UNIVERSITY FOR DEVELOPMENT STUDIES

SOLID WASTE MANAGEMENT IN THE WA MUNICIPALITY:

CHALLENGES AND OPTIONS

BY

DONGBALLE FELIX

APRIL, 2016

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DONGBALLE FELIX (BE.D SOCIAL STUDIES)

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A DISSERTATION SUBMITTED TO THE INSTITUTE FOR CONTINUING EDUCATION AND INTER-DISCIPLINARY RESEARCH, UNIVERSITY FOR DEVELOPMENT STUDIES IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR AWARD OF MASTER OF ARTS DEGREE IN ENVIRONMENTAL SECURITY AND LIVELIHOOD CHANGE

APRIL, 2016

DECLARATIONS

Candidate's Declaration

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

Signature …… Date…….

Dongballe Felix

Supervisor's Declaration

I hereby declare that the preparation and presentation of the dissertation were supervised in accordance with the guidelines on supervision of dissertations laid down by the University for Development Studies.

Signature …… Date…….

Dr. Osumanu Kanton

ABSTRACT

The situation of waste management in emerging cities of developing countries is challenging. This study was undertaken to establish the underpinning causes of poor waste management in the Wa Municipality and to suggest options to deal with the challenges. The study adopted a descriptive research design through the use of questionnaire surveys; and in-depth interviews. The study reveals that residents have been dumping waste improperly and indiscriminately within the study area. Also poor communal participation in waste management, inadequate logistics and lack of a definite schedule for collecting waste in the municipality was identified, as major challenges confronting waste management. The study recommends that households should be sensitized and educated on good waste management practices to whip up their interest in waste management.

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I wish to thank Madam Esther Dam my dear wife for her help throughout this study. Damwaa Agape, thank you for your efforts and encouragement. My profound thanks go to my entire family, colleagues and friends for providing me with the needed data for this research.

DEDICATION

I dedicate this work to my dear parents (Moses, .K. Dongballe and Gertrude Tanye) for nurturing and taken care of me to mature into a man. The write-up is also dedicated to my wife Esther Dam.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

LIST OF ACRONYMS

ADB	African Development Bank
AMA	Accra Metropolitan Assembly
DESSAPS	District Environmental Sanitation strategies and Action Plan
EHSD	Environmental Health Safety Department
EPA	Environmental Protection Agency
GIM	Ghana Innovation Market
IWM	Integrated Waste Management
MLGRD	Ministry of Local Government and Rural Development
MMDAs	Metropolitan, Municipal and District Assemblies
MSW	Municipal Solid Waste
MSWM	Municipal Solid Waste Management
NEMA	National Environmental Management Authority
NESP	National Environmental Sanitation Policy
PPP	Polluter Pay Policy
SWM	Solid Waste Management
UNEP	United Nations Environment Programme
USEPA	United States Environment Protection Agency
WMA	Wa Municipal Assembly
WMD	Waste Management Department

CHAPTER ONE

INTRODUCTION

1.1 Background of Research

Many Developing Countries are still struggling with solid waste collection and management (Wilson, 2007). China currently produces the largest quantity of municipal solid waste (MSW) in the world at 190, 000, 000 metric tons. Projections indicate that by 2030 the rate of waste generation will be 480,000,000 metric tons per year (World Bank, 2005).

Solid waste is any material which comes from domestic, commercial, and industrial sources arising from human activities which has no value to people who possess it and is discarded as useless (Shafiul and Mansoor, 2003; Puopiel, 2010). According to Medina (2000), solid waste are materials generated from the result of human daily activities resulting from areas such as households, public places and city streets, shops, offices and hospitals. In addition, Solid waste is any material that arises from human and animal activities that are normally discarded as useless or unwanted. It includes non-hazardous industrial, commercial and domestic waste including: household organic trash, street sweepings, institutional garbage and, construction wastes (Tchobanoglous *et al.,* 1993; Zerbock, 2003). Waste is more easily recognized than defined. Something can become waste when it is no longer useful to the owner or it is used and fails to fulfil its intended purpose. There are basically two types of waste namely liquid and solid waste (Freduah, 2004). Between 0.7 and 1.8 g per capita of waste is produced every day in developed countries' urban areas and approximately 0.4 to 0.9 kg is produced in the cities of developing countries (Mungure, 2008).

According to Jarrod and Associates (1999), within the Africa continent, Nigeria and Ghana are not an exception to the countries which generates a greater part of African's waste. Municipal solid waste in developing countries is composed of wastes from household refuse, institutional wastes, commercial wastes, streets sweepings and also remains from various construction works (Mungure, 2008). Solid waste management refers to source separation, storage, collection, transportation and final disposal of waste in an environmentally sustainable manner (Puopiel, 2010). According to Mensah and Larbi (2005) based on an estimated population of 22 million and an average daily waste generation per capita of 0.45 kg, Ghana generates annually about 3.0 million tons of solid waste. Municipal solid waste is defined to include refuse from households, non-hazardous solid waste from industrial, commercial and institutional establishments (including hospitals), market waste, yard waste and street sweepings. Municipal solid waste management (MSWM) encompasses the functions of collection, transfer, treatment, recycling, resource recovery and disposal of municipal solid waste (Peter *et al.,* 1996). The first goal of municipal solid waste management is to protect the health of the population, particularly that of low-income groups. Other goals include promotion of environmental quality and sustainability, support of economic productivity and employment generation (Peter *et al*., 1996).

According to Zurbrugg (2009), 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. Also Boadi and Kuitunen (2004) pointed out some of the problems affecting solid waste management in Ghana, these include: weak institutional capacity and lack of resources; both human and capital.

Furthermore, MLGRD (2004) summarizes the challenges of solid waste management in Ghana as follows: poor planning for waste management programmes; inadequate equipment and operational funds to support waste management activities; inadequate sites and facilities for waste management operations; inadequate skills and capacity of waste management staff; and negative attitudes of the general public towards the environment in general. 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. This can result in the loss of human resources needed in the development of the country (Puopiel, 2010).

1.2 Statement of the Problem

According to UNEP (2009), in 2006 the total amount of municipal solid waste (MSW) generated globally reached 2.02 billion tones, representing a 7 percent annual increase since 2003. It is further estimated that between 2007 and 2011, global generation of municipal waste rose by 37.3 per cent, equivalent to roughly 8 percent increase per year (UNEP, 2009). Reports from Ghana Statistical Service, (2002) and Oduro-Kwarteng *et al.* (2006) indicates that a significant proportion (about 30%) of the population in Ghana does not have access to solid waste services.

The Ghana Innovation Market Place (2009) defines solid waste as neither wastewater discharges nor atmospheric emissions, arising from domestic, commercial, industrial, and institutional activities in an urban area. Events of the 20th and early into the 21st century indicate that waste in whatever form or classification- solid, liquid or toxic have become a major consequence of modernization and economic development (Tsiboe and Marbell, 2004).

The associated problems in solid waste management are basically inadequate institutional facilities to deal with the problem arising out of shortage of expertise, financial resources, legal and administrative enforcement of environmental regulations, many of which do not conform to the need of the time (Visvanathan, et al., 2003). Coupled with this is the lack of public awareness and environmental ethics that results in uncontrolled solid waste disposal (Visvanathan, *et al*., 2003).

According to Puopiel (2010), Solid waste management in Ghana has become a major challenge to MMDAs due to urbanization and increasing population densities. Municipal Assemblies find it difficult to deal with the large quantities of solid waste generated, resulting in people resorting to indiscriminate dumping as the only means to managing their domestic solid waste. This leads to littering and heaping of waste. Puopiel (2010) reported that poor waste management has resulted in littering, heaping of waste and overflowing of skips with waste most especially in the low class residential and peri-urban areas. The recent proliferation of polythene bags for packaging has also seriously aggravated the situation. This situation when unchecked could result in the outbreak of diseases, illness or even death. Poor waste management could lead to extra cost spent in treating avoidable diseases. Also illness may result in loss of human resource and work-time hours. Solid waste management has become a major problem in the Wa Municipality as a result of poor waste collection, storage, and disposal. Also, the municipality is an emerging city, because of that little attention is given to the issue of waste management, probably due to competition with other sectors of development for funds. This research is therefore intended to find out the composition of solid waste generated, disposal and challenges confronting the Wa Municipality.

1.3 Research Questions

This study was designed to address the following questions:

The main research question is what are the current waste management system and practices in the Wa Municipality?

i. What are the different types of solid waste generated in the Wa Municipality?
ii. How do residents in the Wa Municipality dispose their domestic solid waste?
iii. What are the challenges/problems associated with the current solid waste management in the Wa Municipality?
iv. What is the frequency of solid waste collection and disposal in the municipality?
v. What equipment and resources are available in collecting and disposing solid waste generated in the municipality?
vi. What are the adaptable solutions to identify to arrest the solid waste situation in the Wa Municipality?

1.4 Research Objectives

The main objective of the study was to assess the challenges to the current waste management practices in the Wa Municipality.

i. To assess the composition of solid waste produced in the Wa municipality.
ii. To examine the methods of solid waste collection and disposal in the Wa Municipality.

iii. To analyse the frequency of solid waste collection in the Wa Municipality.

iv. To examine the challenges of solid waste management in the Wa Municipality.

v. To evaluate the equipment and resources available in collecting and disposing solid waste generated in the municipality.

vi. To identify options and strategies for sound waste management in the Wa Municipality.

1.5 Justification of the Study

Despite the fact that developing countries do spend about 20 to 40 percent of metropolitan revenues on waste management, they are unable to keep pace with the scope of the problem (Zerbock, 2003). Solid waste was identified as the second most important problem after water quality (Senkoro, 2003 cited by Zerbock, 2003). The problems of solid waste management in cities have become burdensome despite efforts being made by city authorities and governments (Onibokun and Kumuyi, 1999). Mensah and Larbi (2005) reported that based on an estimated population of 22 million and an average daily waste generation per capita of 0.45 kg, Ghana generates annually about 3.0 million tonnes of solid waste. 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 (Zurbrugg 2009). A significant proportion (about 30%) of the population in Ghana does not have access to solid waste services (Ghana Statistical Service, 2002; Oduro-Kwarteng *et al*., 2006). Solid waste management in Ghana has become a major challenge to metropolitan, municipal and district assemblies (MMDA) due to urbanization and increasing

densities, Municipal Assemblies find it difficult to deal with the large quantities of solid waste generated. Resulting in people resorting to indiscriminate dumping as the only means to managing their domestic solid waste, this leads to littering and heaping of waste (Puopiel, 2010). According to Boadi *et al*. (2003) indiscriminate disposal of waste in surface drains and streams creates unsanitary and unsightly environment. In most cities of developing countries, waste management is inadequate: a significant portion of the population does not have access to a waste collection service and only a fraction of the generated waste is actually collected (Peter *et al*., 1996; Issahaku, 2011).

The Wa Municipality is one of the developing cosmopolitans in Ghana. It is surrounded by cluster of commerce businesses and market-links and in recent times, solid waste generation, collection, and disposal has become an emerging challenge. However, there is a dearth of research and information on types of solid waste, methods of solid waste management and the frequency of waste collection in the municipality. This research work therefore seeks to help provide the necessary information that the municipal assembly and other stake holders need in other to inform their decisions on solid waste management. Also, recommendations from this research work would lay the foundation for future studies on solid waste management in the metropolis; this would help improve the sanitation challenges faced in the municipality.

1.6 Scope of the Study

This research is limited to waste disposal management and its challenges in the Wa Municipality. The study intends to investigate the residents inability to maintain a sanitary clean environment and to emphasis on the link between good health and

clean environment. The Geographical scope of the study is the Wa Municipality, and the study covers some residential areas.

The study area has been demarcated around the municipality which will enable the investigator have access to all areas and its populace to circulate questionnaires and conduct interviews to unearth and reveal all the details needed to satisfy the answers to the questions arising from the dissertation and the research needs. The study will not exclude schools, the market site, churches and other human organizational concentrations such as stadium to scan the good sanitary traits of those which are clean and impact these traits on those which are not clean.

1.7 Organization of the Research

This dissertation is chronologically organized into five (5) main and distinctive chapters whose details are outlined below:

Chapter one introduces the entire dissertation and presents the context of the research. It covers the background to the study; statement of the problem for this research and followed by the research questions with objectives arising from the purpose or need for the study.

Chapter two treats the literature review related to the conceptual issues addressed in the dissertation. The first section of the literature review discusses some basic concepts related to solid waste management, whiles the second part review literature on solid waste management problems in urban settlements, which focuses on the urban solid waste problem in developing countries, discussing the nature and the causes of the problem.

Chapter three treats the chosen methodology of this research study which comprises the circulation of questionnaire for responses in the catchment area of the study, which is the Wa Municipality which is accompanied by interviews of the Environmental Health Director and the Municipal Supervisor of Zoomlion Company, students, market women, store owners and businessmen.

Chapter four follows next and analyses and presents the results of the study on individual respondents and institutions.

The research ends in chapter five which treats and discusses the observations, suggestions made by the investigator to help solve the menace in the Wa Municipality and finally ends in the concluding remarks.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Literature review is important in such work, to give a panoramic view of the terrain in which a particular research traverses. It enables the researcher to capture a cross section of perceptions and positions on the subject matter and contextualizes the study. Consequently, it helps the ultimate reader to appreciate a particular study against the backdrop of existing knowledge and viewpoints. It is in this connection that an overview of relevant literature on solid waste management is hereby made.

2.2 Definition and Historical Background on Solid Waste

According to Tsiboe and Marbell (2004), events of the 20th and early into the 21st century indicate that waste in whatever form or classification- solid, liquid or toxic have become a major consequence of modernization and economic development. Throughout history, cities and towns have struggled with how to collect and dispose of the refuse generated by their populations (Doan, 1998).

Waste is a dynamic concept which can be defined in different ways (Pongrácz, 2009). The Ghana Innovation Market Place (2009) popularly known as 'GIM` defines solid waste as neither wastewater discharges nor atmospheric emissions, arising from domestic, commercial, industrial, and institutional activities in an urban area. Waste also refers to an item, material or substance you as an individual consider useless at a given time and place (Mugambwa, 2009).

According to Cointreau-Levine and Coad (2000), municipal waste refers to wastes from domestic, commercial, institutional, municipal and industrial sources, but excluding excreta, except when it is mixed with solid waste.

Solid waste also known as garbage is not very different from municipal waste. This study takes on the definition by the State of the Environment Report for Uganda (NEMA, 2007) that defines solid waste as organic and inorganic waste materials produced by households, commercial, institutional and industrial activities that have lost value in the sight of the initial user.

2.3 Source, Type and Classification of Solid Waste

Tchobanoglous *et al.* (1993) classified types of solid waste in relation to the sources and generation facilities, activities, or locations associated with each type. Tchobanoglous *et al.* (1993) has further explained the types of solid waste which include food waste, rubbish, ashes and residues and special waste.

Furthermore, the centre for Environment and Development (2003) has also classified types of solid waste based on origin (food waste, rubbish, ashes and residue, demolition and construction, agricultural waste), based on characteristics (biodegradable and non-biodegradable), based on the risk potential (hazardous waste).

According to Denison and Ruston (1990); Kreith (1994) and Zerbock, 2003) solid waste is composed of combustibles and non-combustibles materials. The combustible materials include paper, plastics, yard debris, food waste, wood, textiles, disposable diapers, and other organics. Non-combustibles also include glass, metal, bones, leather, and aluminium.

Table 2.1: Typical Waste Generation Facilities, Source and Location associated with Various Sources of Solid Waste

Source	Typical Location	Types Of Solid Waste
Residential	Single-family and multifamily dwellings, low-medium, and high-rise apartments.	Food wastes, rubbish, ashes, special wastes
Commercial/ Municipal	Stores, restaurants, markets, office buildings, hotels, motels, print shops, auto repair shops, medical facilities and institutions.	Food wastes, rubbish, ashes, demolition and construction wastes, special wastes, occasionally hazardous wastes
Industrial	Construction, fabrication, light and heavy manufacturing, refineries, chemical plants, lumbering, mining, demolition.	Food wastes, rubbish, ashes, demolition and construction wastes, special wastes, occasionally hazardous wastes
Open areas	Streets, alleys, parks, vacant plots, playgrounds, beaches, highways and recreational areas.	Special waste, Rubbish
Treatment plants sites	Water, waste water, and industrial treatment processes.	Treatment plant wastes, principally composed of residual sludge.
Agricultural	Field and row crops, orchards, vineyards, dairies, feedlots and farms.	Spoiled food wastes, agricultural waste, rubbish, hazardous wastes.

Source: Tchobanoglous et al. (1993), Cited in Puopiel, (2010)

2.4 Management of Solid Waste

Waste generation has become inevitable in recent times; however, Management of solid waste is an important component after waste generation. According to Kumah (2007) solid waste management is the administration of activities that provide for the

collection, source separation, storage, transportation, transfer, processing, treatment, and disposal of waste. However, Tchobanoglous *et al.* (1993) provide a detailed definition as 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 accordance with the best principles of public health, economics, engineering, conservation, aesthetics and other environmental considerations and that is also responsive to public attitudes. An effective system of solid waste management must be both environmentally and economically sustainable. Environmentally sustainable means it must reduce, as much as possible, the environmental impacts of waste management. Economically sustainable means it must operate at a cost acceptable to the community.

Clearly it is difficult to minimize the two variables, cost and environmental impact, simultaneously. There will always be a trade-off. The balance that needs to be struck is to reduce the overall environmental impacts of the waste management system as far as possible, within an acceptable level of cost (Sombroek, 2008; Amler *et al.*, 1999). According to Puopiel, (2010) there are six Key Elements of Solid Waste Management (Figure 2.1).

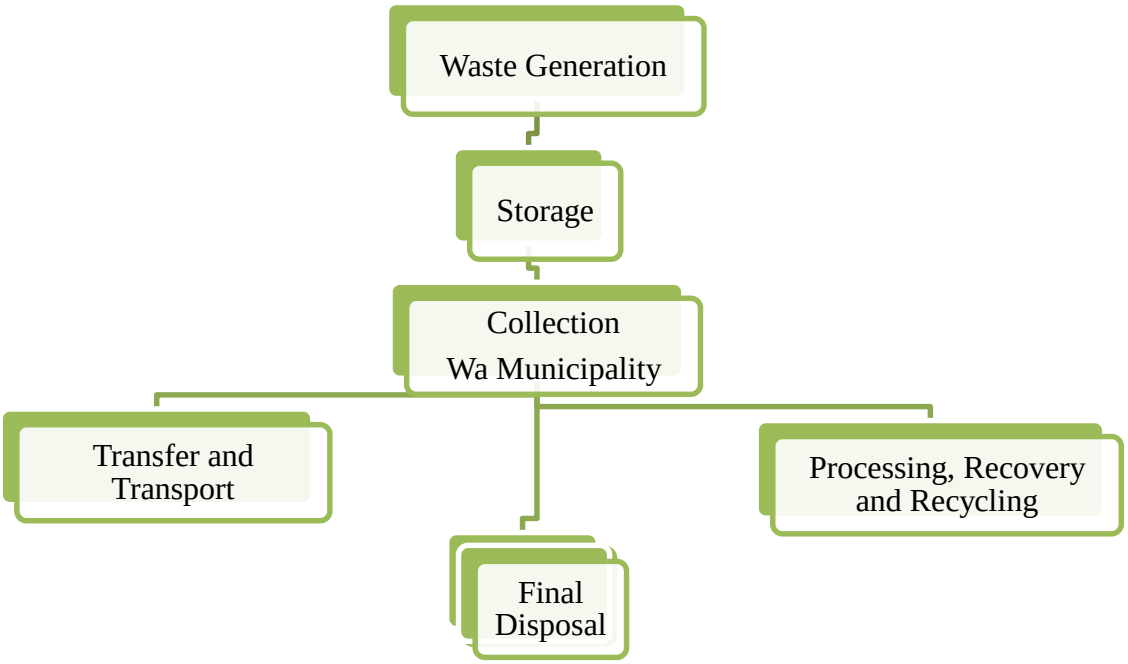

Figure 2.1: Conceptual Framework of Solid Waste Management

Source: (Puopiel, 2010)

Storage is where solid waste is stored before it is collected. It could be stored in a skip or dustbins and not thrown away indiscriminately (Tchobanoglous *et al.*, 1977). 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, 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 (Kreith, 1994). 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. 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*, 1977).

Solid waste management is one of the most important services for ensuring sustainable development and maintaining the quality of life in urban areas. Sustainable solid waste management involves a system that is appropriate to the local conditions from a social, financial, and environment perspectives, and capable to maintain itself over long time without reducing the resources it needs (van de Klundert and Anchutz, 2001). Thus, creating the need for an effective management of solid waste.

2.5 Integrated Waste Management Approach

Integrated Waste Management (IWM) is an approach to waste management that is most compatible with an environmentally sustainable development. It refers to the complementary use of a variety of practices to safely and effectively handle municipal solid waste (USEPA, 1995; Mungure, 2008). According to Schubeler *et al*. (1996) agencies responsible for solid waste management often pay too little attention to integrated management approaches based on adequate information systems, management approaches, methods, and techniques.

According to Seadon (2006), Integrated Waste Management provides a flexible framework on how to manage and optimize waste management and it is a framework of reference for designing and implementing new waste management systems and for analysis and optimizing existing systems.

Solid Waste Management (SWM) aims to minimize the impact of municipal solid wastes on public health within communities and the environment, to promote environmental hygiene and cleanliness by preventing environmental pollution, and to

recover and recycle valuable resources to minimize waste and disposal cost as well as stimulate local employment opportunities (Oduro-Kwarteng, 2011).

The concept refers to Reduce, Reuse and Recycle. The concept emphasizes on an increase in the ratio of recyclable materials, use of raw materials and manufacturing waste as well as an overall reduction in the resources and energy used. The strategy is to identify the levels at which the highest values of individual and collective materials can be recovered. The most favourable is reduction, which suggests using less to begin with and reusing more, thereby saving material production, resource cost, and energy. The approach not only aims at maximizing recovery of reusable and recyclable materials, but also reduces pollution and protects human health and the environment. The least desirable is landfilling (USEPA, 1995; Mungure, 2008). The major components of integrated solid waste management is explained below.

Waste Reduction: The main idea is to minimize the amount of waste generated. Amount of waste for disposal is minimized and kept in check. But waste reduction also involves an aspect of culture on people's behaviour and attitudes (USEPA, 2002).

Reuse: Common materials for reuse include plastic bags, bottles, paper, cans and cardboards which are recovered for domestic purposes normally at household levels. Reuse plays a valuable resource conserving role (ADB, 2002).

Recycling and composting: Recycling and composting are beneficial in terms of taking up less land and leads to low rate of pollution. Composting is a controlled natural process of decomposition of organic waste material (ADB, 2002).

Incineration: only beneficial in regions where land suitable for landfilling is scarce due to geographical constrains, highly urbanized region or environmental conditions.

Main benefit of incineration is reduction of weight and volume reaching up to 75% and 90% respectively (UNEP- IETC, 1996).

Landfilling: Though the last preferred method, it is a common disposable practice in most African countries. Many operate as dumps on open sites, wetlands or lands with water near the surface. Types of landfills include uncontrolled open dumps, controlled dumps and secure sanitary landfills. Uncontrolled open dumps are the least effective disposal of municipal solid waste in relation to appropriate local health and environmental standards (UNEP- IETC, 1996).

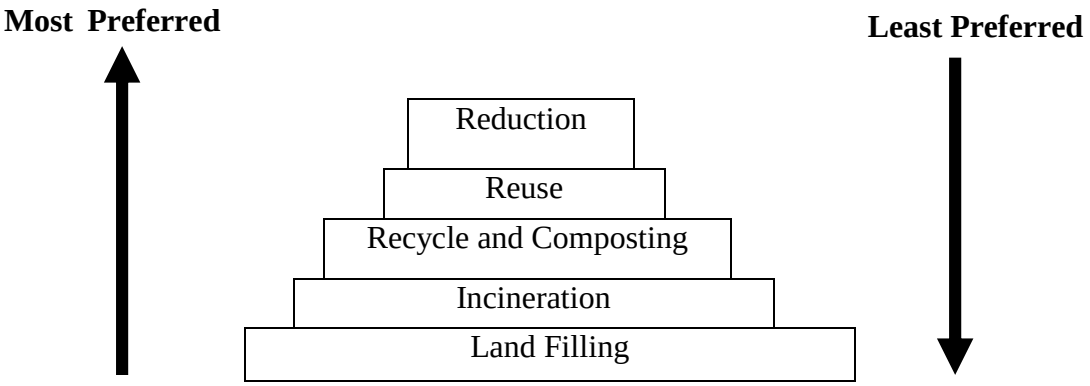

Figure 2.2: Hierarchy of Integrated Waste Management

Source: (USEPA, 1995 cited in Mungure, 2008).

2.6 Methods of Solid Waste Disposal

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 by Tchobanoglous *et al.* (1993). However, according to Puopiel (2010), 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. 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. Contemporary methods of solid waste management, especially in Ghana include source reduction, sanitary landfills, composting, recycling, and incineration (Denison and Ruston, 1990). The disposal of solid waste has always been an intractable problem throughout Ghana (Landfill Guidelines, 2000). Landfills in Ghana are primarily open dumps, bushes, surface drains and streams, open heaps, drainage channels and parcels of land without leachate or gas recovery systems (Ghana Landfill Guideline, 2002).

Ambat *et al*. (2003) reported that Garbage generated in households of the City is seldom stored for more than a day and is mostly taken to the Dump Place or Container or just dumped on the adjacent roadside from where it is collected by the municipal workers while sweeping of the roads. 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. Composting is another method of waste disposal. The 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, 2003). UNEP (2009) 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; it is the option that, with few exceptions, best fits within the limited resources available in developing countries. Low-technology approach to waste reduction is composting (Zerbock, 2003).

Another method of waste disposal is incineration; it is a controlled combustion process for burning combustible waste to gases and reducing it to a residue of non-combustible ingredients. However 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 (Centre for Environment and Development 2003). In most of the developing countries the main disposal method for solid waste is open dumping; more often than not the dumping sites are very near to areas of human habitation (Medina, 2002).

2.7 Challenges and Problems Associated with Solid Waste Generation and Management in Ghana

Solid waste management can be described as a mechanism associated with the control of generation, storage, collection, transport, processing and disposal of solid wastes in a way that favours the best interests of public health and takes into considerations environmental concerns (Mungure, 2008).

According to Zurbrugg (2009), 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. 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 (Ogawa, 2005).

Solid waste management especially in developing countries have technical problems which affects their level of efficiency. There are inadequate human resources with technical expertise necessary for solid waste management planning and operation. Many officers have little or no technical background or training in engineering or management.

Also low priority is given to solid waste management, resulting in the challenges of managing large quantities of waste. And little financial commitment is given for solid waste management by governments (Ogawa, 2005; Puopiel 2010). Zerbock (2003) also confirmed that in developing countries the problems associated with solid waste management are more acute than in developed countries. The storage, collection, transportation and final treatment/disposal of wastes are reported to have become a major problem in urban centres (ADB 2002; Kaseva and Mbuligwe 2005; Okot-Okumu and Nyenje 2011; Rotich *et al.,* 2006).

According to Mensah and Larbi (2005), based on an estimated population of 22 million and an average daily waste generation per capita of 0.45 kg, Ghana generates annually about 3.0 million tonnes of solid waste. Boadi and Kuitunen (2004) pointed out some of the problems affecting solid waste management in Ghana, these include: weak institutional capacity and lack of resources; both human and capital.

According to Puopiel, (2010) 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. In addition, 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 (Ogawa, 2005; Puopiel, 2010).

According to Visvanathan *et al.* (2003), the associated problems in solid waste management are basically inadequate institutional facilities to deal with the problem arising out of shortage of expertise, financial resources legal and administrative enforcement of environmental regulations, many of which do not conform to the need of the time. Coupled with this is the lack of public awareness and environmental ethics that result in uncontrolled solid waste disposal.

Furthermore, MLGRD (2004) summarizes the challenges of solid waste management in Ghana as follows: poor planning for waste management programmes; inadequate equipment and operational funds to support waste management activities; inadequate sites and facilities for waste management operations; inadequate skills and capacity of waste management staff; and negative attitudes of the general public towards the environment in general.

Solid waste management in Ghana has become a major challenge to MMDAs due to urbanization and increasing densities, Metropolitan Assemblies find it difficult to deal with the large quantities of solid waste generated. Resulting in people resorting to indiscriminate dumping as the only means to managing their domestic solid waste, this leads to littering and heaping of waste (Puopiel, 2010).

Table 2.2: Per capita Solid Waste Generation and Garbage Collection Efficiency (%) in Selected African Countries with their Population Estimates

Country	City Name	Per capita SW generation Kg/day	Households with garbage collection(%)	Population >0.5million
Benin	Porto Novo	0.5	25	0.6
Burkina Faso	Ouagadougou	0.7	40	1.6
Burundi	Bujumbura	1.4	41	-
Cameroon	Douala	0.7	60	1.1
	Yaounde	0.8	44	1.0
Congo, DR	Kinshasa	1.2	0	6.3
Congo Rep	Brazzaville	0.6	72	0.9
Cote d'ivore	Abidjan	1.0	70	3.4
Egypt	Cairo	0.5	65	14.5
The Gambia	Banjul	0.3	35	0.5
Ghana	Accra	0.4	60	1.7
Guinea	Conakry	0.4	60	1.7
Mauritania	Nouakchott	0.9	15	0.6
Morocco	Rabat	0.6	90	106
Namibia	Windhoek	0.7	93	-
Niger	Niamey	1.0	25	0.5
Nigeria	Ibadan	1.1	40	2.0
	Lagos	0.3	8	8.0
Senegal	Dakar	0.7	36	2.3
Tanzania	Dar es Salaam	1.0	25	2.3
Togo	Lome	1.9	27	0.8
Tunisia	Tunis	0.5	61	1.8
Uganda	Kampala	0.6	20	0.8
Zimbabwe	Harare	0.7	100	1.5

Source: World Resources, 1998-1999., Cited in Mungure, (2008)

2.8 Solid Waste Disposal Methods and Regulative Policies in Ghana

General waste management in Ghana is the responsibility of the Ministry of Local Government and Rural Development (MLGRD), which supervises the decentralized Metropolitan, Municipal and District Assemblies (MMDAs). However, the ministry indicates that, regulatory authority is vested in the Environmental Protection Agency (EPA) under the auspices of the Ministry of Environment and Science MLGRD, (2004). According to Anomanyo (2004), in the Accra Metropolitan Assembly (AMA) different methods of solid waste disposal have been adopted by residents. 51.4 %

constituting over half the population of the metropolis that use public dumping site to dispose their waste, 12.2% and 19.5% burn and bury their solid waste respectively. Only 19.5% of solid waste in the metropolis is collected by waste management agents.

Metropolitan, Municipal and District Assemblies are responsible for the collection and final disposal of solid waste through their Waste Management Departments (WMDs) and their Environmental Health and Sanitation Departments (EHSD). The policy framework guiding the management of hazardous, solid and radioactive waste includes the Local Government Act (1994), 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). All these Acts and Regulations emanate from the National Environmental Action Plan (MLGRD, 2004; cited in Puopiel, 2010). The National Environmental Sanitation Policy (NESP) was published in May 1999. The policy looks at the basic principles of environmental sanitation, problems and constraints. Its Co-ordination Council is responsible for coordinating the policy and ensuring effective communication and cooperation between the many different agencies involved in environmental management in their respective Districts (MLGRD**,** 2004, cited in Puopiel, 2010).

The 1992 Constitution of Ghana provides various relevant legislations for the control of waste in Ghana to include the following (Republic of Ghana, 1992):

- Local Government Act, 1990 (Act 462)
- Environmental Assessment Regulations, 1999 (LI 1652).
- Criminal Code, 1960 (Act 29).

• Water Resources Commission Act, 1996 (Act 522).

• Pesticides Control and Management Act, 1996 (Act 528).

• National Building Regulations, 1996 (LI 1630).

Also, under the Ministry of Environment, Science and Technology (MEST), EPA and the Ministry of Health the following guidelines and standards for waste management have been enacted:

• National Environmental Quality Guidelines (1998)

• Ghana Landfill Guidelines (2002)

• Manual for the preparation of district waste management plans in Ghana (2002)

• Guidelines for the management of healthcare and veterinary waste in Ghana (2002)

- Handbook for the preparation of District level Environmental Sanitation Strategies and Action Plans (DESSAPs).

2.9 Human Health Risk Associated with Solid Waste Management

There are some human health risks associated with solid waste handling and disposal in all countries to some degree, but certain problems are more acute and widespread in developing countries. (Cointereau,1982 cited by Abdul-Latif, 2010) has classified these into four main categories; the presence of human faecal matter, presence of potentially hazardous industrial waste, the decomposition of solids into constituent chemicals which contaminate air and water systems, and the air pollution caused by

consistently burning dumps and methane release. Human faecal matter is present in every solid waste system; in developing nations the problem varies with the prevalence of adequate sanitary disposal systems such as municipal sewage or on-site septic system. In areas where such facilities are lacking (especially municipal districts), the amount of human faecal matter present in the solid waste stream is likely to be higher. This presents a potential health problem not only to waste workers, but also to scavengers, other use of the same municipal drop-off point and even small children who like to play in or around waste containers as in the case of the Wa Municipality.

Waste pickers and those directly involved in its primary management, especially the Zoomlion and national youth employment sector, are susceptible to diseases, and it has been proposed to provide low-cost or free protective wear. According to Essumang and Bentum (unpublished), solid waste that are mishandled can harbour disease-carrying agents, become air and water pollutants, and pose serious health hazard both for the general public and for professionals engaged in waste collection and processing. Mismanagement of solid waste will also contribute to other forms of pollution that constitute health hazards. Rainwater falling on a garbage dump will wash salts and organic materials into nearby streams or into ground water, a process known as leaching. Leaching from solid wastes as mine tailings can be particularly dangerous if copper, arsenic and similar toxic elements are present. Some of the diseases associated with solid waste management are cholera, dysentery, typhoid fever, diarrhoea, tuberculosis, and even malaria.

In Ghana, the sight and smell of inadequately managed wastes constitute a major discomfort to resident and visitors. Pollution of water resource increase the technical

difficulty and cost of providing water supplies and the environmental health situation also has serious health impact, with attendant social and economic cost. Flooding with its associated damage to public infrastructure and private property increases with improper solid waste management.

The prevalence of parasites, diarrhoea and malaria, in the parts of Accra has been as a result of unsanitary conditions in and around these areas. Common diseases like malaria, intestinal worms, and other common health problems reported at the out-patient facilities in Accra, and majority of these cases are residents in and around the slums (Songsore and McGranahan, 1993) where sanitation is poor. Choked drains and gutter have created stagnant waters that act as breeding grounds for mosquitoes, which transmit, among other diseases, malaria.

2.10 The “Cradle to Cradle” Theory (Continues Improvement Strategy)

The term 'cradle to cradle' was first coined in the early 1970's. However, it has more recently become widely recognized following publication of the book 'cradle to cradle'-remaking the way we make things (Michael and William, 2002) and subsequently released in Europe in a documentary 'Waste= Food'. The cradle to cradle theory is fundamentally about constantly improving and moving from simply being "less bad" to becoming good.

As for solid waste, it is not just waste, but it is also the resources that we should treat. From the above description, the way that reduces solid waste is the first and most important way. Cities should avoid excessive wastage of resources, which includes goods packaging for Products, recycling of material, continues reuse of waste and the economical use in public life. The ”Cradle to cradle” is designed to stop the cycle of use-waste-pollute, which suggests that certain products could be reused endlessly to

make similar products (cradle to cradle), rather than recycled into lower-grade products until the last stop is a landfill (cradle to grave), McDonough et al., (2002). That means that the products described above can be used, recycled, and used again without losing any material quality in cradle to cradle cycles. Therefore, the theory could be a very good way for reducing the waste from the raw materials of the products instead of using more and more virgin materials. Besides, considering from the waste hierarchy, it also increases the proportion of the waste reuse. Hence when we face the problems of municipal solid waste, this theory can bring us the possibility for the breakthrough. Finally the "cradle to cradle" if adopted by Ghana could serve as a panacea to the numerous waste management challenges facing Ghana in general and the Wa Municipality in particular.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the methods and tools that were used to conduct this research. It specifies the research design, sampling procedure, research instruments, sources of data and data analysis techniques that were used to explore the causes of poor waste management in the Wa municipality.

3.2 Research Design

Research design is a framework for conducting a research. It specifies detailed procedures for obtaining information needed to solve a research problem, Malhotra (2007). Saunders et al. (2007) also defines research design as the general plan of how the questions would be answered.

Descriptive research method was used for the study. According to Isaac and Michael (1978), the method is used to describe systematically a situation or area of interest actually and accurately. They further stated that the design could be public opinion survey, fact finding surveys and status studies.

A descriptive research is intended to find facts concerning the nature and the status of the situation, as it exist at the time of the study and to describe the present conditions and events based on impressions or reactions of the respondents of the research (Natamba, 2011). This study was concerned with the relationships and parties that exist, beliefs and processes that are on-going, effects that are being felt or trends that are developing around poor waste management. The researcher used cross-section study and triangular method (qualitative and quantitative designs).

For instance the qualitative approach was used to ensure that opinions that were obtained were confirmed by statistical data. Finally, the study used in-depth interviews, observations as well as survey and statistical records.

3.3 The Study Area

3.3.1 Location and Size

The study area is the entire Wa Municipality. Wa Municipality is one of the 11 administrative and political districts in the Upper West Region of Ghana. The district was upgraded to a municipal status in 2004 and this has changed the structure of the area significantly. The municipality lies between latitude 1°40'N and 2°45'N and longitude 9°32 to 10°20W, thus covering an area of approximately 23,474 square kilometres which is about 32% and 2.56% of the total land area of the region and the country respectively (Figure 3.1). The Wa Municipality is located in the southern part of the region and shares administrative boundaries with, the Nadowli-Kaleo District to the North, the Wa East District to the South-East and Wa West District to the South-West (Wa Municipal Assembly, 2012). Wa the Municipal Capital is the commercial and political seat of the region.

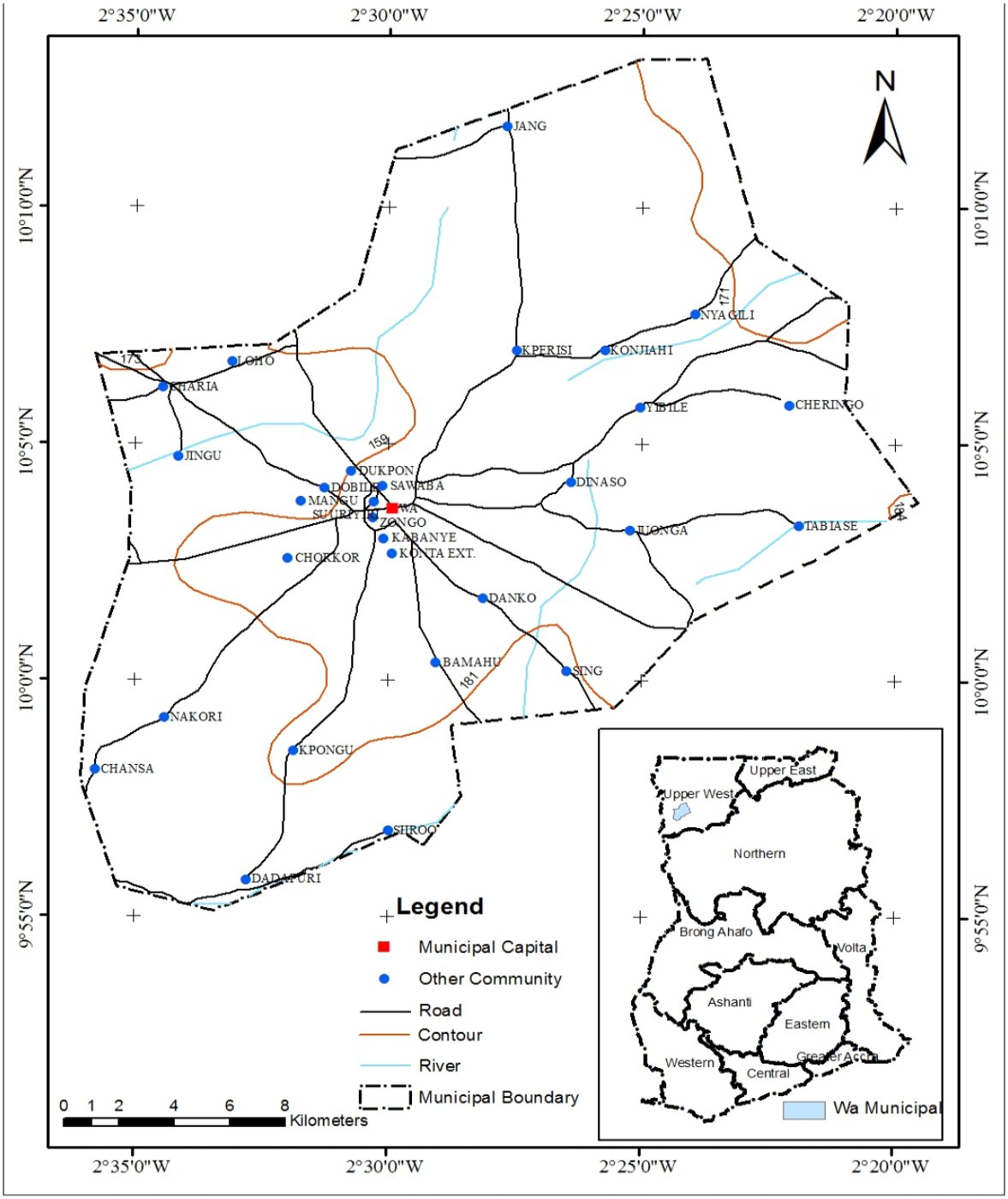

Figure 3.1: Map of the Wa Municipality

Source: Aduah and Aabeyir, (2012)

3.3.2 *Structure of the Municipality*

Most of the people in the study area are peasant farmers and traders. The population is heterogeneous comprising Sissalas, Walas, Dagaabas and Moshies among others. Basically, the agricultural sector supports the major economic activities of the municipality and employs about (66.6%) of the labour force (Abdul-Latif, 2011). The major food crops grown in the area are millet, sorghum (guinea corn), maize, groundnuts, cowpea and yam. Cash crops such as cotton, shea-nut and dawadawa are also found in the area. The regional hospital, supported by three other known health centres (the Ahmadiyya, Islamic and Lotsu clinic) are the only health facilities found within the study area.

Abdul-Latif (2011), observed that the development of the Wa Municipality is saddled with lack of funds and high rate of illiteracy to deal with when it comes to the collection of revenue for the Assembly. Sanitation facilities in the municipality are still very poor and malaria continues to be a major disease in the area. Floods are the recent problems that besiege the area, simply because of the erection of illegal structures on water ways and poor sanitary practices.

3.3.3 *Population*

The population of the study area is 107, 214 comprising 22,167 males above 18 years and 30,829 males under 18 years and 22,393 females above 18 years and 31,825 females under 18 years, Ghana Statistical Service (2012). The population structure of the Wa Municipality revealed a preponderance of youth over the aged and females over males. The youth form 49%, potential working population 47% and the aged 4%. This means that there is high dependency ratio since the economically active population is 47% as compared to the dependent population of 53%.The population is

also a female dominated, that is 51% females against 49% males GSS(2012).The growth rate of the municipality varies between 2.7% for rural and 4% for urban.

The population density is 542 per square kilometre. There is growing population density as result of migration and the establishment of the University for Development Studies and the Wa Polytechnic consequently puts pressure on land and socio economic infrastructure. This raises the issue of population management, specifically, housing, wastes, streetism and conflict management.

3.4 Sample Size Estimation

In all a total of two hundred (200) respondents were selected for the study. The sample size comprised of 60 respondents from high class residential areas, 50 from the middle class and 90 from low class areas. 1 worker each from the municipal assembly and Zoomlion Ghana Ltd were also interviewed. Institutions and households were sampled to get accurate representation of the solid waste situation of the municipality and a better reflection of the problem.

3.5 Sampling Techniques

The following sampling techniques were employed to select respondents for the study. These were stratified, systematic, purposive and accidental sampling. The municipality was zoned into three strata of economic classes, namely, high class, middle class and low class residential areas. The classification took into consideration the following characteristics; type of construction materials used (blocks, bricks), type of roof (zinc, thatch), layout of houses, drainage system, potable water supply and disposal of waste. Table 3.1 shows economic classes of the Wa Municipality.

Table 3.1: Showing Economic Classes of the Wa Municipality

High Class Residential Areas	**Middle Class Areas**	**Low Class Areas**	
Degu	Konta	Zongo	Mangu
Upland hotel	Bamahu	Sokpayiri	Nayiri
SSNIT	Kpaguri	Fongo	Dondoli
Airport	Wapaani	Kperesi	Tuomuni
Wa poly	Seventy seven	Guli	Sandamuni
Jahan	Dobile	Kpongo	Tagrayiri
Kalsaga	Kambali	Busa	Konjiehi
State Housing	Danku	Sing	Kyegli
Locust	Kumbiehi	Boli	Limanyiri
Xavier		Piisi	Charia
Sahel		Chansa	Tampieni
		Nakori	

Source: Field Survey, June 2014

From the strata, systematic sampling technique was used to select residential areas in each stratum and households in the selected area. Because of lack of census data of the population in the listed areas, the sample size of 200 respondents was divided equally among the 20 selected areas. This gave a sample size of 10 respondents interviewed in each selected area in the municipality. Table 3.2 shows the systematic sampling procedure.

Table 3.2: Sampled Populations

Selected area	No. of houses	Total people to be surveyed	Sample fraction
Xavier	130	10	Every 10th house
SSNIT Flats	43	10	Every 3rd house
State Housing	80	10	Every 7th house
Degu	60	10	Every 5th house
Jahan	100	10	Every 8th house
Airstrip	140	10	Every 11th house
Konta	150	10	Every 12th house
Kumbiehi	180	10	Every 14th house
Bamahu	130	10	Every 10th house
Dobile	198	10	Every 15th house
Wapaani	200	10	Every 15th house
Zongo	180	10	Every 14th house
Sandamuni	160	10	Every 13th house
Piisi	50	10	Every 4th house
Busa	115	10	Every 9th house
Kpongo	110	10	Every 8th house
Kperisi	120	10	Every 9th house
Dondoli	145	10	Every 11th house
Donkpong	162	10	Every 12th house
Suriyiri	180	10	Every 14th house

Source: Field Survey, June 2014

Because most of the houses in the selected areas were not properly planned with serial numbers, the houses were listed in a form of a sampling frame and every K^{th} house was selected starting from the direction of the first point of contact with any house in the selected area. With this approach a respondent was interviewed in each K^{th} house until the sample size of 10 people is obtained in each area. Finally, accidental sampling method was used to select the respondents for interview. That is, the first person to be contacted in a selected house was interviewed. If the first person contacted was not ready, the next available person was interviewed.

Since some respondents did not understand the English language, research assistants who understood both English and the local dialect were trained to administer the questionnaires. The questionnaires were pre-tested in the study area before the full

survey was carried out. The pre-testing gave the opportunity to improve clarity of questions for certain pertinent issues which could not be captured initially to be included in the final questionnaire. The questionnaire survey was carried out before the interview because certain new issues came up during the survey which could not be captured in the questionnaire survey.

Purposive sampling technique was used to select the Municipal Director of the Environmental Health Department of the Wa Municipal Assembly and Zoomlion Municipal supervisor. This is because; the researcher felt that they were having an in-depth knowledge on the subject matter in the study area.

3.6 Methods of Data Collection

Both primary and secondary sources of data were collected for the study.

3.6.1 Survey questionnaire

In gathering the primary data for the study, questionnaires were administered to respondents. The questionnaire comprised of two sections; the demography included the respondent's sex, age, level of education, occupation and duration of stay in the municipality. They also consisted of questions both open and closed ended in which if answered well, would have exhausted the research objectives. In this method of data collection, the respondents got and filled in a well-structured questionnaire. The questionnaire were personally delivered and later picked from the premises of the respondents. The respondent were given time to fill in the questionnaires. The researcher believes that this method gave the respondents enough time to reflect, concentrate and in some instances to consult. However, to the semi-literate

respondents, the questions were translated into local languages for clear understanding and correct responses.

3.6.2 Interviews

The researcher conducted personal interviews especially to key informants like the Zoomlion Municipal Supervisor and the Municipal Environmental Health Officer. The researcher also introduced himself to the respondents by presenting an introductory letter from the University. The researcher then precisely explained the purpose of the study as the causes of poor waste management in the Wa Municipality. The researcher went ahead to explain how the potential respondents were selected and that the responses would be treated confidentially and only used for academic purposes. It was made clear to the respondents that the interviews were not testing knowledge but rather helping the researcher to learn from them.

3.6.3 Observation

This is a purposive or intentional examination of something, particularly for purposes of data gathering (Chaplain 1968, cited by Natamba, 2011). The researcher used observation to record instances of poor waste management events in the municipality. The researcher used a camera to take pictures of waste littered around the municipality.

3.7 Sources and Type of Data

Different sources of data were utilized in this study. The methodological technique was selected based on the fact that multiple sources of evidence are the way to ensure construct validity (Yin, 1994). The study utilized both primary and secondary data sources. Also, the main data were both quantitative and qualitative. A combination of qualitative and quantitative data is important, since by combining qualitative with

quantitative information, a deeper understanding of the organization can be achieved (Lusthaus *et al*., 1995). Also, according to Flowerdew and Martin (2005), a multiple method approach gives a deeper understanding of the complexity of the issues as well as enables triangulation of the results. In this study, the secondary data sources were, books, articles, newspapers, journals and the internet. Also, data was obtained from the Wa Municipal Assembly during the research work. Issues around which data was collected included, were how solid waste is managed by the Municipal Assembly, waste management policies and partners, activities, period of operation, implementing agencies, and cost involved in managing solid waste in the municipality. Others included challenges encountered during waste management and the municipality plans in the future.

3.8 Validity and Reliability

Validity refers to the appropriateness, meaningfulness and usefulness of the inference/deductions a researcher makes (Fraenkel and Wallen: 153, cited by Natamba, 2011). In order to make sure that the instruments were valid, the draft questionnaire was given to the supervisor and colleagues to comment on the wording, clarity and their ability to address the research objectives. The comments helped improve on the research instruments.

Reliability refers to the consistency, dependability or trust worthiness of the responses obtained from one administration of an instrument to another and from one set of items to another (Frankel and Wallen 1996:160, cited by Natamba, 2010). To ensure consistency of the research instrument, the researcher used simple, concise language and clear expressions which were quite appropriate to the respondents. Instructions were made as simple and clear as possible. Questions were phrased clearly to ensure

consistency in responses of the participants. The respondents who participated in the study were expected to be knowledgeable to provide reliable information. The selected sample was adequate and representative. After all that, 10 instruments were pre-tested in a pilot study. The researcher did that in instances where he was not sure about the adequacy of the optional response categories that had been devised for one question, for instance questions that had options like 'others, please specify', the researcher's concern was that the responses set to such question might not be effective; as a result the option 'other, please specify' might attract a disproportionately large number of responses, a problem the researcher wished to avoid. The results of the pre-testing brought on board very important modifications in the questionnaire.

3.9 Data Analysis and Presentation

As observed by Natamba (2011), Data obtained from the field in raw form is difficult to interpret. The initial data collected was subjected to quality checks to ensure that the recordings were correctly done with minimal errors. This entailed editing, repeated interviews where necessary, coding, summarizing, categorizing and grouping similar information, analysing according to the theme of the study. The researcher deemed it important to note quotations and observations made during the interviews and their sources or the name of the interviewee. All the questionnaires were analysed whether completed or not. Microsoft Excel was used to analyse the data. The results were done using emerging issues on solid waste and were later presented in a tabular or graphic form like pie-chats, bar graph and frequencies and percentages.

Care was taken to avoid discarding any data, as this could be reverted to in a later analysis. Relevant quotations were ear-marked. Analysis was done manually as earlier

mentioned by identifying areas of emphasis according to themes and summarized in a narrative form as a presentation of the major findings of the study.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter is divided into two main components. The first section seeks to outline, among other issues, the institutional mechanisms and shortfalls of ensuring effective waste management practices in the Wa Municipality with a focus on key institutions such as Zoomlion Ghana Limited, which runs a Public Private Partnership with the various MMDAs. The second section provides a detailed analysis of data collected from 20 communities across the Wa Municipality with a total of 200 respondents.

4.2 Sex Distribution of Respondents

With regard to waste management, gender plays an important role in determining and outlining individual roles in waste management at the household and community level. This is because both men and women play different roles in dealing with sanitation issues due to socio-cultural factors. Male and female respondents constituted 52.7 percent and 57.3 percent respectively (Figure 4.1).

This is attributed to the fact that most males rather referred to the women to respond to the questions posed with the indication that it is women who are concerned with issues related to waste management. From personal observation, even the men that responded to the questions posed to them did so with the guidance of their wives.

The high representation of women is an indication that high standards of environmental sanitation can be achieved in line with the objectives of the WMA if waste management policies are strategically targeted at women.

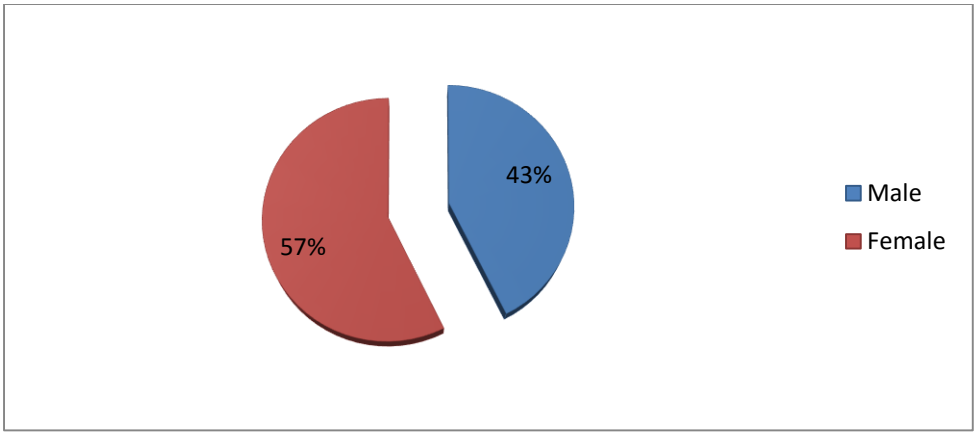

Figure 4.1: Sex of Respondents

Source: Field Survey, June 2014

4.3 Respondents Level of Education

From the survey, 72 percent of the respondents had formal education as against 28% who have no formal education as shown in Figure 4.2. One major impediment to the achievement of high environmental sanitation and effective waste management has to do with changing the lukewarm attitude of individuals towards waste management which can be done through civic educational campaigns. The result of 72 percent literacy rate among the respondents is a clue that intensive public educational campaigns on the print and electronic media can achieve appreciable results in this direction.

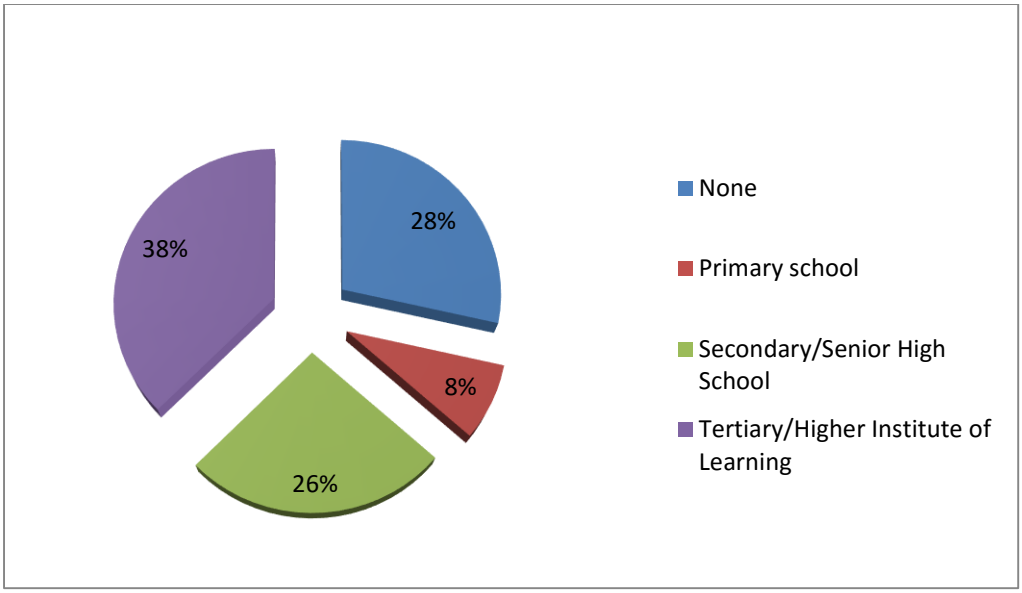

Figure 4.2: Respondents level of education

Source: Field Survey, June 2014

4.4 Institutional Mechanisms for Waste Management in the Wa Municipality

The Wa Municipal Assembly together with Zoomlion Ghana limited are the two key players in relation to waste management issues in the municipality. These two institutions have signed a Memorandum of Understanding through a PPP to, among other issues, oversee the promotion of private participation in waste management and improvement in monitoring and supervision of waste collection and proper disposal, public education on environmental hygiene and ensuring community participation in waste management. To ensure the achievement of these objectives several activities' have been put in place, these include but not limited to provision of logistics and haulage equipment, capacity building and refresher courses for staff of WMD of the Wa Municipal Assembly, introduction of street sweepers, monthly clean-up exercises and the acquisition of more sanitary facilities i.e. dustbins and building of more toilets in various communities.

Knowledge on types and components of waste generated informs key players in the waste management industry to use appropriate methods to effectively deal with the various components of solid waste and also make budgetary allocations on equipment and logistics. It also enables the WMD of the WMA and Zoomlion to target the special needs of the communities they serve since the population size of a particular area has a direct relationship with the amount of waste generated. Methods such as source separation, recycling and composting are all part of the outlined ways of managing waste in the municipality but only the conventional method of collection and dumping on waste dump sites is common in the municipality.

The Waste Management Department (WMD) of the Wa Municipal Assembly (WMA) estimates that the municipality generates an average of 99.86 tonnes of waste per day. These amounts to 3,6448.9 tonnes of waste per year. However since both institutions work in sync it may be safely concluded that the figure above represents the quantum of waste generated per year across the municipality as shown in table 4.1. According to Zoomlion and the WMA, the commonest types of waste generated in the municipality were food, wood, metal, plastics, rubbish, and organic waste. These components are shown in Table 4.1.

Table 4.1: Forms of Waste Generated In the Wa Municipality

Institution	Plastic	Glass	Wood	Metals	Food Waste	Others
Zoomlion(%)	90	1	1	3	5	0
Municipal Assembly(%)	25.46	0	0	0	54.76	19.77

Source: Field Survey, June 2014

Plate 4.1 Plastic Waste

Table 4.1 shows that plastic waste constitutes the largest component of waste generated in the municipality and the least components of waste generated was glass and wood. This is because a lot of polythene bags are used for packaging goods by entities and households. Furthermore this scenario explains why a lot of polythene bags were seen littered in most of the study areas such as Zongo, Wapaani, Dondoli, Sandamuni and Suuriyiri, (Plate 4.1). The disposal of household solid waste is one of the essential elements in the management of waste. Waste disposal if not done properly and regularly results in large scale environmental pollution and the breeding of vectors such as mosquitoes and flies which spread communicable diseases. Table 4.2 shows the methods of collection and number of times waste is collected and disposed per week in the municipality.

Table 4.2: Waste Collection Method and Frequency of Waste Collection per week

Area	Mode of collection	Number of times per week
Degu	Litter bin	Depends on logistics
Ssnit	Communal container/Litter bin	Depends on logistics
Jahan	Communal container	Depends on logistics
State housing	Crude dumping	-
Xavier	Communal container/Litter bin	Depends on logistics
Airport	Communal container	Depends on logistics
Konta	Communal container	Depends on logistics
Dobile	Crude dumping	-
Kunbiehi	Communal container	Twice
Wapaani	Communal container	Twice
Bamahu	Crude dumping	-
Zongo	Communal container	Twice
Suriyiri	Communal container	Twice
Kperisi	Crude dumping	-
Kpongo	Crude dumping	-
Piisi	Crude dumping	-
Dondoli	Communal container	Twice
Sandamuni	Communal container	Twice
Dokpong	Communal container	Twice
Busa	Crude dumping	-

Source: Field Survey, June 2014

From Table 4.2, communities that have high population density and closer proximity to the central business district of Wa Township have been supplied with communal containers for household waste collection and disposal. These include areas such as Konta, Wapaani, Zongo, Kumbiahi and Dondoli. First class residential areas such as Xavier and SSNIT Flats also have these communal containers for waste collection. From Table 4.2, both the Zoomlion and the WMD of the WMA do not have a definite and efficient routine schedule for emptying containers. Containers are emptied depending on factors such as availability of fuel, haulage lorries being in good condition, or pressure from community members especially the assembly men and women.

In instances where they don't make follow-ups, the containers are left spilling over with waste for weeks and sometimes months. Communities, such as Busa, Kpongo and Kperisi which are quite remote and sparsely populated lack containers for dumping waste.

Residents in these areas resort to dumping their waste mostly behind their houses in pits or in the open. Data from the field survey and personal observations indicated that both Zoomlion and the WMA had inadequate equipment to deal with the increasing amounts of waste spawned in the municipality.

The municipal assembly is hard-hit by the shortage of equipment as required, (Table 4.3).

Table 4.3: Availability of Waste Management Equipment

Institution	Equipment's	Dustbin	Tricycle	Skip Loader	Compaction Trucks	Bull Dozers	Road sweepers	Road on/roll trucks	Graders
Zoomlion	No. available	2,000	55	8	2	0	0	2	None
	No. required	3,000	400	20	10	1	1	2	1
WMA	No. available	1,000	None	1	1	1	None	None	None
	No. required	2,500	None	15	5	2	None	None	1

Source: Field Survey, June 2014

Available records from the (PPP) Polluter Pay Policy with Zoomlion indicates that the Municipal Assembly is required to provide 30 percent capacity to assist Zoomlion but in the case of WMA, they rather rely heavily on Zoomlion's equipment and this ultimately results in frequent breakdown of equipment, leaving waste uncollected for several weeks in most of the densely populated communities.

4.5 Waste Management Mechanisms at the Household and Community Level

Effective waste management is a collective responsibility for institutions, households, individuals and the community at large. A polluted environment at one end of a community affects people at the other end. To this effect 200 respondents were interviewed across communities of the Wa Municipality stratified under first class, middle class and low class residential areas. The purpose of this stratification was to peruse the residential dynamics for improving waste management in the Wa Municipality.

4.6 Types of Waste Commonly Generated by Households

From Figure 4.3, plastic waste constitutes a major portion of the waste generated in the Wa Municipality, representing 50.5 percent of the total waste generated. Since plastics are not biodegradable, they have long-lasting negative effects on the environment. Plastic waste if not properly disposed can easily be blown by wind very far away from its point of generation thereby intensifying environmental pollution. The dumping of plastic waste in gutters (Plate 4.2, 4.3 and 4.4) can easily cause gutters to be choked since plastics usually block the free flow of water. Additionally, choked gutters serve as breeding grounds for mosquitos which may also cause malaria.

On the positive side however, alternative ways of managing plastics such as using them for weaving baskets, ropes, making of beads can be adopted to reduce and reuse plastics. This can also serve as supplementary sources of income for poor households. Food waste constituted 43percent of waste generated in the municipality. This is an indication that a good proportion of waste generated can be recycled into compost for agricultural activities.

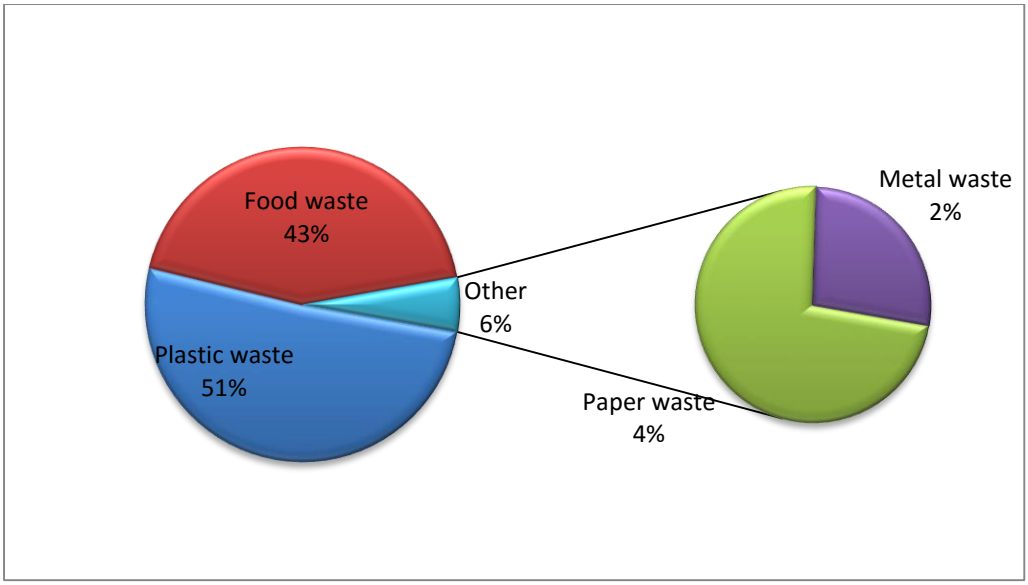

Figure 4.3: Forms of Waste Generated in the Wa Municipality

Source: Field Survey, June 2014

Plate 4.2, 4.3 and 4.4: Show drains choked with solid waste in the municipality

Source: Field Survey, June 2014

4.7 Types of containers used for collecting and storing waste at the household level

The traditional method of waste collection is the commonest method of collecting waste in the Wa Municipality (gathering and storing waste in used things). From

Figure 4.4 residents have found various ways for instance using spoiled basin, old basin, plastic bag, used fertilizer sacks for collecting and safely storing waste within the household and emptying it whenever it is necessary (Plate 4.5 and 4.6). This is a clear example of reusing materials that would otherwise have constituted wastes. This is a positive indication that with the necessary resources and advocacy, waste in the municipality can be reused repeatedly thereby reducing waste. Since every household keeps a container in one way or the other for waste collection, the prospects of encouraging households to sort their waste can be exploited to enhance effective waste management and recycling.

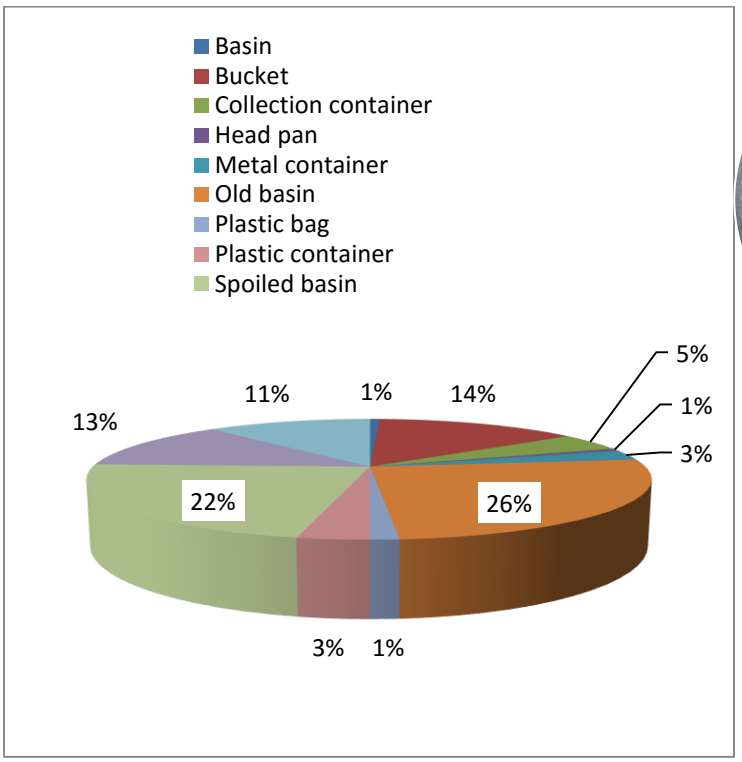

Figure 4.4: Types of Containers used for Collection and of Waste

Plates 4.5 and 4.6: plastic litter bins

Source: Field Survey, June 2014

Waste disposal if not properly engineered can thwart efforts aimed at facilitating effective waste management at the community level. From the study, it was observed

that a good majority of residents are able to store waste properly at the household level using various kinds of storage containers. However, properly disposing waste off poses a serious setback for community members and institutions dealing with waste. Communal containers are mostly found within places of high population density and apparently, due to settlement patterns in these areas, natural vegetation is virtually none-existent. Due to this, most residents are compelled to empty their waste into the communal skips. From the survey, 58 percent of the respondents who live in areas blessed with rich vegetation cover resort to throwing waste into the bush as shown on Plate 4.7, whereas 17 percent of the respondents dump their rubbish in the open. Another 17% burn their rubbish in the open. As indicated in Figure 4.5, 8 percent of the respondents have no specific place for dumping waste. From observation, this category of respondents dumps their waste in gutters, open drains, on the streets or uncompleted buildings. These unconventional methods of dumping waste has the tendency to cause environmental pollution, death of animals that graze on dumping sites and the spread of vector diseases such as malaria and cholera.

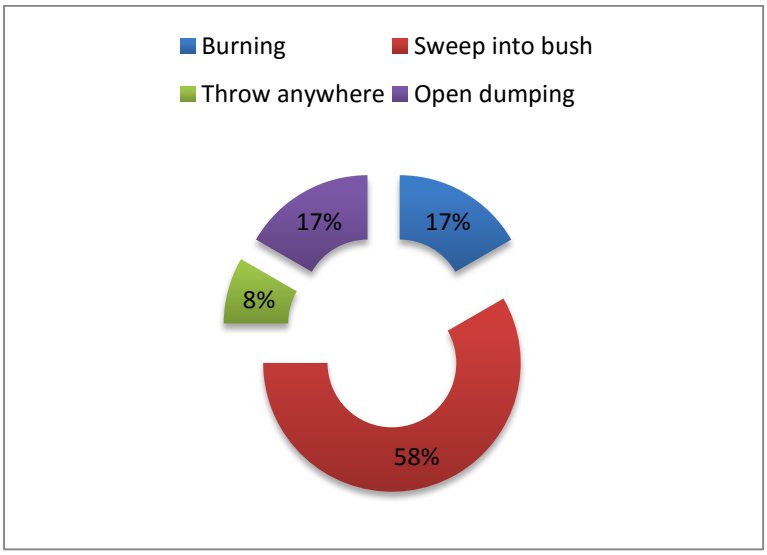

Plate 4.7: Waste openly dumped on natural vegetation

Figure 4.5: Alternative Ways of Waste Disposal

Source: Field Survey, June 2014

4.8 Perceptions of Waste Management in the Wa Municipality

The issue of effective waste management becomes more complex and costly with regard to increasing urbanization and growing populations. The acquisition of a municipal status by the then Wa District Assembly in the year 2004, among other issues, has been a catalyst of population growth and this has come with its ramifications for waste management.

About 53.9 percent of the respondent's interviewed from the Wa Municipality opined that the attainment of a municipal status has brought about an improvement in waste management in the municipality. They cited among other concerns, the (PPP) Polluter Pay Policy with Zoomlion, the availability of more communal containers, and the dotting of several toilets in various communities as being the cause of this improvement. About 46.1 percent of the respondents in sharp contrast opined that the attainment of the status of a municipality has rather worsened the capacity of the WMA to deal effectively with waste (Figure 4.6). They cited among other issues rapid urbanization, logistical constraints of the WMD of the WMA and inadequate personnel as being a ban on effective waste management.

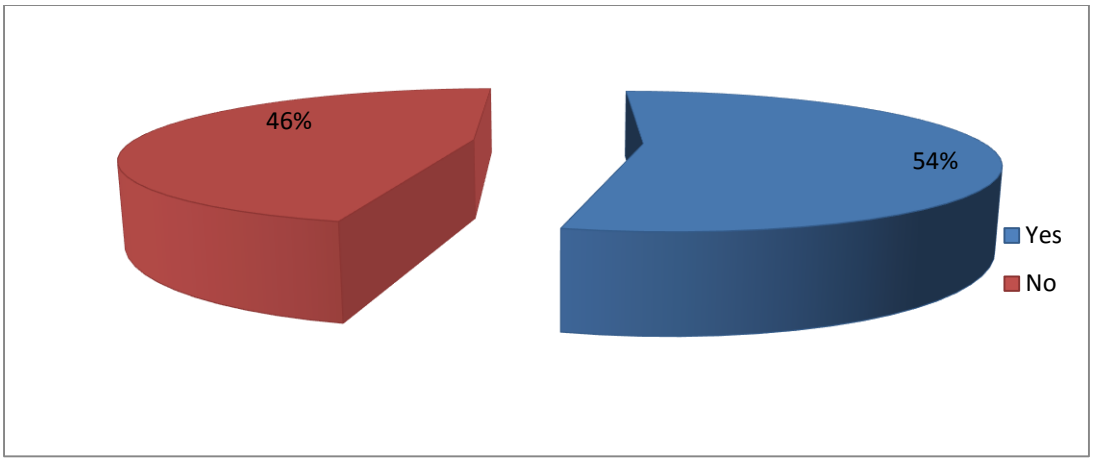

Figure 4.6: Acquisition of Municipal Status and Improvement in Waste Management

Source: Field Survey, June 2014

Wrong attitudes and people's perceptions on the level of seriousness that should be attached to environmental sanitation and waste management will have serious repercussions on the efforts of the WMA and Zoomlion to rid the municipality of filth. Since effective waste management is a collective responsibility, the success of getting individual hands on board to ensure safe and sound environmental health largely depends on the level of importance people attach to waste management.

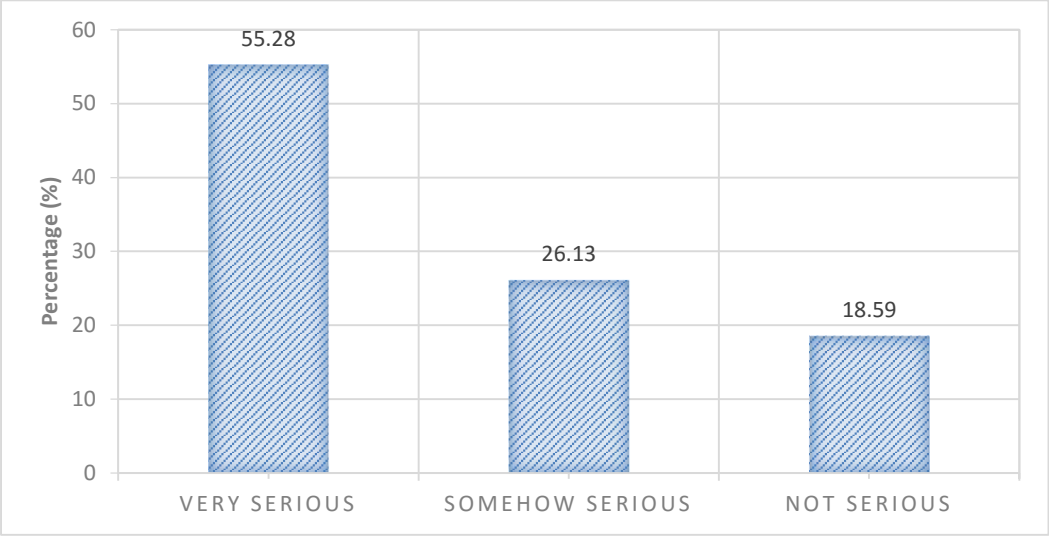

Figure 4.7: Perceptions of waste management in the Wa Municipality

Source: Field Survey, June 2014

The first step in solving a problem is accepting that it really exits. From the survey 55.3 percent of the respondents were of the view that managing waste effectively was a very serious problem in the Wa Municipality, 26.1 percent of the respondents opined that the issue of managing waste was somehow serious with the explanation that the municipality is doing well in managing waste as compared to some other places in Ghana. However, these categories of respondents were quick to add that much still remains to be done. In sharp contrast, 18.6 percent of the respondents were satisfied with the level of sanitation that prevails in the Wa Municipality as shown in

Figure 4.7. They stated that diseases such as cholera that are direct products of poor sanitation are things of the past. With more than half of the respondents not satisfied with the level of sanitation in the Wa Municipality, it means that both the WMA and Zoomlion needs to step-up their work if they are to meet the objective of ensuring proper environmental sanitation and goal 7 of the Millennium Development Goals. The research sought to outline the major causes of poor waste management in the Wa Municipality so as to outline possible remedies to the situation. From the field survey 36 percent of the respondents observed that poor enforcement of sanitation bye laws was the major cause of poor waste management in the Wa Municipality. The respondents cited socio-cultural factors such as the '*tigyaa bonyeni'* (we are all one) cliché, political interference and inadequate sanitary inspectors, known among the people as '*tangaase,'* as being responsible for the poor enforcement of laws.

About 10 percent of the people believed that poor supervision on the part of the WMD of the WMA and Zoomlion was another major cause of poor sanitation. 18 percent of the respondents also opined that inadequate funding on the part of government as another major blow on enforcing proper sanitation. They observed that other issues such as health, poverty and provision of infrastructure takes the local government's priority over the issue of sanitation, hence less funds are always committed to dealing with waste management. This poor supervision could be attributed to inadequate supply of professional staff as identified earlier on in the survey. Supervision has a direct correlation with enforcement of laws, if supervision is poor, then people who flout sanitation laws cannot be identified, not to talk of applying sanctions. From Figure 4.8, 1 percent of the respondents also identified inadequate dustbins especially in public places such as lorry packs, schools, churches, recreational centres and major streets as being the cause of poor waste management in

the municipality. The remaining 22 percent cited lack of skips, illiteracy, inadequate personnel and untimely collection of waste and poor attitude of residents as other causes of poor waste management. From observation, all the above mentioned factors are interrelated. Therefore a shortfall in one area exacerbates the occurrence of another. Inadequate staffing could lead to poor supervision, which could also lead to poor enforcement of laws, For example 8 percent cited inadequate staffing of waste management agencies as the cause of the waste menace in the municipality, 10 percent cited poor supervision, whiles 36 percent said poor enforcement of laws was the cause of poor waste management as indicated in Figure 4.8.

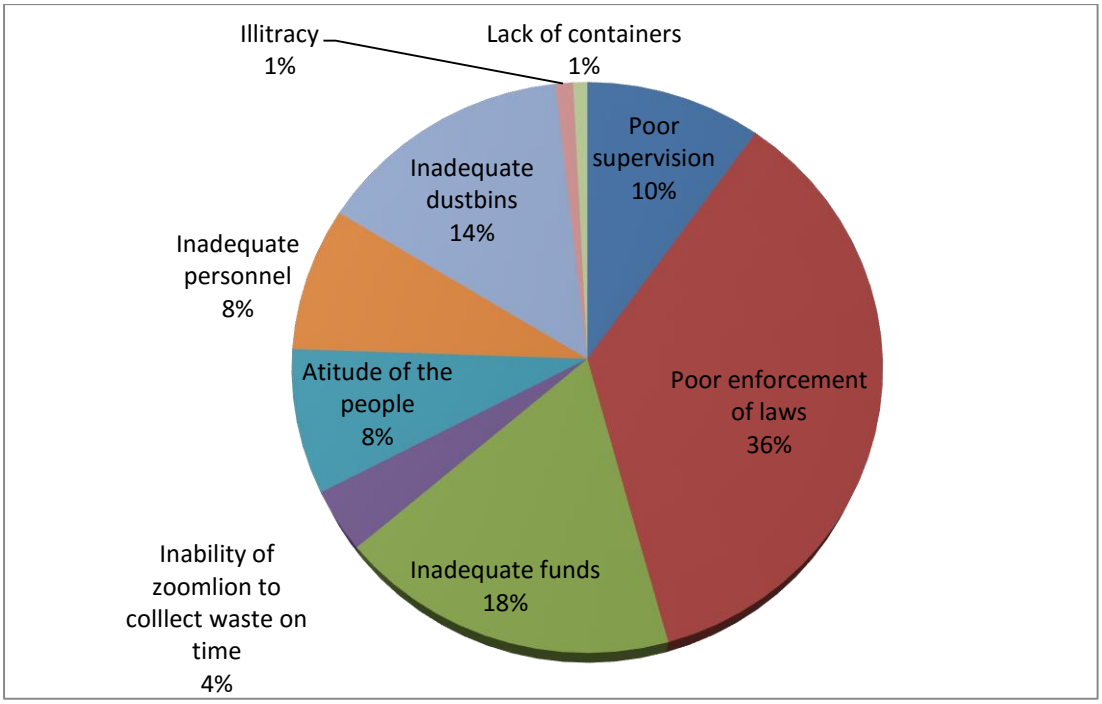

Figure 4.8: Causes of poor waste management in the Wa Municipality

Source: Field Survey, June 2014

The field survey also sought to identify the common indicators of poor waste management in the municipality and how this affects collective efforts in managing waste effectively. From Figure 4.9 indiscriminate littering of the environment

constituted the highest (44%) indicator of poor waste management. This is tied with the observation that most residential areas were littered with polythene bags, food rappers, gutters choked with rubbish and open defecation. About (23%) of the respondent's identified the use of unapproved rubbish dumps as another serious indicator of poor waste management in the municipality. They identified unapproved rubbish dumps as gutters, streets, water bodies, and even the situation whereby residents rather dump rubbish on the floor of open space instead of the communal skip. The above practices usually lead to choked gutters and this recorded (19%) as identified by the respondents. Nearly fifteen percent (14%) of the respondents identified stench from gutters, drains and rubbish dumps as an indicator of poor waste management in the municipality. The stench as observed from the survey is usually a direct result of choked gutters, open defecation, and striking irregularity of emptying communal skips mostly in densely populated areas such as Dondoli, Wapaani, Sandamuni, Suuriyiri and Zongo (plate 4.8,4.9 and 4.10).

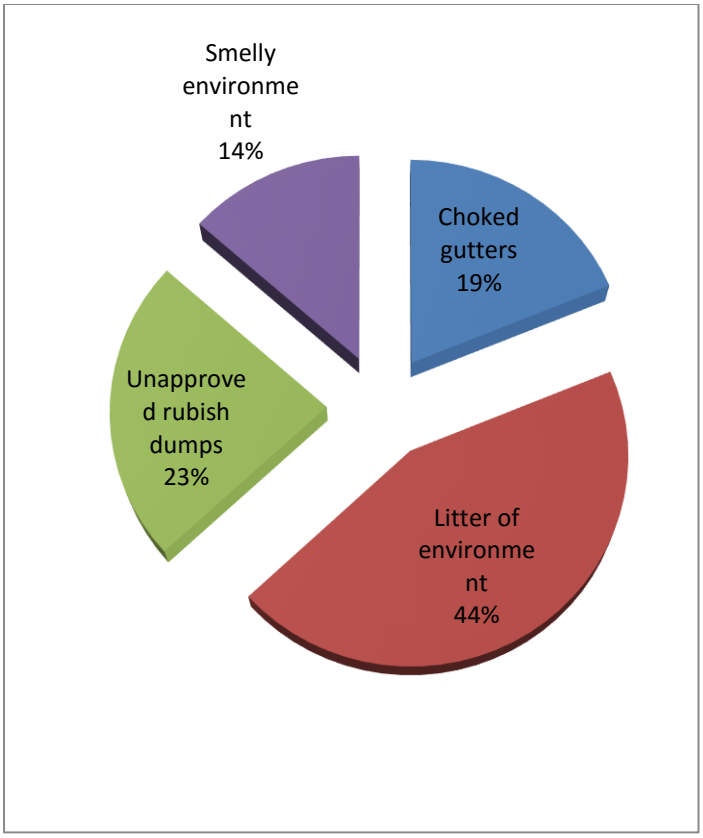

Figure 4.9: Indicators of Poor Waste Management

Plate 4.8: choked gutter

Plate 4.9: choked culvert

Plate 4.10: choked gully

Source: Field Survey, June 2014

4.9 Responsibility for collecting waste at the community level

By a contractual agreement through a Polluter Pay Policy (PPP) signed between Zoomlion Ghana Limited and the WMA, the assembly is expected to provide 30 percent capacity in terms of equipment and personnel while Zoomlion provides 70 percent. The research sought to ascertain the tenacity of this contractual agreement and test how it works on the ground. This came about as a result of the blame game between Zoomlion and the WMD that has always characterised waste collection when containers are full and not emptied (Plate 4.11). From Figure 4.10, more than two thirds (70%) of the respondents attested that the communal skips in their residential areas were emptied by Zoomlion where as 20 percent said the skips in the municipality were emptied by the Wa Municipal Assembly. This implies that WMA

is yet to meet its (30%) capacity as expected. 10 percent of the respondents did not receive any kind of services from either institution. From observation, it is this category of residents that resort to other environmentally unfriendly practices such as dumping waste into gutters, streets, water bodies, bush or burning.

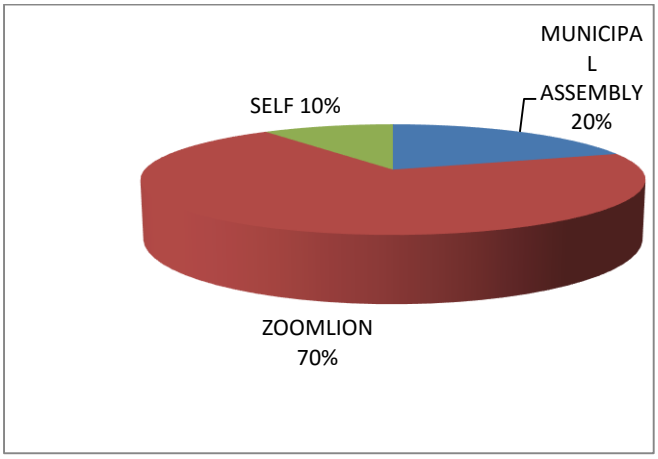

Figure 4.10: Responsibilities for Collecting Waste at the Community Level

Plate 4.11: WMA Skip

Source: Field Survey, June 2014

During the field investigation it was observed that a lot of skips were overflowing with waste uncollected for days in the low class residential areas. This has the tendency of causing diseases such as typhoid, cholera, chicken pox which are sanitation related diseases.

The frequency of emptying rubbish by households into the skips has a direct relation with waste generation and to a very large extent the rate at which communal skips get filled up. From the survey 59% of the respondents empty their waste into the communal skips every day as shown in Plate 4.10. These categories of respondents were mostly from densely populated areas such as Zongo, Wapaani, Sandamuni and Dokpong.

This is a good indication that a good number of residents are conscious of good sanitation at the individual household level since they do not keep rubbish for long periods which would otherwise have health implications on the household members.

It also explains why the communal containers (skips) are always filled and overflowing frequently as shown on Plate 4.12. About 23 percent of the respondents emptied their waste once a week while 11 percent, 4 percent , 2 percent and (1%) emptied their waste twice daily, less frequently, three times a week and twice a week respectively (Figure 4.11).

This is an indication that with these frequency levels, both the WMD of the WMA and Zoomlion will have to provide more communal skips and empty them more frequently especially in densely populated areas such as Wapaani, Zongo, Dobile, etc. and also provide more collection and haulage equipment to meet up with the levels of waste generation if they are to achieve the objective of riding the Wa Municipality of filth.

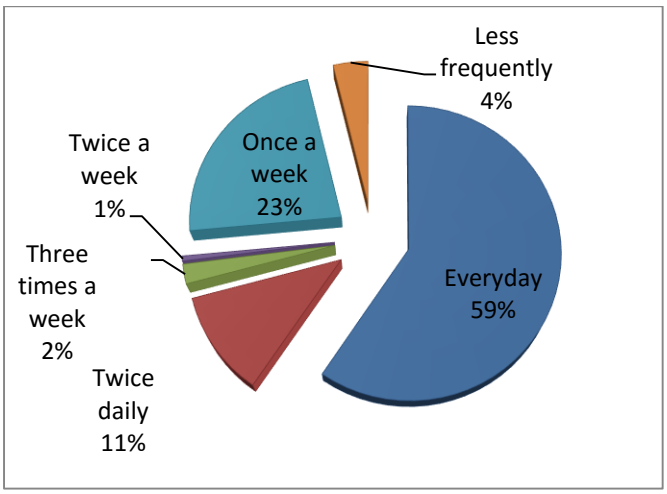

Figure 4.11: Frequency of Emptying Waste Containers

Plate 4.12: A communal skip overflowing with refuse at Zongo, Children exposed to health hazards while defecating

Source: Field Survey, June 2014

4.10 Effects of Poor Waste Management in the Wa Municipality

The consequences of poor waste management affect all members of a community. Failure of one individual to dispose of waste properly can have serious ramifications on health and general well-being of the whole community.

Form the study, the spread of diseases came up tops as the major effect of poor waste management in the Wa Municipality as shown in Figure 4.12. Nearly two-thirds (65%) of the respondents attributed failure to effectively manage waste has often resulted in the breeding of mosquitoes, flies, causing diseases such as malaria and cholera as well as the death of domestic animals which feed on grass where rubbish is dumped. Environmental pollution as a cause of poor waste management recorded 25 percent whereas flooding, which is a direct result of dumping waste in gutters, water ways and water bodies, recorded 10 percent (Plate 4.13,14 and 15).

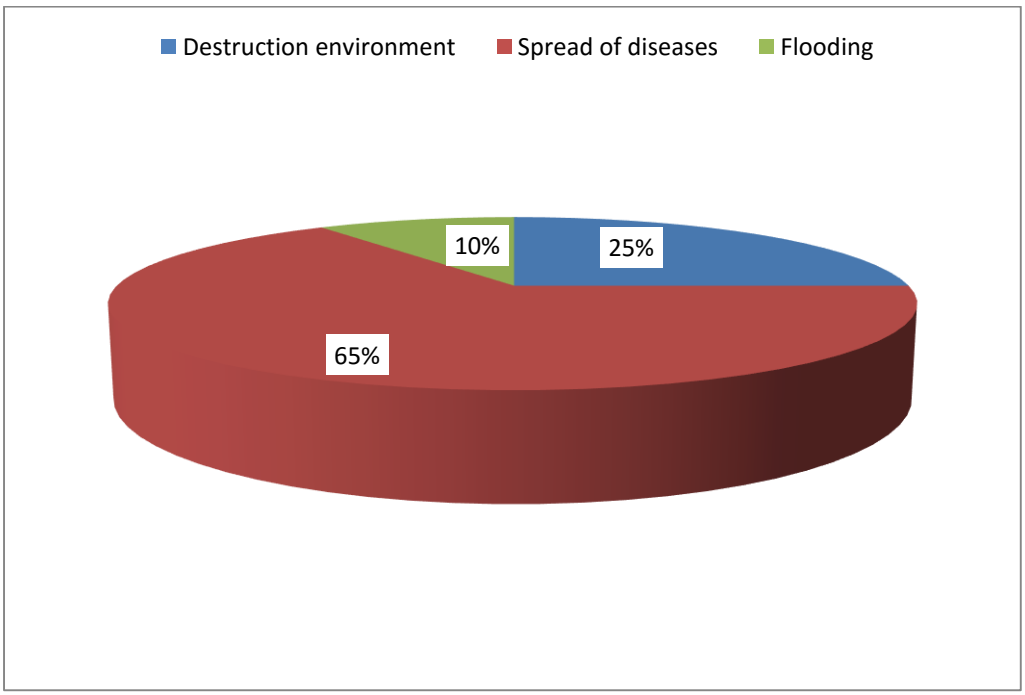

Figure 4.12: Effects of Poor Waste Management in the Wa Municipality

Source: Field Survey, June 2014

Plate 4.13: Breeding ground of vectors in a chocked and stinky gutter

Plate 4.14: Skips overflowing with waste and animals feeding in the filth

Plate 4.15: Destruction of the environment

Source: Field Survey, June 2014

4.11 Challenges to Waste Management

As observed in Figure 4.13, 8 percent of the respondents suggested that poor communal participation in waste management is thwarting the efforts of waste management in the municipality. This is largely due to the lukewarm attitude of residents towards waste management. Similarly, waste management agencies in the municipality have done little to enact income generating activities from waste to whip up the interest of the community in waste management issues.

The lack of an effective community mobilization frame work to support and mobilize households for effective waste disposal is a ban on effective waste management in the Wa Municipality. As a result, there is little community effort to reduce the problem of waste management.

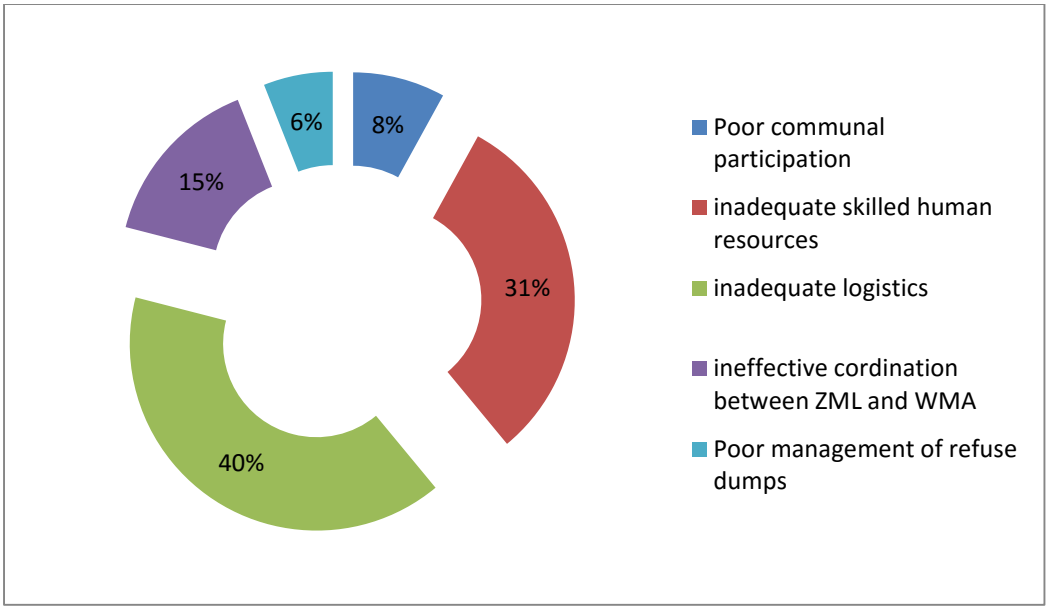

Figure 4.13: Challenges to Waste Management in the Wa Municipality

Source: Field Survey, June 2014

As shown in Figure 4.13, 31 percent of respondents indicated that inadequate skilled human resources to effectively monitor and enforce sanitation bye laws is one of the challenges of waste management in the municipality. Since time immemorial the authorities in charge of the collection of refuse are the sanitary health workers who are controlled by the Environmental Health Division of the Municipal Assembly workers called "Samasama" and road sweepers. These authorities have proven incapable in their effort to do the job and ineffective in terms of covering the dotted refuse dumps in the whole Municipality. The aforementioned authorities do not practice integrated waste management policies. They still resort to the unconventional methods of waste management which includes collecting and dumping waste in the forest or any available space in the outskirts of the Municipality.

As shown on Figure 4.13, 40 percent said inadequate logistics for proper waste management is another serious challenge impeding the effective management of

waste in the Wa Municipality which include but not limited to inadequate logistics, inadequate communication and lack of data on waste generation and well defined programmes and policies on solid waste management. For instance the two skip loaders of the Municipal Assembly are obsolete, often broken down and hardly repaired or maintained. The Municipal Assembly also has three old fashioned compaction trucks with only one on the road which can hardly cover the length and breadth of the municipality. It is clear from the study that the waste management situation in the Wa Municipality is worsening day by day and is nothing good to write home about. Inadequate refuse bins and communal containers sum up to worsen the problem of proper waste management. Refuse containers are insufficient in the Wa Municipality, especially in the market area where there is dense human concentration.

There is absolutely no refuse container to take care of the huge quantities of waste generated daily. Consequently, the waste is eroded into huge gutters in the market square, thereby choking the gutters. A good example is the Wa Central Market wide gutter which is always chocked with eroded rubber mixed with sand and other materials.

About 15 percent of respondents said ineffective coordination of efforts between Zoomlion and the Wa Municipal Assembly as one of the waste management challenges in the municipality (Figure 4.13). The inability of the MMDAS to rid the country of filth prompted the Government of Ghana in 2006 to contract Zoomlion to augment the efforts of Metropolitan, Municipal and District Assemblies (MMDAS) across the country in solid waste management.

Currently the responsibility for solid waste management within the Municipality is shared between the Municipal Assembly and Zoomlion Ghana Limited with the later

responsible for collecting and disposing up to 70 percent of waste generated in the municipality and the remaining 30 percent managed by the former.

Government interventions in waste management issues, programmes and activities are not very well coordinated with that of Zoomlion in the municipality except when a very important person like the president, his vice or other governmental dignities or agencies are due to arrive in the municipality, that you will see the Zoomlion personnel running with long brooms to sweep the city out of plastic litter and other waste material. Sound and effective government policies, programmes and interventions are highly needed to rid the municipality of filth.

With the inclusion of Zoomlion in the management of waste, the situation has slightly been improved in some residential areas by the few elites who can pay for the cost of the services of Zoomlion. Such areas are the Upland Hotel environs, the Food and Agricultural Residential Quarters, the Ministries/ Regional Coordinating Council of the municipality which is the eye of the city, and lastly the SSNIT residential area. On the flip side of the spectrum, the inception of the Zoomlion Company to assist in the management of waste in the Wa Municipality leaves much to be desired as far as effective waste management in the Wa Municipality is concerned.

Poor management of refuse dumps is one of the challenges of solid waste management in the municipality as observed by 5% of the respondents, (Figure 4.13). A notable example is the current refuse dump at Siiriyiri which serve the whole of the municipality. It is situated along the Wa-Dorimon road. The methods or approaches used for waste disposal in the Wa Municipality is inappropriate and even in some cases illegal. These include burning of waste, open space dumping of waste which affects poor and vulnerable population groups.

The residents of these areas are worried as they cannot contain the situation. In the whole of the municipality there is not a single recycling plant to process the numerous polyethene bags that are used by food vendors and other rubber bags which are used in putting sold or bought items from stores and open market vendors. Plastic waste is a serious and major waste management problem in the Wa Municipality because the rubber cannot decay and its lightness easily sends it flying from place to place with the slightest wind or air raise and hence litters the whole environment.

4.12 Proposed Interventions to Help Improve Waste Management in the Wa Municipality

To ascertain communal responsibility towards enhancing a cleaner and safer environment for residents of the Wa Municipality, respondents were asked to propose workable interventions for the improvement of waste management in the municipality. Multiple responses were given by respondents as stipulated in Figure 4.14. A third, (33%) of respondents suggested that more Zoomlion waste containers should be provided for households, institutions and public places so as to prevent the indiscriminate dumping of refuse in the open which topped the list of indicators of poor waste management in the Wa Municipality (Figure 4.14).

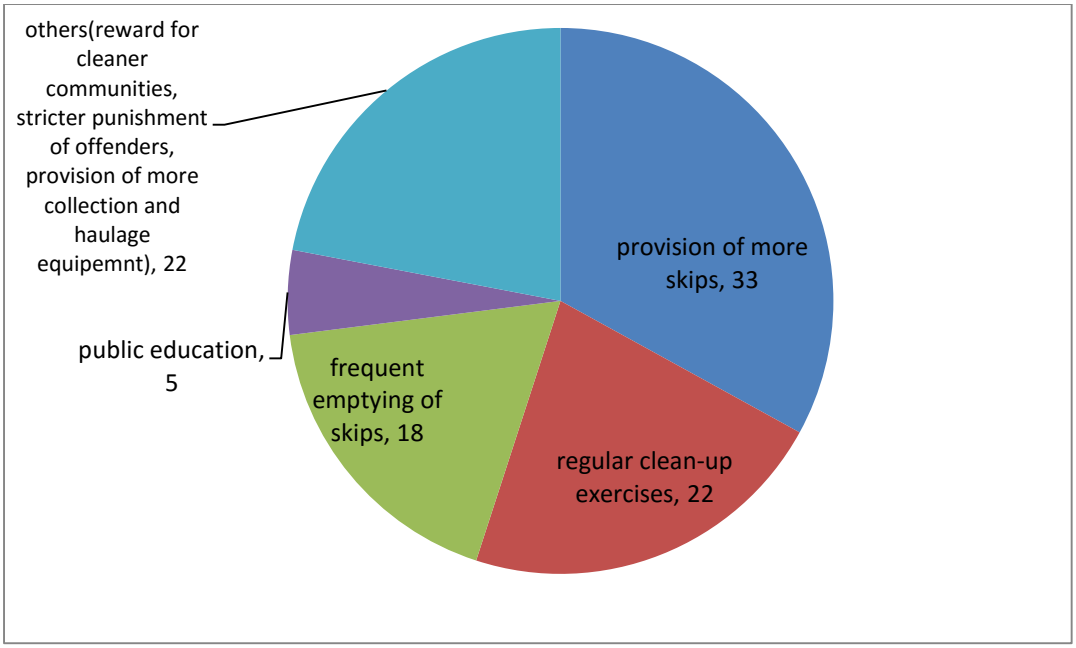

Figure 4.14: Proposed Interventions to Help Improve Waste Management in the Wa Municipality

Source: Field Survey, June 2014

Also 22 percent proposed that clean-up campaigns should be stepped up and made more frequent while 18 percent of the respondents proposed that communal skips should be emptied more frequently to reduce the rate of waste spillage and stench from containers. Another (5%) suggested public education of community members on waste management issues while the remaining (22%) proposed that other measures such as rewarding cleaner communities, provision of more collection and haulage equipment and stricter punishments for offenders should be enacted to manage waste effectively in the municipality. Recycling of waste was not mentioned as an option. Both households and institutions attributed this to the lack of capacity.

The Environmental Health and Safety Unit of Ghana believe that the Ghana-Polluter Pay Principle (PPP) is the answer to waste generation and management. The PPP is a civil and social act that would enable economic agents as well as individuals to pay

for waste that they produce daily. This is an initiative from the Environmental Services Providers Association which explains that this initiative would provide the opportunity for waste generators to contribute to sustainable financing of waste management, and mobilize additional revenue for environmental management.

The initiative would help reduce pollution, provide incentive to control and clean pollution, including waste management, recycling, reuse as well as recovery of waste. PPP is also expected to discourage the importation of over aged goods, prevent the use of Ghana as a dumping ground for unwanted goods and improve the quality of the environment. In line with this assertion, the survey sought to test the acceptance level of the Polluter Pays Principle in the Wa Municipality.

As shown in Figure 4.15, more than three quarters (76%) of respondents were not willing to pay for their waste to be collected and disposed. They cited among other reasons that they were paying tax to the government and it is the duty of government to cater for waste related issues. This category of respondents were mostly from densely populated and low class residential areas such as Wapaani, Dondoli, Sandamuni, Zongo, etc. About 24% of the respondents were, however, willing to pay for their waste to be properly disposed. These categories of respondents were mostly from high class residential areas such as Xavier, Airstrip and SSNIT Flats. From observation, this category of respondents had the Zoomlion waste collection bins and were paying between GH¢ 20.00 and GH¢ 30.00 a month for their waste to be disposed of by Zoomlion. The findings suggest that majority of the residents from the municipality are not yet ready to pay for proper waste disposal in line with the Polluter Pays Principle.

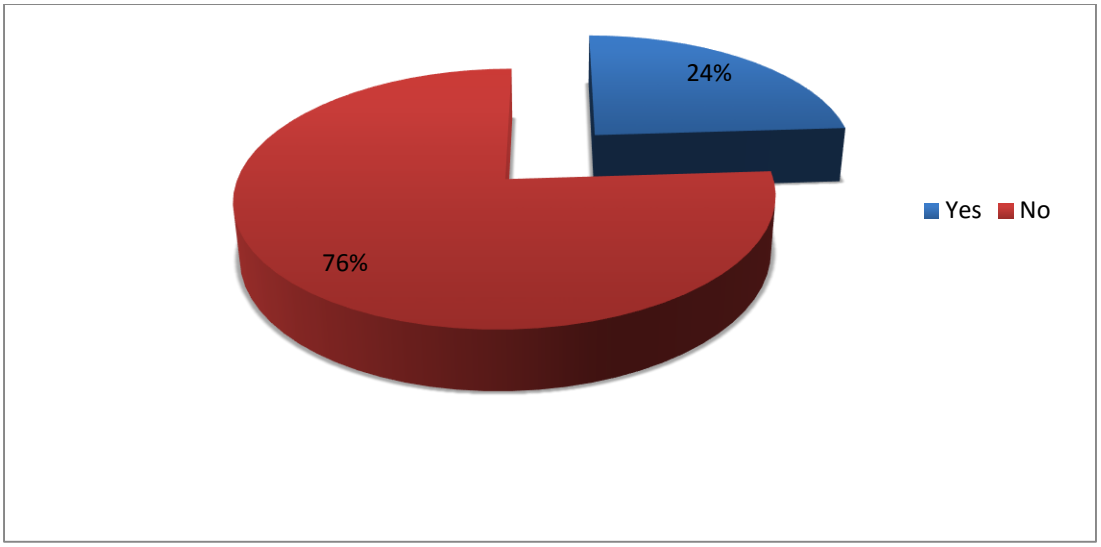

Figure 4.15: Willingness to Pay for Waste to be Disposed

Source: Field Survey, June 2014

The views of residents on how to ensure compliance with the bye laws on waste management in the municipality were sampled so as to suggest ways of adopting and enforcing these views. As indicated in Figure 4.16, (37%) of the respondents are of the view that, there are many laws on environmental sanitation. However, these existing laws are not enforced. Instead of drafting more laws, they are of the view that if the existing laws are enforced, the menace of poor environmental sanitation can be curbed.

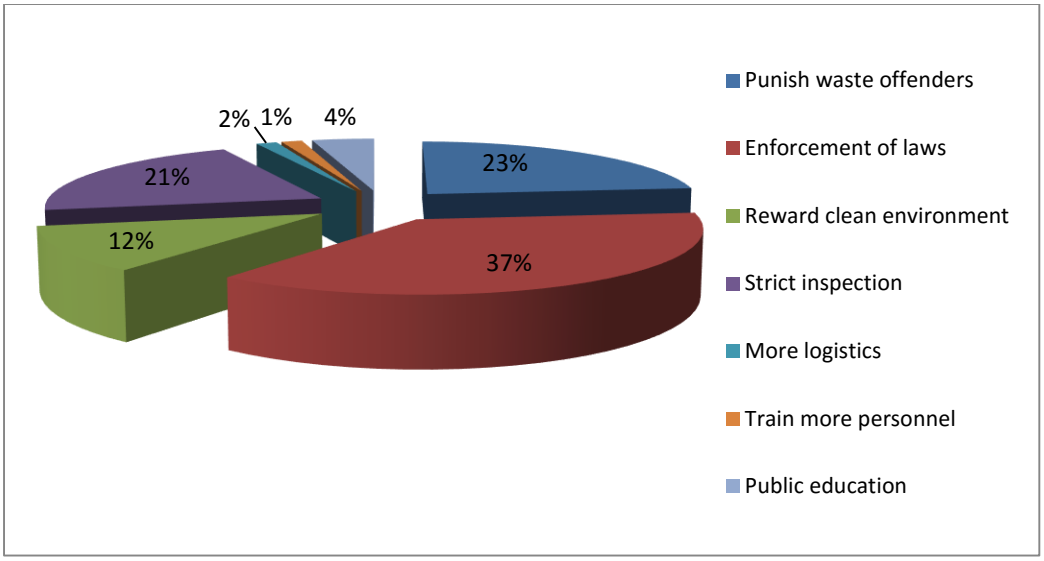

Figure 4.16: Remedies to ensure compliance with bye laws on sanitation

Source: Field Survey, June 2014

If laws are strictly enforced, offenders will surely be punished, this is closely tied with the attestation of 23 percent of the respondents that people and institutions which fall foul of the laws should be punished through fines and jail sentences to serve as a deterrent for others. About 21 percent of the respondents suggested that more sanitary inspectors, known locally as *'tangaase,'* should be trained to man, inspect and supervise waste management in the municipality.

They are of the opinion that if more inspectors are trained they will be able to effectively carry out inspection activities and enhance compliance instead of relying on few sanitary inspectors in the municipality who are already overrun by the growing population of the municipality. From Figure 4.16, (12%) of the respondents were of the view that clean-up campaigns should be organised and communities rewarded on the basis of the cleanest communities and rewards in the form of providing social amenities on cleanest communities should be instituted. They are of the view that if competition is introduced through a compensation system, communal waste

management will be heightened thereby ensuring compliance. The remaining (7%) of the respondents suggested that public education, provision of more waste management logistics and training more personnel will facilitate compliance with bye laws on sanitation.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter entails a summary of key findings of the study and offers recommendations for waste management based on fundamental insights of the study in the Wa Municipality and Ghana at large.

5.2 Summary of Major Findings

The primary objective of the study was to examine the institutional mechanisms for waste management in the Wa Municipality and to outline the challenges and options with a focus on individual households, residential areas and waste management institutions. The study became imperative due to the fact that the Wa Municipality, in the Upper West Region, like most urban areas in Ghana has grown into an urban centre with the inception of the Polytechnic, the establishment of the University for Development Studies and a number of Second Cycle, Institutions such as Wa Senior High Technical, Wa Technical Institute and T.I Ahmmaddya senior High School. This has increased the population in the municipality, and as a result, has also increased the magnitude of solid waste in the municipality. With regard to the findings of the study, three general institutional and attitudinal barriers to effective waste management in the municipality were identified.

Firstly, poor communal participation in waste management is largely due to the lukewarm attitude of residents towards waste management. Similarly, waste management agencies in the municipality have done little to enact income generating activities from waste to whip up the interest of the community in waste management issues. The lack of an effective community mobilization frame work to support and

mobilize households for effective waste disposal is a ban on effective waste management in the Wa Municipality. As a result, there is little community effort to reduce the problem of waste management.

Secondly, indiscriminate and improper dumping of waste in street corners, in between houses, in gutters and drains, in water ways etc. is a major setback in the delivery of good sanitation in the municipality. Just like the WMD of the WMA, Zoomlion does not practice Integrated Waste Management Policy which includes among other things reducing waste generation, reusing and recycling waste, but simply collects refuse and dumps them in open dumps between Wa and its surrounding suburbs and villages which causes problems to the dwellers of these and travellers who ply these areas. From the study, an overwhelming 76% of respondents in the Wa Municipality are not willing to pay for proper disposal of waste in line with the Polluter Pays Principle which has been touted as panacea to solving the waste menace confronting most developing nations like Ghana.

Thirdly, weak enforcement of environmental regulations: this allows local authorities and residents to flout environmental regulations without any sanctions.

Also, lack of definite schedule for collecting waste from storage to disposal point is a serious challenge of waste management in the municipality. Waste collectors may show up every week, every three weeks or after one month. Such inconsistent waste collection schedules leads to an overflow of garbage at storage points, chocked gutters and crude dumping of waste.

In addition, inadequate logistics for proper waste management is another serious challenge impeding the effective management of waste in the Wa Municipality. These factors such as lack of communication and data on waste generation and well defined

programmes and policies on solid waste management. For instance, the two skip loaders of the Municipal Assembly are obsolete, frequently broken down and hardly repaired or maintained. The Municipal Assembly also has three old fashioned compaction trucks with only one on the road which can hardly cover the length and breadth of the municipality.

More so, ineffective coordination of efforts between Zoomlion and the WMD of The Wa Municipal Assembly is another challenge at hand. The inability of the MMDAS to rid the country of filth prompted the Government of Ghana in 2006 to contract Zoomlion to augment the efforts of Metropolitan, Municipal and District Assemblies (MMDAS) across the country in solid waste management. However, there seem to be lack of coordination between Zoomlion, Wa Municipal Assembly and the Environmental Protection Agency to draw a well laid down policy and plan activities and programmes to clean the Wa Municipality.

Poor management of refuse dumps is another challenge of solid waste management in the municipality. Notable example is the current dump site at Siiriyiri which serve the whole of the municipality. It is situated along the Wa- Dorimon road. The dumpsite is poorly managed as such when one gets near there you observe polyethene products flying in the air and birds scavenging for food. The methods used for waste disposal in the Wa Municipality are inappropriate and even in some cases illegal. These include burning of waste, open space dumping of waste which affects the inhabitants in that area. The authorities in the municipality have not got a single recycling plant to process the numerous polythene products which cannot decay easily and its lightness easily sends it flying from place to place with the slightest wind and hence litters the environment.

Inadequate logistics was identified as another serious challenge affecting the effective management of waste in the Wa Municipality. This has made it difficult for waste management agencies to fully implement their programmes to get the municipality rid of waste.

5.3 Conclusion

The research has shown that different components of waste is generated daily in the Wa Municipality. The commonest waste generated in the municipality is plastic waste. This is followed by food, paper and metal waste. These components of waste especially plastic waste has made the work of waste management agencies extremely difficult because of its non-biodegradable nature. Undoubtedly used plastics fly from different areas in the municipality to dirty clean environments.

Effective waste management is the collective responsibility of institutions, households, individuals and the community at large. A polluted environment at one end affects people at the other end. Most residents in the municipality use the traditional methods of collecting and storing waste, (gathering and storing waste in used things). Spoiled basins, old basins, plastic bags and fertilizer sacks are used to collect and store waste for disposal. The waste is then deposited in the community skip, thrown into any available space or open space by the residents.

In a broad perspective, the study provided in-depth analysis and diverse reflections on barriers to effective waste management in the Wa Municipality as well as success areas that can be improved upon. Notwithstanding the good prospects and successes of the Public-Private Partnership (PPP) arrangement, the municipality's sanitation problems are far from over as the waste management is persistently plagued with multiple challenges of varying magnitudes that greatly affect the effectiveness and

smooth operations of the service providers. These problems include poor interest in waste technology and application, inadequate waste management logistics, inadequate skilled waste management personnel, poor enforcement of regulations on environmental sanitation, poor coordination of defined roles and responsibilities of key actors and relevant stakeholders. Others include the unavailability of properly engineered disposal sites and waste treatment plants, inadequate haulage equipment and the lack of expertise and appropriate technical know-how. The rapid urbanization of the Wa Municipality coupled with the weak financial capacity of authorities in dealing with waste, has made it increasingly expensive for city authorities alone to handle the situation. In view of the sanitation problems enumerated above, it is not trite to state that there is a lack of well laid down enforceable waste management policy in the Wa Municipality. Improper solid waste disposal has made it extremely difficult for the municipality to have a stink-free and disease-free environment.

Among the numerous problems the waste and sanitation sector faces, the two predominant ones that have ready and direct influence on the effectiveness of waste management and sanitation efforts are the lack of properly engineered dumping/ sanitary landfill sites in the municipality and the generally poor attitude and perception of the populace towards waste and environmental sanitation. There is not trite to say that without addressing these two factors and giving the attention that they deserve, not much will be achieved in efforts to manage the waste and sanitation problems effectively. Poor management of solid waste coupled with poor attitude of citizens towards waste disposal was also turning the clock backward for the country in achieving the MDG target on sanitation, and environmental sustainability.

In order to enhance a cleaner and a safer environment for residents in the municipality, residents suggested that more skip containers should be provided for

households, institutions and public places to prevent indiscriminate dumping of refuse. Some also suggested regular clean up campaigns in communities, regular emptying of community skips, public education, provision of haulage equipment and stricter punishment for offenders to change the trend of poor waste management in the municipality.

5.4 Recommendations

This study recommends the following approaches or methods which will to a large extent contribute to solving the waste management problems of the Wa Municipality and Ghana at large.

- Composting Waste for Manure: this will not only turn the organic component of the waste, which is estimated to be between 60 and 70%, into good quality compost for agricultural and horticultural purposes, but will also recover other materials such as metals and plastics to be reused for several other purposes. Research has shown that compost or organic fertilizer is safer when used to support the production of food for human consumption. This will go a long way to support poor and vulnerable farmers who can hardly afford fertilizer.
- Recycling of Waste: Waste is regarded both as a useless and a useful material that can provide alternative and sustainable employment and income to the unemployed. A perfunctory examination of waste management practices requires that municipal authorities need to inject more funds into the sector so that we can move away from the conventional practice of "collection-haulage-dumping" to more modern systems of waste management that integrates waste reduction, separation, reuse, recycling and treatment. Such a system looks more sustainable, economically prudent and environmentally acceptable for a

country like Ghana, where sanitary landfill sites are scarce and final waste disposal poses a daunting challenge to the environmental sanitation industry. Sachet water bags in the municipality should be collected, stored and resold to end-users for the manufacture of plastic items such as plastic chairs, carpets, bowls and many others. Such projects, when adopted in the municipality, can serve as a sustainable source of livelihood for thousands of unemployed people.

- Sensitization of community members to whip up communal participation in waste management efforts. Institutional capacity at the community level still remains a major challenge and successful community waste management programmes will need to be roped in to enhance income generation. All the sophisticated expertise can be adopted in dealing with waste, but, if the attitude of the individual and households is wrong and they do not see their individual actions as part of the problem or the solution, the issue of solid waste would be a hard-hitting one for society to address.
- Waste must be managed on a community to community basis. The leadership of each community must map out how its waste is collected, stored, processed, and disposed of timely in a hygienic manner. This could be done by separating waste at the source so that contamination is prevented so that the work of community based volunteers and waste management agencies are facilitated.
- Ban on the use of non-degradable plastics should be reconsidered as part of measures to stem Ghana's increasing waste management difficulties. Rather degradable materials like paper and leaves (teak and cola leaves) which is not difficult to come by should be encouraged for packaging take away food and other products.

- An Integrated Solid Waste Management (ISWM) policy should be adopted by the Municipal Assembly, sanitary health workers and Zoomlion Company who are the main authorities in charge of waste collection and its general management. The ISWM system involves primary collection and recycling at community level while improving the health and environmental conditions of community dwellers. The entire system of waste management needs a total overhauling from collection, storage, recycling to disposal.
- Community members must be encouraged and educated on how to prepare briquettes. It is the combination and blending of every waste material available to come out with a new product. This can be used as fuel for cooking in the various households in the municipality.
- Recycling and composting of waste can be done by using indigenous technology to recycle waste. Plastics waste can be recycled into plastic baskets, bags, beads, toys and bangles. Metals can be recycled into nails, quarter rods and other metal products.

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APPENDIX I

UNIVERSITY FOR DEVELOPMENT STUDIES

Questionnaire for residential areas

My name is Dongbablle Felix, a student of University for Development Studies, Navrongo campus. This study is in partial fulfillment for the award of a Master of Arts degree in Environmental Security and Livelihood Change. This questionnaire is intended to find out the challenges and options of waste management in the Wa Municipality focusing on institutions, food vendors, traders, general businesses and other people. Please answer all the questions with honesty. The information you will give is purely academic and it will be treated with a lot of confidentiality. I am requesting you to kindly participate in this study by responding to the following questions.

BACKGROUND CHARACTERISTICS

Section A Background Characteristics

Area……

Sex male…… female…..

SECTION B

Bio-data

(Circle the right option)

1. What is your age? (a) under 20 years (b)21-30years (c)31-40years (d)41-50 (e)51-60 (f)above 61

2. What is your level of education? (a) None (b) Primary school (c) Secondary/Senior high school (d)Tertiary/higher institution of learning (e)others (please specify) …….
3. Occupation of the respondent (a) Farmer (b) Business person (c) Professional (d) others specify ……
4. How long have you been a resident in the Wa municipality?
   (a) less than a year (b) more than one year but less than three years
   (c) more than three years but less than ten years (d) more than ten years
   (e) others
5. Is waste management a problem in this area? Yes / No
6. In your opinion, how serious is the problem of waste management? (a) very serious (b) somehow serious (c) not serious (d) don't know
7. What forms of waste is commonly generated in your household? (a) plastic waste (b) food waste (c)paper waste (d) metal waste (e) others specify
8. Approximately, estimate the quantity of waste produced in your household per week in kilograms? ……
9. Does your household have a waste container? No/ Yes
10. If yes what type of container? ……..
11. Who provided the container that is used in your area? (a) self (b) municipal assembly (c) zoomlion (d) others
12. If no in 10 how do you collect your waste? .....

13. How often do you empty the container? (a) every day (b) twice daily (c) three times a week (d) twice a week (e) once a week (f) less frequently (g) don't know?
14. Where do you empty your container? (a) in a pit (b) burning (c) onto the collection vehicle (d) onto the collection container (e) in the open space
15. Does your household receive any waste collection service of any type? (a) no (b) yes (c) don't know
16. If yes in 16 who collects garbage from your household or area? (a) self (b) municipal assembly (c) zoomlion (d) others specify……
17. If no in 16 how do you dispose of your waste.....
18. How are the collected waste transported? (a) use wheel barrow (b) municipal assembly's vehicle (c) zoomlion's vehicle (d) any other (specify)……
19. Do you think the acquisition of a municipality status made any improvement in waste management?
20. What do you think is the cause of poor waste management in your area?.....

    ……
21. What are the indicators of poor waste management in your area?.....

    ……
22. What are the challenges to solid waste management in the Wa Municipality?

.....

.....

.....

.....

22. What do you consider the most urgent effects related to the poor waste management issues in your area? If so list them……

    ……

    ……

    ……

23. To what extend to you think the issues of enforcement to ensure compliance with the waste laws are taken seriously? Give your reasons……

    ……

    ……

    ……

    ……

24. What are some of the interventions/options you would propose to help improve the situation of waste management in the Wa municipality?

    ……

    ……

    ……

    ……

    ……

    ……

    ……

    ……

Thank you!!!

Appendix II

UNIVERSITY FOR DEVELOPMENT STUDIES

Interview Schedule for Zoomlion Company and the Environmental Health Department of the Wa Municipal Assembly

My name is Dongbablle Felix, a student of University for Development Studies, Navrongo campus. This study is in partial fulfillment for the award of a Master of Arts degree in Environmental Security and Livelihood Change. This interview is intended to find out the challenges and options of waste management in the Wa Municipality focusing on institutions, food vendors, traders, general businesses and other people. Please answer all the questions with honesty. The information you will give is purely academic and it will be treated with a lot of confidentiality. I am requesting you to kindly participate in this study by responding to the following questions.

Thank you.

Position of respondents ……

Date of response ……

Section A

Waste collection and Disposal

1. What is the quantity of waste generated in a day in tones? (In figures)
2. What is the quantity of waste generated per capita in a day in tones?
3. What are the common types of waste generated in the Municipality? List them

1. …….
2. ……..
3. ……

4. ……
5. ……
6. ……

4. How is the waste collected?

5. Do you separate the waste before disposal? Yes/No

6. Indicted reasons

1. ……
2. ……
3. ……
4. ……

7. What are the major components of waste generated in the Wa Municipality?

Indicate their percentages in the table below

Major component	**Percentages**
Plastic	
Glass	
Wood	
Metals	
Food waste	
Other	

8. What is the mode of collection and the number of times waste is collected per week in the following areas listed in the Municipality?

Name of area	**Mode of collection**	**Number of times per week**
Degu		
Ssnit		
Jahan		
State housing		
Xavier		
Airport		
Konta		
Dobile		
Kunbiehi		
Wapaani		
Bamahu		
Zongo		
Suriyiri		
Kperisi		
Kpongo		
Piisi		
Dondoli		
Sandamuni		
Dokpong		
Busa		

9. What is the cost of collection per week? Indicate the amount. GH₵……

10. Where do you dispose the waste from the various areas in the Municipality?

11. What methods do you use in managing the solid waste generated in the Municipality? (If more than one indicate them.)

☐ Composting

☐ Recycling

☐ Incineration

☐ Integrates solid waste management

☐ None

☐ Other's (Specify)

12. Why do you choose to use any of the methods for managing solid waste above? (Indicate the reasons in the spaces provided below)

1. ……..
2. ……...
3. …….
4. …….
5. ……..

Availability of resources for managing Waste.

13. Waste collection and disposal equipment (Indicate the number available and the number needed)

	Equipment	Number available	Number required
1	Dust bins		
2	Skips		
3	Tricycle		
4	Motorcycle		
5	Graders		
6	Skip loaders		
7	Compaction trucks		
8	Bull dozers		
9	Road Sweepers		
10	Roll on/Roll of trucks		
11	Others		

14. Availability of qualified personnel managing waste (Technical staff)

Personal (technical staff)	Number	Qualification

15. In your view what are some of the challenges/problems facing waste management in the Wa Municipality?

1. ……
2. ……
3. …….
4. ……

16. What options can be adopted to solve these problems? State them briefly.

1. ……..
2. ……
3. ……..
4. ……