, sinks, toilets, bathtubs, plumbing parts, automobile or truck parts, vehicle batteries, machinery, tree logs and limbs exceeding 6 inches in diameter and tree stumps (Castanino, 2011).

2.4.3   Food waste

Food wastes are any food substance, raw or cooked, which is discarded, or intended or required to be discarded. Food wastes are the organic residues generated by the handling, storage, sale, preparation and cooking and serving of food (US EPA, 2008). Food waste includes uneaten portions of meals and trimmings from food preparation activities in kitchens, restaurants and cafeterias (Miller, 2014). According to Kreith (2014), food waste also serves as a source of food to some animals. Food waste includes uneaten food and food preparation wastes from residences, commercial establishments (e.g. restaurants), institutions (e.g. schools, hospitals), and some industrial sources (e.g. factory cafeterias or lunchrooms).

2.4.4   Yard waste

This is referred to as solid vegetative waste resulting from landscaping and yard maintenance such as pruning and dropping of plant part such as brush, tree limbs and leaves and similar vegetative material that has a C:N ratio higher than 75. Where ‗C: N‘ refers to carbon to nitrogen ratio.

2.4.5   Ashes and residues

Municipal solid waste combustion creates a solid waste called ash, which can contain any of the elements that were originally present in the waste. Municipal solid waste power plants reduce the need for landfill capacity because disposal of MSW ash requires less land area than does unprocessed MSW.

However, because ash and other residues from municipal solid waste operations may contain toxic materials, the power plant wastes must be tested regularly to assure that the wastes are safely disposed to prevent toxic substances from migrating into ground-water supplies (US EPA, 2008). In urban areas, burning is

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not advisable, as the fly ash, toxic gases and acidic gases pose a much greater health threat in more densely populated urban environments than in rural areas (EGSSAA, 2009).

2.4.6 Special waste

Special waste is defined as any waste material which, because of its physical characteristics, chemical make-up, or biological nature requires either special handling procedures or permitting, or poses an unusual threat to human health, equipment, property, or the environment (Miller, 2014).

2.4.7 Hazardous waste

Hazardous wastes endanger many different classes of people, placing waste producers, collectors, landfill workers, waste pickers, and nearby residents at risk. The leachate from a landfill may be dangerous as well; its level of toxicity is directly related to the quantity and toxicity of hazardous materials mixed in with other solid waste. Management of hazardous wastes needs urgent attention in Africa. The variety and classes of materials and sources from households to industrial and medical facilities makes this particularly challenging (EGSSAA, 2009).

2.5 The Concept of Solid Waste Management

The term solid waste management has been viewed differently by various authors. Kumah (2007) defines solid waste management as the administration of activities that provide for the collection, source separation, storage, transportation, transfer, processing, treatment, and disposal of waste. However, Tchobanoglous et al (2013), provide a more comprehensive definition of solid waste management. According to them, solid waste management is: that discipline associated with the control of generation, storage, collection, transfer and transport, processing and

disposal of solid wastes in a manner that is in accord with the best principles of public health, economics, engineering, conservation, aesthetics and other environmental considerations and that is also responsive to public attitudes.

Similar among all the definitions of solid waste management are that, it is a comprehensive process which involves collection, source separation, storage, transportation, transfer, processing, treatment, and disposal of waste. It includes all administrative, financial, legal, planning and engineering functions. For example, Dhindaw (2014) and Puopiel (2010) defined solid waste management as that discipline associated with the control of generation, storage, collection, transfer and transport, processing and recovery, and final disposal of solid waste. These are done in a manner that is in accordance with the best principles of public health, economics, engineering, urban and regional planning, conservation, aesthetics, and other environmental considerations which are also responsive to public attitudes. Zender (2010) also defined solid waste management as the administration of activities that provide for the collection, source separation, storage, transportation, transfer, processing, treatment, and disposal of waste.

According to Puopiel (2010), solid waste management is an important environmental health service, and an integral part of basic urban services. This is because, the health implications of poor waste management can be very damaging to the people exposed to these unsanitary conditions. Diseases such as cholera, typhoid, dysentery and malaria are all related to the practice of poor waste management (Puopiel, 2010).

Schübeler, Guang, Lenny, Baldwin, and Cucchiella (2016) provide a comprehensive description of solid waste management which summarises the definitions underlined above. In its scope, solid waste management is a complex task, which depends as much upon organisation and cooperation between numerous public and private sector actors as it does upon appropriate technical solutions. It includes all administrative, financial, legal, planning and engineering functions involved in the whole spectrum of solutions to the problem of solid waste. The solutions often involve complex interdisciplinary relationships among various fields such as planning, geography, economics, health science, engineering and politics (Schübeler et al., 2016). Therefore, if solid waste management is to be accomplished in an efficient and orderly manner, the fundamental aspects and relationships involved must be indentified and understood clearly (Tchobanoglous et al., 2013).

2.6   Solid Waste Management Practices

2.6.1 Early practices of solid waste management

According to Tchobanoglous et al. (2013), the most commonly recognized methods for the final disposal of solid wastes were:

- dumping on land, canyons and mining pits

- dumping in water

- ploughing into the soil

- feeding to hogs

- reduction and incineration

Some of these unwholesome practices of solid waste identified during the early disposal practices still exist in cities, towns and villages today. Indiscriminate dumping on opened land and dumping in gutters particularly are clearly evident in towns and cities, while dumping in water especially people living in coastal towns is common place.

Burning of dumps is also common in peri-urban and rural communities in Ghana and in many other less developed countries. A study carried out in Ado-Akiti in Nigeria by Momoh and Oladebeye (2010) showed that, the methods of solid waste disposal include dumping of waste in gutters, drains, by roadside, unauthorized dumping sites and stream channels during raining season and burning of wastes on unapproved dumping sites during the dry season. This has gone to confirm that the practices of solid waste disposal in the 1950s still exist today and study area is not an exception. On the other hand, Momoh and Oladebeye's (2010), assessment of waste situation in Ado-Akiti in Nigeria is questionable as they did not further explain what brought about the indiscriminate dumping. It could be that people dumped the waste any how because they were no skips or dustbins for the people to store their waste for collection. Having assessed how solid waste was disposed in the early days, the next section discusses the contemporary methods of managing solid waste.

2.6.2 Contemporary solid waste management practices

In the contemporary era, the methods of managing solid waste include source reduction, sanitary landfills, composting, recycling, and incineration (Denison & Ruston, 2010). These methods are examined below.

2.6.2.1 Source reduction

Denison and Ruston (2010) viewed source reduction as any action that reduces the volume or toxicity of solid waste prior to its processing and disposal in incinerators or landfills. This view is similar to the one given by Kreith (2014). According to him, source reduction focuses on reducing the volume and /or toxicity of waste generated. Source reduction includes the switch to reusable products and packaging, the most familiar example being returnable bottles. According to USPS (2010) in the city of Thimphu in Bhutan to reduce waste problems in future, reduction in waste generation would be the most important factor. Examples of possible reduction at the consumption level include reuse of containers (including bags), better buying habits, and cutting down on the use of disposable products and packaging (USPS, 2010).

It is agreed that, source separation and resource recovery is an important method in waste management. This is because there is nothing like waste on this earth. Wastes that are discharged may be of significant value in another setting, but they are of little or no value to the possessor who wants to dispose of it. According to Tsiboe and Marbel (2014), Austria, the Netherlands, and Denmark developed a waste management processes to efficiently resolve the waste disposal problem by essentially coaxing their citizens to separate their domestic solid waste into glass, paper, plastic categories; thereby enabling easy collection and consequently reuse. As suggested by the three authors, one way of effectively managing solid waste is to minimise solid waste generation through source reduction.

2.6.2.2 Sanitary landfill

Sanitary land filling includes confining the waste, compacting it and covering with soil. It not only prevents burning of garbage but also helps in reclamation of land for valuable use (Centre for Environment and Development, 2013). The placement of solid waste in landfills is the oldest and definitely the most prevalent form of ultimate waste disposal (Zerbock, 2013). He further argued that ―landfills‖ are nothing more than open, sometimes controlled dumps. According to him the difference between landfills and dumps is the level of engineering, planning, and administration involved. Open dumps are characterized by the lack of engineering measures, no leachate management, no consideration of landfill gas management, and few, if any, operational measures such as registration of users, control of the number of ―tipping fronts‖ or compaction of waste (Zerbeck, 2013).

Further more, landfills are one form of waste management that nobody wants but everybody needs (Kreith, 2014). According to him, there are simply no combinations of waste management techniques that do not require landfilling to make them work. Of the basic management options of solid waste, landfills are the only management technique that is both necessary and sufficient. According to Kreith (1994) some wastes are simply not recyclable, many recyclable wastes eventually reach a point where their intrinsic value is completely dissipated and they no longer can be recovered, and recycling itself produces residuals. He further highlighted that the technology and operation of modern land fill can assure the protection of human health and the environment.

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In contrast to what the various authors have said about sanitary landfill as an option for waste management, they have failed to recognize that land fill in itself has some disadvantages as it is costly to construct and maintain, can pollute ground water through leaching, location is a problem in terms of availability of land particularly in the cities. Other critical factors such as gas recovery, composting, waste to energy recovery, storm water control, distance to any settlement and water body were not clearly spelt out by the authors. Therefore, there could be an alternative which is recycling.

2.6.2.3 Recycling

According to Momoh and Oladebeye (2010) recycling has been viewed as a veritable tool in minimizing the amount of household solid wastes that enter the dump sites. It also provides the needed raw materials for industries. According to them, it has been established that, it is the best, efficient and effective method of solid waste management system. However, this may not be cost effective in developing countries like Ghana. The United States Environmental Protection Agency (USEPA) (2008) has recommended recovery for recycling as one of the most effective waste management techniques. According to USEPA, recycling turns materials that would otherwise become waste into valuable resources and, it yields environmental, financial, and social returns in natural resource conservation, energy conservation, pollution prevention, and economic expansion and competitiveness. More importantly, a sizeable portion of what is thrown away contains valuable resources—metals, glass, paper, wood, and plastic—that can be reprocessed and used again as raw materials (USEPA, 2008).

Kreith (2014) has also added that, recycling is the most positively perceived and doable of all the waste management options. According to him recycling will return raw materials to market by separating reusable products from the rest of the municipal waste stream. The benefits of recycling are many, he added. It saves precious finite resources, lessens the need for mining of virgin materials which lowers the environmental impact for mining and processing. For example, according to the Institute of Waste Management cited by Tsiboe and Marbel (2014), UK recycles only 11per cent of it s household waste, Italy and Spain only 3 per cent, Netherlands 43 per cent, Denmark 29 per cent, and Austria 50 per cent respectively. Having proposed recycling by different authors as the best option to manage solid waste in modern times; they have forgotten about the cost component which is key to successful implementation of any recycling project. Even developed countries are not able to successfully do it. But alternatively, it may be the best option for effectively managing solid waste in Ghana.

2.6.2.4 Composting

Composting process uses microorganisms to degrade the organic content of the waste. Aerobic composting proceeds at a higher rate and converts the heterogeneous organic waste materials into homogeneous and stable humus (Centre for Environment and Development, 2013). UNEP (2011) has also defined composting as a biological decomposition of biodegradable solid waste under controlled predominantly aerobic conditions to a state that is sufficiently stable for nuisance-free storage and handling and is satisfactorily matured for safe use in agriculture. According to the UNEP (2011), composting is the option that, with few exceptions, best fits within the limited resources available in developing countries. A characteristic that renders composting especially suitable is its adaptability to a broad

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range of situations. According to Zerbeck (2013), a low-technology approach to waste reduction is composting. He further says that in developing countries, the average city's municipal waste stream is over 50 per cent organic material.

2.6.2.5 Incineration

According to the Centre for Environment and Development (2013), incineration is a controlled combustion process for burning combustible waste to gases and reducing it to a residue of non-combustible ingredients. According to the Centre, during incineration, moisture in the solid waste gets vapourised and the combustible portion gets oxidised and vapourised. CO_2, water vapour, ash and non-combustible residue are the end products of incineration. Incinerators have the capacity to reduce the volume of waste drastically, up to nine fold than any other method (Kreith, 2014). According to him incineration can also recover useful energy either in the form of steam or electricity. He however recognised that the main constraints of incineration are high cost of operation, relatively high degree of sophistication needed to operate them safely and economically as well as the tendency to pollute the environment through emissions of carbon dioxide. Having assessed the major methods that have been proposed by the various authors, literature has further revealed that there is an alternative method of managing solid waste effectively which is synonymous to waste reduction and recycling as mentioned earlier on. This forms the next section of the review.

2.7   Readiness to Reduce, Reuse and Recycle Solid Waste

Sustainable practices can fit within management strategies if everyone works interdependently to implement sustainable practices. Kim, Kim and Lee (2015) indicated that a relationship exists between a general manager's commitment to a sustainable environment and the way in which the hotel affects the environment. General managers are decision makers in the hotel industry. They are responsible for ensuring their staff members are making every effort to meet the needs of their guests. Managers are also held responsible for their hotel operations adverse impact on the environment, so they should have a commitment to sustaining the environment (Patiar & Wang, 2016; Sun-Young, & Levy, 2014). Kim et al. (2015) also explained that ―environmentally conscious hotel managers are likely to affect their organizations according to their own perceptions and personal values" (p. 1500). General managers educated in environmental sustainability are likely to implement sustainable practices as a part of their organizational strategies to minimize solid waste generation and all other adverse impacts their hotels have on the environment, thus improving the reputation of the hotel as well as its commitment to environmental management (Popșa, 2017).

Employees have a major role in the performance of companies in the hospitality industry. Many hoteliers of chain properties implement ways to conserve energy and water consumption as well as ensure their individual hotels receive the assistance needed to implement environmental practices. However, there has been an increase in the turnover rate of employees in these hotels. Employees are resistant to change and want to maintain the normal way of doing their responsibilities. Chan, Hon, Chan, and Okumus (2014) contended that employees with strong ecological

behavior are more in favor of implementing green practices if they have environmental knowledge, environmental concern, and environmental awareness.

These three factors increase employees' ecological behavior and hence increase their chance of being environmentally conscious. The result from Chan et al.'s (2014) study showed that some form of ecological mechanism is necessary to integrate in the managers' environmental management system to develop employees' knowledge, awareness, and concern for the environment. Managers' attitude or behavior toward an environment can motivate or imply how their employees affect the environment. If a manager has strong ecological behaviors toward the environment, employees are also likely to demonstrate that kind of behavior and be more willing to maintain that kind of standard throughout a hotel (Abdelmotaal & Abdel-Kader, 2016). Kim et al. (2015) indicated that many business leaders are realizing that integrating socially responsible practices into their business strategies. Managers used to focus on CSR with regard to the financial performance of their firm instead of their impact on their stakeholders' well-being (Abdelmotaal & Abdel-Kader, 2016). CSR can increase a firm's reputation if it has a positive influence on the society. Employees' perception of CSR in the hospitality industry can add to the sustainable performance of an organization. Employees of chain hotels will have a higher perception of CSR and are more willing to participate in the CSR performance of the hotels (Kim *et al.,* 2015).

Hoteliers who implement environmental practices and green practices implement green purchasing; train staff to reuse, reduce, and recycle their resources; and minimize their impact on the environment. CSR can influence employees' retention and minimize turnover rates, which helps hoteliers maintain costs and

increase their comparative advantage in the market for the long term (Kim et al., 2015).

2.8   Solid Waste Management Processes

Solid waste management process incorporates the following: source separation, storage, collection, transportation and disposal of solid waste in an environmentally sustainable manner. These are some of the six key elements illustrated in Figure 2.2 below.
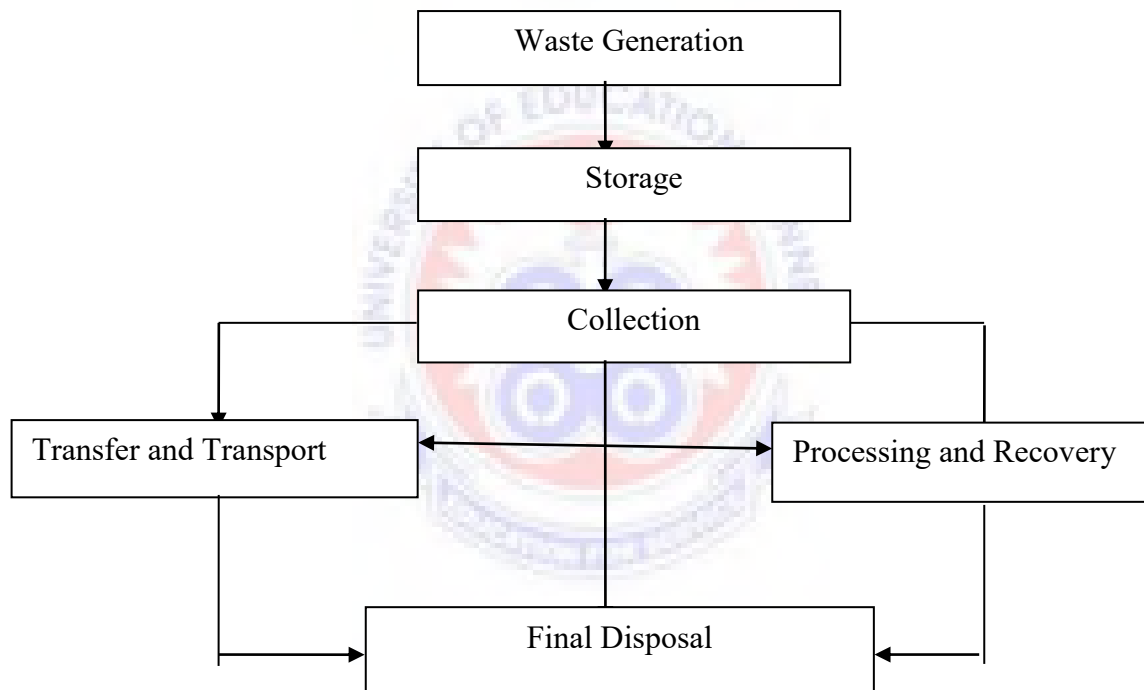
Figure 2.2: Key elements of solid waste management

Source: Puopiel (2010)

As shown in figure 2.2 above, the key elements in solid waste management include: waste generation, storage, collection, transfer and transport, processing and recovery and final disposal. This means that when waste is generated it is first stored in either dustbins or skips. It is then collected and finally disposed of in landfill. Also, when waste is collected it can be transfered from small collection equipment like the

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tricycle to a bigger truck for final disposal. On the other hand, waste collected can be processed and recovered for materials to be reused. These elements are further elaborated below:

2.8.1 Waste generation

Waste generation encompasses those activities in which materials are identified as no longer being of value and are either thrown away or gathered together for disposal (Momoh & Oladebeye, 2010). According to UNEP (2009), in 2006 the total amount of municipal solid waste (MSW) generated globally reached 2.02 billion tones, representing a 7 per cent annual increase since 2003. It is further estimated that between 2007 and 2011, global generation of municipal waste will rise by 37.3 per cent, equivalent to roughly 8 per cent increase per year (UNEP, 2009). The programme also says that, as per WHO estimations, the total health-care waste per person per year in most low income countries, is anywhere from 0.5 kg to 3 kg.

That notwithstanding, the causes of this increased should have enumerated by the organisation and therefore, has not exhausted the issue on discussion. It is accepted that solid waste generation is increasing at a faster rate globally as indicated by UNEP and this is confirmed by Mensah and Larbi (2005) concerning solid waste generation in Ghana.

2.8.2 Storage

Tchobanoglous *et al.* (2013) explain storage to mean where solid waste is stored before it is collected. It could be stored in a skip or dustbins and not thrown away indiscriminately. According to them, storage is of primary importance because of the aesthetic consideration.

2.8.3 Collection

The element of collection includes not only the gathering of solid waste, but also the hauling of waste after collection to the location where the collection vehicle is emptied (Kreith, 2014). According to Kreith (2014), the most common type of residential collection services in the United States include ―curb‖, ―setout-setback‖ and ―backyard carry‖. According to the USPS (2010), in the city of Thimphu in Bhutan the collection of solid waste from households, commercial set-ups was done in concrete receptacles placed at strategic points and conveyed by trucks/tractors. Accordingly, there were concrete bins and containers provided at various locations from where the waste was lifted for disposal. Individual bins/containers were also placed alongside the shops in certain areas, which were emptied directly into the trucks/tippers. This prevents people from dumping waste indiscriminately. On the other hand, the building of these concrete bins and containers may be expensive to do in Ghana.

2.8.4 Transfer and transport

According to Kreith (2014), transfer and transport involves two steps: (1) the transfer of wastes from the smaller collection vehicle to the larger transport equipment and (2) the subsequent transport of the wastes, usually over long distances to the final disposal site.

2.8.5 Processing and recovery

The element of processing and recovery includes all the technology, equipment, and facilities used both to improve the efficiency of other functional elements and to recover usable materials, conversion products or energy from solid wastes (Tchobanoglous et al., 2013). In the recovery, separation operations have been

devised to recover valuable resources from the mixed solid wastes delivered to transfer stations or solid waste processing plants (Tchobanoglous et al., 2013).

2.8.6   Disposal

It is the ultimate fate of all solid wastes whether they are residential wastes collected and transported directly to landfill site. Having explained the various elements in figure 2.2 by some authorities, the next section analyses in further details the final disposal methods of solid waste.   Several methods of solid waste management have evolved over the years. These methods according to the Centre for Environment and Development (2013) vary greatly with types of wastes and local conditions. For the purpose of this analysis, this section is divided into early practices of managing solid waste and contemporary methods of waste management systems.

2.9   Solid Waste Management Strategic Action Plan

Waste management planning requires reliable data concerning solid waste generation, influencing factors on waste generation and forecasts of waste quantities based on facts (Lebersorger & Beigl, 2011). According to Asase (2013), there is no single approach to solid waste management that makes it sustainable; however, the principles of integrated waste management could be followed to guide the development of site-specific MSW system that will be sustainable as demonstrated in the city of London. To Thorneloe *et al.* (2015), at the 10th International Waste Management and Landfill Symposium in Cagliari Italy, the determination of the best means to manage solid waste is not straightforward; nevertheless, solid waste management is characterized by ready-made prescribed answers, with single-issue interest groups promoting a single solution, at the expense of others (Read, 2009). The truth, he argued, is that no single solution can manage society's waste adequately.

Thus it is proposed that in practice, solid waste management must combine many different methods based on an integrated system.

Disposal of waste freely into the biosphere has now given way to think about and try to implement, an integrated waste management approach. The United Nations Environmental Programme (UNEP) defined ‗integrated waste management' as *„a framework of reference for designing and implementing new waste management systems and for analysing and optimising existing systems".* To incorporate a long-term and viable solid waste management system into a societal context requires that all of the elements in 6-tier waste management hierarchy be addressed in an integrated approach, this hierarchy is defined as: ‗reduction, reuse, recycling, recovery, treatment and disposal'' (Seadon, 2016). In preparing a strategic integrated solid waste management plan, such plan should be drawn taking into account the waste generation sources, quantity, characteristics and the socio-economic and cultural structure of the industry (Asase, 2013).

Furthermore, for the plan to gain social acceptability public participation is vital and communication is a critical part to secure the public participation. The communities should be involved in making decisions concerning waste management strategies. There should be a method of communicating waste management system performance and proposed strategies with the organisation in order to get feedback and support from the community (Seadon, 2016; Asase, 2013). Organisation consultation and communication cannot be over looked in developing a sustainable waste management plan. For example, in New York City (NYC), an IWM plan that focused on the solid waste stream was adopted in 1988 (Clarke, 2009). A 20-year plan worked on by 12 consultancies produced 12 different outcomes with two main general outlooks. Half called for a waste-to-energy plant with associated composting and

landfill sites and the other half used a combination of material recovery facilities, processing plants, composting and landfills as their solutions. Interestingly, Citizen Advisory Boards rejected all 12 plans in 1992 and after meeting with communities, called for a plan that gave greater emphasis to source reduction and recycling. However, due to the overwhelming support of the Advisory Boards, NYC continued to support the programme and the process bore results (Seadon, 2016). Therefore, what may make sense for one organisation may be very different for another depending upon existing infrastructure, policies, and environmental goals. This is why site-specific analyses are important in developing efficient and effective management plans (Thorneloe, 2015).

The USA has made major progress in increasing recycling rates. However, the choices to be made in the future are becoming more complex and material specific such as waste conversion technologies and wet waste recycling programmes (Thorneloe, 2015).

2.9.1 Integrated solid waste management

Although considerable efforts are being made by many governments and other entities in tackling waste-related problems, there are still major gaps to be filled in this area (UNEP, 2011). According to UNEP (2011), the World Bank estimates that in developing countries, it is common for municipalities to spend 20 to 50 percent of their available budget on solid waste management, even though 30 to 60 percent of all the urban solid wastes remain uncollected and less than 50 percent of the population is served. The programme (UNEP) suggested that if most of the waste could be diverted for material and resource recovery, then a substantial reduction in final volumes of waste could be achieved and the recovered material and resources could be utilized to generate revenue to fund waste management. This forms the premise for the

Integrated Solid Waste Management (ISWM) system based on 3Rs (reduce, reuse and recycle) principle. ISWM system has been pilot tested in a few locations (Wuxi, PR China; Pune, India; Maseru, Lesotho) and has been well received by local authorities. It has been shown that with appropriate segregation and recycling system significant quantity of waste can be diverted from landfills and converted into resource (UNEP, 2011). Similarly, the United States Environmental Protection Agency (2009) has said that if a state or local government wants to plan for and implement ISWM, they have to consider a hierarchy of methods which are reduce, recycle, and incinerate/landfill. Figure 2.3 below is a model of the ISWM.
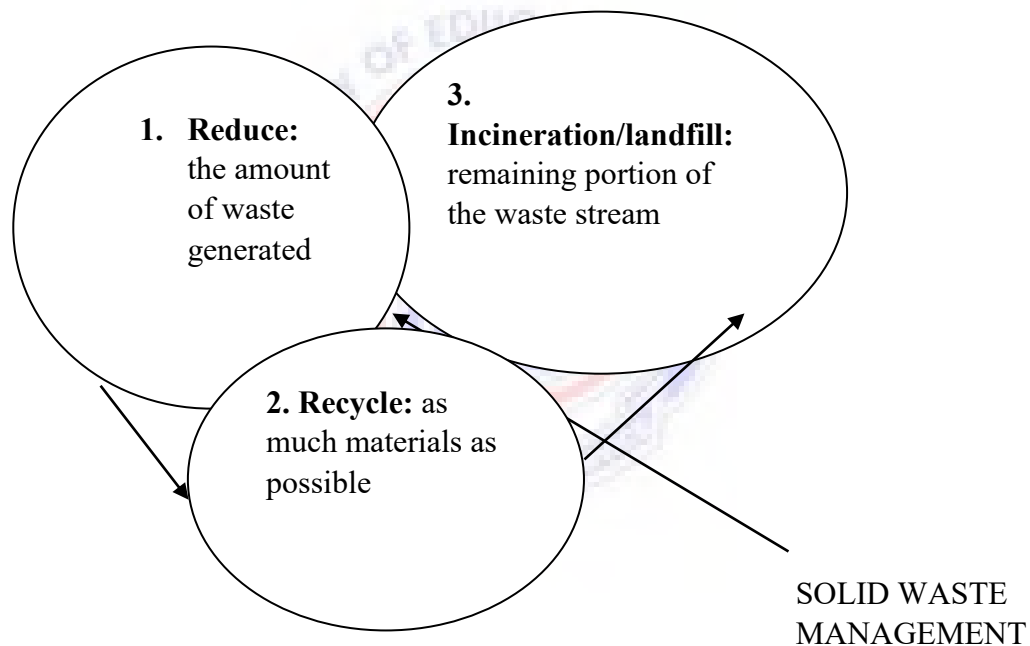
Figure 2.3: Model of ISWM

2.10 Environmental Management Policies and Practices

Several policies related to waste management is available at international, national and local levels. For example, International Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matters (1972) and Basel Convention on the Control of Trans-Boundary Movements of Hazardous Wastes

(1989). In Ghana, there are laws to protect the environment. These laws include the Local Government Act (1993), Act 462, the Environmental Protection Agency Act (1994), Act 490, the Pesticides Control and Management Act (1996), Act 528, the Environmental Assessment Regulations 1999, (LI 1652), the Environmental Sanitation Policy of Ghana (2010) among others. Mariwah (2012) indicated that Ghana has almost all the institutions, agencies and policies for waste management at all levels of government; from central government down to the very local level of unit committees. Waste management is the responsibility of the Ministry of Local Government and Rural Development, which supervises the Metropolitan, Municipal and District Assemblies. However, regulatory authority is vested in the Environmental Protection Agency (EPA) under the auspices of the Ministry of Environment, Science, Technology and Innovations. The Metropolitan, Municipal and District Assemblies are responsible for the collection and final disposal of solid waste through their Waste Management Departments and their Environmental Health and Sanitation Departments (Mariwah, 2012).

The policy framework guiding the management of hazardous, solid waste and radioactive substances include the Local Government Act (1993), Act 462, the Environmental Protection Agency Act (1994), Act 490, the Pesticides Control and Management Act (1996), Act 528, the Environmental Assessment Regulations 1999, (LI1652), the Environmental Sanitation Policy of Ghana (1999), the Guidelines for the Development and Management of Landfills in Ghana, the Guidelines for Bio-medical Waste (2000) and Environmental Sanitation Policy of Ghana (2010). All these Acts and Regulations emanate from the National Environmental Action Plan. The only guidelines, which indirectly discourage unsustainable practices and promote sustainable consumption and production, are those of Environmental Impact

Assessment. Environmental Impact Assessment is a requirement under legislation (Act 528) and guidelines have been prepared through the Environmental Protection Agency with private sector collaboration (SMA, 2006). Even though Ghana has all these policies to guide waste management, enforcement of these laws has been a problem. This coupled with poor institutional arrangement and funding present challenges to the implementation of solid waste management in Ghana.

2.10.1 Ministry of Local Government and Rural Development (MLGRD)

The MLGRD is the ministry that is the core agency responsible in the sanitation sector of the country. It is responsible for creating and coordinating sanitation policy, issuing guidelines on sanitation services and their management, and for supervising the National Environmental Sanitation Policy Coordinating Council (MLGRD, 1999). The MLGRD is supposed to have the overall responsibility for formulating environmental sanitation policies as guidelines for the MMDAs in the country.

2.10.2 Environmental Protection Agency (EPA)

The Environmental Protection Agency (EPA) seeks to ensure environmentally sound and efficient use of both renewable and non-renewable resources, to prevent, reduce, and eliminate pollution and actions that lower the quality of life; and to apply the legal processes in a fair, equitable manner to ensure responsible environmental behaviour in the country.

The Environmental Protection Agency is the leading public body responsible for protecting and improving the environment in Ghana. Its job is to make sure that air, land and water are looked after by everyone in today's society, so that the next generations inherit a cleaner and healthier environment.

2.11   Problems of Managing Solid Waste

According to Palczynski (2012), waste collection plays a vital role in waste management processes. Collection is a major aspect in the solid waste management chain, which links the process of generation to disposal. The collection process requires diverse elements involving collection system, special equipments, routes to collection sites including the loading and unloading activities (Baptiste, 2017). The methods of waste collection employed in Ghana include the door-to-door (which also includes curbside method) and the community waste collection.

World Resources Institute (2016) reports that one to two thirds of the solid waste generated in cities of developing countries is not collected. These uncollected wastes are dumped indiscriminately in the drains, and on the principal streets. This contributes to the flooding situations in some of the communities in the cities, breeding of insects and rodents and the spread of diseases (World Resources Institute, 2016; Zurbrugg, 2012). However, the waste that is collected is disposed off on land, which is often done haphazardly, or in an uncontrolled manner (Mosler, 2015). The consequences of the uncontrolled waste disposal have grave effects on the economic and welfare of the people as well. The available resources that include land, water and even the atmosphere are degraded as a result of the indiscriminate waste disposal.

The inefficient and ineffective application of waste management approaches has become central to many discussions concerning the progress of Sub-Sahara countries - good governance. Good governance involves the successful management of community affairs through the mixing of private, public and voluntary actors. It encompasses visionary leadership and incorporates legislated bye-laws (Thompson, 2013.). Where there is good governance, there is enforcement of law and people are fined and punished when they fail to comply with the law. Ghana has established sets

of comprehensive environmental laws, however, the implementers lack the means to enforce these laws.

According to Ogawa (2015), a typical solid waste management system in a developing country displays an array of problems, including low collection coverage and irregular collection services, crude open dumping and burning without air and water pollution control. He categorised these challenges into technical, financial, institutional and social constraints. He further discussed these constraints in relation to the sustainability of solid waste in developing countries.

2.11.1 Technical constraints

According to Ogawa (2015), in most developing countries, there are inadequate human resources at both the national and local levels with technical expertise necessary for solid waste management planning and operation. Many officers in charge of solid waste management, particularly at the local level, have little or no technical background or training in engineering or management.

2.11.2 Financial constraints

Ogawa (2015) intimated that, solid waste management is given a very low priority in developing countries, except perhaps in capital and large cities. As a result, very limited funds are provided to the solid waste management sector by the governments, and the levels of services required for protection of public health and the environment are not attained. The problem is acute at the local government level where the local taxation system is inadequately developed and, therefore, the financial basis for public services, including solid waste management, is weak. This weak financial basis of local governments can be supplemented by the collection of user service charges. However, users' ability to pay for the services is very limited in

poorer developing countries, and their willingness to pay for the services which are irregular and ineffective.

2.11.3 Institutional constraints

Ogawa (2015) indicates that, several agencies at the national level are usually involved at least partially in solid waste management. He however, indicated that, there are often no clear roles or functions of the various national agencies defined in relation to solid waste management and also no single agency or committee designated to coordinate their projects and activities.

> *"......The lack of coordination among the relevant agencies often results in different agencies becoming the national counterpart to different external support agencies for different solid waste management collaborative projects without being aware of what other national agencies are doing. This leads to duplication of efforts, wasting of resources, and unsustainability of overall solid waste management programmes. The lack of effective legislation for solid waste management, which is a norm in most developing countries, is partially responsible for the roles/functions of the relevant national agencies not being clearly defined and the lack of coordination among them" (Ogawa, 2015).*

According to Ogawa (2015), Legislation (Public Health Act, Local Government Act, Environmental Protection Act) related to solid waste management in developing countries is usually fragmented. Zurbrugg (2012) further added that, solid waste collection schemes of cities in the developing world generally serve only a limited part of the urban population. The people remaining without waste collection services are usually the low-income population living in peri-urban areas. According to Ogawa (2015), one of the main reasons is the lack of financial resources to cope with the increasing amount of generated waste produced by the rapid growing cities. Often inadequate fees charged and insufficient funds from a central municipal budget cannot finance adequate levels of service. He indicated that, apart from financial

constraints that affect the availability or sustainability of a waste collection service; operational inefficiencies of solid waste services such as deficient management capacity of the institutions and inappropriate technologies affect effective waste management. Zurbrugg (2012) therefore underscores the key challenges of waste management which include financial and institutional constraints.

2.11.4 Inadequate funds and logistics

Ghana, like other Sub-Sahara countries, is faced with the challenge of providing adequate logistics in terms of collection containers, the vehicles to transport the waste and recycling thereby resulting in inadequate collection. The state of infrastructure facilities is poor and badly managed. All these are as a result of the lack of fund to acquire these items. It was revealed in Anomanyo (2014) that, in Ghana, 80 percent of the waste delivery service is free of charge. The waste management departments are also not geared towards income generation and all the operational costs come from government subsidy. Many of the vehicles that are used for the collection are old and have not been replaced because there are no funds available to replace them.

2.11.5 Difficulty applying service charges

Due to poor structures and the lack of proper demarcation of houses, there is no good database on the population that do not have access to waste collection services. Municipal assemblies find it difficult to generate funds internally because they do not have access to household locations. Moreover, the areas are not demarcated properly and the houses are scattered. For this reason, it is difficult to apply service charges towards environmental improvement. Coupled with this challenge is the perceived notion by many households that the government does not

perform efficient tasks. This provides the leeway for non-payment since many of the households have perceived ideas that the probability of government mismanaging the service is high.

2.11.6 Nature of roads within the city

The nature of roads in some of the cities and towns in the Greater Accra Region are either under construction or in very bad condition. This has affected the ability of waste providers to access some dumpsites. Usually, these waste trucks are found on the roads either stuck in mud or broken down. They are often left on the road for days. Waste containers become full and are left uncollected for weeks leading into months. These uncollected wastes are brought back into the communities through natural activities such as rainfall and air coupled with human and animal activities.

All the above factors to a larger extent are the result of poor governance. If environmental laws are strictly enforced and culprits punished, people will practice proper waste management.

2.12 Impact of Solid Waste Management

There are various perspectives to consider when seeking to obtain an integrated view of Solid Waste Management in developing countries. An introduction to SWM issues in developing countries will be provided for the following perspectives: environment and health, economic, socio-cultural, and planning and management.

2.12.1 Environment and health

In developing regions of Asia such as Indonesia, improper disposal of solid waste is a major source of environmental pollution (Listyawan, 2007). Wisnu (2009) estimated that 60% of solid waste is not collected or disposed of properly in Bali, and

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is instead dumped in ―informal‖ landfills, the ocean or along the side of roads. The need to improve public cleansing and solid waste management has gained the attention of citizens, government and industry in Indonesia (Listyawan, 2007).

Waste is unsightly and malodourous, polluting land, air and water, clogging drainage systems, posing serious public health risks, and restricting potential land use (Pernia, 2012; Haan, Coad & Lardinois 2008). Spontaneous ignition of gases and deliberate burning are common at dumpsites (Thomas-Hope, 2018). The burning of garbage releases smoke and hazardous substances. Leachate from the waste can contaminate soil, surface water and groundwater. Mosquitoes that can carry dengue fever and yellow fever breed in fresh water from accumulated rainfall in cans and bottles (Pinnock, 2008).

Disease vectors such as mosquitoes, flies, cockroaches and rodents thrive on solid waste (Pinnock, 2008). The pathways of direct and indirect contact identified include insects, rodents, pigs, birds, air and water pollution, and food contamination (Pinnock, 2008).

Similarly, Fedorak and Rogers (2011) identified three mechanisms by which micro-organisms could be disseminated from a waste disposal site. The first mechanism was leachates into groundwater, the second was airborne particles, and the third was life forms that consume or pick up microbes. Waste such as facial tissues, pet feces, soiled diapers and putrescible food may contain large numbers of micro-organisms (Fedorak & Rogers, 2011).

In developing countries, amenities for workers‘ welfare are normally absent (Jindal, 2008). People working in the waste management sector can encounter a number of work related health concerns such as pain, illness, stress, injuries, accidents and emergencies. Waste pickers at dump sites report numerous negative health

effects, such as eye irritations, respiratory diseases, asthma, leg cramps, backache, pain in arms, dental problems, parasitism, intestinal disorders, diarrhoea, skin diseases, severe headache, lacerations, puncture injuries, minor accidents and mental health problems (Lohani & Baldisimo, 2011; Pinnock 2008). Factors that contribute to these ailments include unsanitary conditions (smoke, dust, faecal matter, rats, insects), unhealthy practices (food contamination), heavy loads, handling operation, mechanised equipment, nature of the materials handled, extent to which safeguards are employed (gloves, boots, etc.) and availability of cleaning facilities (Lohani & Baldisimo, 2011; Pinnock, 2008).

Workers often do not use safety equipment such as facemasks, ear plugs, gloves and proper footwear, and there is a need for education about health and safety issues (Thomas-Hope, 2018). The lack of precautions, unsafe practices, noise, high temperatures, polluted atmosphere (dust, hazardous chemicals), contaminated waste, and long working hours in many working areas present serious health hazards (Habitat 2014). There is a need to improve standards and strengthen labour and health regulations, however, even when regulations exist, many informal recycling activities do not comply with them (Lardinois & van de Klundert, 2015). Lack of enforcement of legislation is a common problem in Asian developing countries (Jindal, 2008).

2.12.2 Economic

In Bangkok, Jakarta, Kanpur, Karachi and Manila, on average around US$15 million is spent annually on waste collection and disposal per city (Habitat, 2014). The collection and transportation stages are usually the most expensive components of the system (Jindal, 2008). Although municipal governments spend 30-50% of their operating budgets on solid waste management, they are generally able to collect only 60-70% of the solid waste in cities (Habitat, 2014).

Waste recycling can reduce waste disposal costs for local authorities by extending the life of landfills, reducing the need to invest in transport vehicles and equipment, reducing vehicle operation and maintenance costs, and reducing fuel consumption for transporting waste (Habitat, 2014). Businesses are provided with cheap raw materials. In several countries, steel, paper and glass industries are dependent on recycled materials (Jindal, 2008). The use of recycled materials reduces the need to import raw materials, meaning that less money is spent on foreign currency. Banning the import of foreign waste helps prevent the destruction of local markets for recycled materials, and the health and environmental problems associated with contaminated waste (Habitat, 2014).

Local conditions affect the attractiveness of recycling for local entrepreneurs. The costs associated with using recycled materials can be higher than those for virgin materials if virgin materials are available in concentrated form and have a more homogeneous composition (Jindal, 2008). It is easiest to find markets for high quality, readily accessible waste materials. Mixed, contaminated, low value waste materials offer less potential for recovery and reprocessing. A recycling rate of 7.5% results in an annual cost reduction of over US$1 million in each city, therefore, the potential cost savings from improving the recycling rate are even greater (Habitat, 2014). An estimated 1% of the urban population is involved in the recycling sector, however, if the recycling system were to be developed to its potential, as much as 2-3% of the urban population could be employed in recycling activities (Habitat 2014).

Recycling is a labour-intensive activity with relatively low start-up costs, providing opportunities for employment and income generation for a great number of people as waste pickers, itinerant waste buyers, waste dealers, workers in recycling businesses, business managers and entrepreneurs (Lardinois & van de Klundert,

2015). Waste recycling often serves as an entry point into the urban economy, providing participants with economic benefits, higher social status, on-the-job training and business opportunities (Marti 2011; Panwalkar 2011).

2.12.3 Socio-cultural

Although waste management projects that focus on human development and community participation sound promising, they do not come easily (Mungai, 2008). Changing the attitudes and behaviour of people in developing countries can be a challenging task if a culture of cooperation and enforcement mechanisms is lacking (Thomas-Hope, 2018).

Although there is some awareness of waste management problems, greater appreciation of SWM issues (such as waste minimisation) is needed at all levels of society (UNCRD, as cited in Fernandez, 2017). In Asian countries, the general public is ―still unmindful of its crude ways of disposing of wastes" (Jindal, 2008). Vandalism, social alienation and disregard for property are not uncommon (Thomas-Hope, 2018). Premature introduction of SWM reforms could result in adverse effects such as ―illegal dumping, burning of household garbage and the bribing to collection staff to take up materials for which they are not responsible" (Figueroa, 2008).

In developing countries, a cultural transformation is needed to solve waste management problems (Figueroa, 2008). Cultural transformation can be measured in terms of changes in perceptions regarding roles and responsibilities concerning waste and the environment in general, and participation in formal and informal organisations (Figueroa, 2008; Thomas-Hope, 2018). Environmental education and student involvement are needed to cultivate ecological literacy and empower the public to investigate issues, make decisions and take action (Figueroa, 2008). Education and public awareness are key elements of any strategy involving public participation and

source separation, however, it takes time to raise awareness and gain public support. The minds and behaviour of the population need to be redirected towards the shared goal of maintaining a beautiful, clean and healthy environment (Thomas-Hope, 2018).

Environmental awareness and the willingness of people to voluntarily participate in waste reduction and sorting programs are indicators of social capital in the environmental field (Figueroa, 2018). In response to SWM problems and growing environmental awareness, citizen groups have begun to participate in waste management projects in Asian cities (Furedy, 2017). Community participation, incentives and legislation must be based on citizens understanding environmental issues (e.g. resource use, waste production, waste management costs) and being prepared to change their daily lives (Figueroa, 2008). Development of this social capital involves cultivating popular consciousness, knowledge, organisation and experience to support significant changes in behaviour patterns, social interactions and relationships between individuals and between the individual and society (Figueroa, 2008). The relationship between waste pickers and society is an important issue in SWM in developing countries. The contribution of waste pickers to waste recycling is often not appreciated by governments and residents who tend to view waste pickers as outcasts who are a nuisance and security threat (Chaturvedi, 2008). Many politicians and residents oppose waste pickers because they can interfere with collection and dumping operations (Jindal, 2008; Thomas-Hope, 2018). In general, people involved with waste management have ―very low social and economic standing because society perceives that dealing with something which is dirty and thrown away by others is demeaning" (Habitat, 2014).

The informal sector often comprises of poor and lowly educated people who have migrated to the cities from rural areas in search of employment (Habitat, 2014). Waste pickers face low social esteem, long work hours, precarious conditions and health hazards (Jindal, 2008). Within the informal recycling sector, waste pickers receive the lowest profit margins and are often vulnerable to exploitation by waste dealers (Habitat, 2014). Changes to the waste management system can threaten the means of survival for people working in the informal sector (Lardinois & van de Klundert, 2015). To improve the welfare of waste pickers, integration of waste pickers into the SWM system has been promoted (Chaturvedi, 2008). However, this can be challenging because of resistance to waste pickers who are suspected to be involved with illegal activities (Furedy, 2017). Furedy (2017) promotes source separation efforts, as well as continuing efforts to improve living and working conditions for the poor, with recognition that the different goals of stakeholders in SWM can lead to conflict regarding street picking, public health concerns and efficient management of solid waste.

Waste generation is the creation or handiwork of human activities (which are as a result of economic growth, urbanization and industrialization) and it is the way in which these wastes are handled, stored, collected and disposed of that poses risks to human economics and welfare and the environment (Zurbrügg, 2012). Other ways by which living organisms come in contact with solid waste include soil adsorption, storage or biodegrading, plant uptake, ventilation, leaching, animal activities and through direct dumping of waste into seas, rivers and lakes (Alam & Ahmade, 2013). These toxic materials and pathogens bleed into the leachate of dumps. The leachate is composed of rotten organic waste, liquid waste and infiltrated rainwater. These can contaminate ground and surface water depending on the drainage system and the

composition of the underlying soil (USAID, 2009). In 1998, malaria accounted for 53% of all reported diseases at the Ghana outpatient's facilities and is the leading cause of morbidity in the Greater Accra Region (Thompson, 2018).

Data from the Ghana Health Service indicate that six out of the top ten diseases in Ghana are related to poor environmental sanitation, with malaria, diarrhea and typhoid fever jointly constituting 70% - 85% of out-patient cases at health facilities (MLGRD, 1999; Oteng-Ababio, 2010).

A report by the EPA on the state of Ghana's environment reveals that, environmental degradation is a problem of areas along the coast and this coupled with poverty and rapid urbanization inhibits human development. Thus, the lagoons in and around densely populated areas and industrial establishment have been heavily degraded. For instance, the ―Korle and Kpeshie Lagoons in Accra, Fosu Lagoon in Cape Coast and Chemu Lagoon in Tema have all been polluted in different states of degradation due to impacts of insanitary practices" (EPA, 2012). Dumpsites or landfills in sensitive ecosystems may destroy or significantly damage these valuable natural resources and the services they provide (EPA, 2012). Food particles contribute significantly to water contamination (Alois, 2007). The Korle Lagoon and its tributary (the Odaw River) serves as the largest drainage basin for population and industry in the environs of Accra. Most of the industries in Accra are located in the lower drainage of the Korle/Odaw basin, which has become grossly polluted with discharges of effluents and disposal of waste. The water quality has deteriorated making the lagoon unsuitable to support a thriving fishery of both fin and shell fishes (UNEP, 2011). In a UNEP report, about 1.2 million people have been affected by polluted water and also contribute to the deaths of 15 million children every year (UNEP, as cited by Alois, 2007).

According to USAID (2009) report, when organic wastes are disposed of in deep dumps or landfills, they undergo anaerobic degradation and become significant sources of methane, a gas with twenty-one (21) times the effect of carbon dioxide in trapping heat in the atmosphere. In residential areas, garbage is often burnt in landfills to reduce volume and uncover metals. Burning creates thick smoke that contains carbon monoxide, soot and nitrogen oxides, all of which are hazardous to human health and degrade urban air quality.

A Rapid Disaster Waste Management Assessment report by UNEP/OCHA (2011) revealed that the negative attitudes and practices to waste disposal are partly responsible for the persistent flooding and the associated severe consequences in most urban areas. The June 2010 flooding in Accra and Tema for example claimed 14 lives and destroyed properties worth millions of Cedis. The October 26, 2011 flooding caused a lot of damages to houses and businesses along the Odaw River banks. These included damages and loss of lives (14 people), loss of livelihoods (43,000 people were affected and 17,000 lost their homes) and loss of economic value (damages to roads, waterway and bridges) (UNEP/OCHA, 2011).

The aesthetic value of the town is diminished because of the refuse spreading all over the community. The unpleasant odour and unattractive appearance of piles of uncollected solid waste in the parts of the township discourages investment of business and hence the development of the area. The exposure of these community containers to the rain and sun contributes to the deterioration of the air quality as well as disturbing human activities. The dumpsites are freely accessed by animals like dogs, cats, hens, goats and others which scatter the waste about in the surrounding areas (Mudzengerere & Chigwenya, 2012).

As clearly stated by Owusu (2010), poor urban sanitation and waste management problems are usually expressed in terms of health and environmental issues, however, there seems to be social consequences associated with this problem. In his article, he outlines some social consequences that arise as a result of poor waste management. One of the social effects is the stigmatization of communities that are characterized by poor waste management. Considering Tema Newtown, one would say that the town is underdeveloped and their inability to contribute towards the control and collection of waste in the area has led to stigmatization of the town. Therefore, it makes it difficult for the assembly to support them in their developmental projects. Various communities in Tema are well developed and structured as compared to Tema Newtown.

In addition, the environment serves as the arena for cultural rules and norms that guide the activities and behaviours which are reinforced and reproduced through the repetition of those daily activities in which people participate (Pellow, 2012). Poor living environments have particularly far reaching consequences for children and adolescents as they are more vulnerable than adults to a range of environmental concerns and more likely to be affected in ways that have longer-term repercussions (Bartlett, 2009). According to Bandura's social learning theory, children are able to learn through observation and begin to imitate the actions of people they consider significant persons (Bandura, 1977 as cited by Kendra, 2013).

In most parts of the African countires, parents and the elderly are perceived to be standards for measuring good morals or behaviour (Owusu, 2010). Growing up within an environment of garbage all around and poor sanitary practices, the youths and young children of the community are unlikely to behave any differently from their older community members who litter the community (Owusu, 2010). This may

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partly account for some of the youths' undisciplined behaviour towards littering and their lack of appreciation of good sanitary practices.

When these learned behaviour patterns develop over time, they become uncontrollable and may lead to deviant behaviour. This occurs when the social ties that bind a person to a particular social group is weakened as explained by Travis Hirschi's Social Control Theory (Crossman, 2012). Thus, peoples' attachment toward their communities may be broken when they realize there is no strict adherence to that particular value or situation. With regards to waste management, we can say that the systems that control the management of waste in the communities are weak and partly contribute to the undisciplined behaviour of indiscriminately dumping refuse at unauthorized place. This effect can further be explained by the imbalances between cultural goals and structurally available means to achieve this goal can lead people to deviant behaviour (Crossman, 2012). In this particular situation, the means to securing better well-paid jobs are not available and therefore people become angry and frustrated by the demand for payment toward trash collection or waste management.

2.13 Empirical Review

2.13.1 Readiness to reduce, reuse and recycle solid waste

According to a study by Ustad (2010), hotel businesses consume significant amounts of natural resources, expel large amounts of raw and solid waste and affect the sustainability of the natural environment in which they are developed and operate. To reduce the negative impact on the environment, the hotel sector worldwide has embarked on a course of implementing environmental management practices or a much formal tool called environmental management systems (EMS), an innovation which has been profoundly promoted to offer additional benefits to its adopters. To better understand the environmental efforts of the New Zealand accommodation

sector, the study sought to achieve four main objectives: to determine New Zealand hotel managers' awareness of environmental management system (EMS); to identify sustainable programmes that have been implemented in New Zealand hotels; to explore the hotel managers' understanding of the benefits associated with the adoption and implementation of EMS and to identify hotel managers' understanding of the possible barriers associated with the adoption and implementation of EMS.

To achieve the objectives of this study, the researcher employed a quantitative survey approach through which environmental management systems in the accommodation sector of New Zealand were examined. The data was collected through a postal questionnaire distributed to 41 hotels that agreed to participate in this research, out of which 36 hotels were involved in completing the survey. In total, 94 hotel managers participated in this study, representing 36 hotels from different parts of New Zealand.

The key issues analysed in this study were environmental practices, awareness of EMS, reasons (motives), benefits and constraints for adoption and implementation of EMS. Hotels that participated in this study showed greater involvement in energy, water and waste management practices than hotels examined by previous research in different geographical areas. It was further noted that New Zealand hotel managers have a limited basic understanding of the term EMS, and this may be an indication that EMS is currently not being widely used as a management tool, but rather as an approach or framework for implementing environmental practices. The research provided some of the first practical evidence about New Zealand hotel Managers' perceived benefit s and barriers of implementing EMS. The managers in New Zealand showed greater commitment towards environmental safety and conservation and indicated it to be the greatest motivator for implementing EMS. However, in the study

similar benefits were identified as compared to previous research where marketing and cost saving opportunities were highly acknowledged. The study identified two main barriers for the implementation of EMS. These barriers are implementation cost and lack of supporting technology. It was indeed surprising that lack of human resources and no potential benefits were rated as a less important barrier of EMS.

Zhou (2007) sought to ascertain what SWM programs have been implemented in college and university foodservices operations and determine how NACUFS members' attitudes, subjective norms, and barriers affect the implementation of additional SWM programs based on the Theory of Planned Behaviour (TPB). A secondary purpose was to identify the differences in intention to implement sustainable waste management programs based on characteristics of the respondents' age, size of facility, region of the country and if the facility had a sustainable waste management committee.

In this study, 2,184 NACUFS members whose e-mail addresses were listed in the NACUFS membership directory were selected as subjects. The data were analyzed using SPSS version 17.0. Multiple linear regression analysis, T-tests, and ANOVA were used to test the hypotheses and research questions. Statistical significance was set at p=0.05. The total number of responses was 212 resulting in a 13.5% response rate. The majority of respondents had implemented SWM programs that don't require major resources. NACUFS members had positive attitudes about implementing a SWM program and their superiors, university administrators, and students' opinions were important others to consider when implementing a SWM program. Whether a college and university foodservice has a sustainability committee was the only demographic that significantly influenced NACUFS members' intentions to implement a SWM program.

Overall, attitude and subjective norms were the only significant predictors of intention to implement a SWM programme (*p*.05). Therefore, if NACFUS members have a positive attitude about sustainability, important others around them who agree and there is a sustainability committee within the operation, they are more likely to implement a SWM program.

Puopiel (2010) conducted a study on aimed at ensuring a clean environment in the Tamale Metropolis. It analysed the underlying factors affecting effective solid waste management in the metropolis and suggested possible measures to tackle the problem. The research gathered data from two main sources namely: secondary and primary sources. The three main techniques employed in gathering the primary data were: preliminary field investigation, questionnaire survey and face-to-face interview. The following key findings were established to be the factors affecting effective solid waste management in the Metropolis. These are: inadequate skip supply for storing waste, lack of routine collection of waste, poor methods of waste management, and inadequate resources for waste management institutions to effectively collect the waste generated.

In the light of these problems enumerated above, the research recommended the adequate supply of skips, regular collection of waste, use of Integrated Solid Waste Management (ISWM) Model, proper management of the landfill and adequate rsourcing of the waste management institutions.

According to Yeboah (2017), solid waste management is one of the major issues facing most countries globally. Solid waste was already a problem long before water and air pollution issues attracted public attention. Solid waste management represents a major economic and environmental issue throughout the world. Governments have adopted public private partnership (PPP) as a solution for solid

waste management because of the herculean nature of the waste management task in terms of finance and technical expertise. The study focused on public private partnership in solid waste management. The main objective of the study was to interrogate the institutional arrangement put in place for public private partnership. To achieve the objective the study adopted the qualitative approach and interviewed 32 respondents using semi-structured interviewing and non-participant observation. Data collected were analysed and presented under themes. The study found that the institutional arrangement for PPP was weak. However, it was established that solid waste management in the municipality was guided by national laws on environmental health and bye-laws of the Assembly. With respect to resources in the implementation of PPP, the study found that, even though the private partner had some resources, they were not enough for the proper management of solid waste under a PPP arrangement. The study recommends the strengthening of institutional arrangement such as monitoring, sanctioning of poor performance and the formulation of bye-laws by the Assembly to guide the PPP arrangement.

According to Amankwaa (2012), by and large, hotels are being appraised by their level of environmental performance rather than their financial performance. As a result of competition and uncontainable pressures from customers, regulatory bodies, investors and other stakeholders, management of hotels are motivated to adopt proper environmental practices. Golden Tulip Kumasi City which has an international exposure was selected as a case study to help achieve the main objectives of the research. An extensive and a comprehensive literature was also reviewed on ISO 14000 Standard to formulate the guidelines and Environmental Management Programmes for the industry. The research sought to identify the specific environmental aspects and their respective impacts on the environment in tandem

with formulating an Environmental Management Programme and guidelines according to ISO 14001 Standard. The results showed that some of the facilities, activities and services such as air conditioning, laundry and kitchen provided by the hotels have a significant impact on the environment. Among such impacts are increased in waste and disposal of unsorted waste, steam and chemical vapours released to air and contamination of soil and water. Therefore, there is an earnest need for an adoption of proper environmental management practices in the hospitality industry. In summary, the hospitality industry in Ghana has no guideline for a successful implementation of an EMS according to ISO 14001 Standard. Therefore, there is a strong recommendation for them to adopt the standard for an improvement on their environmental performance.

Addy (2013) explains that, the problem of waste collection and disposal has been a canker to the development of cities and towns across Ghana. Day in day out, there are reports of piles of waste left uncollected around city centres and residences. Huge tonnes of waste are seen scattered in streets and gutters and the effects are enormous especially in the face of rapid urbanization. Some of the effects include flooding, the spread of diseases as a result of cross contaminations, the aesthetic value of the community among others. The city of Tema is one fast urbanizing area with such challenges associated with waste generation. This study therefore sought to ascertain the effects of uncollected household waste generated in Tema Newtown – a community within the Tema Metropolitan Area. The study used a survey of 120 households, key informant interviews of officials within the administrative and traditional jurisdiction of Tema and observations to achieve its objectives. Additionally, the Contingent Valuation Method was used to elicit and analyze respondents' willingness to pay.

The results of the study showed that out of 11.64 tonnes of waste generated per day in Tema Newtown, 3.8 tonnes remains uncollected. The study also revealed that the respondents were aware of the problem of uncollected yet were unconcerned. However, they were aware of the effects of the waste generated and what was left uncollected which included the widespread of diseases, flooding, contamination of water bodies and devaluation of the town due to the odour in some communities within the town. According to the result of the valuation, majority of the respondents are willing to pay a fee for better and improved waste management system. The study therefore encourages the adoption of the Public Private Partnership and the various recycling of waste materials to reduce the rate of uncollected waste and efficient waste management.

Nshimiyimana (2015) conducted a study to assess the management of Municipal solid waste management practices using a case study of Nyarugenge District in Kigali Capital city of Rwanda. Three specific objectives guided this study and these include establishing the status of the existing solid waste collection, transportation and disposal practices in Nyarugenge District; to examine magnitude solid waste management problems and to design strategies to overcome waste management challenges in Nyarugenge District.

A case study of research design was used for this study in which a total of 381 respondents informed this study. These were reached through purposive and random sampling. Observation, questionnaires and interviews were used during the collection of primary data. Data was analyzed quantitatively and qualitatively.

According to the findings of the study, people in Nyarugenge District use different methods in collection of solid waste, transport it and later dispose at recognized site. It was found that solid waste management is the work of private

companies under the authority of the municipality. It established that materials such as sacks are used in the due course to collect solid waste.

The study concludes that the management and collection of solid waste is never a duty of neither one person nor one organization; rather all groups and individuals at hand. Therefore, there is a need for all people to work for the clean environment and a better life at hand. The study also calls different groups and organizations to apply modern techniques for the collection, transportation and disposing of solid waste in Nyarugenge District.

Ebrahiem (2015) indicates that, there are number of factors contribute to municipal waste generation growth rate globally and locally factors are represented by increasing population levels, development, rapid urbanization and the rise in community living standards. Malaysia municipal waste is growing rapidly due to influence by these factors. This makes improving waste management practice highly demanded in every sector producing this waste. Restaurants have credible share in municipal waste as one of major waste source globally and in Malaysia as well, therefore this increase the necessity of study waste management practice among restaurants. This study aims to investigate waste management practice among restaurants in Petaling Jaya city with reference to the compliance, awareness on waste management, and incorporating these findings on waste management practice. The study was done using two approaches; the first approach way a survey to study the compliance of the restaurants to the Local Government Act (LGA) 1976 and that was done by researcher walkthrough investigation. The second approach was done by questionnaire through personal interview by the researcher. SS2 district has been suggested by Petaling Jaya city council for being the most complied area. Perception and waste management practice were assessed by e-checklists prepared according to

Green Restaurant Checklist prepared by Burbank Green Alliance, January 2009 and Supplemental Checklist for Restaurants and Food Service prepared by Green Business Programme, February 23 2010. Perception and waste management practice were done based on interview by modifying the checklists into questionnaire. The data of this study has been analysed manually by analyzing the closed-ended questions and answers and then find out the total result from different parts in the study. Compliance study is to assess commitment of restaurants operators to the Local Government Act 1976. , which find 93% compliance among the surveyed restaurants. Perception study on waste management is to find out level of understanding by restaurants operators on waste management aspects. The total result of perception study on waste management was 21%. Waste management practice is converting perception of restaurants operators on good waste management performance. The total result of waste management practice performance was 66%. Therefore, the result of waste management practice comes as effort of empowering the Act which gives restaurant operators high compliance.

CHAPTER THREE

METHODOLOGY

3.0   Introduction

This chapter provides a description of the methodology that was used in collecting the data for the study. This chapter takes into consideration, the research design, the population, sample and sampling procedure, the research instrument, the data collection procedure as well as data analysis procedure.

3.1   Research Approach

The study adopted the quantitative research approach. Quantitative research is a research strategy that emphasizes quantification in the collection and analysis of data (Gay, Mills, & Airasian, 2009). In the context of this study, the quantitative approach helps to quantify data that was collected on the categories of solid waste generated; solid waste management practices; barriers to effective solid waste management; and the effectiveness of environmental management policies and practices of solid waste management in the Komenda-Edina Eguafo-Abrem Municipality of Ghana.

3.2   Research Design

This study adopted the cross-sectional descriptive survey research design. According to Amedahe (2004), ―cross-sectional descriptive survey specifies the nature of a given phenomenon" (p. 50). Gay (as cited in Amedahe, 2004), explains that cross-sectional descriptive survey involves the collection of data in order to answer research questions concerning the current status of the subjects of the study. In the context of this study, the cross-sectional descriptive survey design was adopted

because it offers the researcher the opportunity to assess, observe and describe the categories, generation practices and barriers to solid waste management in the Central Region of Ghana at a specific point in time.

According to Murphy (2009), the major advantage that goes with this type of design is that, the data collection techniques present several advantages as they provide a multifaceted approach for data collection. For example, a survey can provide statistics about an event while also illustrating how people experience that event. Again, Murphy (2009) stated that the descriptive research design also offers a unique means of data collection thus it provides more accurate picture of events and seeks to explain peoples' perceptions and behaviour on the basis of data gathered at a point in time (Murphy, 2009).

However, the design has some weaknesses. Confidentiality is the primary weakness of descriptive research (Murphy, 2009). According to Murphy (2009), respondents are often not truthful as they feel the need to tell the researcher what they think the researcher wants to hear and also participants may refuse to provide responses they view to be too personal. Another weakness of this design, according to Murphy (2009) is that it presents the possibility for error and subjectivity. However, the design will used despite its weaknesses because it seeks to explain people's perceptions and behaviour on the basis of data gathered at a point in time and can provide statistics about an event while also illustrating how people experience that event thus providing a multifaceted approach for data collection.

3.3   Study Area

The area under study was Komenda-Edina-Eguafo-Aberim (KEEA) Municpality. The municipality is one of the 170 metropolises, municipalities and districts in Ghana. It is located in the Central Region. It is bordered to the North by Twifu Heman Lower Denkyira, to the East by Cape Coast Metropolitan Area, to the West by Shama District and to the South by the Gulf of Guinea. Elmina is the capital town of the KEEA Municipality. Politically, the district is divided into six zones. These are Elmina, Ntranoa, Ayensudo, Eguafo, Komenda and Kissi zones. The main occupations of the inhabitants in the municipal area are fishing, farming tourism and salt production. Most parts of the municipality serve as tourist attraction. This is due to historical reasons and its location. Many local and foreign tourists are therefore attracted to the area on daily basis.

KEEA municipal area is divided into eight areas for the purpose of refuse collection. However, due to the inadequate number of refuse trailers, only three areas enjoy organised refuse collection. The refuse containers are therefore placed at vantage points where the population is high. Figure 3.1 presents the map of the Komenda-Edina-Eguafo-Abrem Municipality of Ghana.

3.4   Population

A population in a research refers to the lager group of people with common observable features to which one hopes to apply the research result (Fraenkel & Wallen, 2003). Kwabia (2006) posits that social research is an investigation into the actions of people in society. He stressed that these social actors constitute what we call population.

The population for the study comprised all residents of 18 years or older as well as waste management agencies in the KEEA Municipality. There were 32,819 residents who are 18 years and older together with 52 staff of the Zoomlion Waste Management Company in the KEEA Municipality. The accessible population for the study was 380 residents and 45 staff of the Zoomlion Waste Management Company in the KEEA Municipality. Residents and the staff of the Municipal waste Management agency were involved in the study because they could provide information on the categories of solid waste generated; solid waste management practices; barriers to effective solid waste management; and the effectiveness of environmental management policies and practices of solid waste management.

3.5   Sample and Sampling Procedures

A sample size is basically the subset of actual number of individuals of the population. It has been confirmed by some scholars in Social Science that for a sample to be representative in a study it must be a good proportion of the population (Welman, Kruger & Mitchell, 2005; Zikmund, 1994). Using the Krejcie and Morgan (as cited in Sarantakos, 1997) the table for determining sample size from a given population, 380 residents together with 45 staff of the Zoomlion Company Ltd in the KEEA Municipality were selected for the study. This constituted the sample size for the study.

The simple random sampling procedure was used for the study. The simple random sampling procedure was used to select both the residents and the Zoomlion staff for the study. This type of sampling gives all units of the target population an equal chance of being selected. Using the lottery method, the researcher selected both the 380 residents and the 45 staff of Zoomlion Company Ltd in the KEEA Municipality for the study.

3.6   Research Instruments

Instrument for data collection is a tool that is used by researchers for collection of data in social science research (Bhandarkar & Wilkinson, 2010). It is related not only to instrument design, selection, construction, and assessment, but also the conditions under which the designated instruments are administered (Hsu & Sandford, 2010). The questionnaire was the main instrument used for the data collection. Deng (2010) says that a questionnaire is a form prepared and distributed to secure responses to certain questions. It is a systematic compilation of questions that are submitted to a sampling population from which information is desired. As to why the questionnaire would be used, it is advantageous whenever the sample size is large enough for reasons of time or funds to interview every subject in the study (Osuala, 2005). The study used a self-developed questionnaire which was designed to address each of the research questions. The questionnaires for the respondents was on a five-point Likert scale (1=Strongly Disagree (SD); 2= Disagree (D); 3= Uncertain (U); 4= Agree (A); 5= Strongly Agree (SA).

The questionnaire for the residents consisted of 52 items in six sections (A, B, C, D, E, and F). The A part entailed four (4) items geared towards obtaining information about the demographic characteristics of the respondents. Section B consisted of eleven (11) items which aimed at obtaining information on the categories of solid waste generated. Section C had twelve (12) items which looked at solid waste management practices. Again, section D was made up of nine (9) items which considered barriers to effective solid waste management. Section E had five (5) items which considered solid waste management action plan for sustainable development; and Section F has eleven (11) items on the effectiveness of environmental management policies and practices of solid waste management.

The questionnaire for the Zoomlion staff consisted of consisted of 23 items in six sections (A, B, C, and D). The A part entailed four (4) items geared towards obtaining information about the demographic characteristics of the respondents. Section B consisted of five (5) items which aimed at obtaining information on the solid waste management practices. Again, section C was made up of nine (9) items which considered barriers to effective solid waste management. Section D had five (5) items which considered solid waste management action plan for sustainable development.

3.6.1   Validity and reliability of instruments

The research instrument was subjected to a validity and reliability test. The instrument was given to an expert, my supervisor, to ascertain how they met face and content validity. The suggestions as given by the expert were used to effect the necessary changes to improve upon the instrument. Thereafter, a pilot-test of the instruments was conducted whereby the questionnaires were administered to thirty (30) residents and staff of the Zoomlion Company Ltd in the Ga-South Municipality. This is because, the Ga-South Municipality is a fishing community and is engulfed with filth just as what pertains in the KEEA Municipality. Both Municipalities therefore encounter similar challenges in the management of solid waste.

The questionnaire for the residents consisted of six (6) sections i.e. sections A, B, C, D, E, and F covering various relevant areas such as demographic information; categories of solid waste; solid waste management practices; barriers to effective solid waste management practices; waste management strategic action plan for sustainable development; as well as effectiveness of environmental management policies and practices of solid waste management. The homogeneity values (Cronbach`s alpha) of the scales vary between .73 and .89. The Cronbach's alpha of .86 was obtained for the

residents' questionnaire. The 6 sections covered the following areas: demographic information (items no. 1, 2, 3, 4; Cronbach`s alpha 0.72). This area covers background information such as gender, age, employment status, and educational level. Section B (items no. 5, 6, 7, 8, 9, 10, 11; 12; 13; 14; 15; Cronbach`s alpha 0.86) included the categories of solid waste. Section C (Items no. 16; 17; 18; 19, 20, 21; 22; 23; 24; 25; 26; 27; Cronbach`s alpha 0.89) consisted solid waste management practices. Section D (items no. 28; 29; 30; 31; 32; 33; 34; 35; 36; Cronbach`s alpha 0.81): This section covered barriers to effective solid waste management. Section E (Items no. 37; 38; 39; 40; 41; Cronbach`s alpha 0.76) consisted waste management strategic action plan for sustainable development. Section F (items no. 42, 43, 44, 45, 46, 47, 48, 49, 50, 51; 52; Cronbach`s alpha 0.78): This section covered effectiveness of environmental management policies and practices of solid waste management.

Similarly, the questionnaire for the Zoomlion staff consisted of four (4) sections i.e. sections A, B, C, and D covering various relevant areas such as demographic information; solid waste management practices; barriers to effective solid waste management practices; and waste management strategic action plan for sustainable development. The homogeneity values (Cronbach`s alpha) of the scales vary between .72 and .91. The Cronbach's alpha of .91 was obtained for the Zoomlion staff questionnaire. The 4 sections cover the following areas: demographic information (items no. 1, 2, 3; 4; Cronbach`s alpha 0.72). This area covers background information such as gender, age, years of working experience, and educational level. Section B (items no. 5; 6; 7; 8; 9; Cronbach`s alpha 0.89) included solid waste management practices. Section C (Items no. 10; 11; 12; 13; 14; 15; 16; 17; 18; Cronbach`s alpha 0.91) consisted the barriers to effective solid waste management practices. Section D (items no. 19; 20; 21; 22; 23; Cronbach`s alpha 0.86): This

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section covered waste management strategic action plan for sustainable development The queries that came out of the item analyses were catered for. All these actions were taken to ensure that the instruments were capable of collecting quality and useful data for the study.

3.7   Data Collection Procedure

In order to ensure a high return rate, the instruments were self administered. Before data collection, the researcher presented copies of an introductory letter from the head of the department to the residents and staff of the Zoomlion Company Ltd who served as respondents for the study. The purpose of this introductory letter was to solicit for cooperation and also to create rapport between the researcher and the respondents for the study. The respondents were briefed concerning how to respond to the items and supervised by the researcher to complete the questionnaire. The entire data collection exercise took two weeks.

3.8   Data Processing and Analysis

This study sought to examine the generation practices and barriers to solid waste management in the Komenda-Edina-Eguafo-Abrem Municipality. To answer the research questions formulated to guide the study, descriptive statistics was employed in the analysis of the data. Specifically, frequencies, percentages, means and standard deviations were used to analyse the questionnaire items on the background characteristics/demographics of the respondents as well as research questions 1-5. These were done with the use of the Statistical Package for Service Solutions (SPSS) version 21.

3.9   Ethical Considerations

Before the commencement of the study, an informed consent form detailing the researcher's background, contact information, purpose of the study, procedures, confidentiality, voluntary participation, and right to withdraw in the study was given to participants and respondents to read. Upon agreement to participate in the study, research participants were asked to sign the forms. Research participants were also informed that they can choose not to answer any questions they felt uncomfortable with. Participants were made to understand that participation in the study is voluntary and they can withdraw from the study at any time without attracting any consequence. The researcher ensured that participants' privacy was respected and ensured their anonymity. Data collected for study was kept confidential and used solely for the purpose indicated.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0   Introduction

The purpose of this study was to examine the generation practices and barriers to solid waste management in the Central Region of Ghana. Two sets of questionnaires (for residents and zoom lion staff) were employed to gather the requisite data for the study. The data gathered from the respondents were analysed through the computation of frequencies, percentages and mean of means distributions. This chapter presents the interpretations, discussions and inferences that were made from the output.

4.1   Demographic Characteristics of Respondents

Table 4.1 shows the characteristics of residents at the Komenda-Edina-Eguafo-Abrem Municipality of Ghana who served as respondents for the study.

Table 4.1: Characteristics of respondents (n=365)

Variable	Subscale	No.	%
Gender	Male	170	46.6
	Female	195	53.4
Age	20-29 years	109	29.9
	30-39 years	146	40.0
	40-49 years	37	10.1
	50-59 years	24	6.6
	60-69 years	36	9.9
	70+ years	13	3.6
Employment Status	Unemployed	111	30.4
	Employed	205	56.2
	Self-employed	49	13.4
Educational Level	No Formal Education	38	10.4
	JHS	24	6.6
	SHS	73	20.0
	Tertiary	230	63.0

Source: Field Data, August 2020

Out of the targeted sample size of 380 residents, the accessible sample size was 365 indicating 96.1% return rate. From Table 4.1, out of the 365 residents who were involved in the study, 46.6% were males, whiles 53.4% were females. Therefore, many of the residents were females. Concerning the age of the respondents, 29.9% were between 20-29 years, 40.0% were between 30-39 years, 10.1% were between 40-49 years, 6.6% were between 50-59 years, 9.9% were between 60-69 years, and 3.6% were 70 years and above. Thus, the majority of the residents were between 30-39 years. With regards to employment status, 30.4% were unemployed, 56.2% were employed, and 13.4% were self-employed. So the majority of the residents were employed. In line with the educational level, 10.4% had no formal education, 6.6% had reached JHS, 20.0% reached SHS and 63.0% attained tertiary level education.

Table 4.2 presents the bio-data of Zoomlion staff in the KEEA Municipality who were involved in the study.

Table 4.2: Characteristics of zoomlion Staff (n=42)

Variable	Subscale	No.	%
Gender	Male	19	45.2
	Female	23	54.8
Age	16-19 years	3	7.1
	20-29 years	15	35.7
	30-39 yrs	18	42.9
	40-49 yrs	3	7.1
	60-69 yrs	3	7.1
Years of working experience	1-5 years	21	50.0
	6-10 years	10	23.8
	11-15 years	8	19.0
	Above 20 years	3	7.1
Educational Level	SHS	12	28.6
	Tertiary	30	71.4

Source: Field data, August 2020

From Table 4.2, out of the 42 Zoomlion staff who were involved in the study, 45.2% were males, whiles 54.8% were females. So a greater number of respondents

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were females. In line with the age of the respondents, 7.1% were between 16-19 years, 35.7% were between 20-29 years, 42.9% were between 30-39 years, 7.1% were between 40-49 years, and 7.1% were between 60-69 years. Therefore, the majority of the staff were between 30-39 years. It is also evident from Table 4.2 that the majority of the respondents had 1-5 years of working experience. This is because, 50.0% had worked between 1-5 years, 23.8% had worked between 6-10 years, 19.0% had worked between 11-15 years, and 7.1% had worked for more than 20 years. Concerning the educational level of the respondents, 28.6% had reached SHS, and 71.4% had reached tertiary level of education. Thus, the majority of the Zoomlion staff in the study area had reached tertiary level of education.

This section presents the results and discussions of data collected to answer the four research questions formulated to guide the study. It comprised data from the questionnaires of the residents and Zoomlion staff.

4.2 Categories of Solid Wastes Generated

Research question 1: What categories of solid wastes are generated in the Komenda-Edina-Eguafo-Abrem Municipality?

This research objective sought to find out the categories of solid waste that are generated in the Komenda-Edina-Eguafo-Abrem Municipality. It is important that, residents of the KEEA Municipality share their views on the categories of solid waste that they generate so that appropriate measures can be put in place. Table 4.3 presents the views of residents as to whether they generate any unwanted substance or unusable material that is usually discarded.

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Table 4.3: Views of respondents as to whether they generate any unwanted substance or unusable material that is usually discarded in their homes

Response	No.	%
Yes	365	100.0
No	0	0.0

Source: Field Data, August 2020

Table 4.3, sought to find out from the respondents whether they generated any unwanted substance or unusable material that is usually discarded. With this, all (100.0%) the respondents agreed that they generate unwanted substance or unusable material that is usually discarded. Thus, all the respondents in the KEEA Municpality agreed that they generate waste in their homes. Freduah (2014) explains that something can become waste when it is no longer useful to the owner or it is used and fails to perform its purpose. The views of residents as to whether they generate solid waste in their homes are presented in Table 4.4.

Table 4.4: Views of respondents as to whether they generate solid waste in their homes

Response	No.	%
Yes	341	93.4
No	24	6.6

Source: Field Data, August 2020

Table 4.4, sought to find out from the respondents whether they generated solid waste from their homes. With this, 341 respondents representing 93.4% indicated ＿yes' whereas 24 respondents representing 6.6% responded ＿no'. So it goes that the majority of the respondents in the KEEA Municipality generate solid waste in the course of their activities. Tchobanoglous, Theisen and Vigil (2013), solid waste is any material that arises from human and animal activities that are normally discarded

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as useless or unwanted. The views of residents concerning how often they generate solid waste in their homes are presented in Table 4.5.

Table 4.5: Views of respondents concerning how often they generate solid waste

Response	No.	%
Very often	307	84.1
Often	58	15.9

Source: Field Data, August 2020

Concerning how often the respondents generated solid waste in their homes, 307 respondents representing 84.1% indicated ─very often", and 58 respondents representing 15.9% indicated ─often". Therefore, the majority of the respondents generate solid waste very often in their homes. The views of residents concerning the various forms of solid waste generated in their homes are presented in Table 4.6.

Table 4.6: Views of respondents concerning the various forms of solid waste generated

Statements	Yes N(%)	No N(%)
Rubbish (e.g. combustible rubbish i.e. paper, cardboard, plastics, textiles, rubber, leather, wood, furniture, and garden trimmings. Non-combustible rubbish i.e. glass, tin cans, aluminium cans, ferrous and other non-ferrous metals, and dirt).	353(96.7)	12(3.3)
Food waste (i.e. uneaten portions of meals and trimmings from food preparation activities in kitchens, restaurants and cafeterias).	353(96.7)	12(3.3)
Trash (rubble concrete and waste parts, installations and repairs, sinks, toilets, bathtubs, plumbing parts, automobile or truck parts, vehicle batteries, machinery, tree logs and limbs exceeding 6 inches in diameter and tree stumps).	267(73.2)	98(26.8)
Special waste (street waste, animals and abandoned vehicles, litter from roadside, litter from municipal containers and bin debris).	74(20.3)	291(79.7)
Harzardous waste (i.e. toxic, flammable, corrosive, radioactive, explosive and other dangerous materials).	37(10.1)	328(89.9)

Source: Field Data, August 2020

Table 4.6 sought to find out the views of the respondents concerning the various forms of solid waste generated in their homes. Concerning rubbish, 96.7% indicated ‗yes' whereas 3.3% responded ‗no'. Thus the majority of the respondents generate rubbish in their homes. The United States Environmental Protection Agency (US EPA, 2008) defines solid waste as something composed of garbage and rubbish, which normally originates in a private home or apartment house... may contain a significant amount of toxic or hazardous waste. Similarly, the majority (96.7%) of the respondents agreed that they generated food waste in their homes. As to whether the residents generated trash, 267 respondents representing 73.2% agreed whereas 98 respondents representing 26.8% disagreed to the statement. This means that the majority of the respondents generate trash in their activities. Also, the majority of the respondents indicated that they do not generate special waste in their homes. With this, 74 respondents representing 20.3% indicated ―yes" and 291 respondents representing 79.7% indicated ―no" to the statement. In line with harzadous waste, 37 respondents representing 10.1% agreed to the statement whereas 328 respondents representing 89.9% disagreed to the statement. Thus the majority of the respondents do not generate harzadous waste in their homes. According to the US EPA (2008), hazardous wastes can be liquids, solids, contained gases, or sludge and can be the by-products of manufacturing processes or simply discarded commercial products like cleaning fluids or pesticides.

From the foregoing, it can be concluded that, residents in the KEEA Municipality generate waste. Solid and liquid wastes were generated very often in their homes but gaseous wastes were sometimes or rarely generated. Again, rubbish, food waste, and trash were the forms of solid wastes that were generated by the residents in the KEEA Municipality.

4.3 Solid Waste Management Practices

Research question 2: What are the solid waste management practices in the Komenda-Edina-Eguafo-Abrem Municipality?

The aim of this research objective was to determine the solid waste management practices in the KEEA Municipality. Table 4.7 presents the views of the respondents concerning the solid waste management practices.

Table 4.7: Views of respondents concerning solid waste management practices (n=365)

Statements:	M	SD
My home is committed to reducing solid waste in order to promote a sustainable environment.	4.30	.64
My home serves proper portion of food to reduce waste.	4.20	.75
My home composts spoiled food into organic materials than trucking them to landfills.	2.85	1.13
My home donates equipment, furniture and other items for reuse to charity.	2.71	1.32
My home purchases reusable utensils and products (such as: refillable pens and pencils, rechargeable batteries, durable cups, cutlery, provides cloth towels as an alternative to paper towels, etc.) rather than disposables.	3.57	1.36
My home is motivated to reuse items in order to reduce solid waste going to landfill in order to reduce pollution.	3.87	.99
My home repairs solid waste items rather than buy new.	3.20	1.27
Additional bins have been provided in order to segregate the recyclable materials.	2.78	1.45
My home considers recycling as important activities.	3.87	.99
My home has little interest in recycling solid waste because such activities are too expensive.	2.95	1.32
My home tries as much as possible not to contaminate waste food because it is an important role in the waste recycling programme.	3.61	.96
Recycling solid waste can be time-consuming hence my unpreparedness to adopt such activities.	2.86	1.28

Source: Field Data, August 2020

Scale: 1= Strongly Disagree, 2= Disagree, 3 = Uncertain, 4= Agree, 5= Strongly Agree
Mean of means = 3.40, Mean of standard deviation = 1.12

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Table 4.7 indicates that, a mean of means of 3.40 and a mean of standard deviation of 1.12 were obtained with regards to the views of respondents concerning solid waste management practices. The means and standard deviation were obtained based on the responses recorded for each of the items on the questionnaire that were given to the respondents. Details of the individual items are presented in the subsequent paragraphs.

The finding depicts that, most of the respondents agreed to the statement: ―My home is committed to reducing solid waste in order to promote a sustainable environment". With a mean of 4.30 and a standard deviation of .64 it could be concluded that the mean falls into the scale of 4 (agree). This finding resonates with Kim et al. (2015) that, environmentally conscious managers are likely to affect their organizations according to their own perceptions and personal values. Also, from Table 4.7, the respondents agreed that their home serves proper portion of food to reduce waste. This is evidenced by the mean score of 4.20 and a standard deviation of .75 for this item. The mean is approximately 4, showing that the respondents agreed to the statement. As to whether the respondents composts spoiled food into organic materials than trucking them to landfills, the majority of the respondents were uncertain about the statement. This is evidenced in the mean of 2.85 and a standard deviation of 1.13 that were realized. In relation to the statement; ―My home donates equipment, furniture and other items for reuse to charity", the majority of the respondents were uncertain about the statement. This can be seen from a mean of 2.71 and a standard deviation of 1.32 that were obtained. This means that the mean falls on the option ―3" (uncertain) looking at the scale under Table 4.7. A mean of 3.57 and a standard deviation of 1.36 were achieved for the statement: ―My home purchase reusable utensils and products rather than disposables". This means that, the

respondents agreed to the statement. The high standard deviation obtained indicates that there were variations recorded for this item. However, it still remains that the majority of the respondents agreed to the statement. Again, when the respondents were asked whether they are motivated to reuse items in order to reduce solid waste going to landfill in order to reduce pollution, the respondents were agreed to the statement. Here, a mean of 3.87 and a standard deviation of .99 were obtained for this item showing the respondents agreed to the statement.

Also, from Table 4.7, the respondents were uncertain as to whether they repair solid waste items rather than buy new. This is evidenced by the mean score of 3.20 and a standard deviation of 1.27 for this item. The mean is approximately 3, showing that the respondents were uncertain about the statement. Regarding the statement; ―Additional bins have been provided in order to segregate the recyclable materials", the majority of the respondents were uncertain about the statement. This can be seen from the mean of 2.78 and a standard deviation of 1.45 that were realized. Also, a mean of 3.87 and a standard deviation .99 were recorded for the item ―My home considers recycling as important activities". This means that, the majority of the respondents agreed to this statement. This is because the mean falls on scale 4 (agree) looking at the scale under Table 4.7. The high standard deviation obtained indicates that there were variations recorded for this item. However, it still remains that the majority of the respondents agreed to the statement. The finding depicts that, most of the respondents were uncertain about the statement: ―My home has little interest in recycling solid waste because such activities are too expensive". With a mean of 2.95 and a standard deviation of 1.32 it could be concluded that the mean falls into the scale of 3 (uncertain). In line with this finding, Chan and Lam (2011) assert that, many small hotel operators have very little interest in reducing and/or recycling

waste, believing that such activities are too expensive and time-consuming. Again, when the respondents were asked whether they try as much as possible not to contaminate waste food because it is an important role in the waste recycling programme, they agreed to the statement. Here, a mean of 3.61 and a standard deviation of .96 were obtained for this item showing the respondents agreed to the statement. The majority of the respondents were uncertain as to whether recycling solid waste can be time-consuming hence their unpreparedness to adopt such activities. This is evidenced by the mean score of 2.86 and a standard deviation of 1.28 for this item. The mean is approximately 3, showing that the respondents were uncertain about the statement.

The views of the Zoomlion staff in the KEEA Municipality are presented in Table 4.8.

Table 4.8: Views of zoomlion staff concerning solid waste management practices (n=42)

Statements:	M	SD
The company is responsible for collecting solid waste in the Komenda-Edina-Eguafo-Abrem Municipality.	3.83	.54
The company undertakes door-to-door solid waste collection from homes at KEEA Municipality.	3.05	1.10
The company collects waste frequently from the Municipality.	3.55	1.10
The company sorts the waste for proper treatment and disposal.	3.60	.96
The company sorts the waste in order to recycle/ for reuse.	3.33	1.39

Source: Field Data, August 2020

Scale: 1= Strongly Disagree, 2= Disagree, 3 = Uncertain, 4= Agree, 5= Strongly Agree
Mean of means = 3.40, Mean of standard deviation = 1.12

From Table 4.8 a mean of means of 3.40 and a mean of standard deviation of 1.02 were obtained. This means that the Zoomlion staff in the KEEA Municipality were uncertain about most of the statements that were posed to them on the solid waste management practices. The following individual items attest to this fact.

Most of the Zoomlion staff agreed to the statement: ―The company is responsible for collecting solid waste in the Komenda-Edina-Eguafo-Abrem Municipality". With a mean of 3.83 and a standard deviation of .54 it could be concluded that the mean falls into the scale of 4 (agree). Again, when the respondents were asked whether the company undertakes door-to-door solid waste collection from homes at KEEA Municipality, they were uncertain about the statement. Here, a mean of 3.05 and a standard deviation of 1.10 were obtained for this item showing the respondents were uncertain about the statement. Also, from Table 4.8, the respondents agreed that the company collects waste frequently from the Municipality. This is evidenced by the mean score of 3.55 and a standard deviation of 1.10 for this item. The mean is approximately 4, showing that the respondents agreed to the statement. Regarding the statement ―The company sorts the waste for proper treatment and disposal", the majority of the respondents agreed to the statement. This can be seen from the mean of 3.60 and a standard deviation of .96 that were realized. Also, a mean of 3.33 and a standard deviation 1.39 were recorded for the item ―The company sorts the waste in order to recycle/ for reuse". This means that, the majority of the Zoomlion staff were uncertain about this statement. This is because the mean falls on scale 3 (Uncertain) looking at the scale under Table 4.8.

From the foregoing, it can be concluded that, the both residents and Zoomlion staff observed a number of solid waste management practices. This is because, the residents indicated that they were committed to reducing solid waste in order to promote a sustainable environment; they served proper portion of food to reduce waste; they purchase reusable utensils and products in their homes rather than disposables; and they are motivated to reuse items in order to reduce solid waste going to landfill in order to reduce pollution. Again, the residents consider recycling as important activities; and they try as much as possible not to contaminate waste food because it is an important role in the waste recycling programme. The Zoomlion company is responsible for collecting solid waste in the Komenda-Edina-Eguafo-Abrem Municipality; the company collects waste frequently from the Municipality; and the company sorts the waste for proper treatment and disposal.

4.4   Barriers to Effective Solid Waste Management Practices

Research question 3: What are the barriers to effective solid waste management in the Komenda-Edina-Eguafo-Abrem Municipality?

The aim of this research objective was to find out the barriers to effective solid waste management practices. Table 4.9 presents the views of the respondents concerning the barriers to effective solid waste management.

Table 4.9: Views of respondents concerning barriers to effective solid waste management practices (n=365)

Statements:	M	SD
Inadequate environmental education.	4.27	.77
Inadequate logistics and funds.	4.21	.91
Inadequate depots, skips and dustbins.	4.21	.79
Lack of adequate skilled personnel to manage services efficiently.	3.93	.92
Apathetic attitude/inertia on the part of some of the residents.	3.87	.88
Irregular collection of waste by waste management company.	3.90	.94
Lack of appropriate site for waste disposal.	3.64	1.27
Unwillingness of some households to pay for the collection and appropriate disposal of solid waste.	3.93	.85
Refuse dump located very far from home.	3.41	1.25

Source: Field Data, August 2020

Scale: 1= Strongly Disagree, 2= Disagree, 3 = Uncertain, 4= Agree, 5= Strongly Agree
Mean of means = 3.40, Mean of standard deviation = 1.12

Table 4.9 indicates that, a mean of means of 3.93 and a mean of standard deviation of .95 were obtained with regards to the barriers to effective solid waste management. The means and standard deviation were obtained based on the responses recorded for each of the items on the questionnaire that were given to the respondents. Details of the individual items are presented in the subsequent paragraphs.

The finding depicts that, most of the respondents agreed to the statement: ―Inadequate environmental education‖. With a mean of 4.27 and a standard deviation of .77 it could be concluded that the mean falls into the scale of 4 (agree). Also, from Table 4.9, the respondents agreed to inadequate logistics and funds as barriers to effective solid waste management practices. This is evidenced by the mean score of 4.21 and a standard deviation of .91 for this item. The mean is approximately 4, showing that the respondents agreed to the statement. As to whether inadequate depots, skips and dustbins were barriers to effective solid waste management practices, the majority of the respondents agreed to the statement. This is evidenced in

the mean of 4.21 and a standard deviation of .79 that were realized. In relation to the statement; ―Lack of adequate skilled personnel to manage services efficiently", the majority of the respondents agreed to the statement. This can be seen from a mean of 3.93 and a standard deviation of .92 that were obtained. This means that the mean falls on the option ―4" (Agree) looking at the scale under Table 4.9. A mean of 3.87 and a standard deviation of .88 were achieved for the statement: ―Apathetic attitude/inertia on the part of some of the residents". This means that, the respondents agreed to the statement.

Again, when the respondents were asked whether irregular collection of waste by waste management company was a barrier to effective solid waste management practices, the respondents were agreed to the statement. Here, a mean of 3.90 and a standard deviation of .94 were obtained for this item showing the respondents agreed to the statement. Also, from Table 4.9, the respondents agreed that lack of appropriate site for waste disposal was a barrier to effective waste management practice. This is evidenced by the mean score of 3.64 and a standard deviation of 1.27 for this item. The mean is approximately 4, showing that the respondents agreed to the statement. Regarding the statement; ―Unwillingness of some households to pay for the collection and appropriate disposal of solid waste", the majority of the respondents agreed to the statement. This can be seen from the mean of 3.93 and a standard deviation of .85 that were realized. Also, a mean of 3.41 and a standard deviation 1.25 were recorded for the item ―Refuse dump located very far from home". This means that, the majority of the respondents were uncertain about the statement. This is because the mean falls on scale 3 (uncertain) looking at the scale under Table 4.9. The high standard deviation obtained indicates that there were variations recorded for this item. However, it still

remains that the majority of the respondents agreed to the statement. The responses from the Zoomlion staff are presented in Table 4.10.

Table 4.10: Views of zoomlion staff concerning barriers to effective solid waste management practices (n=42)

Statements:	M	SD
Inadequate environmental education.	4.02	.56
Inadequate logistics and funds.	4.10	.73
Inadequate depots, skips and dustbins.	3.48	.83
Lack of adequate skilled personnel to manage services efficiently.	3.64	1.19
Apathetic attitude/inertia on the part of some of the residents.	3.52	1.27
Irregular collection of waste by waste management company.	3.98	1.07
Lack of appropriate site for waste disposal.	3.79	.78
Unwillingness of some households to pay for the collection and appropriate disposal of solid waste.	3.29	.97
Refuse dump located very far from home.	3.62	1.29

Source: Field Data, August 2020

Scale: 1= Strongly Disagree,   2= Disagree,   3 = Uncertain, 4= Agree, 5= Strongly Agree
Mean of means = 3.40, Mean of standard deviation = 1.12

Table 4.10 indicates that, a mean of means of 3.72 and a mean of standard deviation of .97 were obtained with regards to the barriers to effective solid waste management. The means and standard deviation were obtained based on the responses recorded for each of the items on the questionnaire that were given to the respondents (Zoomlion staff). The subsequent paragraphs discuss details of the individual items.

Most of the Zoomlion staff agreed to the statement: ―Inadequate environmental education". With a mean of 4.02 and a standard deviation of .56 it could be concluded that the mean falls into the scale of 4 (agree). Also, from Table 4.10, the respondents agreed to inadequate logistics and funds as barriers to effective solid waste management practices. This is evidenced by the mean score of 4.10 and a standard deviation of .73 for this item. The mean is approximately 4, showing that the

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respondents agreed to the statement. As to whether inadequate depots, skips and dustbins were barriers to effective solid waste management practices, the majority of the respondents were uncertain about the statement. This is evidenced in the mean of 3.48 and a standard deviation of .83 that were realized. In relation to the statement; ―Lack of adequate skilled personnel to manage services efficiently", the majority of the respondents agreed to the statement. This can be seen from a mean of 3.64 and a standard deviation of 1.19 that were obtained. This means that the mean falls on the option ―4" (Agree) looking at the scale under Table 4.10. A mean of 3.52 and a standard deviation of 1.27 were achieved for the statement: ―Apathetic attitude/inertia on the part of some of the residents". This means that, the respondents agreed to the statement.

Again, when the respondents were asked whether irregular collection of waste by waste management company was a barrier to effective solid waste management practices, the respondents were agreed to the statement. Here, a mean of 3.98 and a standard deviation of 1.07 were obtained for this item showing the respondents agreed to the statement. Also, from Table 4.10, the respondents agreed that lack of appropriate site for waste disposal was a barrier to effective waste management practice. This is evidenced by the mean score of 3.79 and a standard deviation of .78 for this item. The mean is approximately 4, showing that the respondents agreed to the statement. Regarding the statement; ―Unwillingness of some households to pay for the collection and appropriate disposal of solid waste", the majority of the respondents were uncertain about the statement. This can be seen from the mean of 3.29 and a standard deviation of .97 that were realized. Also, a mean of 3.62 and a standard deviation 1.29 were recorded for the item ―Refuse dump located very far from home". This means that, the majority of the respondents agreed to the statement. This is

because the mean falls on scale 4 (agree) looking at the scale under Table 4.10. The high standard deviation obtained indicates that there were variations recorded for this item. However, it still remains that the majority of the respondents agreed to the statement.

From the above discussions, it can be concluded that there were a number of barriers to the effective solid waste management practices. These included inadequate environmental education; inadequate logistics and funds; inadequate depots, skips and dustbins; lack of adequate skilled personnel to manage services efficiently; and apathetic attitude/inertia on the part of some of the residents. Some other barriers included: irregular collection of waste by waste management company; lack of appropriate site for waste disposal; unwillingness of some households to pay for the collection and appropriate disposal of solid; and refuse dump located very far from home.

4.5   Waste Management Strategic Action Plan for Sustainable Development

Research question 4: What is the waste management action plan for sustainable development in the Komenda-Edina-Eguafo-Abrem Municipality?

The aim of this research objective was to examine waste management strategic action plan for sustainable development in the KEEA Municipality. The responses given by the respondents are shown in Table 4.11.

Table 4.11: Views of respondents on waste management strategic action plan for sustainable development (n=365)

Statements: What strategies can be adopted for solid waste management?	M	SD
Regular monitoring system should be in place to ensure that households adhere to the solid waste management practices.	4.40	.55
Education/Training programmes on solid waste management should be provided for residents in the Municipality.	4.43	.50
Enforcing sanctions on those who do not adhere to proper waste management.	4.53	.56
There is the need for a reliable data on solid waste generation for households in the Municipality.	3.93	.85
Through the provision of additional bins, solid waste generation could be reduced and recycled as much as possible through composting process and use this fertilizer for home gardening.	4.75	.49

Source: Field Data, August 2020

Scale: 1= Strongly Disagree,   2= Disagree,   3 = Uncertain, 4= Agree, 5= Strongly Agree
Mean of means = 3.40, Mean of standard deviation = 1.12

Table 4.11 sought to examine the views of the respondents on waste management strategic action plan for sustainable development. The means and standard deviation were obtained based on the responses recorded for each of the items on the questionnaire that were given to the respondents in the KEEA Municipality. A mean of means of 4.41 and a mean of standard deviation of .59 were realized. This means that the majority of the respondents agreed to most of the statements that were posed to them about the waste management strategic action plan for sustainable development. Further discussions of individual items are presented in the paragraphs below.

From Table 4.11, a mean of 4.41 and a standard deviation of .59 were achieved for the statement: ―Regular monitoring system should be in place to ensure that households adhere to the solid waste management practices". This means that, the respondents agreed to the statement. Also, from Table 4.11, the respondents agreed that education/training programmes on solid waste management should be provided

for residents in the Municipality. This is evidenced by the mean score of 4.43 and a standard deviation of .50 for this item. The mean is 4, showing that the respondents agreed to the statement. This finding confirms that of Cummings (2017) that, it is essential to educate and provide training about waste minimisation practices to enhance commitment to the programme. Regarding the statement; ―Enforcing sanctions on those who do not adhere to proper waste management", the majority of the respondents strongly agreed to the statement. This can be seen from the mean of 4.53 and a standard deviation of .56 that were realized. Also, a mean of 3.93 and a standard deviation .85 were recorded for the statement ―There is the need for a reliable data on solid waste generation for households in the Municipality". This means that, the majority of the respondents agreed to the statement. This is because the mean falls on scale 4 (agree) looking at the scale under Table 4.11. The finding depicts that, most of the respondents strongly agreed that through the provision of additional bins, solid waste generation could be reduced and recycled as much as possible through composting process and use this fertilizer for home gardening.

The responses from the Zoomlion staff are presented in Table 4.12.

Table 4.12: Views of zoomlion staff on waste management strategic action plan for sustainable development (n=42)

Statements: What strategies can be adopted for solid waste management?	M	SD
Regular monitoring system should be in place to ensure that households adhere to the solid waste management practices.	4.24	.69
Education/Training programmes on solid waste management should be provided for residents in the Municipality.	4.10	.73
Enforcing sanctions on those who do not adhere to proper waste management.	4.31	.47
There is the need for a reliable data on solid waste generation for households in the Municipality.	3.55	1.06
Through the provision of additional bins, solid waste generation could be reduced and recycled as much as possible through composting process and use this fertilizer for home gardening.	4.21	.42

Source: Field Data, August 2020

Scale: 1= Strongly Disagree, 2= Disagree,   3 = Uncertain, 4= Agree, 5= Strongly Agree
Mean of means = 3.40, Mean of standard deviation = 1.12

Table 4.12 sought to examine the views of the Zoomlion staff on waste management strategic action plan for sustainable development. The means and standard deviation were obtained based on the responses recorded for each of the items on the questionnaire that were given to the Zoomlion staff. A mean of means of 4.08 and a mean of standard deviation of .67 were realized. This means that the majority of the respondents agreed to most of the statements that were posed to them about the waste management strategic action plan for sustainable development. Further discussions of individual items are presented in the paragraphs below.

From Table 4.12, a mean of 4.24 and a standard deviation of .69 were achieved for the statement: ―Regular monitoring system should be in place to ensure that households adhere to the solid waste management practices". This means that, the Zoomlion staff agreed to the statement. Also, from Table 4.12, the respondents agreed that education/training programmes on solid waste management should be provided for residents in the Municipality. This is evidenced by the mean score of 4.10 and a

standard deviation of .73 for this item. The mean is 4, showing that the respondents agreed to the statement. This finding confirms that of Cummings (2017) that, it is essential to educate and provide training about waste minimisation practices to enhance commitment to the programme. Regarding the statement; ―Enforcing sanctions on those who do not adhere to proper waste management", the majority of the respondents agreed to the statement. This can be seen from the mean of 4.31 and a standard deviation of .47 that were realized. Also, a mean of 3.55 and a standard deviation 1.06 were recorded for the statement: ―There is the need for a reliable data on solid waste generation for households in the Municipality". This means that, the majority of the respondents agreed to the statement. This is because the mean falls on scale 4 (agree) looking at the scale under Table 4.12. The finding depicts that, most of the respondents agreed that through the provision of additional bins, solid waste generation could be reduced and recycled as much as possible through composting process and use this fertilizer for home gardening. Here, a mean of 4.21 and a standard deviation of .42 were achieved.

From the above discussions, it can be concluded that, both Zoomlion staff and residents of the KEEA Municipality agreed to a number of the waste management strategic action plan for sustainable development. With this, they indicated that regular monitoring system should be in place to ensure that households adhere to the solid waste management practices; education/training programmes on solid waste management should be provided for residents in the Municipality; there is the need to enforce sanctions on those who do not adhere to proper waste management. Again, there is the need for a reliable data on solid waste generation for households in the Municipality; and through the provision of additional bins, solid waste generation

could be reduced and recycled as much as possible through composting process and use this fertilizer for home gardening.

4.6 Effectiveness of Environmental Management Policies and Practices of Solid Waste Management

Research question 5: What are the effectiveness of the environmental management policies and practices of solid waste management in the Komenda-Edina-Eguafo-Abrem Municipality?

This objective sought to evaluate the effectiveness of environmental management policies and practices of solid waste management in the KEEA Municipality. The responses given by the respondents are shown in Table 4.13.

Table 4.13: Views of respondents on the effectiveness of environmental management policies and practices of solid waste management (n=42)

Statements: How effective are the environmental management policies and practices of solid waste management?	M	SD
My home has engaged the services of a licensed collector (e.g. Zoomlion Company Ltd.) approved by the Assembly to collect solid waste generated from our premises.	2.77	1.33
The Assembly/licensed contractor determine the manner of disposal of all harzadous or health care wastes.	2.58	1.25
The collection of solid waste is subject to charging of fees as approved by the Assembly in its fee fixing resolution.	3.17	1.13
The Assembly conducts regular monitoring to find out solid waste management practices of various households in the Municipality.	2.71	1.19
The Assembly ensures that no person or firm deposit any solid waste at any site apart from the site designated by the Assembly for solid waste to be placed.	2.98	1.26
The Assembly ensures that we provide in our premises approved containers (plastic/galvanized containers) for storage of solid waste.	3.07	1.29
The Assembly sanctions any person or firm that burns solid waste on their premises.	2.71	1.24
The Assembly ensures that we not burn solid waste on our premises	2.84	1.13
The Assembly provides education to persons/employees of the firm on appropriate ways of storing solid waste for collection.	3.13	.99
The Assembly sanctions persons or firms who dump solid waste in an open space, drain, gutter, sewer, open land, quarry, river channel, swamp or their place not designated by the Assembly for that purpose.	3.34	1.14
The Assembly ensures proper enforcement of the bye-laws on sanitation and appropriate solid waste management practices.	3.27	.96

Source: Field Data, August 2020

Scale: 1= Strongly Disagree,   2= Disagree,   3 = Uncertain, 4= Agree, 5= Strongly Agree
Mean of means = 3.40, Mean of standard deviation = 1.12

A mean of means of 2.96 and a mean of standard deviation of 1.17 were achieved showing that the majority of the respondents in the KEEA Municpality were uncertain about most of the statements that were posed to them on the effectiveness of environmental management policies and practices of solid waste management. Details of the individual items are discussed in the subsequent paragraphs.

Most of the respondents were uncertain as to whether they had engaged the services of a licensed collector (e.g. Zoomlion Company Ltd.) approved by the Assembly to collect solid waste generated from our premises. This is because, a mean of 2.77 and a standard deviation of 1.33 were achieved for the statement. Again, when the residents were asked whether the Assembly/licensed contractor determine the manner of disposal of all harzadous or health care wastes, the respondents were uncertain about the statement. Here, a mean of 2.58 and a standard deviation of 1.25 were obtained for this item showing the respondents were uncertain about the statement. Also, from Table 4.13, the residents were uncertain as to whether the collection of solid waste is subject to charging of fees as approved by the Assembly in its fee fixing resolution. This is evidenced by the mean score of 3.17 and a standard deviation of 1.13 for this item. The mean is approximately 3, showing that the respondents were uncertain about the statement. Regarding the statement: ―The Assembly conducts regular monitoring to find out solid waste management practices of various households in the Municipality", the majority of the residents were uncertain about the statement. This can be seen from the mean of 2.71 and a standard deviation of 1.19 that were realized. Also, a mean of 2.98 and a standard deviation 1.26 were recorded for the item: ―The Assembly ensures that no person or firm deposit any solid waste at any site apart from the site designated by the Assembly for solid waste to be placed". This means that, the majority of the respondents were uncertain about the statement. This is because the mean falls on scale 3 (uncertain) looking at the scale under Table 4.13.

The finding depicts that, most of the respondents were uncertain as to whether the Assembly ensures that they provide in their premises approved containers (plastic/galvanized containers) for storage of solid waste. With a mean of 3.07 and a

standard deviation of 1.29 it could be concluded that the mean falls into the scale of 3 (uncertain). Thus, the majority of the respondents were uncertain about the statement. Also, from Table 4.13, the respondents were uncertain as to whether the Assembly sanctions persons or firms who burn solid waste on their premises. This is evidenced by the mean score of 2.71 and a standard deviation of 1.24 for this item. The mean falls on scale 3, showing that the respondents were uncertain about the statement. Most of the respondents were uncertain as to whether the Assembly ensures that they do not burn solid waste on their premises. With this, a mean of 2.84 and a standard deviation of 1.13 were obtained. Again, when the respondents were asked whether the Assembly provides education to persons on appropriate ways of storing solid waste for collection, they were uncertain about the statement. Here, a mean of 3.13 and a standard deviation of .99 were obtained for this item showing that the respondents were uncertain as to whether the Assembly provides education to persons on appropriate ways of storing solid waste for collection. Regarding the statement: ―The Assembly sanctions persons or firms who dump solid waste in an open space, drain, gutter, sewer, open land, quarry, river channel, swamp or their place not designated by the Assembly for that purpose" the majority of the respondents were uncertain about the statement. Here, a mean of 3.34 and a standard deviation of 1.14 were obtained ―― ―The Assembly ensures proper enforcement of the bye-laws on sanitation and appropriate solid waste management practices" the majority of the respondents were uncertain about the statement. This can be seen from the mean of 3.27 and a standard deviation of .96 that were realized. This means that, the respondents were uncertain as to whether the Assembly ensures proper enforcement of the bye-laws on sanitation and appropriate solid waste management practices.

From the foregoing, it can be concluded that, the residents of the KEEA Municipality were uncertain about the effectiveness of environmental management policies and practices of solid waste management. This is because, they were uncertain as to whether the Assembly ensures that they provide in their premises approved containers (plastic/galvanized containers) for storage of solid waste. Again, they were uncertain whether Assembly sanctions any person or firm that burns solid waste on their premises; and were uncertain whether the Assembly sanctions persons or firms who dump solid waste in an open space, drain, gutter, sewer, open land, quarry, river channel, swamp or places not designated by the Assembly for that purpose. They were also uncertain whether the Assembly provided education to persons on appropriate ways of storing solid waste for collection; and were uncertain whether the Assembly conducts regular monitoring to find out solid waste management practices. Again, the residents were uncertain whether the Assembly ensures that no person or firm deposits any solid waste at any site apart from the site designated by the Assembly for solid waste to be placed; and were uncertain as to whether Assembly ensures proper enforcement of the bye-laws on sanitation and appropriate solid waste management practices.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0   Overview

This chapter marks the concluding part of the study. It aims at highlighting the main findings. It also presents a summary of the research process, the conclusions and offers the implications for future research.

5.1   Summary of Research Process

The increasingly growing population in Ghana and its associated increase in urbanization and economic activities have made the impact of the municipal solid waste very noticeable. The urban areas of Accra produce about 760,000 tons of municipal solid waste (MSW) per year or approximately 2000 metric tons per day (Government of Ghana, 2016). According to the Government of Ghana, EPA report, by 2025, this figure is expected to double. Solid waste disposal is becoming problematic. This situation therefore leads to worsening solid waste management problems in urban settlements in particular. Municipal and Metropolitan authorities as well as institutions and households seem unable to organize adequate collection and safe disposal of solid waste. Hence, wastes are left uncollected and posing threats to public health and the environment (Oteng-Ababio, 2010). A walk within town reveals visible solid waste problems such as garbage accumulation, littering and open burning. The situation in the Central Region of Ghana is not any different as Municipal Solid Waste generated from commercial and domestic sources has been increasing steadily. Therefore, this research sought to examine the generation practices and barriers to solid waste management in the Central Region of Ghana. Specifically, the study was undertaken to; classify the solid waste generated;

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determine the solid waste management practices; identify the barriers to effective solid waste management; examine solid waste management action plan for sustainable development; and evaluate; and evaluate the effectiveness of environmental management policies and practices of solid waste management in the KEEA Municipality. The cross-sectional descriptive survey research design was employed. The study covered all residents of 18 years or older and Zoomlion staff in the KEEA Municipality. In all, 425 respondents comprising of 380 residents and 45 Zoomlion staff were involved in the study. The simple random sampling procedure was used to select both the residents and the Zoomlion staff to serve as respondents. Two sets of questionnaires, for residents and Zoomlion staff were the instruments used in collecting data to address the five research questions. The data gathered was analyzed using the computation of frequencies, percentages, and mean of means distributions. The following were the main findings of the study.

5.2   Key Findings

1. It was realized that, residents in the KEEA Municipality generate waste. Solid and liquid wastes were generated very often in their homes but gaseous wastes were sometimes or rarely generated. Again, rubbish, food waste, and trash were the forms of solid wastes that were generated by the residents.

2. It was found out that, both residents and Zoomlion staff observed a number of solid waste management practices. This is because, the residents indicated that they were committed to reducing solid waste in order to promote a sustainable environment; they served proper portion of food to reduce waste; they purchase reusable utensils and products in their homes rather than disposables; and they are motivated to reuse items in order to reduce solid waste going to landfill in order to reduce pollution. Again, the residents consider recycling as

important activities; and they try as much as possible not to contaminate waste food because it is an important role in the waste recycling programme. The Zoomlion company is responsible for collecting solid waste in the Komenda-Edina-Eguafo-Abrem Municipality; the company collects waste frequently from the Municipality; and the company sorts the waste for proper treatment and disposal.

3. It was realized that, there were a number of barriers to the effective solid waste management practices. These included inadequate environmental education; inadequate logistics and funds; inadequate depots, skips and dustbins; lack of adequate skilled personnel to manage services efficiently; and apathetic attitude/inertia on the part of some of the residents. Some other barriers included: irregular collection of waste by waste management company; lack of appropriate site for waste disposal; unwillingness of some households to pay for the collection and appropriate disposal of solid; and refuse dump located very far from home.

4. Also, a number of the waste management strategic action plan for sustainable development were identified. The strategies were that, regular monitoring system should be in place to ensure that households adhere to the solid waste management practices; education/training programmes on solid waste management should be provided for residents in the Municipality; there is the need to enforce sanctions on those who do not adhere to proper waste management. Again, there is the need for a reliable data on solid waste generation for households in the Municipality; and through the provision of additional bins, solid waste generation could be reduced and recycled as much

as possible through composting process and use this fertilizer for home gardening.

5. It was realized that, the residents of the KEEA Municipality were uncertain about the effectiveness of environmental management policies and practices of solid waste management. This is because, they were uncertain as to whether the Assembly ensures that they provide in their premises approved containers (plastic/galvanized containers) for storage of solid waste. Again, they were uncertain whether Assembly sanctions any person or firm that burns solid waste on their premises; and were uncertain whether the Assembly sanctions persons or firms who dump solid waste in an open space, drain, gutter, sewer, open land, quarry, river channel, swamp or places not designated by the Assembly for that purpose. They were also uncertain whether the Assembly provided education to persons on appropriate ways of storing solid waste for collection; and were uncertain whether the Assembly conducts regular monitoring to find out solid waste management practices. Again, the residents were uncertain whether the Assembly ensures that no person or firm deposits any solid waste at any site apart from the site designated by the Assembly for solid waste to be placed; and were uncertain as to whether Assembly ensures proper enforcement of the bye-laws on sanitation and appropriate solid waste management practices.

5.3 Conclusion

The following conclusions could be drawn from the findings of the study. It can be concluded that, rubbish, food waste, and trash were the categories or forms of solid wastes that were generated in the KEEA Municipality. However, residents did not provide separate bins to sort out the types of solid waste (e.g. glass, paper, plastic,

and rubber). This raises a lot of questions. Perhaps, the residents do not appreciate the need to provide additional bins or were just being negligent.

It can be concluded that, both residents and Zoomlion staff observed a number of solid waste management practices as they were ready to reduce solid waste to a very high extent but were not ready to reuse, and recycle solid waste. In reusing solid waste, the residents were uncertain as to whether they were motivated to reuse items in order to reduce solid waste going to landfill in order to reduce pollution. Again, in recycling solid waste, the residents had little interest in recycling solid waste because such activities are too expensive; and they were not prepared to recycle solid waste because such activities can be time-consuming. Perhaps, the residents do not have enough knowledge on the need and benefits associated with reducing, reusing and recycling sold waste. It could also mean that, perhaps, the residents do not consider recycling as important activities.

It can be concluded that there were a number of barriers to the effective solid waste management practices. Some of the barriers were inadequate environmental education; inadequate logistics and funds; inadequate depots, skips and dustbins; lack of adequate skilled personnel to manage services efficiently; and apathetic attitude/inertia on the part of some of the residents. Some other barriers included: irregular collection of waste by waste management company; lack of appropriate site for waste disposal; unwillingness of some households to pay for the collection and appropriate disposal of solid; and refuse dump located very far from home.

On the waste management strategic action plan for sustainable development, it can be concluded that, regular monitoring system should be in place to ensure that households adhere to the solid waste management practices; and education/training programmes on solid waste management should be provided for employees so that

they can appreciate the need for sustainable development practices. Again, there is the need for a reliable data on solid waste generation for households in the Municipality; and through the provision of additional bins, solid waste generation could be reduced and recycled as much as possible through composting process and use this fertilizer for home gardening.

Again, it can be concluded that, most of the environmental management policies and practices of solid waste management were not effective in the KEEA Municipality because the residents were uncertain about the effectiveness of the environmental policies that have been put in place. Perhaps, the Assembly does not conduct regular monitoring to find out solid waste management practices of the various households. It could be that the Assembly does not enforce bye-laws on sanitation on appropriate solid waste management practices.

5.4   Recommendations

Based on the findings and conclusions drawn from the study, the following recommendations have been made.

1. The Environmental Protection Agency (EPA), and the Municipal Assembly should ensure that, the various households provide separate bins to sort out the types of solid waste (e.g. glass, paper, plastic, and rubber). This would help manage solid waste generation as solid waste can be reduced and recycled as much as possible.

2. It is commendable that residents in the KEEA Municpality were ready to reduce solid waste. However, because they were not ready to reuse and recycle solid waste, the study recommends that, the Environmental Protection Agency (EPA) and the Assembly organize regular education/training programmes on solid waste management on the need to reduce, reuse and recycle solid waste

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so that they can appreciate the need for sustainable development practices. This would help the residents to realize that, reducing and recycling solid waste can create significant cost saving effects.

3. The study suggests that, government through the Ministry of Local Government should provide adequate logistics and funds for the procurement of dustbins in order to ensure proper solid waste management. The Assembly should ensure that Zoomlion collects wastes regularly. The Assembly should encourage residents to pay for the collection of waste and sanction recalcitrant residents who do not adhere to appropriate solid waste management practices.

4. On the waste management strategic action plan, the study recommends that, the Environmental Protection Agency (EPA), and the Assembly should conduct regular monitoring system in order to ensure that residents adhere to the solid waste management practices. Again, the Assembly should make available a reliable data on solid waste generation for households in the Municipality.

5. The study suggests that, the Environmental Protection Agency (EPA) and the Assembly should ensure proper enforcement of the bye-laws on sanitation on appropriate solid waste management practices. Residents of the KEEA Municipality should be encouraged by the Environmental Protection Agency (EPA) to consider reuse and recycling as important activities.

5.5 Areas for Further Research

This study sought to examine the generation practices and barriers to solid waste management in the Central Region of Ghana. The study could be replicated in other Municipalities, Metropolis and regions in the country to find out what persists there. Also, the study involved residents and Zoomlion staff as respondents for the study. Future studies may involve the workers from the Municipal Assembly, and the Environmental Protection Agencies (EPA) in order to find out the views they hold about solid waste management practices in their regions. Again, the study adopted the use of questionnaires as instruments for data collection. Future studies may consider using interview guides and observations in order to have first-hand information and be able to probe further and collect detailed information on the subject from respondents.

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APPENDICES

APPENDIX A

INTRODUCTORY LETTER

UNIVERSITY OF EDUCATION, WINNEBA
FACULTY OF SOCIAL SCIENCE EDUCATION
DEPARTMENT OF SOCIAL STUDIES EDUCATION
P. O. Box 25, Winneba, Ghana   socialstudies@uew.edu.gh
+233 (020) 2041096

14th September, 2020

TO WHOM IT MAY CONCERN

Dear Sir/Madam,
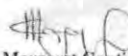
LETTER OF INTRODUCTION: MR. BASSAW THEOPHILUS KWEKU

We write to introduce Mr. Bassaw Theophilus Kweku to your outfit. He is an M.Phil. Social Studies Education student with index number 200029510 from the Department of Social Studies Education, University of Education, Winneba.

As part of the requirements for the award of the Master of Philosophy degree, he is undertaking a research on the topic: 'Categories, Generation Practices and Barriers to Solid Waste Management'.

Thank you.

Yours faithfully,

Margaret Gantier Nyala (Mrs.)
For: Ag. Head of Department

APPENDIX B

QUESTIONNAIRE FOR RESIDENTS

UNIVERSITY OF EDUCATION, WINNEBA

SCHOOL OF GRADUATE STUDIES

Questionnaire on ‒solid waste management in the Komenda-Edina-Eguafo-Abrem Municipality. This questionnaire is purely for academic work. I therefore ask for your maximum co-operation and assure you that information provided will be treated with utmost confidentiality.

SECTION A: DEMOGRAPHIC INFORMATION

Please respond to each of the following items by ticking (√) the appropriate response box.

1. Gender:

   a. Male   [   ]

   b. Female   [   ]

2. Age:

   a. 16-19 years [   ]

   b. 20-29 years [   ]

   c. 30-39 years [   ]

   d. 40-49 years [   ]

   e. 40-49 years [   ]

   f. 50-59 years [   ]

   g. 60-69 years [   ]

   h. 70+   [   ]

3. Employment Status:

    a. Unemployed   [   ]

    b. Employed   [   ]

    c. Self-employed   [   ]

4. Educational level:

    a. No formal education [   ]

    b. JHS   [   ]

    c. SHS   [   ]

    d. Tertiary   [   ]

SECTION –B CATEGORIES OF SOLID WASTE

Please tick (√) the appropriate box to indicate your opinion on these statements.

5. Do you generate any unwanted substance or unusable material that is usually discarded in your home?

    a. Yes   [ ]   b. No [ ]

If yes, please indicate the examples of waste (solid, liquid, gaseous wastes, etc.) that are usually generated. Key:

Never: means you do not generate such waste at all in your home

Rarely: means you scarcely generate such waste only once in a while (e.g. once in a week)

Sometimes: means you generate such waste from time to time (e.g. twice in a week)

Often: means you generate such waste regularly (e.g. thrice in a week)

Very Often: means you generate such waste always (e.g. every day)

Example(s) of Waste Generated	Never	Rarely	Sometimes	Often	Very Often
Solid					
Liquid					
Gas.					

9. Do you generate solid waste in your home?

    a. Yes [ ]   b. No [ ]

10. How often do you generate solid waste in your home?

    a. Very Often   [ ]   b. Often   [ ]   c. Sometimes [ ]   d.   Rarely

           [ ]

    e. Never [ ]

Please tick (√) the appropriate box to indicate your opinion on the various form(s) of solid waste generated in your home.

STATEMENT: What categories of solid waste do you generate in your home?	Yes	No
11. Rubbish (e.g. combustible rubbish i.e. paper, cardboard, plastics, textiles, rubber, leather, wood, furniture, and garden trimmings. Non-combustible rubbish i.e. glass, tin cans, aluminium cans, ferrous and other non-ferrous metals, and dirt).		
12. Food waste (i.e. uneaten portions of meals and trimmings from food preparation activities in kitchens, restaurants and cafeterias).		
13. Trash (rubble concrete and waste parts, installations and repairs, sinks, toilets, bathtubs, plumbing parts, automobile or truck parts, vehicle batteries, machinery, tree logs and limbs exceeding 6 inches in diameter and tree stumps).		

14. Special waste (street waste, animals and abandoned vehicles, litter from roadside, litter from municipal containers and bin debris).		
15. Harzardous waste (i.e. toxic, flammable, corrosive, radioactive, explosive and other dangerous materials).		

SECTION C: SOLID WASTE MANAGEMENT PRACTICES

Please tick (√) the appropriate box to indicate your opinion on the solid waste management practices in your home. Key:

Strongly Disagree (SD) = 1; Disagree (D) = 2; Uncertain (U) = 3; Agree (A) = 4; and Strongly Agree (SA) = 5.

Statements	SD	D	U	A	SA
16. My home is commitment to reducing solid waste in order to promote a sustainable environment.					
17. My home serves proper portion of food to reduce waste.					
18. This hotel/restaurant composts spoiled food into organic materials than trucking them to landfills.					
19. My home donates equipment, furniture and other items for reuse to charity.					
20. My home purchases reusable utensils and products (such as: rechargeable batteries, durable cups, cutlery, etc.) rather than disposables.					
21. My home is motivated to reuse items in order to reduce solid waste going to landfill and reducing pollution.					
22. My home repairs solid waste items rather than buy new.					
23. Additional bins have been provided in order to segregate the recyclable materials.					
24. My home considers recycling as important activities.					
25. My home has little interest in recycling solid waste because such activities are too expensive.					

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26. My home tries as much as possible not to contaminate waste food because it is an important role in the waste recycling programme					
27. Recycling solid waste can be time-consuming hence my unpreparedness to adopt such activities.					

Others, please specify,...

....

....

....

SECTION –D BARRIERS TO EFFECTIVE SOLID WASTE MANAGEMENT PRACTICES

Please tick (√) the appropriate box to indicate your opinion on these statements. Key:

Strongly Disagree (SD) = 1; Disagree (D) = 2; Uncertain (U) = 3; Agree (A) = 4; and

Strongly Agree (SA) = 5.

STATEMENT: What are the barriers to effective solid waste management practices in the Municipality?	SD	D	U	A	SA
28. Inadequate environmental education.					
29. Inadequate logistics and funds.					
30. Inadequate depots, skips and dustbins.					
31. Lack of adequate skilled personnel to manage services efficiently.					
32. Apathetic attitude/inertia on the part of some of the residents.					
33. Irregular collection of waste by waste management company.					
34. Lack of appropriate site for waste disposal.					
35. Unwillingness of some households to pay for the collection and appropriate disposal of solid waste.					
36. Refuse dump located very far from home.					

Others, please specify...

SECTION –E WASTE MANAGEMENT STRATEGIC ACTION PLAN FOR

SUSTAINABLE DEVELOPMENT

Please tick (√) the appropriate box to indicate your opinion on these statements. Key:

Strongly Disagree (SD) = 1; Disagree (D) = 2; Uncertain (U) = 3; Agree (A) = 4; and

Strongly Agree (SA) = 5.

STATEMENT: What strategies can be adopted for solid waste management?	SD	D	U	A	SA
37. Regular monitoring system should be in place to ensure that households adhere to the solid waste management practices.					
38. Education/Training programmes on solid waste management should be provided for residents in the Municipality.					
39. Enforcing sanctions on those who do not adhere to proper waste management.					
40. There is the need for a reliable data on solid waste generation for households in the Municipality.					
41. Through the provision of additional bins, solid waste generation could be reused and recycled as much as possible through composting process and use this fertilizer for home gardening.					

Others, please specify...

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SECTION –F EFFECTIVENESS OF ENVIRONMENTAL MANAGEMENT

POLICIES AND PRACTICES OF SOLID WASTE MANAGEMENT

Please tick (√) the appropriate box to indicate your opinion on these statements. Key:

Strongly Disagree (SD) = 1; Disagree (D) = 2; Uncertain (U) = 3; Agree (A) = 4; and

Strongly Agree (SA) = 5.

STATEMENT: How effective are the environmental management policies and practices of solid waste management in the Municipality?	SD	D	U	A	SA
42. My home has engaged the services of a licensed collector (e.g. Zoomlion Company Ltd.) approved by the Assembly to collect solid waste generated from our premises.					
43. The Assembly/licensed contractor determine the manner of disposal of all harzardous or health care wastes.					
44. The collection of solid waste is subject to charging of fees as approved by the Assembly in its fee fixing resolution.					
45. The Assembly conducts regular monitoring to find out solid waste management practices of various households in the Municipality.					
46. The Assembly ensures that no person or firm deposit any solid waste at any site apart from the site designated by the assembly for solid waste to be placed.					
47. The Assembly ensures that we provide in our premises approved containers (plastic/galvanised containers) for storage of solid waste.					
48. The Assembly sanctions any person or firm that burns solid waste on their premises.					

49. The Assembly ensures that we do not bum solid waste on our premises.					
50. The Assembly provides education to persons/employees of the firm on appropriate ways of storing solid waste for collection.					
51. The Assembly sanctions persons or firms who dump solid waste in an open space, drain, gutter, sewer, open land, quarry, river channel, swamp or their place not designated by the Assembly for that purpose.					
52. The Assembly ensures proper enforcement of the bye-laws on sanitation and appropriate solid waste management practices.					

Others, please specify..

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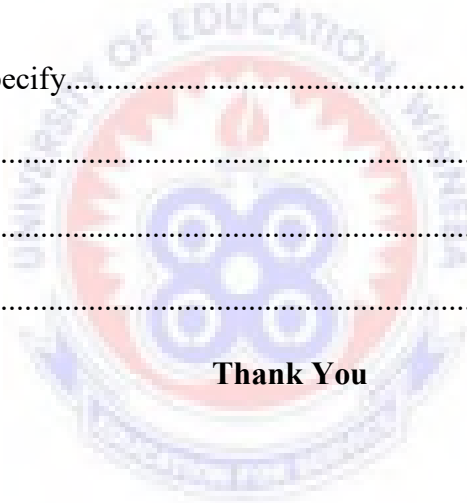
Thank You

APPENDIX C

QUESTIONNAIRE FOR ZOOMLION STAFF

UNIVERSITY OF EDUCATION, WINNEBA

SCHOOL OF GRADUATE STUDIES

Questionnaire on ─solid waste management in the Komenda-Edina-Eguafo-Abrem Municipality. This questionnaire is purely for academic work. I therefore ask for your maximum co-operation and assure you that information provided will be treated with utmost confidentiality.

SECTION A: DEMOGRAPHIC INFORMATION

Please respond to each of the following items by ticking (√) the appropriate response box.

1. Gender:

   a. Male   [   ]

   b. Female   [   ]

2. Age:

   a. 16-19 years   [   ]

   b. 20-29 years   [   ]

   c. 30-39 years   [   ]

   d. 40-49 years   [   ]

   e. 50-59 years   [   ]

   f. 60-69 years   [   ]

   g. 70+   [   ]

   h.

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3. Years of working experience:

    a. 1-5 years   [   ]

    b. 6-10 years   [   ]

    c. 11-15 years   [   ]

    d. 16-20 years   [   ]

    e. Above 20 years   [   ]

4. Educational level:

    a. No formal education   [   ]

    b. JHS   [   ]

    c. SHS   [   ]

    d. Tertiary   [   ]

SECTION B: SOLID WASTE MANAGEMENT PRACTICES

Please tick (√) the appropriate box to indicate your opinion on the solid waste management practices in your home. Key:

Strongly Disagree (SD) = 1; Disagree (D) = 2; Uncertain (U) = 3; Agree (A) = 4; and Strongly Agree (SA) = 5.

Statements	SD	D	U	A	SA
5. The company is responsible for collecting solid waste in the Komenda-Edina-Eguafo-Abrem Municipality.					
6. The company undertakes door-to-door solid waste collection from homes at KEEA Municipality.					
7. The company collects waste frequently from the Municipality.					
8. The company sorts the waste for proper treatment and disposal.					
9. The company sorts the waste in order to recycle/for reuse.					

Please indicate how solid wastes collected from the Municipality are disposed?

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SECTION C: BARRIERS TO EFFECTIVE SOLID WASTE MANAGEMENT

PRACTICES

Please tick (√) the appropriate box to indicate your opinion on these statements. Key:

Strongly Disagree (SD) = 1; Disagree (D) = 2; Uncertain (U) = 3; Agree (A) = 4; and

Strongly Agree (SA) = 5.

STATEMENT: What are the barriers to effective solid waste management practices in the Municipality?	SD	D	U	A	SA
10. Inadequate environmental education.					
11. Inadequate logistics and funds.					
12. Inadequate depots, skips and dustbins.					
13. Lack of adequate skilled personnel to manage services efficiently.					
14. Apathetic attitude/inertia on the part of some of the residents.					
15. Irregular collection of waste by waste management company.					
16. Lack of appropriate site for waste disposal.					
17. Unwillingness of some households to pay for the collection and appropriate disposal of solid waste.					
18. Refuse dump located very far from home.					

Others, please specify...

SECTION D: WASTE MANAGEMENT STRATEGIC ACTION PLAN FOR

SUSTAINABLE DEVELOPMENT

Please tick (√) the appropriate box to indicate your opinion on these statements. Key:

Strongly Disagree (SD) = 1; Disagree (D) = 2; Uncertain (U) = 3; Agree (A) = 4; and

Strongly Agree (SA) = 5.

STATEMENT: What strategies can be adopted for solid waste management?	SD	D	U	A	SA
19. Regular monitoring system should be in place to ensure that households adhere to the solid waste management practices.					
20. Education/Training programmes on solid waste management should be provided for residents in the Municipality.					
21. Enforcing sanctions on those who do not adhere to proper waste management.					
22. There is the need for a reliable data on solid waste generation for households in the Municipality.					
23. Through the provision of additional bins, solid waste generation could be reused and recycled as much as possible through composting process and use this fertilizer for home gardening.					

Others, please specify...

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Thank You

APPENDIX D

KOMENDA-EDINA-EGUAFO-ABREM MUNICIPAL ASSEMBLY

SOLID WASTE COLLECTION AND DISPOSAL BYE-LAWS, 2007

In the exercise of the powers conferred on the Komenda-Edina-Eguafo-Abrem Municipal Assembly by section 79 of the Local Government Act of 1993 (Act 462) these Bye-Laws are hereby made:

(a) The Assembly may for the purpose of the management of solid wastes generated within its area of authority, divide the area into solid waste collection service areas.

(b) The Assembly or its authorized agents franchises or contractors shall serve notice of commencement of solid waste collection services in areas specified for particular services and days for collection.

(c) Schedule 2 of these Bye-Laws specifies the area designated for particular collection services and days.

3. The Assembly may engage a licensed contractor or franchisee for any such terms as may be agreed upon by the Assembly.

4. All occupiers/owners of premises within a solid waste collection services area shall register with the authorized provider of such service.

(a) All occupier/owners of premises within a solid waste collection service area shall, prior to collection of the waste, store it on the premises in a container of a type approved by the Assembly for the type and level of service provided in such area, in accordance with Schedule 3 of these Bye-Laws.

(b) All occupiers/owners of premises within a solid waste collection service area shall place such container for col1ection on the day, at the time and in the manner as may be announced by the authorized provider of such service.

5. Solid waste thus made available for collection shall remain at all times the property of the Assembly.

6. Any occupier/owner of premises within a solid waste collection service area may, notwithstanding the other provisions of these Bye-Laws, engage a licensed collector to collect solid waste from the premises subject to the approval of the Assembly.

7. The Assembly shall designate a safe and accessible site or sites for treatment and/or final disposal of solid waste and shall for this purpose provide or cause to be provided such infrastructure as may be necessary.

(a) No person shall place or deposit any solid waste at any site, or cause or knowingly allow solid waste to place or deposited at any site, or use any vehicle plant or equipment for the purpose of placing or depositing solid waste unless the site at which the waste is place or deposited is so designated by the assembly for the purpose of solid waste treatment and disposal and the person is licensed by the assembly to place the waste at such designated treatment and for disposal site.

8. Schedule 4 of these Bye-Laws indicates the type of wastes acceptable at the assembly's designated solid waste disposal sites.

9. A licensed contractor shall not collect any hazardous or health care waste from any place unless such collection has been approved by the Assembly.

10. The Assembly shall determine the manner of disposal of all hazardous or health care wastes.

(a)The collection of solid waste shall be subject to charging of fees as approved by the Assembly in its Fee Fixing Resolution. If the collection is carried out by a franchisee, such fees shall be payable directly to franchisee.

(b) The Assembly may charge tipping fee for the placement of allowable types of solid waste by licensed operators at any designated disposal site for solid waste as approved by the Assembly in its Fee Fixing Resolution.

11. Any person who:

a) engages in the collection of solid waste in any area where the Assembly has not given them permission so to do;

b) Fails to register with the solid waste collection service provider designated by the Assembly for their area.

c) Fails to provide in their premises approved containers for storage of waste;

d) refuses to allow the Komenda-Edina-Eguafo-Abrem Municipal Assembly of its authorized service provider to collect solid waste from their premises;

e) Fails to make their solid waste collection available for collection on the day, at time and in the manner specified by the authorized service provider;

f) receives solid waste collection services from an unauthorized service provider;

g) bums solid waste on their premises;

h) Places or deposits any waste at an unauthorized disposal site;

i) Fails to pay any waste collection or tipping or discharge fees approved by the Assembly;

j) Places or deposits at any designated disposal site any waste not acceptable at the disposal site, as indicated in Schedule4;

k) Collects any hazardous or health care waste from any place without prior approval by the Assembly; or

1) Dumps solid waste in an open space, drain, gutter, sewer, open land, quarry, river channel, swamp or their place not designated by the Assembly for that purpose commits an offence.