UNIVERSITY OF CAPE COAST

CHALLENGES OF SOLID WASTE MANAGEMENT IN THE WA MUNICIPALITY

BY

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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…….

Mohammed Abdul-latif

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 of Cape Coast.

Signature …… Date…….

Mr. Alex Somuah Obeng

ABSTRACT

Solid waste management presents challenges to both developed and developing countries the world over. This is partly due to increasing population, expansions in towns or cities, poor town planning and inadequate funding of waste management practices. This study looks at the solid waste management practices in the Wa municipality and its associate problems. It describes the management practices in the study area; it also assesses the management practices in the Wa municipality level and the challenges that are associated with the general management. It also considers some recommendations for improving upon the solid waste management in the study area.

Three hundred questionnaires were administered to respondents and all were answered and returned. The respondents include residents in the study area with age brackets of 15-45 years, also some workers of the Zoomlion Company and some officials within the waste management sector in the municipality.

The study reveals that residents have been dumping waste indiscriminately within the study area; also the burning of the containers (skips) was another serious concern. Respondents were willing to pay some amount for the management companies to empty their bins but they suggested figures that were quite insufficient. The study recommends that the people of the study area be educated on good waste management practices. Management should try and convey the skips (containers) on time. The Central Government, Non-Governmental Organizations (NGOs) and Civil Service Organizations (CSOs) should help to alleviate the poverty of the people of the study area.

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The findings from this reports however, do not necessarily replicate the observations of those who contributed to its production, therefore any inaccuracy of facts of analyses are the researcher's responsibility.

DEDICATION

To my dear mother (SARIATA SAWARE), who never lived long enough to enjoy the fruits of her labour, Sophia Latif and Yasmine H. L Bugli.

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LIST OF ACRONYMS

MSW	Municipal Solid Waste
UN	United Nations
NGOs	Non – Governmental Organizations
UNEP	United Nations Environment Programme
UNDP	United Nations Development Programme
US	United States
IDB	International Development Bank
EIs	Economic Instruments
REGRO	British Land Reclamation Group
EPA	Environmental Protection Agency
KMA	Kumasi Metropolitan Assembly
CONIWAS	Coalition of NGOs in the Waste and Sanitation Sector
CWAS	Coalition of Waste and Sanitation Agencies
AMA	Accra Metropolitan Authority
FGDs	Focus Group Discussions
SPSS	Statistical Product and Service Solutions
JHS	Junior High School
CO_2	Carbon Dioxide

CHAPTER ONE

INTRODUCTION

This chapter discusses the background to the study. It also looks at the statement of the problem; the objectives of the study, the research questions, the scope of the study. It also includes the relevance of the study and limitations as well.

Background

The state of the environment determines how well a creature can survive. As the environment deteriorates, so does the earth's ability to sustain life as we know it. The management of solid waste is one of the challenges facing any urban area in the world. An aggregation of human settlements has the potential to produce a large amount of solid waste; the collection, transfer and disposal of that waste has been generally assumed by municipal governments in the developed world. Municipal Solid Waste (MSW) management has become a major issue of concern for many under-developed nations, especially as population increases. The problem is compounded as many nations continue to urbanize rapidly; 30-50% of populations in many developing countries is urban (Thomas-Hope, 1998) and in many African countries the growth rate of urban areas exceeds 4% (Senkoro, 2003).

Waste refers to the materials that are put aside or thrown away because they are of no significant use to the owner again. Waste is also described as any material that is unfit for use by the owner, so discarded because it has served its original intended purpose. Solid waste includes food, cans, plastics, garbage, refuse and other unwanted materials that have been exhausted of their usefulness.

We all produce unwanted by-products and residues in nearly everything we do. Improper disposal practices, however, can result in serious and widespread pollution. As production units engage in the process of transforming raw and semi finished materials into goods and services that will satisfy human wants, there are at least three ways in which the environment can be affected. First, some of the environments stocks of exhaustible resource may be diminished; these include coal, petroleum, and many material deposits. Secondly, it is called upon for replaceable resources like timber, grassland, oxygen and nitrogen. Thirdly, it is used as a place to dispose of the waste of the production and consumption processes-as a gigantic garbage disposal.

The overall problem of MSW is obviously multi-faceted; many organizations, including the United Nations (UN) and various Non-Governmental Organizations (NGO) advocate an integrated approach to MSW management by identifying key stakeholders, identifying specific issues which comprise important "stumbling blocks", and making recommendations based on appropriate technologies, local information and pressing human and environmental health concerns.

As time passes the only certainty is that accumulation of waste will out-strip its management. Throughout the western world there are no longer enough convenient holes in the grounds into which to tip unwanted matter (Gourlay, 1992). The Developing countries also lack the appropriate storage facilities, treatment technologies, and good methods of disposal for its waste.

In developing countries, governments are still grappling with fundamentals of waste management. The Third World cities have enormous garbage disposal problems. Only 50% to 70% of urban residents in developing countries receive collection services despite the fact that solid waste management typically absorbs 20% to 50% of municipal revenues moreover, only 60% to 70% of the refuse is collected. On average, developing countries allocate less than 5% of municipal budgets for waste disposal. The comparable percentage in the industrialized countries is 20% to 30%. In developing countries, open dumping is the most common means of disposal (Bartone, 1990).

It is significant to note that studies in Bamako (Mali) and Ouagadougou (Burkina Faso) have shown that appropriately 0.6 to 0.7 kilograms of waste are generated per person per day in such cities. This amount represents an estimated 600 to 700 tones per day for a city population of about one million (Eaton and Hilhorst, 2003).

Developing countries have solid waste management problems different from those found in fully industrialized countries, indeed; the very composition of their waste is different from that of “developed” nations. Cointreau (1982) and

others (Blight and Mbande 1996, Arlosoroff 1982) noted several common differences in the composition of solid waste in developing nations:

- Waste density 2-3 times greater than industrialized nations,
- Large amount of organic waste.
- Large quantities of dust, dirt (street sweepings etc).

Before one can examine individual problems in MSW management, it is important to understand the political framework in which governments must frequently work in developing countries. With increased urbanization, demand for goods and services will undisputedly increase. Municipal tax and fee revenues, however, are not likely to rise as quickly as the population. This is due to the fact that out of the people moving to the city, the majority are likely to be poor migrants from rural areas in search of employment, unable to contribute significantly to the revenues of the municipality. Although they may demand marginally less services due to their lower level of consumption, they are likely (at least at first) to congregate in the poor, more densely populated areas, exacerbating the health and sanitation problems posed by their often unplanned communities. There fore, widening the gap of finding a solution to the solid waste management conundrum.

In terms of sanitation, the UNDP Human Development Report (1996) ranks Ghana 129th out of 174 developing countries, where 9.5 million of her estimated 20 million populations were without access to good sanitation. Nationally about 58 percent of households dispose of their refuse at public dumpsites. About a quarter of households dispose of their solid waste elsewhere

into valleys, pits, bushes, streams or river sides, open gutters or undeveloped plots of land. About 8 percent burn, 4 percent bury while only about 5 percent of households have their solid waste collected in an organized way. (2000 Population and Housing Census).

For some time now, the continuing deterioration of the waste management situation in the country, especially in the cities and other urban centers, has been a source of concern to most people, ranging from the ordinary man in the street to even the presidency (Daily Graphic, 12th April, 1992). Generation of waste in Ghana is highly influenced by industrial activities, lifestyles and eating habits of the people. The waste generated can be put into forms like industrial, mineral, residential and agricultural waste and examples include rejected plastics, peels of food items, and disposable packages.

The relative political and economic stability in Ghana has resulted in rapid urbanization which is associated with the expansion of cities, is also a contributory factor to so much solid waste generation in Ghana. Not discounting the above factors, other factors might have compounded the problem. People's apathetic and lackadaisical attitude towards matters relating to personal hygiene and environmental cleanliness, of which waste management in general is its focal point, should not be over looked.

The towns especially Wa, the capital of the Upper West Region, with a monotonical increase in population has a consumption pattern that results in large generation of solid waste that has become a major management conundrum. The municipality is noted for using the landfill method of disposal where the wastes

are dumped at known tip sites on the edge of town with no control or covering whatsoever. Solid waste management is an area that requires much money for effectiveness, because of its associated problems like collection, transferring and even looking for a convenient place for dumping. In addition to that, the dumping of waste on the designated collection points of the municipality also call for fresh problems because of the manner of dumping and hence, the nasty site of solid wastes everywhere not even to talk of the bad odour.

The attempt that is made by the Assembly to manage the waste looks so gloomy and unyielding. The municipality has a population of 224, 066, with a population density of 38.9 (2000 population and housing census: 10).

Statement of the problem

Ecologically, one of the functions of the environment is for it to serve as a repository of waste. This is recycled on natural basis. However, the management of waste has come to be a major problem because of factors that include increase in population, consumption and production patterns. Materials like plastics have high durability and resistant to biological decomposition. The Wa Municipality is always littered everywhere with waste, most of which are polythenes of different kinds.

Municipal solid waste management starts at home, and in the Wa municipality where the containers used for collection and storing solid wastes in homes include old buckets, baskets, plastic containers and even polythene bags, are never covered and the wastes are spread around before they get to the

collection sites. They also generate flies at homes because of long stay in their collected containers. At the collection sites, people drop the waste any how, and thereby littering everywhere around the container meant for them to pour in their waste.

The collected solid wastes in the container is left in piles for weeks which creates unsanitary scenes that smell bad and stinks, flies hover everywhere around it, scavengers keep on turning the waste which causes serious health hazards, and to exacerbate the griming situation, the containers breed flies and promotes diseases because of long stay.

In addition to the above, poverty also affects their fuel consumption for most of them use fuel wood as their main source of fuel. This generates large volumes of ashes that are dumped into the containers. The ashes sometimes contain life fire which leads to the burning of some containers provided by the Assembly in the public dump sites. Tabulated facts and figures on how solid waste is disposed of by households in the various districts are as follows:

In Wa, as much as 30.2% and 55.9% of household dispose of their solid waste at public dumpsites and elsewhere respectively. The same source also has it that, only 25.4 per cent of the regions population aged 15years and older are literate in either English or a Known Ghanaian language or literate in both English and a Ghanaian language (2000 Population and Housing Census)

Table 1: Solid waste disposal by households and districts in the Upper West Region

Type of solid waste disposal facility	All districts	District				
		Wa	Nadowli	Sissala	Jirapa / Lambussie	Lawra
Collected	2.3	2.4	1.1	0.8	3.0	3.6
Burnt by household	4.6	5.7	4.3	4.2	3.1	4.2
Public dump site	21.1	30.2	3.4	41.2	10.8	11.2
Dump elsewhere	65.6	55.9	88.3	47.6	71.4	75.7
Buried by household	6.0	5.5	2.5	6.1	11.3	4.5
Others	0.3	0.1	0.3	0.2	0.4	0.8
All types	100.0	100.0	100.0	100.0	100.0	100.0

Source: 2000 Population and Housing Census: Ghana Statistical Service.

Another problem of great concern is that, the conveying vans have not been using nets or any relevant materials to cover the heaped container when it comes to conveying it to the landfill site. This leaves a lot of particulates in the air for citizens to breath in and even littering the streets as the van moves and its content being lifted by the wind.

Also, the landfill site is another serious hurt on the environment, instead of placing their refused at one place, the solid waste in doted everywhere. This creates serious problems including health hazards. With the above problems, the Wa Municipal Assembly has attempted many interventions including radio broadcasts. Zoomlion Ghana (a private solid waste company), engaged in

managing the solid waste on the streets and gutters of the township has only face-lifted the streets but not the households.

Objectives of the study

The main objective of the study was to assess the solid waste management practices in the Wa Municipality of the Upper West Region. The specific objectives were to:

- Analyse the management practices used in the area of study.
- Assess solid waste management both at the household level and municipal level (Zoom lion).
- Examine the problems that were associated with the chain of management in the municipality.
- Assess the effects of poor solid waste management on the health of the individuals
- Make recommendations for improving the solid waste management in the study area.

Research questions

The research questions of the study were as follows:

- What were the management practices used in the study area?
- How were solid wastes managed at both household and municipal levels?
- What were the problems associated with the solid waste management chain in the municipality?

- How could these problems be managed?

The scope of the study

The study covered the legally demarcated area (zone) that was designated as the Wa Municipality. It concentrated on the ways of managing domestic solid waste at house-to-house levels and how the municipal office co-ordinated it. It emphasized on the gap that was created within the chain of management and not necessarily the physical facilities. The study assessed the residents' income levels, their level of education, their compromising ability and their willingness to contribute towards the effective management of waste in the municipality.

Relevance of the study

The study exposed a lot of unknown facts that have made the management of solid waste in the municipality very difficult. It also adds up to the literature on solid waste management in the area. The study has also suggested some useful ways and methods of addressing the management problem that was challenging the municipality.

Apart from serving as an existing literature it will be useful to the government, policy makers, stakeholders in the environmental management sector and all those interested in urban sanitation management. The study will also create the awareness and even provoke debate on waste management issues. In the course of debating, better options may be developed.

Organisation of the study

The study has been divided into five chapters. Chapter one covers the background of the study, the statement of the problem, objectives of the study, research questions, the scope of the study, relevance of the study and the organisation of the study. Chapter two deals with the literature review. This covers the methods of managing solid waste, waste management in Ghana, the private sector participation in solid waste management and the problems faced by municipalities in developing countries. Chapter three involves the methodology used in the study. Chapter four deals with the results and discussions of the findings of the study. Chapter five involves the summary, conclusions and recommendations of the study.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter deals with the related relevant literature to the study. It covers the definitions of waste and its types. The various methods of management and the problems faced in the chain of solid waste management are also discussed. The review starts from international level and ends at the local level. The second section deals with the challenges and the gaps that are created along the solid waste management chain.

Definitions of solid waste and its types

Solid waste is broadly defined as including non-hazardous industrial, commercial and domestic refuse including household organic trash, street sweepings, hospital and institutional garbage, and construction wastes; generally sludge and human waste are regarded as a liquid waste problem outside the scope of municipal solid waste (MSW). Schubeler (1996) points out that although certain contaminated medical wastes and hazardous industrial wastes are not included by definition, in many nations these are in fact part of the municipal waste stream and "special measures" must be employed to encourage their separation and to mitigate their potential harmful effects.

Martin Medina (1998) stated that, Municipal solid waste (MSW) refers to the materials discarded in the urban areas for which municipalities are usually held responsible for collection, transport and final disposal. MSW encompasses household refuse, institutional waste, commercial wastes, as well as construction and demolition debris. In developing countries, MSW also contain varying amounts of industrial wastes from small industries as well as dead animals, and fecal matter.

Waste may be classified as industrial, agricultural, commercial, mineral, domestic, and hospital waste. Industrial waste involves materials or substances that come from the industry and are hazardous, toxic to human life. It includes empty oil containers and scraps.

Hazardous waste refers to a substance that could endanger life if released into the environment and improperly treated, disposed off or managed. It includes lubricating oil, paint containers and fluorescent tubes. It may be flammable, poisonous, tetratogenic or even radioactive. According to Smith and Enger (2000), the United States Environmental Protection Agency defines hazardous materials as having one or more of the following characteristics: ignitability, corrosiveness, reactiveness and toxicity.

Mineral waste involves waste arising from mining activities or the waste that are disposed off at mining sites. It may include empty acid containers, metal scraps, used lead and acid batteries, and used rubber tyres, waste lubricating oil. Cyanide boxes and bags for instance, are classified as combustibles while metal scraps and metal cans are classified as non-combustibles.

Domestic or household waste arises from homes and also includes refuse or rubbish from schools. This form of waste mainly involves packaging papers, plastics, textiles, glass, metals, newsprint and food leftovers. Clinical waste is that, that arises from medical, nursing, dental, veterinary and pharmaceutical investigation care, teaching or research. This type of waste includes human or animal tissue, blood or other body fluids, excretions, drugs or pharmaceutical products, swabs, dressings, syringes, needles on sharp instruments. This type of waste is usually harmful when one comes into contact with it unless rendered safe (Jones, 1995).

Methods of management in developing countries

Transport of waste from households, commercial areas, and other generation sites is a growing problem. The rapid urbanization of much of the developing world leaves little time for adequate layout and planning, many of the most rapidly growing parts of cities are at the periphery of existing settlement. Garbage dumps, with their associated diseases, odour and frequent fires(in some cases) would ideally be located every where (Olar, 2003). These areas are becoming harder to find as population urbanizes and municipal traffic increases; the transport of waste becomes longer and more time-consuming, and therefore more expensive and less efficient (Olar, 2003). Many cities employ neighbourhood-level collection points, where households are responsible for transport to the transfer point and the municipal or private enterprise transports the waste from there to the ultimate disposal location. UNEP (1996) estimates that

in cities in West Africa, up to 70% of collection/transfer vehicles may be out of action at any one time.

In areas where there exist collection services which remove waste from individual household on streets, often there are no standardized containers used to store waste prior to pickup. There may be physical dangers to waste workers in dealing with the former; whether, animals, and other disturbances prior to collection threaten the integrity of the latter. In an examination of current problems in Kenya, Mungai (1998) agreed that the first step in "sanitary and efficient" waste management must be to ensure that all households use some form of corrosion resistant containers with lids in order to facilitate collection. Lidded containers would exclude most animal pest, reduce the amount of rainfall soakings into garbage and help to reduce trash blowing about on the street.

A major problem is that of development at or on top of landfills, many shanty-towns are built from disposed-of waste and in some cases entire neighborhoods are sited on top of existing landfills. For example, the smoky mountain dump in Manila, Philippines had as many as 10,000- families living in shacks or adjacent to the dump site. Aside the obvious health implications, these concentrations of people further complicate transport and unloading procedures and present numerous safety and logistical concerns (Blight and Mbande, 1996) Although it takes only 5-10 seconds to empty a 45-gallon container of waste into a collection truck, it takes 1-2 minutes to shovel the equivalent amount of waste (Gage, 1998). Any potential change to the waste disposal framework must take

into account the urban poor, many of whom may be dependent on waste scavenging for their entire subsistence.

A higher solid waste density also has many implications for the traditional methods of collection and disposal; collection and transfer trucks which are able to achieve compression rates of up to 4:1 in industrialized nations may achieve only 1.5:1 in developing countries and landfill compression technology which average volume reduction of up to 6:1 in industrial nations may only achieve 2:1 compaction with these increased waste densities (Cointreau, 1982). Compactor trucks would therefore probably not be useful in many applications; as income levels increase and the amount of post-consumer waste such as packaging increase correspondingly, such technologies may be more appropriate.

Additionally, the high moisture content and organic composition of wastes in the developing world may lead to problems of increased decomposition rates in areas with high average daily temperatures; presenting additional challenges with insect populations and conditions conducive to disease. To mitigate these problems much more frequent collection is needed. Although daily collection has proven unrealizable or unworkable in many cities, perhaps a twice weekly collection of organic materials would be sufficient to reduce decomposition.

It is important to note that municipal solid waste management (MSW) involves a combination of activities that may include all or most of the following collection of waste, temporal storage, transportation and storage of the waste as well as waste recycling, also reclamation or reuse, treatment of the waste and disposal. There are a lot of factors that determine how solid waste should be

treated. They include technology, economic, manpower, land space and environment.

The command and control approach is designed in such a way that the motivation for agents to comply comes from fear of fines and penalties. For this disincentive to work, however, vigilance and enforcement capacity must be adequate. Most developing countries lack such capacity and generally, tend to have the following problems with their command and control approaches; inadequate detail in law, lack of inspection staff, lack of transport, inadequate empowerment of inspectors to ticket offenders, political intervention to quash tickets, disinterest by the courts for these minor offences and lack of courts for them, inadequate police coverage to enable arrest and follow-up through the court system, and insignificant and therefore non-deterring fines and penalties.

Where there are such performance monitoring and enforcement capacity weaknesses, economic instruments offer a viable alternative. The 1992 Rio Declaration on Environment and Development endorsed the use of economic instruments (E1s) for the achievement of sustainable development (principle 16). In solid waste management, E1s promise to improve the delivery of services and thus lessen the solid waste problems. The methods of solid waste management in developing countries include;

Sanitary land filling

Final disposal of waste at sanitary landfills is given the lowest priority in an integrated waste management approach. A sanitary landfill is a facility

designed specifically for the final disposal of waste that minimizes the risks to human health and the environment associated with solid wastes. Sanitary landfills commonly include one, two or three different liners at the bottom and side of the disposal area, in order to prevent leachates from polluting nearby surface waters or aquifers. Liners also prevent the underground movement of methane. Waste arriving at landfills is compacted and then covered with a layer of earth, usually every day. This prevents animals from having access to the organic matter to fill sanitary landfills may also include other pollution-control measures such as collection and treatment of leachate, and venting or flaring of methane. It is possible to produce electricity by burning the methane that landfills generate.

According to Botkin and Keller (1998), landfills should be designed to concentrate and contain refuse without creating a nuisance or hazard to public health or safety. This means that the waste should be handled with the greatest care. Also hazardous solid waste materials should be land filled separately from non-hazardous materials. Disposing of all municipal wastes collected at landfills is not desirable from a social, economic and environmental point of view, sanitary landfills require significant investments and they often present political obstacles for their construction, due to local opposition. Residents who live near a proposed landfill may oppose its construction.

Sanitary landfills are necessary for final disposal of the waste that could not be prevented, reused, recycled or composted. Ideally, sanitary landfills should be used primarily for non reusable, non recyclable and non compostable residues. Sanitary landfills constitute a dramatic improvement over disposal of wastes in

open dumps. Sanitary landfills greatly reduce pollution and risks to human health and the environment compared to open dumping.

In an examination of landfills throughout the developing world in 1997-1998, Johanessen (1999) found varying amounts of planning and engineering in MSW dumping; among the various regions visited, African nations (with the exception of South Africa) had the fewest engineered landfills, with most nation practicing open dumping for waste disposal; waste managers in Asian and Latin American nations were more likely to be aware of environmental effects of improper landfill design and were much more likely to design and implement some control measures, however limited in scope. Sanitary landfills, on the other hand, are sites where waste is allowed to decompose into biologically and chemically inert materials in a setting isolated from the environment. Cointreau (1982) outline four features that must be present in order for a landfill to be considered sanitary.

- Full or partial hydro geological isolation through the use of lines to prevent leachate infiltration into the soil and groundwater; collection and treatment infrastructure should be used where leachate is expected to be generated.
- Formal engineering preparations with an examination of geological and hydrological features and related environmental impact analysis, waste tipping plan and final site restoration plan.
- Permanent control, with trained and equipped staff to supervise construction and use.

- Planned waste employment and covering with waste and soil placed in compacted cover to reduce water infiltration, odors and pests.

Other practical and social considerations must be addressed when planning landfills, especially in the context of developing nations and their problems, one of the most important is the sitting of landfills in proximity to urban areas. Nationally, there are few people who would be excite by having a landfills in their backyard, however, it is important to realize that landfills must be located within reasonable distance to population concentrations along a good road system. If they are locate too far from collection points and transfer stations, waste transport could become prohibitively expensive due to the distance the waste is transported. However, if it is cited far from the urban area, without regard to the ability of the government to transport waste with its limited finances, scattered unregulated dumping will become financially attractive once again.

Associate externalities of landfill municipal solid waste disposal

An externality is an effect of one economic actor's activities on another actor's well-being that is not taken into account by the normal operations of the price system. According to Ansel, Charles and Paul (2002), externalities are benefits or costs incurred in the production and consumption of goods and services that do not accrue to the producing or consuming unit, but rather accrue to the remainder of the society. The negative externalities that take place in solid waste management in developing countries are impressionlessly conspicuous.

Barrow (1995) has it that world-wide illicit disposal of waste has become more and more of a problem. Within countries 'fly-tipping' takes place and posses health threats, damages environments and wildlife, is aesthetically unpleasant and on frequent means of side stepping 'the polluter pays principle'. Fly-tipping may be done by a householder, a manufacture or by a contractor paid to dispose of the waste (often the client has paid for and expects proper disposal and is being cheated). Leachate is the most significant hazards from a sanitary landfill, which usually leads to the pollution of ground water or surface water. What to note is that the nature and strength of the leachate produced from a disposal site depends largely on the composition of the waste, the amount of water that infiltrates or moves through the waste and the length of time that the infiltrated water is in contract with the refuse (Botkin and Keller, 1998). The leachate of elements from the waste into the surrounding soil is likely to make it unproductive. The increasing health risk mostly because of bad odour is a recognizable externality.

Recycling

According to Barrow (1995), in the future more recycling, reuse and composting might be done at source, in the home. Some countries have national policies to encourage this: elsewhere NGOs are active, for example the use of national solid waste management association and the British Land Reclamation Group (REGRO). Waste recovery and waste recycling or reuse are terms that can lead to misunderstanding: one country might recover 80per cent of its waste paper

but recycle or reuse non; another may recover only 10 percent but recycle or reuse most of it. This is because. Once waste is recovered, there is the problem of sorting, transporting and accumulating different components.

On the local or regional level, waste reduction can be accomplished through the increased use of source separation and subsequent materials recovery and recycling. Separating waste materials at the household level occurs to some extent almost universally, and prevent the most valuable and reusable materials from being discarded. Following human retention of valuable materials, waste-pickers currently remove most valuable materials, either the garbage enters the waste stream or on rout, especially in the lower and middle income areas of many municipalities. In these instances, there is little need for additional encouragement of recycling. Even in the more affluent areas of developing cities, often there are found itinerant "buyers" of waste materials such as cardboard and glass. These buyers will help to direct many materials out of the waste stream, and illustrate a key point.

If recycling materials is a viable undertaking, small enterprises have been and will continue to spring up whenever there is an opportunity; infact the theft of source- separated recyclable materials has been documented in many pilot schemes in both developed and developing nations.

Zerbock (2003) has it that by allowing small enterprises to address the problems, valuable funds are saved, jobs are created, and landfill space is saved. Some improvement in these traditional systems is clearly desirable, however. Foremost are worker health concerns. Waste pickers are highly susceptible to

disease and it has been proposed to provide low-cost productive working gears, such as gloves, boots, and clothing, to prevent contact injuries and reduce pathogens. Experience in Calcutta, India however, has shown that most gear is simply sold by the workers for cash, and they continued to work as before.

In areas where recycling and waste diversion is not as spontaneous, municipally sponsored separation and collection may be needed. To be effective, policies need to be implemented on both the national and local levels. For examples, consumer education, or the incorporation of Municipal solid waste (MSW) issues in school curriculum, would be highly desirable. Recycling will also reduce the volume of waste to be handled, hence, the pressure on disposal systems

Incineration

Another option for waste reduction and disposal is incineration. Incineration should not be considered a disposal option, since following incineration there is still some quantity of ash to be disposed of (probably in a landfill), as well as the dispersal of some ash and constituent chemicals into the atmosphere. It should instead be considered more in terms of its waste-reduction potential, which can be 80-90% in terms of waste volume (Rand, Hankohl and Marxen 2000).Additionally, specific technical expertise and related general repair and maintenance technology are often absent in developing nation scenarios. High costs and environmental problems have led to incinerates being shut down in many cities including Buenos Aires, Mexico City, Sao Paolo and New Delhi.

Incineration seems at present a promising option for few countries; however small island nations are perhaps a category where such technology may be practical. With their smaller land mass, island nations often have less land available to them for land filling, and even in the event land is available, environmental considerations may not reveal these sites to be viable options. Being surrounded by open water, increases the attractiveness of ocean dumping. Most developed nations have abandoned this practice out of environmental concerns; however environmental regulations may not outlaw this practice in some poorer nations. Reduction by incineration, along with sanitary disposal of the residue, would therefore be a useful alternative to traditional disposal methods, and have proven useful in nations such as Bermuda and the British Virgins Islands (Lettsome, 1998).

Negative environmental consequences of incineration mostly revolve around air born emissions. Certainly, incinerators should not be located where prevailing wind patterns would carry emissions over densely settled areas. Incineration volatilizes many compounds potentially harmful to human health: metals (especially lead and mercury), organics (dioxins), acid gases (sulfur dioxide and hydrogen chloride), nitrogen oxides as well as carbon monoxide and dust.

Composting

It is one of the waste disposal methods where organic matter is allowed to decay to a usable product. It is also a biochemical process in which organic

materials are decomposed to rich soil like materials. According to Botkin and Keller (1998), composting is a process or a rapid and partial decomposition of moist, solid or organic waste, by aerobic organisms.

A somewhat more low-technology approach to waste reduction is composting. The waste of many developing nations would theoretically be ideal for reduction through composting, having a much higher composition of organic materials than industrialized countries (Table 1).Composting has not been overwhelmingly successful and widespread in practice throughout the developing world. Although well documented in China and other areas of eastern Asia, composting projects have had a spotty record throughout Africa, Latin America and elsewhere, and have had the largest number of failed facilities world wide (Table 2).

There are many advantages to composting. First and foremost, it would reduce, in some cases significantly, the amount of waste requiring ultimate disposal, extending the life of landfills. When done correctly, the end result becomes a useful product, capable of being used at the household or farm level to augment soil nutrient levels and increase organic matter in the soil, increasing soil stability.

Environmentally, the process by which composting decomposes organic waste is preferable to landfill processes; in a landfill, bacteria break down organics anaerobically in the absence of oxygen, resulting in the aforementioned releases of methane gas. When properly composted, however, the organic matter is decomposed using an aerobic process, which produces no methane by-product.

Table 2: Waste composition of selected cities (by % of weight) in industrialized, middle income, and low income countries

Waste materials	Industrialized		Middle income		Low income		
	Brooklyn NY	London, Eng.	Medellin, Col.	Lagos, Nig.	Jakarta, Indo.	Karachi, Pak.	Lucknow, India
Paper	35	37	22	14	2	<1	2
Class	9	8	2	3	<1	<1	6
Metals	13	8	1	4	4	<1	3
Plastics	10	2	5	-	3	-	4
Leather, rubber	-	-	-	-	-	<1	-
Textiles	4	2	4	-	1	1	3
Wood, bones, straw	4	-	-	-	4	1	<1
Non-food total	74	57	34	21	15	4	18
Vegetative	22	28	56	60	82	56	80
Miscellaneous inert	4	15	10	19	3	40	2
Compostable Total	26	43	66	79	85	96	82
Total	100	100	100	100	100	100	100

Source: Cointreau,1982

There are three scales at which compositing has been implemental at the residential level, the decentralized community level, and the centralized large-scale (municipality-wide) level; the larger the undertaking, the more capital investment is required. Most developing countries which have found success with composting have found it works best when implemented at the household level, with some projects doing well at the community level as well. At the municipal level, certainly overall cost and functionality are the primary reason for the success of a given process; the financial commitment required, as well as the effort required to maintain equipment sufficiently to keep a large scale operation running, has resulted in widespread failures; including India (9 of 11 plants closed between 1974 and 1996) Brazil (Only 18 of 54 facilities operating in 1990, and elsewhere (Hoornweg, D., Thomas, L. and Otten, L.et. 1999).

Hoornweg, et al (1999) also documented neighborhood-level composting in some areas, it has been successful in several cases. In Jakarta in 1990, a community composting project was quite successful, owing to government help (providing rent-free land to establish the site), extensive worker and community education, and establishing a distributor for the final product long before construction began. In 1997, however the project lost its main distribution and now the facility is only able to run at half capacity. In Brazil, some communities are able to operate medium-size community operations where municipal projects have failed.

Household-level composting has the greatest potential for success in many areas, especially those where small scale agriculture is found in great abundance

close to urban areas, where limited gardens are found within the city itself. The key is to find a useful destination for the final product, either by selling to neighborhood farmers/gardeners or on the household's own plots.

Waste management in Ghana and private participation

The high population and its associated increase in urbanisation and economic activities in Ghana especially Accra, has made the impact of the society's solid waste very noticeable. The urban areas of Accra produce about 760,000 tons of municipal solid waste (MSW) per year at approximately 200 metric tons per day (EPA, 2002). The Accra Metropolitan Assembly spends about two billion cedis per month (about $227, 000) on waste collection alone and about 12 billion cedis per year on urban solid waste management. This amount does not however, cater for about 30 per cent of solid waste in the metropolis.

Johannessen and Boyer (1999) observed that the design and optimization of solid waste management technologies and practices that aim at maximizing the yield of valuable products from waste, as well as minimizing the environmental effects have had little or no consideration in the African region. They also observed that at the national and municipal levels, Ghana has not taken steps to construct, operate, or maintain sanitary landfills. It is under the World Banks urban environmental sanitation project that Ghana developed plans to build its first sanitary landfills in Accra, Kumasi and Takoradi all in Ghana.

The inadequate information on quantification and characterization of waste; health, social, economic and environmental impact of municipal solid

waste management is a common occurrence in Ghana especially in the Wa Municipality. The problem is only compounded by insufficient funding. The waste management system so far in Ghana has not properly integrated other solutions as collection treatment, and supply for re-use, reprocessing and final disposal. The system has provided enough room to adapt to future preassures (increase in waste quantities and composition). It is also pertinent in Ghana where waste management services are largely inefficient and ineffective. It is estimated that about 83% of the population dump their refuse in either authorized or unauthorized sites in their neighborhood, and due to weak capacity to handle solid waste, unsanitary conditions are created. Although these weaknesses have been attributed to lack of logistics and financial management, people's attitude towards waste management should not be ignored. Several factors have conspired to promote the massive build up of urban garbage and waste.

The Daily Graphic on Friday, September 19, 2008; reported that filth had engulfed the central market of Kumasi in the Ashanti Region. It further stated that, they openly sold foodstuffs and their wares in the middle of the road and on the pavements in the midst of the filth which they themselves generated. That, one always wondered why there was so much indiscipline at the city centre of the Kumasi metropolis, especially at the precincts of the central market, and whose responsibility it was to ensure sanity at the place as the Kumasi Metropolitan Assembly (KMA), looked on unconcerned.

The coalition of NGOs in the water and sanitation sector (CONIWAS) organized a sanitation forum on September 18, 2008 in Wa in the Upper West

region. Lance Bayuor, the regional environmental officer clearly stated that environmental sanitation had become a crisis not only in the upper west region but Ghana as a whole. Poor physical planning, inadequate financing, bad personal attitudes towards sanitation were some of the factors leading to poor sanitation. He went forward to add that environmental health and waste management were the biggest problems of most Assemblies especially the district capitals. Waste management involves costly activities which require the provision of sanitary infrastructure, tools, equipment and capacity development. All these cannot be provided by the District Assemblies alone to ensure improved sustained sanitation services. There is therefore no wonder that our towns, communities and villages are engulfed with waste. According to the UN Human Development Report, Only 18% of Ghanaians have access to safe toilet facilities as at 2006. Improved sanitation facilities and practices can also reduce acute respiratory infections by 50%. Sanitation is therefore a vital component of the health of the people and an important factor in economic development.

Lance Bayuor finally observed that the Environmental Health Directorate has been working in partnership with Zoomlion, Coalition of Waste and Sanitation Agencies (CWAS), PRONET, Ghana Health service, Plan Ghana, Town and country planning Department, Chiefs and traders to prevent diseases.

Private sector participation in waste management in the Wa municipality

Privatisation of Services is emerging as an option open to all Municipal Assemblies. Privatisation concepts (concession, contracting, franchise, open

competition) and their management require that training be offered to Municipal Administrators, civil and sanitary engineers, as well as private sector actors. Health inspectors and environmental health technicians will all require re-training to be able to meet new roles.

Private participation in waste management services delivery should be looked at as a means of enhancing cost-effectiveness and mobilizing the best resources in the management sector. Zoomlion, a private company engaged in the management of solid waste throughout Ghana and even beyond, has been involved in the management of solid waste in the Wa Municipality. Some of the company's aims in managing the waste are;

- The mobilization of more equipment for improved service delivery which otherwise is a problem to the Municipality.
- Improve service quality and reduce cost which will finally increase the revenue for the municipality.
- To ensure a completely cleared environment for the people of the Wa Municipality.

The above statements have a direct link with the public health service statement of the United States which has identified twenty-two human diseases that can be associated with solid wastes as observed by Essumang and Bentum (undated). The diseases include typhoid fever, cholera, dysentery, various diarrhoeas, anthrax, tuberculosis, trachoma, plague, muuire, letospirosis, rabies rickettsial pox, malaria, yellow fever, dengue, encephalitis, and trichinosis among others.

Like any other private company, Zoomlion has a contract with the Wa Municipal Assembly which is to ensure a complete cleanliness of the principal streets of the municipality and also to lift some refuse containers at their strategic points of collection. The municipality has not been zoned but it has forty (40) collection points out of which there in a shared responsibility between Zoom lion and the Municipal Assembly. Fourteen (14) out of the forty (40) containers were being managed by Zoomlion whilst the Wa Municipal Assembly takes charge of the rest of the twenty-six (26) left. Interestingly, because of the griming managerial problems that bedeviled the Wa Municipality in terms of waste Management, zoomlion has extended its contract by lifting and dumping all the containers at the collection sites in the Wa municipality. The system of collection, which is being adopted by the company, includes container lifting, tricycle collection and sweeping of the principal streets of the Municipality in the early hours of each day.

Studies have shown that Wa Municipality is the fastest growing urban centre in the Upper West Region, with a growing rate of 4%.The Municipality has a population of two hundred and twenty four thousand and sixty-six (224,066)-(2000, population and housing census). The result of this is the generation of various kinds of waste. This is evidence from the heap of materials found around various car parks, market centers and residential areas.

The Ministry of Local Government and Rural Development (1999) notes that all waste, deposited in the public domain shall be the property of the District Assembly and the Assembly may also direct generators of waste to dispose of or

surrender such waste to the District Assembly in a manner and at such times and places as may be approved by the District Assembly. This is to ensure a clean environment and also to prevent hazards associated with improper handling of waste.

Hence, after collecting the waste, the dumping site is located at Siiriyiri about 5km from Wa. Also from the office of the Zoomlion in Wa, the Manager noted that the constituents of the waste are mostly sand, ashes, plastics, outdated newspapers and garbage from dining tables among others. With the higher percentage being sand and ashes which reflect the high poverty level of the indigenes that still use charcoal and fuel wood as their sources of cooking. According to the 2000 Population and Housing Census reports, wood is the main source of cooking fuel in the region (79.8%), with charcoal (16.5%) a distant second.

Table 3: Source of cooking fuel for households by district in the Upper West Region

Main source of cooking fuel	District					
	All districts	Wa	Nadowli	Sissala	Jirapa Lambussie	Lawra
Wood	79.8	66.4	92.4	87.7	89.0	84.6
Charcoal	16.5	28.8	4.9	9.2	8.4	12.2
Kerosene	1.3	1.3	1.2	1.2	1.6	1.3
Gas	0.7	1.2	0.5	0.3	0.2	0.4
Electricity	0.4	0.6	-	0.4	0.1	0.4
All others	0.4	0.5	0.4	0.4	0.3	0.5
None, No Cooking	0.9	1.2	0.8	0.8	0.4	0.6
All sources	100.0	100.0	100.0	100.0	100.0	100.0

Source: 2000 Population and Housing Census

As with the disposal of human and liquid waste, few houses in the region provide for the adequate disposal of solid waste. This is a national concern and not only in the municipality (2000 Population and Housing Census).

As with the practice at the national level, most households in the region dispose of their solid waste elsewhere at their convenience (65.6%) or at a public dumpsite (21.1%). Only about a tenth (12.9%) of household has a means of burning or burying their solid waste presumably around the house or having it collected for disposal (2000 Population and Housing Census). In the Wa Municipality, dumping of solid waste elsewhere represent 55.9% which gives Zoomlion a lot of work to be done on daily basis.

Waste problems faced by municipalities in developing countries

Indeed, in many countries of the world, including Africa, the privatisation of waste management services is often seen as the only viable option, and potentially offers higher quality of service at competitive prices, allowing the government sector to focus on the roles of monitoring and enforcement of services. On this matter, the African Development Bank's guidelines for waste management state that private enterprises may play a role in vastly improving solid waste management services in Africa. However, it should be noted that compared to development country models, the African models required greater involvement of the communities in the process. Private companies in the solid waste management sector in developing countries face current problems. Collection, transporting and disposing of Municipal solid waste represents a large

expenditure for third world cities but other problems apart from finance are described as inadequate service coverage and operational inefficiencies of services; limited utilisation of recycling activities; inadequate management of hazardous and health waste. The quantity of waste comprising-solid, liquid and gaseous are generally considered to be growing across the globe as a result of increase in the world's population, increasing industrialisation, increasing urbanisation and rising standards of living.

Inadequate logistics

The state of infrastructure and facilities for storage (Containers), vehicles and frequency of collection of solid waste is inadequate. In Accra, the capital of Ghana, the total per month paid to contractors is estimated to be over two billion cedis per month (over $227,000) (AMA, 2004).

The current domestic waste generation in Kumasi is based on a population of 1.2 million and a per capital generation rate of 0.6kg of waste per day. In total this results in a domestically generated waste level of 720 tones daily. In addition, an estimated 250 tones is generated in the 2 main markets of the city. Total daily generation of solid waste in Kumasi is estimated at 970 metric tones, and about 80% of this daily generation is presently collected. However, the issue of low service coverage and poor quality of service has been identified as a major short coming of the waste management sector (KMA Waste Management Plan for 2004-2005).

The same source went further to state that, inadequate equipment resulting in limited service delivery and several heaps of refuse at disposal sites, inadequate revenue mobilisation to finance waste collection and management cost, bad attitudes of residents such as indiscriminate disposal of household waste, poor infrastructural conditions, particularly roads and waste collection points which impact negatively on service delivery and inpropriate system for storage and haulage; the high reach of containers result in waste being thrown on the ground particularly by children (KMA, 2004-2005).

The Wa Municipal Assembly is not different and the only private company that is engaged in waste management (Zoomlion) is equally facing serious problems like inadequate access roads, poor system of dumping at the collection sites and dumping at different areas instead of the designated collection site.

Human health risk associated with solid waste management

There are some human health risks associated with solid waste handing and disposal in all countries to some degree, but certain problems are more acute and widespread in developing countries. Cointereau (1982) has classified these into four main categories; the presence of human fecal 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 fecal 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 fecal 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 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 (undated), solid waste that are mishandled can harbor 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, various diarrhoeas, tuberculosis, rabies 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.

CHAPTER THREE

METHODOLOGY

Introduction

This chapter discusses the methods and procedures used in collecting data for the study. It involves the description of the research design, the targeted population, sample and sampling techniques, instruments used, data collection procedure and data analysis plan.

Study area

The study area is the Wa Municipality, of the Upper West Region of Ghana. It was elevated to Municipal status in 2004 as part of the government's decentralization programme in bringing governance to the door steps of the ordinary people. The Wa Municipality is located in the southern part of the region and shares boundaries with the Wa – West District to the West, Wa – East district to the East and south, and the Nadoli District to the North. The 2000 population and housing census pegs the Municipality's population at 224,066 representing 38.9 per cent of the Regions population with an average growth rate of 1.7 per cent. However, the population of the town is about three thousand (3000). Most of the people in the study area are peasant farmers and traders. The population is heterogeneous, comprising Sissalas, Walas, Dagaabas, moshies, etc. and with a

very low level of education in the Municipality. Basically, the agricultural sector supports the major economic activities of the Municipality and employs about 66.6% of the labour force. 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 centers (the Ahmadiyya, Islamic and Lotchu clinic) are the only health facilities found within the study area.

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.

Research design

A survey design was used in the study. The study was to sample opinions of people within the Wa Municipality regarding waste management. Essentially, the study is a descriptive survey. A descriptive survey involves collecting data in order to test hypothesis or to answer questions concerning current status of the subject of study. Fraenkel and Wallen (1993) also noted that a descriptive survey provides information on the current status of the phenomena, and determines the nature of the situation as it exists at the time of the study. These authors further point out that descriptive survey has the advantage of procuring good amount of

responses from a wide range of people, and giving a clear meaning of events and seeking to explain peoples' perception and behaviours on the basis of data gathered at the point in time among other things. Finally they agree that descriptive surveys allow follow up questions which make room for items that are not clearly explained. A descriptive survey simply describes and provides an understanding of a phenomenon usually with simple descriptive statistics and is particularly valuable when an area of study is fairly new (Macmillan, 1996).

The choice of descriptive survey design has a number of advantages. The data collected enabled the researcher to discuss the views of the respondents as it is related to the topic under survey. Again, this approach enabled the researcher to make some diagnosis of the problem as they were and to make some prognosis with the view of coming out with possible suggestions and recommendations for the challenges associated with waste management in the Wa municipality.

Population

The targeted population for the study included:

- Men and women with age brackets of 16 – 50 years for both sexes who were either family or household heads residents in the Municipality.
- Officials of Zoom lion and workers of the sanitation unit in the Municipal Assembly.
- The Ghana Health Service and the Environmental Protection Agency (EPA).
- Solid waste management officials in the municipality, especially those at the municipal office..

Sample size

A total of 300 respondents were involved in the study. This was based on the population of the study area. Eleven communities were used, and in each community 25 respondents were interviewed, totaling to 275, the rest of the 25 respondents were officials of solid waste management within the municipality. This figure is about ten percent of the total population. Royse, (1991), states that the general rule for selecting a sample for a survey should be ten percent of the population. The composition of the sample was not based on percentages for males and females because random sampling (where everyone had equal chance of being chosen) was mainly used.

Nwana (1992) suggests that if the population is few hundreds a 40% or more sample size will do; if several hundreds a 20% sample size will do; if a few thousands a 10% sample size will do; and if several thousands 5% or less sample size will do. Also, the sample size needs to be large enough to ensure that it is theoretically possible for each cell in the analytical table to have at least five cases fall in it. Hence, the stated sample size for the population is large enough to have at least five cases in each cell.

Sampling technique

Multiple sampling methods were adopted. The methods used include simple random sampling, systematic and purposive sampling. Simple random sampling (lottery method) was used to select the communities in the municipality while systematic sampling was used to select the households for the study.

Further more, a simple random sampling technique was employed to select members of the households. According to Patton (1990), the quality of the sample affects the quality of the research generalisations. Patton further explains that obtaining an unbiased sample is the main criterion when evaluating the adequacy of a sample. Patton identifies an unbiased sample as one in which every member of the population has equal opportunity of being selected in the sample

Also, purposive sampling was used to select the Zoom lion workers and officials, the officials of the Waste Management Unit in the Municipality, some opinion leaders and members of the Ghana Health Service. Sarantakos (1998) explains that purposive sampling allows the researcher to choose subjects who in his or her opinion are relevant to the research.

Research instruments

Questionnaires, focus group discussions and interview guides were used to collect data for the study.

Questionnaire

Questionnaire items were in five sections. Section 'A' consisted of nine items that sought to gather information concerning respondents' background. Section 'B' had fourteen items seeking to gather data on the management practices used in the study area. Section 'C' was made up of ten items that sought to find out the relationship between improper waste management and health. Section 'D' which was to gather data on the activities of Zoom Lion had eight

items. Section 'E' had eighteen items constructed to determine how solid wastes were managed at both household and municipal levels as well as the problems associated with the solid waste management chain in the municipality and some suggested solutions to the problems.

Interview

An interview guide was also designed to engage the rest of the respondents in some sort of dialogue so that they would be able to express themselves beyond Yes or No responses. The interviews were used as a means of triangulation. Schedules for the interview were devised comprising semi-structured items. This approach allowed interesting responses to be followed up immediately. According to Lynas (2001), in semi-structured interview, only broad areas are identified and questions asked on them. Further, Lynas(2001) contends that the researcher has the option to probe further and the act of probing ensures that issues that are misunderstood are cleared up and good rapport is achieved and cooperation encouraged. The interview guide was used for the focuss group discussion. Each session lasted for about one hour and was recorded using a Philips Dynamax2 hi-fi recorder.

In general, the two instruments, the interviews guide and questionnaire used were considered appropriate for the study because descriptive survey lends itself to questionnaire and interviews. Borg, Gall, and Gall, (1993) agree that survey research typically employs the questionnaire and interview to determine the opinion, attitude, preferences and perception of persons of interest to the

study. Since the researcher was interested in assessing perceptions and preferences of the respondents regarding waste management in the Municipality, it was appropriate to use questionnaire and interviews to determine opinions and attitude consistent with the comments of Borg et al (1993) stated above.

Data collection procedure

Interviews

Before interviewing respondents, their consent was sought and the purpose of the research explained to them. Permission was also sought regarding the use of a recorder to record the interviews. In all cases the respondents agreed. The main procedure was through the use of tape recorder. Fetterman (1998) stated that tape recorders allow the researcher to engage in lengthy informal and semi structured interview. And can also effectively capture long verbatim quotations essential to the fieldwork, whiles maintaining a natural conversational flow. Finally, confidentiality was assured throughout the interview.

Questionnaire

Some respondents do not treat questionnaires seriously. To ensure that this did not happen, copies of questionnaires were administered and retrieved personally by the researcher. A period of one week was allowed for respondents to answer the questionnaire. The return rate was hundred percent, due to effective monitoring.

Focus Group Discussion (FGDs)

Focus Group Discussion (FGD) presents a more natural environment than that of the individual interview. This is because participants are influencing and influenced by others just as they are in real life.

The participants comprised young ladies matured and experienced women between the ages of 15 and 45. These selected groups of people were all in their active levels of being dutiful in their homes in terms of waste management at the house level. They were engaged in the FGD in three communities, thus Limanyiri – vouri, Kabanye and Dondoli. In each community, two groups of eight persons were engaged to discuss a set of questions on solid waste management in general and how they handled the conandrum in their various homes after sweeping. Participants were predominantly illiterates and peasant farmers with a hand full going through basic education.

The participants were also Muslim dominated and were selected through information given during the in – depth interviews. They were made known to each other and each of the groups received a set of instruments such as a tape recorder and a discussion guide. The groups were facilitated by a moderator with their scribes. The moderators ensured balance distribution of questions and also encouraged the participation of every body. Data collected were checked, transcribed and a valid meaning was drawn out of it.

Data analysis plan

Based on the questions raised, a multiple methodology approach was adopted in the analysis of data collected. Descriptive statistic (mainly frequencies

and percentages) was employed to answer the research questions. Also the Statistical Product and Service Solution model was used for the analysis. Reponses to questionnaire were categorised according to how they related to the research questions. Interviews were transcribed and analysed based on emerging themes. In addition, verbatim expressions of respondents were used where applicable.

Pilot testing

The pilot testing of the instrument was conducted in a community within the study area but outside the selected communities for the study. Priority was given to a community that shared similar characteristics with the study area to enhance matching. The purpose of pilot testing was to discover possible weakness, inadequacies, ambiguities and problems in the instrument. Twenty (20) respondents were involved in the pilot study and questionnaires were personally administered and retrieved by the researcher. To determine the validity of the items, the questionnaire was given to experts in the waste management unit of the municipality. Their assertion of its appropriateness guided me in the review of the items. Best and Khan (1993) contends that content validity is normally assessed by experts who judge its adequacy.

Creswell, (1994), states that "researchers have no single stance or consensus on addressing traditional topics such as validity and reliability". As a result, another strategy the researcher used to ensure validity of the instrument was the performance of pilot test. According to Wilson and MacLean (1994),

piloting is able to help in establishing the reliability, validity and practicability of the questionnaire because it helps to check the clarity of the questions, give feedback on validity of test items and also makes sure that the data required will answer the research questions. The researcher as part of the pilot-testing, asked the respondents to comment and recommend suggestions to improve the instrument. Some very useful and valuable suggestions emerged from the pre-testing. These views were collated and studied closely and helped the researcher to remove ambiguous statements; some statements were completely deleted either because of similarity or non relevance.

Recorded interviews were played back for approval and correction, this was later transcribed and copies given to respondents for further checking and approval. All the necessary corrections and changes were effected to ensure credibility, trustworthiness and clarity

Assumptions

The research was based on the assumption that;

- The study population was representative of the total population.
- Funding would be secured for the study.
- The community under study would be receptive and the information given by the respondents were true.

CHAPTER FOUR

RESULTS AND DISCUSSION OF FINDINGS

Introduction

This chapter brings into perspective the findings of solid waste management in the Wa Municipality. The results are presented in three folds. Thus, the challenges facing households in the management of solid waste, how Zoom lion as a private waste management company managed solid waste in the Municipality, and the challenges the Municipal Assembly was going through to ensure that the city was clean.

All the 300 questionnaires sent out to the target groups were retrieved and this gave a response rate of 100%. The respondents were grouped into top level solid waste managers in the municipality, middle level solid waste managers (Zoom lion), and those who resided in the municipality as the first hand managers of the waste.

The views of the top management level were sampled as different from that of the house hold managers.

Socio – demographic characteristics of respondents

Out of the total number of 300 respondents, 70 of them were within the age group of 16 – 20 which invariably forms the highest number out of the total

number of respondents indicated above. Table 4 as well represents the numbers and percentages in terms of sexes within the same age brackets, thus, 28 males and 42 females, representing 25.7% and 22.0% respectively within all respondents. The percentage for the age group 16 – 20 of respondents is 40% and 60% for males and females respectively.

Table 4: Age distribution of respondents against their sex

Age	Sex of respondents		Total
	Male	Female	
16-20	28	42	70
21-25	33	34	67
26-30	19	36	55
31-35	10	38	48
Above 36	19	41	60
Total	109	191	300

Source: Field data, 2010

It is significant because this age bracket takes responsibility of almost all household chores. The age bracket of 31 – 35 recorded the lowest count of 48 out of the 300 respondents, with 10 of them being males representing 9.2% whilst 38 out of the 48 respondents in that group were females. The total number of female respondents out of the whole figure of 300 was 191 which in percentage terms represents 63.7% and that of the male was 36.3% as shown in the table 4. It has been interesting to observe that the age groups of 16 – 20 and 21 – 25, recorded

the highest counts of 70 and 67 respectively out of the total number of 300 respondents. This is significant because the 2000 population and housing census in Ghana shows a considerable youth age of 15 – 19 years to be slightly higher in each district of the region. In addition to this, the age/sex structure as observed in table 4 indicates that there were more females than males in that age groupings. This depicts the national standing of having more females than males in Ghana.

The responses in table (5) show that 89 out of the 300 respondents, constituting 29.7% did not have any formal education. 32 of the respondents with a percentage of 10.7 had up to primary education whilst those who completed middle/JHS were 62 constituting 20.7%. The respondents that completed the secondary level were 65, representing 21.7%. Only 52 respondents had a percentage of 17.3 and had also completed the tertiary level of education.

Table 5: Level of education

Level of education	Frequency	Percent
None	89	29.7
Primary	32	10.7
Middle	62	20.7
Secondary	65	21.7
Tertiary	52	17.3
Total	300	100.0

Source: Field data, 2010

Those who did not have any form of formal education received the highest number of respondents. This has actually confirmed the low level of education in the study area. This is closely followed by middle/JHS education with 20.7%. The least number of respondents is 32 who are at the primary level of education. This must be possible because of the insistence of educational policy makers on completing basic education in recent times.

Table 6: Religion of respondents

Religion	Frequency	Percent
Islam	246	82.0
Christianity	43	14.3
Traditional worship	9	3.0
Pagan	1	0.3
Others	1.	0.3
Total	300	100.0

Source: Field data, 2010

Table 6 shows the various religions practiced by the respondents. The Islamic religion was the highest with 246 respondents, representing 82% out of the 300 respondents. This has been so in the study area because the Wa municipality is predominantly Muslims. Out of the 300 respondents, 43 were Christians and they represented 14.3% of the sample size. Out of the 300 respondents, 9 were traditional worshippers and this represents 3.0%. Pagans and other religions had 1 each and that also represented 0.3% in each case.

Table 7: Occupation of respondents

Occupation	Frequency	Percent
Farming	29	9.7
Salaried worker	49	16.3
Artisan/trading	75	25.0
Unemployed	67	22.3
Other (hawkers, way side sellers, etc)	80	26.7
Total	300	100.0

Source: Field data, 2010

Table 7 reveals that those who do "others" as their occupation received the highest number of responses of 80 out of the 300 respondents. This number represents 26.7%. This category includes those who worked with Zoom lion, hawkers and those who did other menial jobs. This section received the highest number because Zoom lion workers were targeted to sample their views on solid waste management in the study area. Artisans/trading received 25% of the responses as the second highest. The unemployment rate in the country was felt here with 22.3% of respondents. Salaried workers were 16.3%. Farming receives the least response with 9.7%.

Solid waste management practices of respondents in the study area

The following section deals with the generation of solid waste and how respondents managed them at the household level. The findings in Table 8 reveal that a very high number of 47% of respondents collected their solid waste in a

bucket. This was closely followed by 25.7% who collected their waste in proper dust bins or containers after sweeping. Those in the "others" category was 13.7%. This category includes those who used other means like polythene bags and burning to get rid of their waste. Other options were "basket" and "heaping them in a corner", which were 9.7% and 4.0% respectively.

Table 8: Containers for waste collection

Occupation	Frequency	Percent
Basket	29	9.7
Bucket	141	47.0
Heap them in a corner	12	4.0
Proper dustbin	77	25.7
Others (polythene bag, etc)	41	13.7
Total	300	100.0

Source: Field data, 2010

Respondents were to describe the content of their waste and this is shown in table 9. Rubber received 25.4% as the highest; indicating that, majority of the respondents had rubber as the main content in their refuse. Peels and sand closely followed with 19.8% and 19.5% respectively. Table 9 also reveals that Ashes represents 18.6%. Leaves were the least selected with 16.6%. This might be the least because not everybody had a tree in his/her compound.

Table 9: Types of waste generated

Waste type	Responses	
	N	Percent
Rubber	217	25.4
Leaves	142	16.6
Peels	169	19.8
Ashes	159	18.6
Sand	166	19.5
Total	853	100.0

Dichotomy group tabulated at value 1

Source: Field data, 2010

With respect to Table 10, respondents were expected to either say yes or no, 61.0% said no which means they did not face any problem at all at the point of disposing of their waste. Whiles 38.7 % said they faced problems at the point of disposing refuse.

Table 10: Problems faced at the point of disposing of refuse

Response	Frequency	Percent
Yes	116	38.7
No	183	61.0
No response	1	0.3
Total	300	

Source: Field data, 2010

The total count on the number of respondents on the table might seem to be conflicting with the total number of 300 respondents and this is because we are dealing with multiple response and respondents have ticked more than one category in this particular case, others too did not answer it and this is why we have 192 missing cases in Table 11.

Table 11: Problems faced at the point of disposal

Problem	Responses	
	Frequency	Percent
Poor sitting of refuse dumps	32	19.4
Defecating round containers	49	29.7
Indiscriminate dumping	84	50.9
Total	165	100.0

Source: Field data, 2010

Table11 gives details of the respondents who faced problems when disposing of their waste. Indiscriminate dumping of waste around the container side represents 50.9%. Poor sitting of the refuse dumps and containers also saw 19.4%. Out of the total respondents, 29.7% explains that defecating around the container side was a problem to them.

A section was created for the workers of the Zoom lion non–officials only. This is because they were involved in the grassroots management of solid waste in the Municipality. The researcher sought to find out the solid waste situation in

the study area. These included the content of solid waste that was generated, the problems they faced and also some suggested remedies.

This particular item Table 12 was answered by only Zoom lion officials and those who were involved in the management of waste in the municipality. Hence, the rest of the respondents did not respond to it.

Table 12: Description of the waste situation in the municipality in recent times

Response	Frequency	Percent
Very good	4	11.5
Good	20	57.1
Bad	6	17.1
Very bad	5	14.3
Total	35	100.0

Source: Field data, 2010

The valid respondents were 35 and 11.5% out of the valid responded cases indicated that the waste situation in the Municipality then was very good. The response also indicated that 57.1% are satisfied with the situation and had stated 'good' as the waste situation in the Municipality.

Table 13 is about the amount respondents will want to pay if they are given a free dust bin that would always be emptied on regular basis.

Table 13: Willingness to pay

Suggested amount	Frequency	Percent
GH¢ 1	109	36.3
GH¢ 2	47	15.7
GH¢ 3	19	6.3
GH¢ 4	6	2.0
GH¢ 5 and above	24	8.0
Others	1	0.3
No response	94	31.3
Total	300	100.0

Source: Field data, 2010

Respondents were also asked to suggest how much they were willing to pay if they were offered a free dust bin. Out of the 300 respondents, 206 responded to it, representing 68.7%. This is significant because, if people are supplied with free waste bins it could go a long way to increase the financial base of both Zoom Lion and the Municipal Assembly and also help in curbing solid waste management problems to a minimal level.

Also 31.3% were missing cases and this is so because of the previous question which asked respondents whether they would be willing to pay if they were given free dust bins. About 52.9% were willing to pay GHC 1, this is closely followed by a valid percentage of 22.8 who were willing to pay GHC2. Other suggestions were GHC 3, GHC 4, GHC 5 and others. The modal amount was

GHC 1. This is reflecting the not being able to pay attitude of the people of the study area.

Table 14: Reasons for not willing to pay

Reasons	Frequency	Percent
Companies should bear the cost	3	1.0
Very high rate	11	3.7
No money	69	23.0
The place is not far	9	3.0
Total	92	100.0

Source: Field data, 2010

Out of the 300 respondents, the missing cases were 208, representing 69.3% who did not respond to this question. This is because they responded to the previous question by stating how much they will want to pay. Therefore, the valid number to deal with in this case is 92, representing30.7%. 3 respondents, representing a valid percentage of 3.3 thought that the company should bear the cost of taking refuse from residents since they were paid by the Municipal Assembly. Some residents also believed that the rate charged by the private company was very high. 11 respondents, representing a valid percentage of 12.0, believe in this. Most valid respondents of 69, representing 75.0% said there was no money.

This is an interesting category because some would have suggested a figure if there were to be some money for the purpose. 9.8% in this research felt

the public containers where the dumping was done was not far from their homes, they would therefore not pay for any free dust bins.

Table 15: Types of waste collected

Type	Responses	
	Frequency	Percent
Sand	12	9.2
Rubber	34	26.2
Paper	15	11.5
Leaves	25	19.2
Ashes	21	16.2
Others (e.g. milk tin, tomato tins, sardine tins, etc	23	17.7
Total	130	100.0

a. Dichotomy group tabulated at value 1.

Source: Field data, 2010

The prominent constituents were sand, rubber, leaves, ashes and others. With this, respondents could choose as much as they felt the constituents appeared, this brought about high figures as compared to the valid number 35.

Rubber as a constituent was the highest with 26.2%. The least was sand with 9.2%. This might be the case because in some of the places what the workers dealt with might not involve too much sand or may even be covered with cement, tar, concrete, etc.etc. On the contrary rubber continued to appear quite often. This is more interesting when respondents were expected to rate the constituents by

indicating the one that was always the largest. Workers of the Zoom lion company were task to respond to a section of the questionnaire because they delt with the street management directly; therefore the total number of respondents was limited.

Table 16: Constituents of waste

Constituents	Frequency	Percent
Sand	7	20
Rubber	23	65.7
Paper	1	2.9
Leaves	3	8.5
Ashes	1	2.9
Total	35	100.0

Source: Field data, 2010

Out of the 35 valid cases, 65.7% thought that rubber was always the largest, and 2.9% believed ashes were always the largest, and this received the lowest response of 1. The appearance of ashes as a major constituent might be the reason why some of the containers got burnt sometimes, because it might contain life fire.

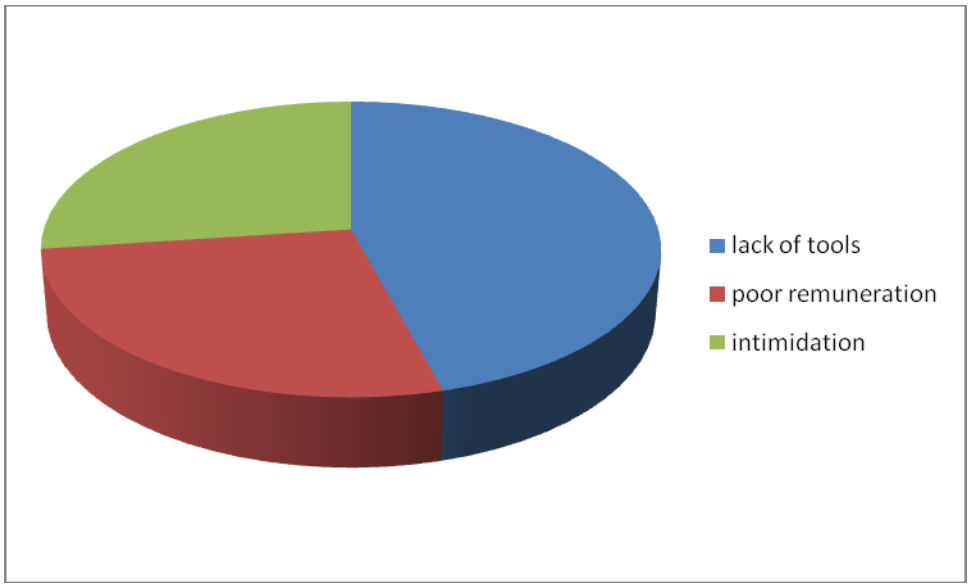

Figure 1: Problems faced at work

Source: Field data, 2010

Figure 1, gives details of the problems they (Zoom Lion Workers) faced at work. These problems were stated as lack of tools, poor remuneration and intimidations by the general public. As a case of multiple response, it required that respondents could choose more than a single case. Hence, 45.8% stated lack of tools as a major problem in the study area. This research also confirmed that poor remuneration and intimidation at work all had 27.1% as some of the problems they faced at work sites.

Table 17: How to improve conditions

Response	Frequency	Percent
Regularise salary	22	23.7
Provide tools and equipment	20	21.5
Educate the public	12	12.9
Good remuneration	23	24.7
Social security	11	11.8
By the public	5	5.4
Total	93	100.0

Source: Field data, 2010

In Table 17, 24.7% of the respondents believed that good remuneration could actually help them to improve upon the services they rendered, whilst 5.4% thought that the public could also support them in different ways for them to improve upon their services.

A section of the questionnaire was also created for the officials of the waste management unit in the Municipality to find out their views on the problems they grappled with and the measures put in place to remedy the situation.

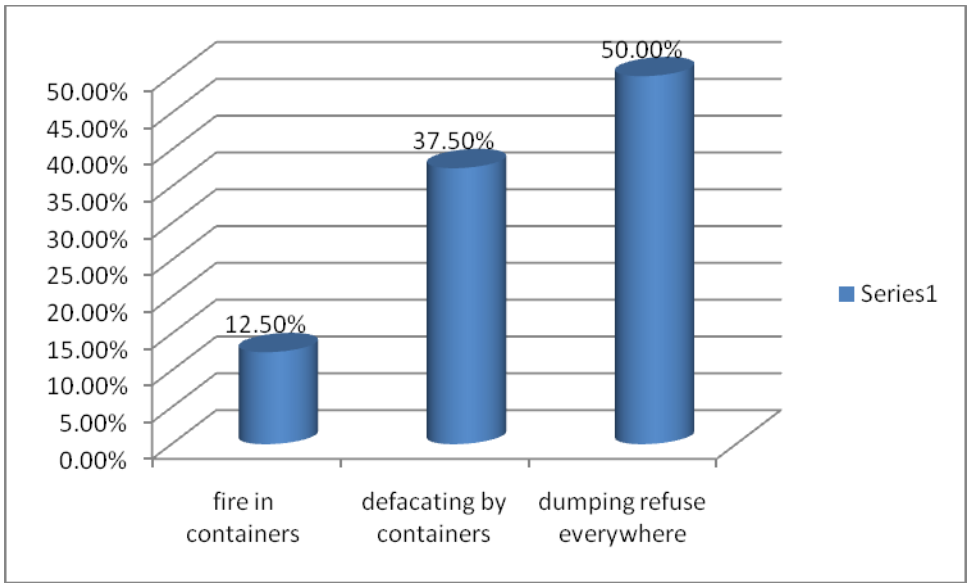

Figure 2: Bad practices that give management problems

Source: Field data, 2010

This response was meant for the officials of waste management only, yet some did not respond to it for lack of knowledge in the line of questioning. Figure 2 was another multiple response question that received a total of 16 valid responses. According to this research, management believes that "dumping refuse everywhere" was the major issue and this had attracted 50.0%.Residents after getting to the container, sometimes dumped their refuse anywhere around the container whilst the container itself was yet to be full. 37.5% and 12.5% also saw defecation by the containers and fire in the containers respectively as bad practices.

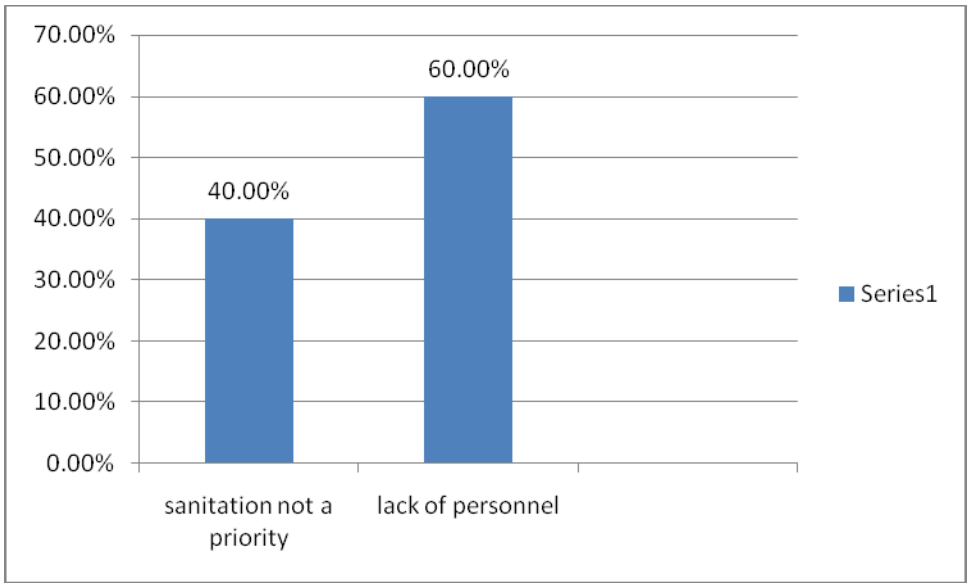

Figure 3: Problems faced by management

Source: Field data, 2010

But since it is a multiple response question, the following might look out of the ordinary. From Figure 3, there is a complete split of ideas for sanitation not a priority and lack of personnel as 40.0% and 60.0% respectively. Most of the respondents refused to respond to that particular item and that made the total number low.

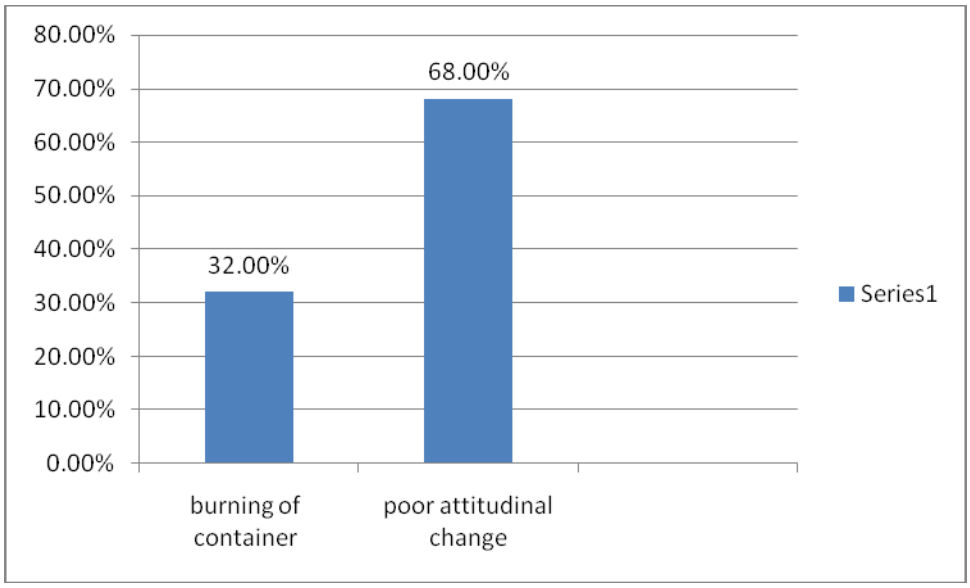

Figure 4: Problems from the general public to management

Source: Field data, 2010

Figure 4 displays the details of the responses out of 25 valid cases, Management believed that the burning of the containers (skips) by the general public was a thing to be worried about and had therefore been labelled with a percentage of 32.0.Figure 4 also explain that 68.0% of management thought that the poor attitudinal change of the general public was also another thing to be worried about.

Respondents' sentiments about what they thought could be done to improve upon the situation with 28.0% believing in the provision of logistics for effective work to be done. Also, 24.0% thought that educating the general public could be a way out. Forty eight percent as the highest out of the valid cases believed that empowering the Assemblies could help improve upon the management situation. This is shown in Figure 5.

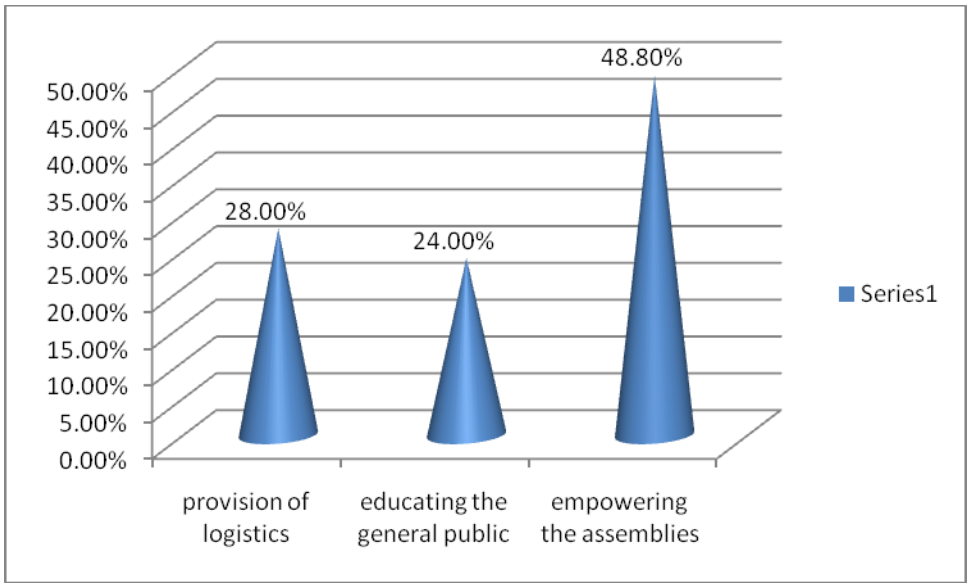

Figure 5: Things to improve upon

Source: Field data, 2010

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter summarises the entire research process as well as the findings. It also gives recommendations as possible measures for solutions to the problems identified out of the research work.

Summary

The study in general sought to examine solid waste management in the Wa Municipality and its associate problems. It was to find out the types and nature of waste generated in the area, and also to describe the management practices used in the study area. The study again sought to assess solid waste management both at the household and municipal levels (Zoomlion), to examine the problems that were associated with the chain of management in the area and to make some recommendations for improving the system.

Respondents involved in the study were in three groups; those who managed waste at the household levels by sweeping and collecting, the Zoom lion street sweepers and also officials at the municipal level who dealt with solid waste management. The study also involved a focus group discussion (FGD) of some selected communities and interviews of some of the managers. About 79% of the

respondents were within the ages of 16years and 35years and were both males and females.

From the above discourse, the following findings are clear;

- The waste management practice in the study area is not in conformity with the best standard of practice (that is the international waste management practice) as recommended by the Ministry of Local Government and Rural Development (1999) of Ghana. There is no use of mixed strategy which includes alternatives like incineration, recycling, re – use, composting, using waste to generate energy, waste prevention and minimization and land filling.
- The research clearly indicates that a distinct category of respondents used either a basket or a bucket to store their solid waste after sweeping. This type of containers could not also be properly covered, hence the incidence of disease pathogens or vectors were likely to be on the increase. This might also be an indication of the high level of poverty in the study area.
- Residents also produced a lot of ashes and sand whenever they swept. The ashes sometimes contained life fire, and this could be the reason why the containers get burnt sometimes. Polythens or rubber products constituted the largest component in most people's solid waste in the study area.
- A good percentage of sixty – five out of the respondents indicated that they did not face any problem at the point of disposing of their refuse. This was possible because the big containers provided by the Wa Municipal Assembly at vantage points gave access to everybody to dispose of their refuse at any time.

- In addition, it was clearly seen in this research (50.9%) that those who faced problems, cited indiscriminate dumping as the most serious problem they had at hand. Residences sometime poured their refuse around the container instead of dumping it inside. This made it difficult to reach the container. Observations also indicate that sometime the containers got full and was left there for a number of days. This drove people to pour their refuse anywhere around it since it was full. The open refuse was also open to the hazards of the weather and scavengers.
- The research also indicated that most respondents preferred paying GHC 1.00 to any other amount if given a free dust bin that will be emptied on regular basis.
- A good number of the Zoom lion workers also believed that the greatest problem they faced at work was the lack of tools, and this research also indicated that the workers of Zoom lion would do better if they were well remunerated.
- Considering the top management level, managers believed that sanitation was not a top priority of the Municipal Assembly and also there were inadequate personnel at that level.
- In addition to the problems faced by managers, the major ones from the general public included the burning of the containers and also poor attitudinal change by the general public.

- Empowering the Assemblies, educating the general public and provision of logistics were some of the areas respondents thought would help the situation if they were well implemented.

Conclusions

Having gone through this research work, the following conclusions are drawn out of the work;

- Most of the people in the study area cannot afford to pay for the use of the zoomlion company's dust bins but rather would have been privileged to use them.
- The burning of the containers (skips) in some areas within the Municipality is as a result of life fire in the ashes that always form a considerable percentage of the generated waste.
- The indiscriminate dumping of the waste around the containers (skips) is because these containers get full and yet are always left there fore a number of days without being conveyed, hence residents would have no option but to pour their refused anywhere around the container.
- The Zoomlion Company is doing a very good job in the sanitation sector of the municipality because despite their numerous challenges, they have uplifted the beauty of the town by improving upon the good sanitational practices in the study area.

- Street sweepers and most of the workers engaged in the management process do not have enough efficient and effective tools and equipment to do their job effectively.
- People are aware of the hazards of poor sanitational practices.

Recommendations

- Communal labour should be encouraged at all levels of the society to promote public cleaning.
- Skips (containers) should be conveyed on regular bases, especially when they are full.
- Refuse bins should be placed at more vantage points that are also accessible in the study area, and also for them to be emptied on regular bases.
- The Environmental Protection Agency (EPA) office in the Municipality should also collaborate with the Municipal Assembly to find alternative ways of dealing with the problem of solid waste management in the Municipality.
- The central government, the local government and NGOs should step up their attempt to help alleviate poverty in the study area. This will help them to resort to other ways of cooking like the use of gas instead of fire wood and charcoal that generate a lot of ashes, which sometimes burn the skips.
- The consciousness of the people on waste management should be raised. This can be done as a means of promoting and ensuring the National Environmental Day, and also educating the general public on the dangers involved in having a filthy environment

- Municipal sanitation officers/task force should be employed and trained, for them to move from one compound to another to inspect the sanitation situation at home levels, and recommend defaulters to be charged for their actions.
- People who are involved in the waste management sector should be well paid and remunerated to encourage them and also make the sector attractive.
- Since the people of the region are known to be poor, the polluter pays principle as a way of managing waste cannot be sustained, but ways should be found to task or levy residents before they dump their refuse at the collection points in the skips.
- The Municipal Assembly should form an environmental task force in each section of the Municipality to monitor the activities of the private companies and also see to the proper dumping of the refuse in the skips. Defaulters should be made to pay, and a percentage of this should be given to the task force.
- Assemblies should be made to pay the private Waste Management companies, and not the Ministry of Local Government, this is because the Assemblies are directly involved with the management at the grass root level and should be able to tell whether a company has worked enough or not to merit the payment.
- Any sector that burns their container should be made to contribute and pay for its replacement with a percentage penalty.

- Respondents indicated to always pay GHC 1.00 a month for their bins to always be emptied regularly if they are provided with free bins. This draws the attention of the Zoom lion Company to find a way of including such people to widen the refuse and money collection base in the study area.

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APPENDIX I

QUESTIONNAIRE ON MUNICIPAL SOLID WASTE MANAGEMENT PRACTICES

Dear respondent, the purpose of this questionnaire is to find out the solid waste management practices of the Wa Municipality and the problems that are associated with it. You are chosen to be part of the respondents, and all answers will be treated confidentially. Please answer the questions in your candid opinion.

SECTION A: BACKGROUND CHARACTERISTICS

Instructions: Please supply a tick [√] in the box or circle the appropriate response where applicable.

1. Age: A.15-20 B. 21-25 C. 26-30 D. 31-35 E. Above 35

2. Gender: Male [ ] Female [ ]

3. Occupation: A. Farming B. Salaried job C. Artisan/ trading
D. Unemployed E. Others (specify)…….

4. Level of Education: A. No School B. Primary C. Middle/JSS
D. Secondary E. Tertiary

5. Religion: A. Islam B. Christianity C. Traditional Worship
D. Pagan E. Others (specify)……

6. How long have you stayed in this community? A. 1-5yrs B. 6-10yrs
C.11-15yrs D. 16-20yrs E. Over 20 yrs

7. Marital status? A. Single B. Married C. Widowed D. Divorced
E. Cohabitating

8. How many people are staying with you in the compound?

A. 1-2 B. 3-4 C. 5-6 D. 7-8 E. 9+

SECTION B: MANAGEMENT PRACTICES IN THE LOCALITY

I would like to discuss issues on solid waste management with you.

9. How often do you sweep your compound in a day? A. Once

B. Twice C. Thrice D. Never E. When necessary

10. How do you store your refuse after sweeping? A. In a basket B. Bucket

C. Heap them in a corner D. Proper dust bin E. Others (specify)…

11. For how long do you keep your refuse before disposing of them?

A. less than an hour B. daily C. Every three hours D. Weekly

12. Do you cover your refused until is due for disposal? Yes [ ] No [ ]

13. What kind of refused do you usually generate?(tick as many as possible)

A. Paper B. Rubber C. Soil D. Ash E. Leaves

14. Where do you deposit your refuse? A. Containers provided by the district

B. Damp site C. Refuse collection point D. Burnt E. Others (specify)….

15. Who collects the refuse in your area?

A. District waste management department B. Private waste management body

C. Not collected D. Others (specify)……

16. How often is the waste collected? A. Daily B. Weekly

C. Monthly D. Irregular E. Others (specify)……

17. a. Do you face any problem at the point of disposing of your refuse?

Yes [ ] No [ ]

17. (b). If yes to question (18a) explain how…….……

18. Do you pay for disposing of your refuse? Yes [ ] No. [ ]

19. If you are given a free dust bin for the collection of your refuse, will you agree to be paying monthly for emptying it regularly? Yes [ ] No [ ]

20. How regular would you like the waste management company to empty your bins? A. Daily B. Weekly C Twice a week D. Monthly E. Twice a month

21. How much will you want to pay on monthly bases? A.GHC 1 – 2 B.GHC 3 – 4 C.GHC 5 – 6 D.GHC 7 – 8 E.GHC 9 - 10

22. If no to question (21) above, why? ……...

SECTION C: SANITATION AND HEALTH

23. (a). Has any member of your house - hold been down with any of the following disease this year? A.. Malaria [ ] B. Cholera [ ] C. Diarrhoea [ ] (Please tick if they are more than one)

23. (b). If you tick any of the diseases in question 23 (a) above, How many times?

…… ……

24. Are you aware that there is a relationship between the level of waste management and the incidence of disease? Yes [ ] No. [ ]

25. If No to question 24 above, will you believe if you are told that there is? Yes [ ] No [ ]

26. If you believe poor sanitation practices can causes the incidence of disease could you please state some of these bad practices?

……

27. Have you ever head of Zoomlion before Yes [ ] No [ ]

28. From your observation what exactly do they do in your community?

……..

29. Have you ever done anything to help lesson the work of the Zoomlion Company? Yes [ ] No [ ]

30. If yes to question 29 above, what exactly did you do?

i.……

ii. ……..……..……

iii. ……

31. Apart from what you think is the work of the Zoomlion Company in your area, what other thing will you like to suggest to them in terms of waste management?

A. House to house inspection of waste

B. Educating the public on waste management practices

C. Educating the public on the dangers involved

D. Others (Specify)……

SECTION D: FOR ZOOMLION WORKERS ONLY

32. How will you describe the waste situation in the Municipality in recent times?

A. Very good B. Good C. Bad D. Very bad

33. (a). Indicate by ticking some of the prominent constituents of the waste you deal with on daily bases.(you can tick more than one) A. Sand [ ]

B. Rubber [ ] C. Paper [ ] D. Leaves [ ] E. Ashes [ ]

F. Others (Specify)

33. (b). In terms of rating, which of these constituents in (33a) is always the largest? ……

34. State the problems you face at work

i.……..……...

ii.……..……..

35. If you are a cleaner, are you assigned to a particular place of work everyday?

Yes [ ] No [ ]

36. If yes to question 35, state the area and the problems you face there

i. Area ……..

ii. Problems (briefly)……

37. How many hours do you work in a day? A. 4hours B. 5 hours C. 6 hours D. 7hours E. 8 hours

38. In your view, what should be done to improve the services you deliver?

i. By the company:……

ii. By the public:……..……..

SECTION D: FOR THE PERSONNEL OF THE MUNICIPAL WASTE MANAGEMENT UNIT

This section is for the officials of the Wa Municipal Assembly, the Zoomlion officials and all those that are involved in the management of solid waste in the Wa Municipality.

39. What is the estimate Daily waste generation (by weight) in the municipality ……..

40. By estimation, how much is always spent monthly on solid waste management in the municipality……....

41. Apart from Zoomlion company and the Wa Municipal Assembly are there other agencies that are involved in the management (list them)……

42. Are you satisfied with the level of management in the municipality?

Yes [ ] No. [ ]

43. If No to question (42) above, why? ……

44. What are the sources of your funding? …...……

45. Are you satisfied with the level of funding? Yes [ ] No. [ ]

46. If No to question 45 above, why? ……

47. Do you have management partners in the municipality? Yes [ ] No. [ ]

48. If yes to question 47 above, are you satisfied with their part of your agreements? Yes [ ] No. [ ]

49. If No to questions 48 above, why? ……

50. What suggestions do you have for your partners? ……

51. How will you rate the contributions of the general public towards solid waste generation in the municipality? A. Very good B. good C. bad

D. Very bad

52. State some of the bad practices of the general public that seems to be giving management some problems

i……

ii……..

iii……..

53. Do you have working code of conducts for the collection and transportation of refuse? Yes [ ] No [ ]

54. Are your personnel practicing the code of conducts effectively?

Yes [ ] No [ ]

55. If No to questions 54, why?

……

56. What practical problems do you face?

i. At the top management level……..……

ii. From the general public as the primary generators of the refuse……

57. What do you think can be done to improve upon the situation……...…

THANK YOU VERY MUCH FOR YOUR TIME, I AM GREATFUL.

APPENDIX II

Interview Schedule on Waste Management

1. Are you a salaried worker? …….

2. What type of religion do you practice? ……..

3. Describe the type of Solid Waste you normally generate within your compound. ……....

4. What type of container do you use in storing your refused after sweeping?.....

5. What problems do face at home in terms of Sweeping, collecting and transferring of your refused to the collection site?.....

6. Describe your experience at the skip (container) site ……..

7. What major problems do you face in your area as much as solid Waste management is concern? …….....

8. In what ways Can Solid waste management be improved in the Municipality?

.....

9. What are your expectations from;

a. the Municipal Authority ?

……

……

b. the Zoomlion Company?

.....

.....

APPENDIX III

Interview Schedule on Waste Management

(For officials of Waste management in the Municipality)

1. What measures do you use in the control of solid waste management in your Municipality?

2. What is the policy of the Municipality on Waste management?

3. What type of wastes are generated in the Municipality?

4. How do you handle the waste in terms of management (collection, transportation and treatment)?

5. Expain the collection rate in the Municipality

6. Which specific areas in the Municipality do you face problems?

7. What method do you use at the treatment site?

8. What are the bodies involved in the management of solid waste in the municipality?

9. What are the challenges and problems faced by management in the municipality?

    a. from the general public:

    b. from the central government:

10. In what ways can waste management be improved in the municipality?

11. What are the expectations of management from the people?