UNIVERSITY FOR DEVELOPMENT STUDIES

PRIVATE SECTOR PARTICIPATION IN SOLID WASTE MANAGEMENT IN WALEWALE TOWNSHIP IN THE NORTHERN REGION OF GHANA

BY

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Declaration

I declare that this dissertation is as a result of my own research work conducted in Walewale Township in the Northern Region of Ghana. It is in partial fulfillment for the award of a Master of Science in Development Management Degree.

All sources and other references which made this work possible have been acknowledged as expected.

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

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ABSTRACT

The study sought to examine private sector participation in solid waste management in the Walewale Township. The study adopted the qualitative research approach to collect and analyse data. The methods employed were semi-structured interviews, focus group discussions, and direct observation. Further the study revealed that Zoomlion Ghana Limited is the only private waste management company in the town. Although 74% of households in Walewale are aware of Zoomlion Ghana Limited, only 26% have registered for their services. The study again revealed that the West Mamprusi District Assembly has no direct control over the activities of Zoomlion Ghana Limited since the contract was entered into by Ministry of Local Government and Rural Development. The only sanction the District Assembly has is to refuse to sign reports of the Company. Also, the District Assembly has no by-laws regarding waste management in the town. The study recommends that the District Assembly enact by-laws on waste management and encourage residents to register for the services of Zoomlion Ghana Limited.

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DEDICATION

This work is dedicated to my late parents, Mr. and Mrs. Seth Tia Panwum, for encouraging me to be the best that I could be. It is also dedicated to my loving children, Miss Ruth Wumpini Panwum and Prince Mishael Demusua Panwum, for urging me on and lastly my endless love Mrs. Eunice Panwum for standing firm by me.

TABLE OF CONTENTS

Chapter Three

Chapter Four

Chapter Five

List of Tables/Figures

List of Tables

List of Figures

Abbreviations and Acronyms

CBO- Community Based Organisation

DHMT- District Health Management Team

ESP-Environmental Sanitation Project

GNP-Gross National Product

GSS-Ghana Statistical Service

HABITAT- United Nations Centre for Human Settlements

IIED-International Institute for Environment and Development

ISSER- Institute of Statistical, Social and Economic Research

MSW- Municipal Solid Waste

NGO-Non-Governmental Organisation

UNEP- United Nations Environmental Programme

USA- United States of America

USAID- United States Agency for International Development

WMDA- West Mamprusi District Assembly

CHAPTER ONE

INTRODUCTION

1.0 Background to the Study

Following the rapid urbanization and population growth in most developing countries in the past half century, there have been calls for extensive infrastructure provision. However, the performance of the public sector in this respect has been unimpressive especially in the low-income countries. The search for alternative strategies for urban environmental services is therefore inevitable.

One obvious consequence of rapid urbanization is the generation of waste, both liquid and solid. Many town and zonal councils face a deepening challenge in managing these, including problems coping with their collection and disposal. Despite the importance of adequate waste management to the urban environment, the performance of many town and city councils leaves much to be desired, According to the 1996 Global Report on human settlement, between one-third and one-half of the solid waste generated within cities in low-income countries are not collected. They usually end up as illegal dumps on streets, open spaces and waste lands (Breeze, 2012). In the last decade, the increase in human population in our cities and towns has made solid waste management a great concern to local government authorities worldwide. In the middle ages, badly managed waste was responsible for millions of deaths in Europe and the causes of the outbreak of diseases like the plague and cholera which claimed more than 380,000 lives in Hamburg (Anderson, 2011).

Local government authorities in developing countries have been faced with the problem of waste management and have been engaged in finding a sustainable solution to it. This has been so

because of inadequate funds and rapid population growth. A mechanism to pave a way for an intervention is an enabling strategy, which encourages private sector participation. This concept was adopted as a global policy in the housing sector of global strategy for shelter in the year 2000. The United Nations City summit held in Istanbul in June 1996, also endorsed partnership arrangements and facilitation by public sector to waste management.

In Lusaka, the city council in its quest to improve the waste management in the city and ensure that waste generators are effectively and efficiently serviced has elaborated a new Municipal Solid Waste Management System. Its new waste management system is based on franchise contracts for conventional residential areas and traditional direct contracts for peri-urban areas (Baabereyir, 2009)

Ghana's waste management practice is guided by the environmental Sanitation policy of 1999 which was revised in the year 2010. Its content holds similar view as expressed by the Ministry of Local Government, Rural Development and Environment which has the oversight responsibility over the Assemblies and encouraging private sector participation in waste management in the country. This is to help champion the constitutional obligation of the various Assemblies in waste management. In that direction, the bulk of environmental sanitation services shall be provided by the private sector, including NGOs and community based organizations under the supervision of the public sector, especially the Metropolitan, Municipal and District Assemblies (Republic of Ghana,1999). With respect to wastes, the deteriorating nature of the urban environment, resulting from the apparent inability of the town authorities to respond effectively to the challenge, necessitated the search for other options in Walewale Township.

Public sector domination in the provision of waste management in Africa has been held responsible for the awful state of these services. It has been argued that public enterprises have been characterized by the absence of competition, low levels of government investment, and lack of service expansion resulting in inefficiency and lack of pricing mechanisms to reflect service cost and meet public demand (UNES/ECA 2005). Consequently, many African governments have taken tentative steps towards privatizing state assets or at least increasing private sector involvement in urban waste management services provision.

1.2 Statement of the Problem

Walewale is one of the towns in Ghana that is faced with waste disposal problems, like poor disposal of waste at illegal open dumps and roadsides, inadequate locations for waste receptacles, pollution of soil and water resources, and a potentially health hazard to plants, animals and humans (WMDA, 2009). The situation is getting worse with time due to rising cost, and growing population situation with its increasing volumes of waste generation. This is probably a social problem as much as a physical one; many people are apparently disposing off waste as inexpensively and as quickly as possible. Many, in fact, may not see dumping their garbage as an environmental problem. The problem is also because there is no or little waste management effort by the authorities. Another limiting factor is the cost of disposal to the District Assembly together with increasing demand on the District Assembly to provide basic infrastructure like schools, health facilities, water and access roads. In recent times, there has been a public outcry about the District Assembly's inability to solve the waste problems with the excuse that there are no funds. The constraints make partnership arrangement between the private sector and the District Assembly necessary. This has also been advocated for by the United Nations in its Localizing Agenda 21 adopted at the Istanbul City Summit of 1996 and The

Revised Environmental Sanitation Policy of Ghana (2010). The rationale behind involving the private sector is to cut size of the public sector in search of new technologies and expertise and gain access to increased capital and greater economic efficiency to improve operations and generate revenue. This study examines the outcome of private sector involvement in waste management service delivery in the Walewale Township and offers policy recommendations for the way forward. Whiles the information on which the analysis is based pertains to the Walewale Township, it is hoped that the recommendations can be applied in other context.

1.3 Research Questions

1.3.1. Main Research Question

What is the level of private sector participation in solid waste management in the Walewale Township?

1.3.2 Sub-Research Questions

i. What is the waste management situation in Walewale?

ii. How does the private sector operate in solid waste management of the Walewale Township?

iii. Are households willing to patronize the services of private companies?

1.4 Objectives of the Study

1.4.1 Main Objective

The study seeks to investigate the degree of private sector participation in Waste Management in Walewale Township.

1.4.2 Specific Objectives

(i) To assess the waste management situation in Walewale.

(ii) To examine private sector operations in solid waste management in the Walewale Township.

(iii) To investigate households willingness to patronize private sector waste management services

(iv) To recommend to policy makers on how to effectively create the environment for private sector participation in solid waste management.

1.5 Significance of the Study

The significance of the study lies in its contribution to sustainable development. It will in particular be beneficial to:

- Development agencies, NGOs and other individuals engaged in activities aim at improving the environmental quality through waste management. The study exposes the real issues of solid waste management in Walewale and this could assist these agencies in designing appropriate policies and programes in dealing with solid waste challenges in the district and the country at large.
- Academicians and Researchers as a point of reference in conducting studies on how to improve urban waste management. The study could provide a solid base for further future research in the area of private sector participation in solid waste management and other areas that could assist in adequately dealing with solid waste challenge in the Walewale Township and the nation in the wider context.

- Policy makers, especially the Metropolitan, Municipal and District Assemblies for formulation of sound environmental management policies. The study could provide authorities with an insight into the reality of the challenges that confront private sector participation in solid waste management.
- Development Management Students who could be equipped with the requisite knowledge and understanding of waste management issues vis-a-vis private sector participation and the willingness and ability of residents of Walewale to pay for waste management.

1.6 Scope of the study

The study covered all the sections of the Walewale Township of the West Mamprusi District of the Northern Region of Ghana. The study covered waste management approaches, decision-making, and participation in waste management. It adopted a comparative approach whereby selected indicators were used to compare the environmental conditions of the study area. These indicators included: the level of participation, decision-making, waste management techniques and awareness. A participatory rural appraisal (PRA) techniques was employed to collect and analysis qualitative data on information in relation to service provision.

1.7 Limitations of the study

A number of caveats need to be noted regarding the present study. The most important limitation lies in the fact that, there was no sufficient time which would have enabled me to cover a wider area. Considering that West Mamprusi is made up of equally populated towns like Janga, Wungu, Nasia, Kpasenkpe and Wulugu, future research should cover these towns as well. Caution must therefore be applied as the findings in Walewale might not be transferable.

- Secondly, the study could not consider the fact that waste management has moved from collection and burning to ways of converting into energy and recycling and could be an area for further study as observed in the course of the study.
- Thirdly, the chosen sample size of 100or so has deprived the research of a broader source of evidence; this was due to the intensive academic work during the trimester with little time to spare.
- However, in spite of all these above, the researchers has been able to squeeze "water out of stone" to produce a quality work and recommends for future study in the area of recycling waste generated in Walewale.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter deals with the definition of concepts and approaches in waste management. The chapter reviews empirical findings on the subject and the various views expressed on private sector participation and solid waste management. It is to also examine theoretical frameworks on solid waste management. The relevance of literature review as captured by Cooper and Schindler (2000) is to guide the researcher and expose him to various works done on the subject area of study and to help the researcher compare his findings. The ''Waste Management Hierarchy'' (minimization, recovery and transformation, and land disposal) has been adopted by most industrialized nations as the menu for developing solid waste management strategies. The extent to which any one option is used within a given country however varies, largely depending on a number of factors, such as topography, population density, and transportation infrastructure, socioeconomic and environmental regulations (Sakai et al., 1996).

Following the unrelenting urbanization and largely unimpressive performance of the public sector in the provision of infrastructure in many cities in low-income countries, the search for alternative strategies for urban environmental services became inevitable. One obvious consequence of rapid urbanization is the growing generation of solid wastes, and many city authorities face unprecedented challenges in managing these, including problems of coping with their collection and disposal (Sakai et al.., 1996)

Despite the importance of adequate solid waste management to the urban environment, the performance of many city authorities in this respect leaves much to be desired

(UNEP,2012).According to the 1996 Global Report on Human Settlements, between one-third and one-half of the solid wastes generated within most cities in low and middle-income countries are not collected. They usually end up as illegal dumps on streets, open spaces and waste land. The review look at various concepts nationally and internationally to enrich the study. This includes a look at Solid Waste generation, Solid Waste collection and Waste Management in developing countries.

2.2 Solid Waste Generation and Characteristics

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). Zerbock (2003) 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.

In a related thought, Medina (2010) 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. However, Solid waste in Ghana is broadly classified into three main categories (Government of Ghana, 2010):

- Domestic refuses (solid waste generated by households, markets, food centers and commercial

Premises such as hotels, restaurants, shops, etc.);

- Industrial refuses (including toxic, hazardous and mineral waste that requires special handling, treatment and disposal);
- Institutional refuse (solid waste from various Government and Statutory Board installations).

In the miss of these types of waste certain terms have to highlighted. 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 (USA, 1996).

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 (USA, 1996).

Elsewhere in Singapore (Ministry of Environment, 1999, 2000), solid waste generation has amounted to about 4.5_4.8 million tonnes per year. This represents a gross per capita waste generation rate between 3.37 and 3.52 kg/day, similar to that of 3.38 kg/day in Canada in 1992 (Sakai, 1996). Although the comparison of national waste statistics may not be a simple task, due to the difference in compositional classifications and the manner in which the data were collected, solid waste composition in Singapore has been found to be quite similar to that in Sapporo, Japan, but very different from those in Yokohama and Osaka, Japan (Sakai, 1996) and those in the US (Chandler et.al, 1997).

In Singapore, food waste accounts for about 39% of the total waste streams and paper makes up 20.60%. Food and paper waste in Sapporo, Japan accounts for 46.6 and 25.2% of its total solid waste, respectively. There are about 40.0, 35.7 and 37.6% of paper waste in Yokohama, Osaka and the US, respectively, almost double the percentage in Singapore, and, on the other hand, food waste in Yokohama (9.8%), Osaka (6.5%) or the US (6.7%) is just about one fourth to one sixth of the percentage in Singapore. The differences in solid waste composition can therefore have a great impact on the system of solid waste management in different countries. It was found that about 85% of the solid waste generated in Singapore is combustible, but the calorific values

of the solid waste vary substantially, depending on the source and the period of the year (i.e. wet or dry season).

Messer's Hamdu (2009) observed that municipal solid waste management in Ghana is at present delivered in an unsustainable manner due to uncontrolled urbanization, large quantities of waste are generated daily, and this exerts much pressure on an over strained solid waste management system. Coupled with weak institutional capacity and lack of resources both human and capital makes the city authorities face difficulties in ensuring that all the waste generated in the city is collected for disposal.

The polokwane declaration on waste management in September 2001 in South Africa noted the efforts of Government to transform the ideals of South Africa policies and legislation into visible participatory integrated waste management programmes. It is therefore evident in Walewale the issue about street sweeping, hospital and institutional garbage which is further detailed into packaging papers, plastics waste, textiles and food left overs. Today, there exist several technologies to aid the use of energy from solid waste, one of the cardinal reasons to wage the private sector participation in its management to arrest the negative effects of untamed solid waste.

2.3 Solid Waste Collection Systems

The waste collection ratio in the five main cities in Ghana is below desirable levels; Accra 67%, Kumasi 51% Tema 59% Sekondi-Takoradi 49% and Koforidua 52%, (KMA, 2007). It indicates that Municipalities in Ghana practices the waste disposal system of incineration and burial at Landfills. Solid waste services in Benin City, Nigeria are inadequate. A study conducted by Ogu, V. (1996), in Benin City, Nigeria showed that over 62 per cent of houses do not have any formal

arrangement for waste collection and disposal, which implies that no public or private waste services are available to these residential houses and their neighborhoods. The households involved usually throw refuse into storm water drains, burn waste materials within or outside the compound use any available vacant or underdeveloped plots of land as "refuse dumps" or throw their refuse into the concretized old city moat. A number of dumping sites exist in residential localities although these are forbidden by the state's town and country planning law. On a zone basis, the survey by Ogu revealed that the planned settlement areas have the highest proportion of in-compound waste bins and on the other hand, the suburban areas have the highest number of cases of indiscriminate waste disposal, followed by the intermediate zone.

Prior to 1996, in Singapore waste collection came under the ambit of the Environmental Health Department (EHD) of the Ministry of environment and the private waste collectors.

The Environmental Health Department provided daily collection services to domestic households, trade and institutional premises, while the private waste collectors served mainly industrial premises, commercial buildings, shopping centers, construction sites, etc.

Faced with an ageing workforce and the difficulties in the recruitment of collection workers, ENV decided to corporatize the waste collection unit. Since 1 April 1996, SEMAC Pte Ltd, a private company and a wholly owned subsidiary of ENV Corporation, has taken over the waste collection service from EHD. As a private company, SEMAC had a greater flexibility in its recruitment program.

The Chartered Institute of Waste Management (The professional body for waste and resource management) published a study tour of the Netherland which revealed that the National Government has set up a waste management policy at national, provincial and municipal level. As a result of the Netherlands waste management programme, which had a 60% recycling target

by 2008 municipalities have been required to undertake separate collections of dry materials such as paper, textiles and hazardous waste. Many municipalities work together to procure and finance facilities for a much larger area, sometimes even the whole of the province.

Landfill is at the bottom of the order of preference for managing waste and landfill tax is Euro 120(€80) per tones meaning that other waste management options do not seem expensive by comparison. However, public engagement at the earliest stages makes it less likely that the solutions needed are blocked. The efficiency of waste collection seems to have declined in the last two decades. Compared to the frequency of waste collection in 1994-1996, a 1975 study showed that 44 per cent of households had regular refuse collections. The decline in the quality of service may not be a surprise if the problems facing waste management agencies are considered.

As in the residential areas, markets and other commercial premises also experience waste disposal problems. Some of the major markets such as Oliha, Ogida and Oba are located close to refuse dumps that are only cleared irregularly and, at night; residents of neighboring areas dump their waste on the illegal sites close to the markets.

Inadequate solid waste disposal affects the residential quality as well as the general environmental quality of Benin City. The absence of waste services can jeopardize other infrastructure services such as roads and storm water drains, for example, by blocking storm water channels and encouraging flash floods and flood pondages, which often occur in the city. This inadequate municipal waste service in Benin is typical not only of Nigerian cities but also of many cities in Africa, South America and South-East Asia. For instance, inadequate waste disposal conditions in the suburban areas of Benin are largely typical of metropolitan Manila,

where the relevant authorities do little to cater for poor and spontaneous suburban settlements (Ogu, 1996).

The literature as followed in these literatures argues for a broader alternative like land filling, incineration and composting where natural energy can be reclaimed for agricultural purposes, these would be advanced as we read on.

2.4 Solid Waste Incineration

The disposal of waste requires careful management so as not to contaminate o pollute the environment thereby creating a hazard to the healthy, safety or welfare of living things. (Montgomery, 2010) identified municipal waste approaches as open dumps, sanitation landfills, incineration, Ocean dumping, source reduction and (USAID, 2004) suggest that "dry refuse should be put in a dustbin and the dustbin should have well fitting lid. Wet refuse must not be put in a dustbin otherwise the dustbin will rot". It stated further that "in the rural areas rubbish should be burnt or buried in pits". The ashes can be used as fertilizers.

In towns, people may take their dustbins to central emptying point or the local authority may empty the dustbins (Republic of Ghana, 2000). This is certainly useful to this research in Koforidua. Solid waste incineration has been given a top priority over other waste disposal methods. The Engineering Services Department (ESD) of ENV is in charge of planning, developing, managing and operating the waste incineration facilities in Singapore. Four incineration plants are already in operation (Ulu Pandan,Tuas, Senoko and Tuas South).The fifth incineration plant will be built adjacent to the Tuas South Incineration Plant by a private sector on a Design, Build, Own and Operation (DBOO) basis, and is scheduled for completion in 2004

and in service by 2006. All the waste incineration plants are equipped with pollution control systems, electricity generation and scrap metal recovery facilities.

The Ulu Pandan Incineration Plant, which has four incinerators, was commissioned in 1979 with a capacity of 1200 tonnes/day. The capacity was later expanded to the present level of 1600 tonnes/day in 1982. The Tuas Incineration Plant, with five incineration units and a total capacity of 2000 tonnes/day,was put into operation in 1987. The Senoko Incineration Plant was commissioned in August 1992 at a capacity of 2400 tonnes/day. The Tuas South Incineration Plant started its operation in November 2000, with six incineration units and a capacity of 3000 tonnes/day.

The capacity for the fifth incineration plant is designed at 3000 tonnes/day. Currently, the daily solid waste disposed in Singapore is about 8000 tonnes/day and 73% of the waste is incinerated (5840 tonnes/day). Since 85% of the solid waste in Singapore is incinerable, this means that an incineration capacity of 6800 tonnes/day would be required. The four incineration plants currently in operation have a total capacity of 9000 tonnes/day. This capacity is expected to be sufficient for waste incineration in Singapore until 2013 as an average annual increase of 5% is predicted for future solid waste generation (UNEP, 2008).

The Ministry of environment further believes that incineration is the best option for waste treatment in Singapore. All the incinerable wastes that are not recovered are to be incinerated because incineration can reduce waste volume up to 90%, which will conserve the limited capacity of the sanitary landfill in Singapore. This option was first adopted in the late 1970s, although it costs six to seven times more than landfill.

These lessons in Singapore from the commentary helped protect the limited land in that country since land is a scarce commodity; its adoption (Sanitary Landfill) as exemplified in Singapore has the tendencies to preserve land despite its perceived expensiveness as compared to landfill.

2.5 Waste Management in Developing Countries

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 everywhere (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 neighborhood-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, 2005) 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 (Reddy, 2011) 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 (Reddy, 2011). 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 (Olar, 2003). 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 (Olar, 2003). 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 (Olar, 2003).

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 (Reddy, 2011).

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 (Olar, 2003).

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 includes but not limited to Sanitary landfilling, Associates externalities of landfill, Recycling and Composting (Johanessen,1999).

2.5.1 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 (Olar, 2003).

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 (Johanessen, 1999).

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. They further 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.

2.5.2 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 Sharp A.C., et.al.(2009), 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 expressionlessly 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.

2.5.3 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 (Barrow, 1995).

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 (Barrow,1995).

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 (Barrow, 1995).

2.5.4 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.

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 worldwide(Keller,1998).

There are many advantages of 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.

2.6 Private Sector Involvement in Solid Waste Market

The delivery of public services has traditionally been carried out by the public sector. The increasing financial burden on the local governments and the inefficiency of the public sector (government failure) in developing countries necessitate the use of markets for public service delivery. However, markets where there is perfect competition with willing buyers and sellers do not work for public services that have externalities and information asymmetry. Solid waste collection service as a public good has externalities (negative environmental impacts) if people are excluded from the service. Solid waste collection cannot be provided through the market without regulation (legislation and incentives). The private sector is involved in solid waste collection due to market and government failures (Oduro, 2011).

There is also non-governmental organization failure, due to the over reliance on donor support to cover investment, operation, and maintenance costs. This means that the private sector failure (inefficiency) – under performance and inability to deliver the expected service quality – could occur if the needed policies, legislation, incentives, and government support are not given to it.

The extension of the market mechanisms of the New Public Management (NPM) to private sector involvement in solid waste collection services is still an emerging issue, especially in developing countries. Contracting out solid waste services to the private sector and charging for services rendered by the private sector are still faced with difficulties. Public services delivery such as water supply, sanitation and solid waste services have been failing in developing countries for a long time despite the NPM and decentralization of local service delivery to the local governments. The expected improvements in service delivery have often not been achieved

(van Dijk, 2006). Obviously, decentralization alone was not enough to bring about improvements in service delivery, and therefore private sector involvement in public service delivery was introduced. The paradigm shift from public sector delivery of public services (solid waste service delivery) in developing countries to private sector provision began in the past two decades. Governments vigorously began to promote the private sector as a provider of services to improve service efficiency1 and effectiveness (Roth, 1987; Cointreau-Levine and Coad, 2000; Batley and Larbi, 2004), but the needed private finance and expertise to bring about the improvement are still issues, especially in developing countries.

In developing countries, different forms of Private Sector Involvement (PSI) have been suggested for achieving greater efficiency and effectiveness, to overcome the government failures in public direct service delivery too many workers, not enough supervisors, few incentives for better performance and limited finance (Cointreau-Levine, 1994; Cointreau-Levine and Coad, 2000; Post et al., 2003). Private Sector Involvement (PSI) in solid waste collection in developed countries emerged in the 1970s, and since then there has been increasing private sector involvement in solid waste collection service in many parts of the world (Eggerth, 2005). By 1994, there were more than 10,000 private firms engaged in urban solid waste collection service in the United States, where more than 80 percent of solid waste was collected by the private firms (Cointreau, 1994). There is now PSI in all the elements of integrated solid waste management from collection, sanitary land filling, recycling to resource recovery in the developed countries (Oduro, 2011).

Private Sector Involvement in all sectors in developing countries has been slow especially in the Sub-Saharan Africa countries, although there is increasing private sector involvement (PSI)

uptake in French-Speaking Africa (Li and Akintoye, 2003). By 1989, there was private sector involvement in solid waste collection in Latin American cities (Santiago, Buenos Aires, Sao Paulo and Caracas) with populations of 3.6 to 12 million (Bartone, 1991). The companies in these cities operated under service contract arrangements with the municipalities. The involvement of private sector in solid waste collection in most developing countries started gaining momentum in the 1990s. The World Bank advocated Private Sector Involvement in the 1994 World Development Report. Since then, the development partners have supported the drive for PSI in solid waste collection and management through capacity building and loans for provision of equipment (Oduro, 2011).

The number of private companies involved in solid waste collection keeps on increasing in developing countries, as in the case of Ghana and there is growing interest of the private sector in many developing countries. However, the presence of PSI in urban solid waste collection in developing countries has not been felt in terms of better service quality and total service coverage, and this may be due to a number of issues such as policy, capacity, regulation, legislation, and investment risk (Oduro, 2011).

2.7 Waste Minimization

Waste minimization has been placed at the top of solid waste management hierarchy in Singapore. Waste minimization consists of two basic operations: source reduction and recycling (Teo, 2006). Source reduction is most desirable to avoid waste generation, while recycling is useful to conserve resources and to prevent materials from entering the waste stream. In the early stages of Singapore's economic development (during the 1960s and 1970s), waste was separated to recover the recyclable and reusable products. It was done more for economic than for

environmental reasons. Along with the rapid industrialization and sustained economic progress was a higher standard of living for most citizens. This inevitably created a consumer society with its accompanying ''throwaway mentality'' (Yue and Hu, 2001). Products were made disposable and usually came with over packaging. Waste recycling became cumbersome and was mainly confined to industrial waste. High-rise public apartments made the waste separation at source more difficult since waste was thrown down through common chutes. The use of compaction vehicles and containers in waste collection also made it more difficult to retrieve valuable resources from domestic waste (Barrow, 1995).

Waste recycling at source, although diverting a fraction of waste stream from the ultimate disposal, had very limited impact on solid waste management in the past. With the problem of land scarcity and the rising cost of waste disposal, the Ministry of environment has continued to encourage waste minimization in all sectors of the community. Spaces have been provided to the private sector to operate recycling facilities (Yue and Hu, 2001). Currently, there is a recycling plant that processes horticultural waste into soil conditioner and fertilizer.

Another company operates a wastepaper recycling plant to produce cartons and other packing materials for the industry. There are also several companies collecting recyclable material, but mostly for the industrial sector. ENV also encourages Town Councils to set up systems for the collection of wastepaper for recycling. However, many recycling schemes have had difficulties sustaining themselves due to the widely fluctuating markets for waste materials. Moreover, the push to recycle higher percentages of the waste stream has resulted in problems with maintaining the quality of the recycled waste materials and hence the sustainability of subsequent secondary products manufacturing (UNEP, 2008). Ghana also followed suit in 2010 when waste reduction and recycling was included in its environmental policy document.

2.8 Contextual Issues of Private Sector Participation in Municipal Solid Waste Management

2.8. 1 The Cost Recovery Context

There is a simplistic argument that public goods should be paid for by public funds and delivered by public agencies, while private goods should be paid for by private individuals (through user charges) and delivered by the private sector. Issues of private sector participation in solid waste management services should not be confused with those of cost recovery. One premise of this paper is that there are sometimes reasons for involving the private sector in solid waste management activities, regardless of whether these activities are public goods or private goods (Bartone et al., 1991).

Many activities within the overall purview of solid waste management vary in the extent to which they are public goods. Taking into consideration only the factor of the degree to which a solid waste activity is exclusive or rivaled, for example most solid waste activities are public goods. For example, public cleansing, which involves sweeping of public streets and cleaning of public parks and lands, is clearly a public good because it benefits the public at large and not any specific individual. As a public good, the cost of these services is expected to be covered through general revenues of local government. This includes the cost for public education regarding the individual's civic duties in maintaining a clean community.

The safe disposal of all collected solid waste within a sanitary landfill is also a public good; it benefits no specific individual but is required for environmental protection purposes that benefit the public at large. The use of a sanitary landfill is usually the lowest cost method of safe

disposal. All other methods of disposal also involve the sanitary landfill of residuals (ash from incineration) or of wastes that are incompatible with the disposal method (noncompostables from composting). It is theoretically appropriate for the cost of sanitary landfill to be covered through general revenues (Donahue, 1989).

Nevertheless, tipping fees (user charges on a per tonne basis) can be readily collected from private refuse haulers and from individual industrial and commercial establishments that bring their solid waste to the landfill. For tipping fees to be levied in a manner that does not encourage clandestine dumping, relevant local government laws and sanctions need to be comprehensive, and inspection and enforcement systems need to be consistently vigilant in their monitoring of such (Dillingers, 1988).

In developing countries, resource recovery (composting, waste-to-energy incineration) can provide safe disposal of solid waste which is comparable environmentally to sanitary landfill. The cost of resource recovery, however, is usually significantly higher than the cost of sanitary landfill. Resource recovery should not be implemented unless a) the recovered resources (compost, secondary materials, steam) can be counted as public goods worthy of subvention from government, or b) the Resource recovery should not be implemented unless or c) the cost difference between sanitary landfill and resource recovery can be covered by revenue from marketing the recovered resources.

In low-income communities characterized by limited access to refuse collection trucks or carts, door-to-door collection service is not economically feasible, and only a communal container or bell system is viable. Collection by communal systems a) inherently involves collection from a public area not from a private establishment or household, and b) requires the participation of residents who bring their refuse to a communal container or to an attending refuse collection

vehicle (upon bell ringing). Such participation represents a significant, voluntary contribution by the community residents. Also, it is not feasible to make an accurate accounting of which residents bring refuse to the communal collection point. Communal systems of solid waste collection are considered a public good, and direct charges are difficult to implement unless a strong community organization exists to enable cost recovery (Dillinger, 1988).

Whether refuse collection from private establishments or individual households can be *treated like a private good* (even though it is a public good) depends on the education and culture of the residents. In communities wherein residents have been sensitized to the need for public cleanliness and to the problem of limited resources (or efficiencies) of government, the door-to-door collection service to households, institutions and to industrial and commercial establishments can be treated as a private good for which those being serviced would be willing to pay. In communities wherein the residents have not been similarly sensitized, there will be resistance, however, to direct user charges and a tendency toward clandestine dumping. Service to all customers, whether paying or nonpaying, is in the public interest.

Unlike water supply or electricity, which can be readily cut off for nonpayment of user charges, solid waste collection cannot be discontinued without jeopardizing the public welfare. Recycling has historically been treated as a private good in most countries, except during war time when governments have conducted recycling in the interest of national security. China has been an exception, and state-operated recycling systems are perceived as an important element of self-sustainable development (Dillinger, 1988).

In the last decade, industrialized countries have slowly changed their perspective on environmental awareness, thus recognizing that everyone benefits from recycling as a public good. Through recycling, foreign exchange is saved, natural resources are conserved,

industrialization is promoted, and waste disposal cost is minimized. While it is true that industries save on their materials and energy costs through the use of recovered waste materials as feedstock and that they are willing to buy recyclables, recycling is seldom achieved at an optimal level when left purely to market forces. Thus, recycling can be labeled a *merit good* (Rest, 1979). Even in the poorest of developing countries, many recyclable materials that could have been effectively recycled remain in disposal sites.

In recognition of recycling as a public good, the governments of industrialized countries are beginning to sponsor education about recycling, to facilitate recovery and purchasing networks, and to provide financial incentives to buyback (redemption) centers and industries that recycle. In developing countries, most local governments experience a serious shortfall in meeting their revenue needs from their tax base (Sulu, 1987). User charges, as one means to cover solid waste cost, should not be neglected, even though most solid waste management services are public goods. User charges give the solid waste agency some autonomy by eliminating the need to compete with all other government agencies for their share of general revenue. User charges also may render the solid waste agency more directly accountable to residents for the cost and value of services that they provide. Whether to involve the private sector in solid waste management services is an issue that is separate from cost recovery (Cointreau-Levine, 1992).

Instead, the question of whether to involve the private sector in solid waste management activities is to be examined from the perspective of service coverage, efficiency, reliability, cost, economies of scale, and accountability, as discussed below.

2.8.2 The Efficiency Context

optimized if they are in

among developing countries, there is as much dissimilarity as similarities. Each city is unique. For example, substantially lower wage and benefit costs have been reported for private sector collection workers in Seoul (Korea) and Bogota-cities where a portion of the municipal solid

industrialization is promoted, and waste disposal cost is minimized. While it is true that industries save on their materials and energy costs through the use of recovered waste materials as feedstock and that they are willing to buy recyclables, recycling is seldom achieved at an optimal level when left purely to market forces. Thus, recycling can be labeled a *merit good* (Rest, 1979). Even in the poorest of developing countries, many recyclable materials that could have been effectively recycled remain in disposal sites.

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Instead, the question of whether to involve the private sector in solid waste management activities is to be examined from the perspective of service coverage, efficiency, reliability, cost, economies of scale, and accountability, as discussed below.

2.8.2 The Efficiency Context

According to the World Bank's World Development Report, 1991, public spending in developing countries is relatively high for their level of development and provides very low returns. Total government expenditure is roughly 20 percent of GNP in low-income countries and 30 percent of GNP in middle-income countries. This report asserts a "need for smaller, more efficient public sectors and a more dynamic private sector." Furthermore, it states that private sector participation "is not to be undertaken as end in itself, but as a means to an end: to use resources more efficiently" (Thomas, 1991).

Within local governments of developing countries, expenditure for municipal solid waste service is usually from 20 percent to 50 percent of total municipal expenditure. Even at such a high level of expenditure, the level of solid waste service is low, and only 50 percent to 70 percent of the solid waste is collected. In response to this high level of expenditure and low level of service, the main argument raised for private sector participation is that the private sector might be more *efficient* than the public sector in providing services. Private sector efficiency is said to derive from management flexibility, freedom of action, greater financial discipline, and accountability to market forces (Cointreau-Levine, 1992).

Presumably, in a competitive environment, private firms must perform efficiently to make a profit and to maintain their position in the market place. Optimum efficiency does not occur when there are no opposing competitive forces. It doesn't occur when there is a public monopoly or a private monopoly. Even when there are many private companies, efficiency will not be optimized if they are in collusion over prices or work practices. This argument certainly holds among developing countries, there is as much dissimilarity as similarities. Each city is unique. For example, substantially lower wage and benefit costs have been reported for private sector collection workers in Seoul (Korea) and Bogota-cities where a portion of the municipal solid

waste collection service is conducted by private contractors. Seoul reports that government collection workers earn 50 percent more than private sector collection workers (Jones, 1986). On the other hand, in Lagos, government workers are paid substantially less than private sector workers (Cointreau, 1989). In Bogota, the private sector has a new standardized fleet, while the city is operating with an old and highly diversified fleet-factor that significantly complicate vehicle productivity. On the other hand, in Lagos, the government fleet is relatively new, standardized, and appropriately designed, while the private sector fleet is old and inappropriately designed. Lagos is somewhat unique among Nigerian cities because of equipment financing provided by the World Bank. Nevertheless, even in those Nigerian cities wherein the World Bank has not financed collection equipment, the fleet owned by the government is appreciably better than those owned by the private sector. Restrictive labor practices, such as those prevalent in sea ports and on railways, are not a major issue in the solid waste sector (Galenson, 1989). Tenured government workers, however, have traditional patterns of behavior that may limit their productivity and that government may find difficult to curtail.

These patterns include several breaks for meals and snacks, performing special service at households for tips, and sorting through the refuse for recyclables. For example, Bangkok (Thailand), Bogota, Lagos, and Mexico City (Mexico), have reported a traditional practice of government refuse collection workers sorting out recyclable materials from the solid waste while working within their assigned collection areas. Of the time available in the collection zone, the time taken for sorting activity has been observed as 10 percent in Mexico City, to 30 percent in Bogota, and 40 percent in Bangkok (Cointreau, 1989).

In metropolitan Manila (the Philippines), government workers have devised a creative solution to their desire to recycle. In this case, many collection trucks transport nongovernment, informal

sector workers who perform the sorting, while government workers perform refuse collection; income is shared equitably among all (Cointreau,1984). Not only government workers are prone to spend their time sorting out recyclable materials. In Lagos, private workers also spend a significant portion of their work day in recycling.

The only difference between government workers and private workers is that private workers are not allowed to use recycling as an excuse for not completing their daily routes. Overtime is regularly authorized to private workers for the extra time they require to finish routes; conversely, overtime is the exception for government workers, not the rule (Cointreau, 1989).

In dealing with inefficiencies in government, the first response should be to determine if they can be corrected within the purview of public service. In other words, to build on what exists and is working and to fix *only* what is not working. If the government does not have the political will to make necessary changes to improve efficiency or if workers will not accept change, one may create a competitive environment by contracting out *a portion* of the public service.

Introducing some private sector service will produce the desired result *only* if a) monitoring is carried out of public versus private service delivery, and b) feedback is provided to ongoing negotiations between management and labor on increasing efficiency. Involvement of the private sector in municipal solid waste service is not the only way of introducing competition as a means of stimulating greater efficiency in municipal solid waste services (Cointreau, 1982).

2.8.3 The Public Accountability Context

According to Donahue in his book *The Privatization Decision,* "But efficiency, at base, is merely one aspect of a more fundamental quality-accountability-. The term suggests the idea of taking 'into account' the consequences of one's actions for the welfare of others" (Dillinger,

1988). Government, which represents the public at large, has a special obligation to be accountable to public values. In this capacity, each government needs to carefully weigh the decision to privatize "by the yardstick of *fidelity to the public's values,* whatever they may be. If the citizenry cares about *how* goods and services are produced, about how equitably they are distributed, about the pay, benefits, and working conditions of those who produce them, then any legitimate measure of efficiency must incorporate these concerns" (Dillinger,1988).

In most developing countries, municipal solid waste service involves labor-intensive street sweeping and waste collection techniques. Because labor costs are relatively low, labor intensive techniques are appropriate. There are roughly 2,000 solid waste workers for every I million urban residents in developing countries, with labor intensity ranging between a high of about 5,000 per million residents in some Central Asian cities and a low of 1,000 per million residents in some Latin American cities (Wunsch,1991).

Local governments in developing countries have typically provided patronage through jobs in the municipal solid waste agency. As a result, the solid waste employment roles are bulging with extra employees, many who are scarcely productive and others who do not produce at all. In addition to the problem of patronage, technological changes have led to labor redundancy. As urban areas become densely populated and travel time to disposal sites increases, local governments tend to change from labor-intensive refuse collection systems, which use pushcarts and open trucks, to capital-intensive systems, which use compaction trucks. Few cities, however, take any parallel steps toward reducing labor redundancy in their refuse collection work force. One expected outcome of privatizing solid waste services is that government employment roles would be reduced. This, however, is not necessarily the case. Excess employees are commonly clerical staff and refuse collectors and sweepers with a long tenure (ten to twenty-five years) of

government service rather than refuse collection truck drivers and laborers (Cointreau, 1989). Moreover, in many developing countries, government employees cannot be terminated without cause. The discontinued need for the employee, limited performance by the employee, or even excessive absenteeism, is commonly not considered adequate justification for laying off a government employee (Furedy, 1990). Where layoffs are permitted as local governments' needs change, governments typically are to pay solid waste employees a severance pay of one to two months' salary for every year of government service (Cointreau,1989).

After privatization of solid waste service, there is seldom the money or political will to do more than to shift government solid waste workers to another department and to retain most of the office employees in place. Over the short term, the role of government as employer needs to be weighed as part of the private sector participation decision, given the recognition that the direct and indirect costs of high unemployment are significantly borne by government. Nevertheless, for the long term, it generally makes more economic sense to reduce the roles and to pay appropriate severance pay to the government workers who are asked to leave their jobs (Cointreau-Levine, 1992).

In many developing countries, solid waste workers in the private sector are paid much less than government workers enjoy fewer vacation days, and receive fewer benefits (Jones, 1986). Because the jobs in the private sector are less secure, the private sector workers may also work much harder. The extent to which government may wish to exploit these disparities between public and private sector workers is one of the social issues involved in deciding whether to privatize (Jones, 1986). Solid waste collection is an arduous job. In developing countries, an average collection worker will lift and load daily from I to 3 tonnes of solid waste. In industrialized countries, an average collection worker will lift and load two to three times this

quantity, because the loading process is facilitated by better designed equipment. Studies in the United States have shown that an older work force is less productive than a younger work force. Comments from solid waste managers in developing countries also indicate that the same is generally true (Sicular, 1991). Given that the primary objective of most developing countries is to promote the evolution of a middle class, governments need to examine how to conduct private sector participation in a manner that does not widen the gap between the rich and the poor. Because solid waste management is a complex service that involves optimizing the productivity of vehicles and workers, politicians may long to escape dealing with it and take an arm's-length approach (Sicular, 1991)

2.8.4 The Management Context

One of the most frequently cited advantages of the private sector over government is its management flexibility. Private sector management has greater ease in firing personnel for nonperformance and in providing upward mobility for workers with good performance. Also, the private sector is not constrained to government hours and overtime constraints. This has been an important factor in the private sector participation case of Bogota. There, government solid waste collection workers have a union contract for a six and one-half hour workday, with overtime at double salary. Because of the difficulty in obtaining authorization for overtime pay, the city is constrained with being able to collect only one full load for each daily shift. On the other hand, the private sector operates on an eight-hour daily shift basis. Bogota is privatizing municipal solid waste collection one zone at a time-and is trying to obtain enough cooperation from the government union to be able to provide efficient service in the remaining publicly served zones (Cointreau, 1989).

In Malaysia, all municipalities are formally obliged to follow government hours. However, one city, Petaling Jaya, reached an informal agreement with its refuse collection workers to implement the "task" system of work, wherein workers may leave work whenever they finish their assigned route (Cointreau, 1989). Constraining government hours have been a motivating factor to increase private sector participation in Indonesia. To have around-the-clock street cleaning and refuse collection of central commercial and tourist areas, the cities of Jakarta and Semarang have hired private companies (Cointreau, 1989). Studies on optimal municipal solid waste management have shown that cost is reduced in cities where the span of management between the manager or supervisor and the worker is appropriate. When the span of management is too high, the supervision of workers is inadequate, and worker productivity is low. When the span of management is too low, the supervision of workers is adequate, but supervisor productivity is low. Both extremes lead unnecessarily to high costs.

Ideally, to obtain low-cost service, the span of management for solid waste collection systems should be about one supervisor for every four vehicle crews required for solid waste collection (Sicular, 1991). In developing countries, most municipal solid waste agencies have a span of management of about one supervisor to every twenty to fifty solid waste collection crews. Also, government often provides inadequate salaries for supervisory positions, which makes it difficult to obtain qualified supervisors (Saleh, 1991). If the private sector has a greater ability to implement more appropriate management practices than government, there is opportunity for cost reduction through private sector participation. Staffing ratios are important in maintenance as well as in supervision. Ideally, there should be one mechanic for every four to five solid waste collection vehicles (Sicular, 1991).

In developing countries, most municipal solid waste agencies commonly have one mechanic for every ten to fifteen vehicles. In addition, repair operations are bogged down with burdensome bureaucratic procedures that dramatically increase the downtime of solid waste collection vehicles. For a spare part to be purchased it typically takes two to four days to obtain the necessary supplier quotations and to submit the lowest quote for the approval of upper management. Most vehicles are down for three to six days just for relatively minor repairs. If the part has to be ordered from a foreign supplier, the vehicle is down for three to six months (Cointreau, 1989). For efficient solid waste management service, at any given time, no more than 20 percent of the equipment should be out of service (Sicular, 1991). In most developing countries, however, typically 25 percent to 50 percent of the operable fleet is down (Cointreau, 1989).

Maintenance and repair service is one area where in which the private sector has typically been able to perform very effectively. Vehicles used in private sector solid waste collection fleets are seldom down for repair service for more than a half day. Private sector participation in solid waste service is not the only way to introduce management flexibility into the system. This goal can be effectively accomplished by commercializing the solid waste management entity by a) restructuring of the solid waste service entity into a Semi private enterprise, and b) the granting of authority to the new enterprise to hire and fire personnel freely and to collect appropriate tariffs to cover costs. It has also included the payment by government of costs related to service of public properties and the removal of government subsidy (Cointreau, 1989).

2.8.5 The Finance Context

In developing countries, cities are hard pressed to obtain enough capital to finance their solid waste systems and are burdened with political constraints limiting their ability to generate revenues. This problem is related to years of inadequate efforts toward cost accounting for cost recovery in solid waste management, as well as to competing political agendas. In response, private sector participation is viewed as one way to secure investment finance from private companies for solid waste equipment and facilities in return for contracts to provide service. In reality, in many developing countries, the private sector has expressed an unwillingness to provide solid waste service under contract with local governments (USAID, 1991).

The private sector queries how local governments in developing countries, which do not obtain the funds to provide for the renewal and expansion of existing equipment, can be expected to reliably meet their payments to suppliers and contractors. The track record is not good. In countries where the private sector is unwilling to work with government under contract, this sector is sometimes willing to work independently (through zonal monopoly or open competition) and to collect its own user charges. Some problems are: How does government deal with those generators of refuse that are not willing to enter into individual agreements with private haulers and pay for service? How does government regulate the tariffs charged? How does government limit collusion and price-setting?. In countries in which the private sector is willing to invest in solid waste management, the apparent and hidden costs of private versus government service need to be carefully analyzed (Cointreau-Levine, 1992). This needs to be put into comparable and equitable terms, showing any hidden subsidies and costs that might exist in either service. For example, in many developing countries, local governments can borrow at substantially lower interest rates than private firms. These governments are exempt from paying property tax on their facilities and equipment; often can import machinery, spare parts, and even

technical assistance without paying custom duties; and can provide a service without paying value added taxes on their services (Stevens, 1980). These can be viewed as hidden subsidies to government.

When comparing private with government service, these hidden subsidies need to be included in a comprehensive accounting of costs. Beyond these subsidies to government (which require analysis), there are hidden costs incurred by the private sector. For example, in many developing countries in which the private sector collects refuse or provides landfill operations, the operators are small (often with only one or two trucks) and the equipment used (open tipper trucks and bulldozers) have already been fully depreciated (during ten to fifteen years of construction use). In such cases, the prices charged by the private sector seldom include monies for renewal. While government may save money in the short term by hiring small operators with old equipment, eventually, the cost of renewal will have to be borne(Stevens,1980).

When solid waste management service is rendered by public means, there are costs related to political exploitation. These involve the hidden cost of patronage and the political manipulation of the purchase of equipment and facilities. On the other hand, awarding and administering contracts with private firms also provides "numerous opportunities for political manipulation" (Stevens, 1980). This issue is particularly true in developing countries wherein governmental procurement regulations typically limit the term of contracts to one year because of reluctance to commit funding beyond the current budget. Every year, the need for contract renewal is revisited and the opportunities for exploitation reappear. Costs to the economy at large in the form of directly unproductive profit-seeking, include not only the transfers made to bureaucrats but also the cost of lobbying (Schertenleib, 1989).

In some developing countries, the government's reputation for corruption is founded on a long-standing reality-one which contractors to government understand better than anyone. The costs of working under contract (in terms of bribes to get contract payments, delays in payments, and risks of nonpayment) can be substantial. While there are many reasons given in each case of delayed payment or nonpayment (lack of budget, change of government, inadequate invoicing, poor performance), the instances occur far too frequently to always be justified.

Private refuse collection companies take advantage of the fact that government must work toward the overall cleanliness of the city. In many developing countries, private sector collectors have been responsible for much of the clandestine dumping of wastes. These collectors have serviced their paying customers and dumped on open land, leaving the resulting mess for government to clear at a great expense (Cointreau, 1989).

The service costs by the operations of Private companies are covered directly by and matched to user charges within the service area, the opportunity is lost for government to source these wealthier residents for the cross-subsidy of service to poorer residents. In the worst case scenario, the government contracts for this service and the cost recovery paid to government is less than the cost of the service-leading to a hidden cross subsidy from poorer residents to cover the service for wealthier residents (Jones, 1986).

2.8.6 The Economies of Scale Context

One reason that solid waste management is viewed as a possible arena for private sector participation is that the economies of scale are not pronounced. This is in contrast to the case of water, electricity, and telecommunications that have such significant economies of scale that they

are often regarded as natural monopolies (Sicular, 1991). In solid waste management, there are economies of scale to a limited extent, as follows:

Collection in low-income areas. Low-income areas are commonly characterized by narrow or steeply graded roads (or both) that are accessible only by relatively small vehicles of about 2-tonne payload capacity that are able to make 2 trips for each daily shift (4 tonnes per day), or by communal container vehicles of about 3-tonne payload capacity able to make 5 trips for each daily shift (15 tonnes per day). Assuming a daily neighborhood waste generation rate of about 0.35 kilograms per capita in low-income residential areas, 1 vehicle can serve about 10,000 to 40,000 residents, respectively.

Collection in high-income areas. High-income areas are commonly characterized by roads of moderate width and grade that are readily accessed by compaction vehicles of about 6-tonne payload capacity able to make 2 trips for each daily shift (12 tonnes per day). Assuming a daily neighborhood waste generation rate of about 0.60 kilograms per capita in high-income residential areas, 1 vehicle can serve about 20,000 residents.

Transfer systems. Transfer station design is based on the use of large-capacity hauling vehicles (tractor trucks with trailers) that have a payload capacity of about 20 tonnes and are able to make at least 4 trips for each daily shift (80 tonnes per day). Assuming a citywide waste generation rate of about 0.70 kilograms per capita per day, 1 vehicle can serve about 115,000 residents. In systems that use compaction devices to fill the trailer trucks, one stationary compactor moves about 60 tonnes per hour, or 480 tonnes per day. Using this same analysis, 1 stationary compactor can serve about 685,000 residents.

Sanitary landfill. Sanitary landfills rely on bulldozers as their main piece of equipment for spreading and grading refuse and for daily soil cover. One bulldozer of 200 horsepower can

handle about 400 tonnes per day. Assuming a daily, citywide waste generation rate of about 0.70 kilograms per capita, 1bulldozer can serve about 570,000 residents.

Composting. Composting systems need be no more complicated than the manual sorting of noncompostables from incoming waste, followed by the mechanized turning of windrow piles with a wheeled loader or windrow turning machine and the screening of compost product with a portable trommel screen. If the composting operation is performed at a site adjacent to the sanitary landfill operation, the wheeled loader used for the excavation of soil cover at the landfill can be shared with the compost operation. If the composting operation is at a separate location, thus requiring dedicated equipment, 1 wheeled loader of about 170 horsepower would handle about 200 tonnes per day. Assuming each windrow pile is turned once weekly over a 7-week period, 1 wheeled loader would handle an incoming waste load of 200 tonnes per day, or serve about 285,000 residents.

Waste-to-energy. Waste-to-energy incineration systems are not technically viable for most developing countries, because the refuse, on an as received basis (wet basis), is not sufficiently high in calorific value to sustain incineration. Refuse of least 1,300 kilocalories per kilogram of "lower heating value" needs to exist on a year-round basis for incineration without supplemental fuel. If waste-to-energy incineration is viable, the frequency and duration of downtime for maintenance require 100 percent standby capacity. A waste-to-energy incinerator needs to operate continuously, on a 24-hour basis, at no less than 5 tonnes per hour per unit. As a result, the smallest viable waste-to-energy incineration system would consist of one 120 tonnes per unit per day, plus one standby, which would serve about 170,000 residents.1.56 Based on studies of costs for refuse collection in the United States, *no* economies of scale are thought to exist for communities greater than 50,000 people (Sicular,1991).

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2.8.7 The Legislative Context

There are Laws in developing countries to influence the private sector significantly in its assessment of whether to become involved in the provision of municipal solid waste management services. Reputable private companies want to have "a level playing field," in which they can compete equitably, fairly and with minimal risk. For example, before private companies will invest in building, owning, and operating a sanitary landfill for public use, they will want environmentally sound, safe disposal practices to be required by law and enforced by penalty. Before spending money on the development of bid documents in response to government procurements, companies will want assurance that government will follow procurement regulations governing fair competition.

Countries that have experienced colonial influence may have old laws from colonial powers that have little relevance to today's needs but which take precedent legally. Although developing countries legally restrict foreign ownership in the joint venture to only a minority share, these countries do not protect against liability for nonperformance of a local partner. Laws in many developing countries restrict the ownership of indigenous land or other property, limit the immigration of foreign professionals needed for technology transfer to the local counterparts, prohibit repatriation of profit and repayment on investment capital, and demand high compensation to be paid to workers that are fired for nonperformance or at the end of a contract period (USAID, 1991). At the same time, there are few, if any, laws that protect a private firm from nonpayment by government for services rendered.

2.8.8 The Institutional Context

Privatizing some aspects of municipal solid waste service delivery does not in any way take away the need for local government (or metropolitan government, if appropriate) to be fully responsible for solid waste management service. Local government needs to have adequate autonomy to enter into multi-year agreements that capture economies-of-scale, as well as efficiencies. Many Asian countries have procurement laws that place low monetary ceilings on the sizes of contracts before provincial and central reviews and approvals are required, and do not allow contracts to extend beyond one fiscal year (Cointreau, 1989). For some of these services to be effectively privatized, government would need to be strengthened (Bartone, 1991). Only a governmental organization with a competent professional staff and an adequately designated authority with commensurate responsibility would be fully able to develop, negotiate, manage, monitor, and enforce a competent contract instrument. If government does not have political leadership with the will to upgrade and professionalize the staffing of the solid waste agency as part of a decision to privatize solid waste management services, it is doubtful if the private sector will be obliged to deliver service at a low cost. Beyond the strengthening of local (or metropolitan) government, there are obvious needs to strengthen central government to deal with the contextual parameters raised above.

According to the World Bank's Urban Policy and Economic Development-An Agenda for the 1 990s, central government needs to "establish expectations of local performance" and to "retain some degree of oversight to ensure accountability over some areas of local decision-making" (Cohen, 1991). Some issues that are directly related to enabling private sector participation to realize low costs can be dealt with only at the central level. These issues include the minimization of risks related to environmental regulatory changes, national inflation, currency

convertibility, fuel prices, pricing policies, import bans or quotas, and taxes. These also include the provision of appropriate incentives, such as guarantees for any borrowings, assumption of foreign exchange risk, tax incentives, customs duty exemption, and special lines of credit (Augenblick, 1990).Which level of government is most appropriate to conduct solid waste collection and street sweeping activities? When the *technology* for a given service is readily known and available, the decentralization of an activity from metropolitan government to local government and private markets may be advisable (Wiradisaastra, 1991). Many unfamiliar with solid waste management view refuse collection and street sweeping as simple services that do not require much knowledge or specialized equipment.

This is far from true. While it is possible to collect and dispose of refuse without knowledge and with only limited equipment, to do it efficiently and effectively requires substantial planning ability, appropriate equipment, and continuous managerial optimization of vehicle and worker productivity. While it is viable to decentralize refuse collection and sweeping from metropolitan government to local government after the appropriate equipment has been procured and the optimal crew size and routing has been determined, it would be ill-advised to decentralize the equipment procurement or optimization planning activities without the significant development of the technological base within local government and the private sector (Wunsch, 1991).

Some solid waste activities, such as refuse collection, have no significant spillovers. That is, all the costs, benefits, and impacts are confined to the area of service. Other solid waste activities, such as refuse disposal, can have significant spillovers, that is, water and air pollution can migrate from the area of service to surrounding areas. Because of the spillovers that typically characterize refuse disposal, it is not advisable to decentralize disposal to local governments

within a metropolitan area or to private markets unless the regulatory framework and sanctions are adequate (Wunsch, 1991).

2.8.9 The Cost Context

What is a *low cost* for solid waste management? At first glance, a low cost for service delivery by the private sector would be one that is lower than the cost for government service. After the cost for government to monitor the performance of the private sector is added, a low cost for service delivery by the private sector would be still lower than the cost of government service.

But what are the costs for government service? In most developing countries, accounting systems show cash flows rather than accruals, with no clear delineation between recurrent and capital expenditures. There is no attempt to aggregate municipal solid waste management costs incurred by all the various agencies that participate in the system. Moreover, there is typically no attempt to keep track of depreciation, debt service, personnel benefits, land acquisition, and human resettlement costs within the solid waste management accounting system. The result is that most developing countries estimate their costs for municipal solid waste management service to be less than 50 percent of actual cost (Cointreau, 1989).

While waste generation rates and labor rates in developing countries are significantly lower than those in industrialized countries, the costs of solid waste collection, sweeping, and disposal in developing countries require a much higher percentage of individual income than those in industrialized countries. That is because income levels are much lower, while costs attributable to equipment purchase, debt service, spare parts, fuel, and oil are typically much higher. Total solid waste management costs in a low income country might consume two to three percent of individual income. Because most of the municipal solid waste management expenditure is for

collection, this should be the first service to examine for private sector participation arrangements that would reduce costs through increasing efficiency (Cointreau, 1989).

2.9 Willingness and Ability to pay for Waste Management Services

There exists several and well thought literature on the willingness and ability to pay for solid waste management. Like other environmental and public goods, willingness and ability to pay reflects consumer preference about purchasing a quantity of goods or services relative to price. As price rises particularly for essential goods and services, consumers may demonstrate a reluctance or unwillingness to pay. A price responsive consumer for example might reduce his consumption of a commodity in response to a rate of increase (Laplace and Kwak, 2005).

In economics, willingness to pay (WTP) is the maximum amount a person would be willing to pay, sacrifice or exchange in order to receive a good or to avoid something undesired such as waste.

Looking at willingness and ability to pay for from the value angle, it is seen as the foundation of economic theory where the idea is, if something is worth having then it is worth paying for. The idea extends into environmental resources like water quality and natural resources like trees and wastes. It is therefore imperative, to examine willingness and ability to pay with reference to a particular time, place and price bearing in mind other variables on which it depend (Laplace and Kwak, 2005).

This gives relevance to perceptions that, rural communities are generally at the bottom of the socio-economic ladder within a country and even within the community there still exist variations in terms of socio-economic status regarding how much one earns and is willing to dispose and still be comfortable.

2.10 Conclusion

These and other studies in the region suggest that local authorities should establish operational and environmental regulations and standards to guide private contractors, and have the capacity to oversee these activities. Supervision and payment should be based on specific performance measures. More attention needs to be given to cost recovery, financial stability and improved disposal practices. There appears to be substantial scope for expanded private sector involvement in the country. The earlier works have provided relative information on the subjects. It has shown the extent to which solid waste is a problem and the concern it has raised. It also indicated the need for the involvement of communities, NGOs, CBOs together with public in waste management, therefore emphasis on private sector participation and partnership with the public sector.

This current work focuses among other actors and stakeholders' willingness to waste management and the extent to which they will contribute or partner.

CHAPTER THREE

STUDY AREA AND METHODOLOGY

3.1 Introduction

The central theme of the chapter is to give a brief account of the physical and socio-demographic characteristics of the study area Walewale Township, give insight into the major features of the town that are relevant to the study and discusses the methodology adopted in the collection and analysis of data from the field and secondary sources. The study employed different but complementary research methods for data collection and analysis. Data gathered for the study were from both primary and secondary sources. Primary data was obtained from the field by interacting with respondents relative to questions regarding private sector participation in solid waste management whiles secondary data was obtained from pre-existing information on solid waste management by private sector organizations.

3.2 The study Area

3.2.1 Geophysical Characteristics

3.2.1.1 Location

Walewale is a small town and is the capital of the West Mamprusi District, a district in the Northern Region of Ghana. It lies on the main road from Bolgatanga to Tamale, at a junction to Nalerigu (Briggs, 2007).It got the status as a district capital in 1988 under LI 1448 as West Mamprusi District. The district is located roughly within longitudes 0°35'W and 1°45'W and Latitude 9°55'N and 10°35'N. It has a total land area of 5,013 km² and shares boundaries with eleven districts and two regions – Upper East Region and Upper West Region. It has strong economic and functional linkages with some major settlements in the Upper East Region like

Bolgatanga and Fumbisi (WMDA, 2007). The location of the District puts it in a position that could enhance economic activities which subsequently could improve their incomes and hence their capacity to patronize private waste management organization services. Indeed where resident have an improved income they can afford to pay for their waste to be collected and transported to the final disposal site or recycling plant.

3.2.1.2 Geology and Soils

The town has a generally undulating terrain characterized by gentle slopes from north-east to south west. There are, however, a few isolated visible outcrops and uplands of not more than 10% slope. Isolated hills, which break the monotony of the landscape, can be found around Karimenga, Shelinvoya, Suhuluya, Manga and the outskirts of Wulugu.

The Geological formation in the West Mamprusi District is underlain mainly by the Middle Lower Voltaian, comprising sandstone, arkose, mudstone and shale. The western part of the district is underlain by the lower Voltaian formation consisting of sandstones and grit. The northern tip is underlain by the Birimian rock formations. Birimian rocks are metamorphosed lavas, which ply Units, schists, tufts and greywacke. Regarding the middle Voltaian, the depth and degree of weathering depends on the lithology.

These hold a lot positive effects for the development of the Walewale Township. Most of these stones are rich in potassium useful for the manufacture of fertilizer for agricultural purposes. They aid in the trapping of moisture laden winds necessary for the formation of rain clouds, and hence rainfall for crop growth. Also, the bases of these hills and mountains are fertile land suitable for the production of food crops. In Walewale most of the successful boreholes are not deeper than 60m. This indicates that the favorable fractured zones are within the first 60m of

drilling. If no water is encountered when the first 40 to 60m is excavated then the chances of finding water inflows in deeper layers are not great. The water table in this district is usually very low though the area is generally low lying. Probably the intake points to support the charging of aquifers are inadequate.

The geological formation is very important in determining the amount of underground water. From available data, hand-dug wells have been found to be the most preferred option because of the average success rate of 50% for borehole drilling. This is because the local people are able to sink some on their own and in some areas they prove to be more successful than boreholes. The average depth of hand-dug wells is 15 meters. There is a 90% success rate for hand-dug wells in the town (WMDA, 2010).

Soils of alluvial origin (Savannah glycols) can be found in the major river valleys and drainage courses; these are predominantly in the west of the district along the basins of the White volta and its tributaries. These soils are deep; fine textured and is well suited for the cultivation of a wide range of crops. The depth of these soils also allows for the use of bullocks and other forms of mechanized farming. Large scale mechanized Agriculture is therefore very possible in Walewale.

In spite of their potentials, soils in this category remain under-utilized due to drainage and flood control problems. On the flat to gentle upland slopes of the eastern parts of the town are found the moderately well drained upland soils developed mainly from Voltaian sandstones. These soils are characterized by deep loamy soils of sand with good water retention capabilities described as moderately well drained.

The Soils development is characterized by deep loamy sand with good water retention capability best described as moderately drained. This development potential is in the fact that they are well suited for a wide range of crops; although good farming practices especially soil conservation is imperative. These soils are prone to sheet and gully erosion especially under cultivation. If organic materials are not applied regularly to these soils, heavy nutrient leaching will occur (WMDA, 2010). The geophysical features discussed above, the District is potentially an agricultural hub. This implies that if solid waste is sorted the various components could especially the organic waste could be used as manure by farmers on their farmland in order to improve crop yield. When farmers get improved crop yield it may translate into improved income and subsequently enable them to patronize waste management services by private sector operators.

3.2.1.3 Climate and Rainfall Pattern

The district is characterized by a single rainy season, which starts in late April with little rainfall, rising to its peak in July-August and declining sharply and coming to a complete halt in October-November.It experiences occasional storms, which have implications for base soil erosion depending on its frequency and intensity especially when they occur at the end of the dry season. Mean annual rainfall ranges between 950 mm - 1,200 mm.

The dry season is characterized by Hamattan winds. These winds, which blow across the Sahara desert, are warm and dry causing significantly daily temperatures and causing the soil to lose moisture rapidly. Maximum day temperatures are recorded between March-April of about 45°C while minimum night temperatures of about 12°C have been recorded in December-January.

The humidity levels between April and October can be as high as 95% in the night falling to 70% in the day. Night humidity for the rest of the years ranges between 80% and 25%. (GMS, 2009). The climate and rainfall pattern of the District suggest that residents are actively employed for only half of the year and for rest of the year they may be idle. The participation of private sector in solid waste management could generate or create employment avenues for the people through which farm income could be complemented. That is some resident could be engaged by private operators as sweepers, carriers, drivers among others.

3.2.1.4 Drainage

The district is drained by the White Volta and its tributaries. This together with the prevailing rainfall and the nature of the underlying rock formations determines to a large extent the ground and surface water potential for the area. The present combination of heavy run-off, high evaporation and transpiration and low infiltration rates to recharge aquifers in some areas in the district, contribute to water deficiencies especially in the Walewale Township. The drainage of the district suggests that the area is prone to erosion which may not support agriculture activities. Solid waste management by private operators could help check this phenomenon. Inorganic waste could be used as materials for filling galleys and gutters created by erosion and subsequently check sheet erosion.

3.2.2 Demographic Characteristics

According to the 2010 population census, the West Mamprusi District recorded a population of 168,011.Out of these 83,005 are males and 85,006 are females. The urban population in the district is 18% (GSS, 2012).

The population is concentrated in and around Walewale, the district capital, of within 10 to 15km radius with Walewale alone accounting for 12% of the district's population. There are other pockets of relative concentration in and around Janga in the southern part of the district, in and around Yagaba-Kubori and Yizesi areas to the western half of the district. The last area of relative concentration is Kpasenkpe-Duu area. The rest are either very sparsely populated or unsettled at all. There is therefore a very vast land of unoccupied land mass in the district.

The demographic charactertice of the district indicate that the female population is more than the male population and this revealing in the sense that women are the ones involve in solid waste management in the district. It therefore important that women are given a key role in any policy, programmed or project to be undertaken by authorities involved in solid waste management.

3.2.3 Culture and Ethnicity

The Mamprusis are the major ethnic group in Walewale who co-exist peacefully with other minor ethnic groupings including the Frafras, Kassinas, Bimobas, Fulanis, and Hausas. The Fulanis who settled in the area are herdsmen for the indigenous people. A typical social hierarchy in the Walewale Township is vested in the Chief, the wudana who is the linguist in the village and leader of the elders.

Religiously, majority of the population are Muslems (66.7%). Traditional Worshipers constitute (16.3%), Christians are (14.4%) whereas the remaining (2.6%) is made up of other religious practitioners. The main festivals of this area are the Bugum and Damma festivals celebrated by the chiefs and people of Walewale. Being a predominant Muslem town, the people also celibate the two festivals of Eid-ul Fitir and Eid-ul Adha (WMDA, 2010).

The people have a high spirit of local participation especially when there are full consultations on issues of development. They are also naturally friendly to anybody either a citizen or a

stranger. This accounts for the comparative peaceful coexistence of the people. Private Waste management organizations could build on the existing social capital to encourage residents to patronize their services and to also individually be responsible in managing solid waste at the level of household.

3.2.4 Economy

The economic base of Walewale is agriculture with an average of 78% of the economically active population engaged in one form or the other of it. Agricultural activities in the town include crop production and livestock. Only 54.7% of the 78%, however, farm as a major activity.

Agriculture is basically on a subsistence level with smallholder farmers representing the main users of agricultural land. The average farm sizes vary from 0.5 ha to 2.4 ha. The predominant type of farm labour is from the immediate family (man, wife or wives and children) a factor that may account for the love for large families. There are however periods where farm labour is hired to supplement family labour (WMDA, 2010). Observations suggest the method of farming is basically traditional using hoes and cutlasses. Food production in some cases is mechanized with the use of animal traction and few tractors.

Primary processing of agricultural produce is done in the district though not on a large scale. Mostly, it simply involves transforming farm produce into another form for local consumption. Sheanuts processing for exports is, however, picking up in the town. Some of the processed produce is groundnut oil, parboiled rice, Shea butter, smoked fish and Dawadawa spice.

The local barn constitutes the most common storage facility in the district. The barns are constructed with grass-thatched roofs supported with wooden structures. Field survey indicates over 70% of farmers storing their harvest in the traditional barn. A lot of the communities visited

have pointed out modern storage facilities as measures of controlling post harvest losses (WMDA, 2010). The use of jute bags for storing maize, rice, guinea corn, millet, groundnuts and beans is also widespread. Others use poly ACs. These produce are bagged after they have been thoroughly dried.

The flat grassland vegetation of the area facilitates the rearing of livestock and poultry in the town. Animals reared include cattle, sheep, goats, pigs, local birds and domesticated guinea fowl. The cattle population mainly consists of the small West African shorthorn breed and the rest being the Zebu type with few Sennas and N'damas. The sheep and goats are mainly the West African Dwarf breeds. The Directorate of Agriculture has begun the promotion of new breeds of guinea fowls. The common disease affecting livestock in the district includes tick, worm infections, diarrhea, black leg, foot and mouth disease, pneumonia, ascariasis, anthrax and helminthiasis. the local economy of the is mainly dominated by agriculture; mainly food crop production and livestock rearing. Private sector participation in solid waste management could provide the avenue encouraging and educating the resident to engage in sorting of solid waste some of which could be used as animal feed and the organic waste as compost for food crop production.

3.2.5 Transportation and Road Network

The total road network of the district is made up of primary, secondary and feeder roads. The district is served by about a total of 476.3KM square of roads made up of 116km of trunk roads and 360km of feeder roads. The Ghana Highways Authority manages 116.3km of roads of which 19km is paved and the remaining 97.3km gravelled. Most of the town roads in Walewale the district capital are tarred.

The total length of feeder roads in the district is about 360km, made up of 211km of which needs re-gravelling whilst others need major construction to ensure all year round use. The town has a road density of about 0.0950 / KM and is relatively one of the lowest in the country. It is important to indicate that road accessibility in the district is very poor and this has had a ripple effect on the provision of other social and economic services. The busiest route in the district is the Tamale-Bolgatanga trunk road which passes through Walewale and is asphalted. Feeder roads leading to major food-producing areas including Kparigu and Yizesi which are are in various stages of disrepair (WMDA, 2010).

3.2.6 Environment

The town is prone to disasters, mostly natural in nature, but probable started by man. The heavy demand on the vegetation for domestic energy use, there has been deterioration in the vegetation. Coupled with this, is the rampant bush burning as well as poor farming practices, which are all steadily deteriorating the environment.

Some of these include floods, wildfire, wind disasters, CSM attacks and pest infestation of farmlands. These disasters are seasonal in nature and of different intensities varying from year to year which affects the entire district eventually. The past situations called for a disaster preparedness plan for the Assembly formulated by various stakeholders with support from Action Aid Ghana (NADMO, 2011).

The district capital, Walewale, has only 7 public aqua privies. These facilities are all in bad state of repair and needs replacement or serious rehabilitation. There are only two alternative KVIP latrines in the centre of the town to serve thousands of people either resident or travelling. There are aqua privies in bigger settlements including Janga, Kparigu, Yagaba, Wungu, Kpasenkpe and Gbimsi which are almost out of use. All these facilities need maintenance or replacement.

There are also water closets located in a number of government bungalows in the town. The district as a whole has 276 household VIP latrines, 7 institutional KVIP latrines and one public two-seater KVIP latrine. General sanitation conditions in several communities in the district are poor. Most people have no access to toilet facilities and the free-range system of human waste disposal is a very common feature in Walewale. This has resulted in a high incidence of faecal-oral diseases in the town.

The town's solid waste disposal system is not well developed yet. However, the district assembly has of late acquired refuse collection and disposal equipment to improve on the situation. The practice of indiscriminate dumping of refuse in both large and small communities still persist in Walewale Township.

3.2.7 Health and Nutrition

Coverage of health services in Walewale is generally very low as available facilities are woefully inadequate. The highest level of health delivery system in the town is the Walewale District Hospital. There is one polyclinic located at Janga and four (4) other Health Centres and some clinics located in the big settlement of the district. Some of which are not functional. This has created serious problems with access to health services thereby putting pressure on the Walewale district hospital. The issue is compounded with the poor physical conditions of the roads in most parts of the district which patients has to drive on to Walewale for health care (DHMT, 2011)

The current staff strength of the health facilities in general in the West Mamprusi District stands at 98. Of this number, there is only one medical officer instead of five. However, there are two Cuban doctors supporting. There are 32 nurses out of a requirement of 69 and 14 Community health nurses. Midwives are 8 with 3 pharmacy technicians. There are also 3 medical assistants and 10 health care assistants almost 90% of these workforces are maintained in Walewale district

hospital. There is therefore a very wide shortage of health workers to take care of the other facilities available.

Complementing the above are activities of 43 TBAs (Traditional Birth Attendants) and 134 Community Based Volunteers trained to provide basic health functions. All Communities have at least one village volunteer who report unusual health events like death and diseases to the disease surveillance unit of the Ministry of Health. Traditional Birth Attendants and Guinea Worm Volunteers complement the efforts of the other health personnel.

The major health problems have been malaria, upper respiratory tract infections and diarrhea. Cerebro-spinal Meningitis (CSM) is a disease that has claimed many lives within the past few years. CSM is seasonal and usually appears in an epidemic form. Diarrheal and malarial diseases can be curtailed through better water supply and hygienic practices. The top ten major diseases and causes of death in the district in 2010 to 2012 are indicated in figure 2.1

There was a slight change however in the disease situation in the year 2011 and 2012 but with malaria still dominating as depicted in figure 2.1

Table 3.1 Top Ten Major Causes of Death 2011/12

DISEASE	%	RANK
Malaria	19.4	1ST
Gastroenteritis	8.3	2ND
Anaemia	5.6	3RD
Septicaemia	5.6	4TH

Pneumonia	5.6	5TH
Bronchopneumonia	5.6	6TH
URTI	5.6	7TH
CVA	1	8TH
Tetanus	1	9TH
TB	1	10TH

Source: DHMT-West Mamprusi District 2012

3.2.8 Education

The Directorate of Education in the West Mamprusi District has twelve educational circuits viz; Walewale Central, Walewale East, Walewale West, Kpasenkpe East, Kpasenkpe West, Janga, Kparigu, Tinguri, Yagaba, Kubori and Yizesi. The District has 48 pre-schools, 106 primary schools, 36 Junior Secondary schools two Senior Secondary Schools operational and 1 under construction, 1 private senior high school and 1 vocational school. However, it is sad to note that the district is still one of the districts in the country with serious deprivation and recording one of the lowest literacy levels in the region. While the regional average literacy rate is 27.3%, that of the West Mamprusi District is 23.3%.

The current enrolment rates are shown in table 3.2

Table 3.2 : Current School Enrolment figures and Staffing

Pupil/Student Enrolment & Staffing in Schools - Districtwide										
No.	Type of school	Enrolments			Trained Teachers			Untrained Teachers		
		Male	Female	Total	Male	Female	Total	Male	Female	Total
1	Pre-School	5680	5547	**11227**	5	19	**24**	3	19	**22**
2	Primary	13112	12375	**25487**	140	38	**178**	178	50	**228**
3	JSS	4269	3814	**8083**	101	19	**120**	34	3	**37**
4	SSS	747	425	**1172**	32	2	**34**	11	3	**14**
		23808	22161	**45969**	278	78	**356**	226	75	**301**

Source: District Education Directorate, 2012.

Of the 657 teachers in the district, 54.2 per cent are trained with the remaining 45.8 per cent untrained. Though there are more trained teachers, teachers turn over from the district is very high. This leaves GES to always ask for more trained teachers which also goes to affect the District Assembly teacher sponsorship budget. A large stable number of trained teachers dedicated to duty provide a good environment for quality education in a district. In the case of senior secondary, trained teachers account for 71 per cent of the 48 teachers. It is imperative that the number of trained teachers must be increased in the district.

The teacher-pupil ratios of nursery, primary, junior and senior secondary schools in the District are as follows. The district average teacher/pupil ratio as of 2012 stood as follows: for pre-school 1:129, primary 1:52 and J.S.S. 1:26. However, the figure for S.S.S. is 1:24 but this is not a true reflection on the ground.

There is a wide skewness in the distribution of teachers. Most of the teachers are stationed in and around Walewale as compared to the rural areas. This has called for an affirmative action to remedy the situation to ensure a balance in the distribution of teachers in the whole district.

The current total enrolment of school children is 45,969 and made up of 23,808 males (representing 51.8%) and 22,161 females (representing 48.2%). The boy/girl ratio gradually

getting to 1:1 in most areas of the District from the previous estimate of 3:1. The total school enrolment for the district is shown in the table 3.2.

3.3 Methodology

3.3.1 Research Design and Approach

Research design gives the plan of action of the researcher in his quest to unravel information about a given subject. It conceptualize the research problem and put into standpoint that will direct him in the data gathering, analysis and presentation (Opoku, 2005). The study adopted the survey research approach in collecting data for analysis and presentation in order to draw conclusion to the phenomenon under study. Survey research developed within the positivist approach to social science is a quantitative method, requiring standardized information from a sample of the population using questionnaire and or an interview. The main objective of survey research is that it measures many variables. The respondent is given multiple questions addressing several issues regarding the subject under study. The survey research approach is mostly used in social science research (Tagoe, 2009).

3.3.2 Sampling and Sampling Procedure

In conducting this study, cluster and multistage sampling was adopted in selecting household respondents. Cluster sampling is the division of the sample population into groups or clusters so that sampled units contain more than an individual in the population. Cluster sample is used when the population under study is large, where the list of a population does not exist, where the geographic distribution of units is scattered. The households covered were one hundred and twenty three (123) located at different sections of the town. The township was zoned into four sections for the purposes of the research where twenty households were randomly selected from

each. The multistage sampling is used in large scale surveys for more comprehensive research. The researchers use more than one sampling technique in selecting respondents. With regards to study, the multistage sampling technique was adopted to select households to respond to questions after the houses were selected (Koul, 1997).

3.3.2.1 Units and Tools of Analysis

According to Patton, the units of analysis depend on prior decision on the focus of the study. Units of analysis may comprise individual persons, small groups, families, and subcultures, formal organizations, agencies or communities, neighborhoods, cities, states even nations if the focus is on international programmes (Patton, 1987:50). Further, Patton argues that in qualitative evaluations, units of analysis may also be particular kinds of events, occurrences or incidences. The key factor in selecting and making decisions about the appropriate unit of analysis is to decide what unit is that you want to be able to say something about at the end of the evaluation (Patton, 1987). Based on the research questions, the primary units of analysis for this study are the individuals, focus groups, traditional rulers, opinion leaders, and head of institutions among others.

The following tools were used to analyze the data collected: Descriptive (frequency and patterns); Explanations; interpretation and maps and graphs. It was also a manual cross-sectional descriptive approach. The units of analysis were households, organizations involved in solid waste management such as Walewale District Assembly, Zoomlion and the Environmental Protection Agency.

3.3.2.3 Sample Size Determination for Households

The total houses of Walewale District according to the Ghana Statistical Service figures for 2010 Population and Housing Census is 1,229 with 2054 households (Ghana Statistical Service, 2010).

The 2054 households represent the sample frame for the study. The sample size is selected using a mathematical formula given by Yamane (1970). The formula is given by: $n=N/1+N(e)^2$; Where n = Sample size, N= Population and e= Significance level or margin of error. Using this formula where N = 2,054 and e = 0.09, the sample size is estimated to be 123 households.

3.3.3 Sources of Data

3.3.3.1 Secondary Data

Secondary data was gathered from Zoomlion Ghana limited. Further, project documents, case studies, census documents and other relevant literature on the subject was consulted. This covered partnership arrangements and waste management approaches.

3.3.3.2 Primary Data

Data collected relied on individual and disaggregated as well as group perception about garbage problem, partnerships and the general environmental condition. The focus is on: The understanding of garbage problem, Ways of collection and disposal, Willingness to contribute to waste management, Ways of solving waste problems.

3.3.4 Data Collection Techniques

3.3.4.1 Semi Structured Interviews

Semi structured interview sometimes referred to as focused interviews involve a series of open ended questions based on the topic areas the researcher wants to cover. The open ended nature of the question defines the topic under investigation but provides opportunities for both interviewer and interviewee to discuss some topics in more detail. If the interviewee has

difficulty answering a question or provides only a brief response, the interviewer can use cues or prompts to encourage the interviewee to consider the question further. In a semi structured interview the interviewer also has the freedom to probe the interviewee to elaborate on the original response or to follow a line of inquiry introduced by the interviewee to solicit views of households (Handcock, 1998). The semi structured interview was adapted to illicit information from respondents more especially households with respect solid waste management and private sector participation. Respondents were given the latitude to delve deep into the subject and bring out information that would have otherwise been lost in a normal conversation.

3.3.4.2 Focus Group Discussions

Sometimes it is preferable to collect information from groups of people rather than from a series of individuals. Focus groups can be useful to obtain certain types of information or when circumstances would make it difficult to collect information using other methods to data collection. They have been widely used in the private sector over the past few decades, particularly market research (Handcock, 1998). In the collection of data for the study four focus group discussion were organized with opinion leaders of the section in the district to illicit their views on the solid waste management situation and the private sector participation in dealing with the challenge of managing solid waste in the district.

3.3.4.3 Key Informants Interviews

Interviewing is a common method used in collecting information from people regarding the subject under study. Any face-to-face interaction with one or more people with the aim of eliciting information is regarded as an interview (Kumar, 1999). The key informant is one person or an institution that has an expert or special knowledge on a particular subject. The method was adopted to collect information from institutions such as Zoomlion, the Municipal Assembly,

opinion leaders and the Environmental Protection Agency (EPA) about their role in managing solid waste in the Municipality.

3.3.4.4 Direct Observation

Not all qualitative data collection approaches require direct interaction with people. It is a technique that can be used when data collected through other means can be of limited value or is difficult to validate. For example, in interviews participants may be asked about how they behave in certain situations but there is no guarantee that they actually do what they say they do. Observing them in those situations is more reliable: it is possible to see how they actually behave. Observation can also serve as a technique for verifying or nullifying information provided in face to face encounters (Handcock, 1998). In this study photographs were taken on solid waste management practices of households especially disposal of solid waste. Photographs are a good way of collecting observable data of phenomena which can be captured in a single shot or series of shots.

3.3.5 Data Analysis and Presentation

Data analysis involved a process of clean-up, inspecting and transforming data with the aim of discovering useful information, arriving at conclusion and supporting informed decision making. The comparative and logical/matrix qualitative analysis methods would be adopted. The comparative analysis involves taking one piece of data and comparing it with all others in order to ascertain possible relations between various pieces of data (Thorne, 1997). The Logical Analysis on the other hand involves assembling and segregating responses to draw patterns of differences and similarities and to show logical flows (Miles and Huberman, 1994).

3.4 Conclusion

Geophysical characteristics, particularly the rainfall pattern, demographic characteristics of Walewale, which accounts for 12% of the whole population of West Mamprusi. Land happens to be a complex issue in Walewale regarding public landfill sites as lands are owned by individual

families in the town. Indeed, environmental condition, where stress is put on the vegetation for domestic energy use, coupled with rampant bush burning as well the major common diseases in the area being malaria and diarrhoea. Going forward, the town enjoys donor support in aid of relieving the people of some suffering like poor nutrition, hygiene and sanitation. The research design and approach would facilitate the logical analysis and presentations of findings which would show a clear appreciation of the problem in the study area in relation to waste management.

DATA ANAYSIS AND PRESENTATION

4.1 Introduction

The chapter focuses on the analysis of data gathered from the study area. A manual cross-sectional description had been adopted for the analysis. Parts of the qualitative data were quantified and presented in tables. Simple percentages were largely used. The chapter generally presents the socio-economic characteristics of respondents as well as the waste management situation of the study area and the general perception of private sector participation in solid waste management.

4.2 The Socio-Economic Characteristics of Respondents

The socio-economic characteristics of respondents such as age, sex, level of education and occupation has a strong correlation with social change. This is supported by Dickson (1976), who asserted that socio-economic characteristics of respondents are considered important because they contribute in one way or the other in shaping the behavior in adopting an innovation. This section of the report discusses the social and economic characteristics of respondents and to see how they could impact on the challenges of private sector participation in solid waste management in the Walewale District.

4.2.1 Age of Respondents

The figure below gives a clear picture of the age structure of the population of the District. The study revealed that the age group of 36 – 40 years constitutes the majority with 19.52% followed by the age category of 31 – 35 years with 18.699%. The age's group of 18 – 25 years constituting 16.26%, 26 – 30 years with 15.447%, 41 – 45 years about 13%, 51+ years with 12%

and 46 - 50 years constitutes just about 4%. The age structure demonstrate that the population is youthful who could be sensitized to adopt proper solid waste management practices and also patronize the services provided Zoomlion in order to sustain private sector participation in dealing with the challenges confronting the District.

Age of Respondents

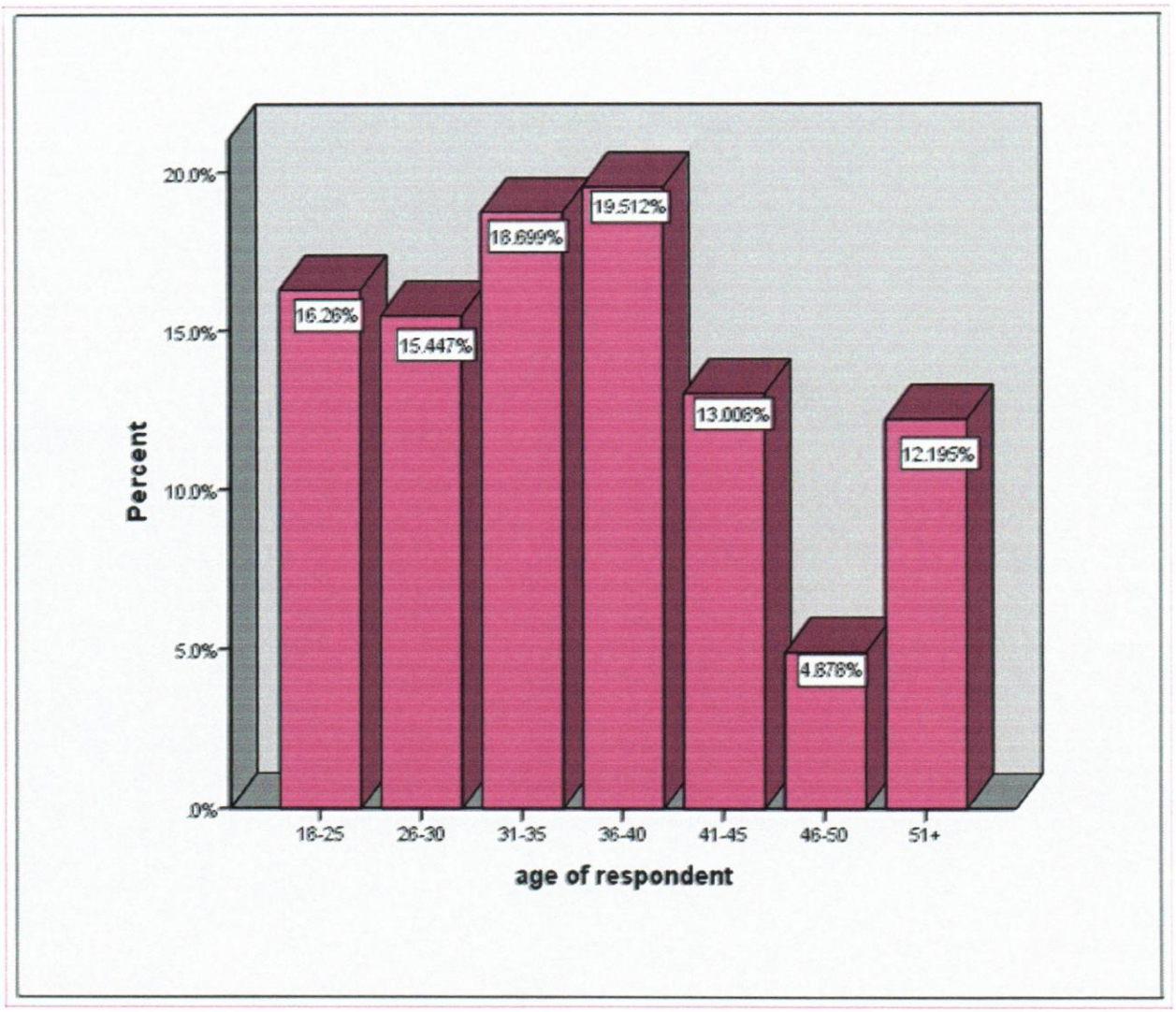

Figure 4. 1 Source: Field Survey 2013

4.2.2 Sex Distribution of Respondents

The study revealed that female constitutes the majority of respondents scoring about 62% and male representing 37%. The sex distribution of respondents demonstrates that women must be at the centre of any effort to deal with the solid waste challenge that is currently confronting the District. The figure below depicts the real situation in terms of active participation in the waste management efforts.

Sex Distribution of Respondents

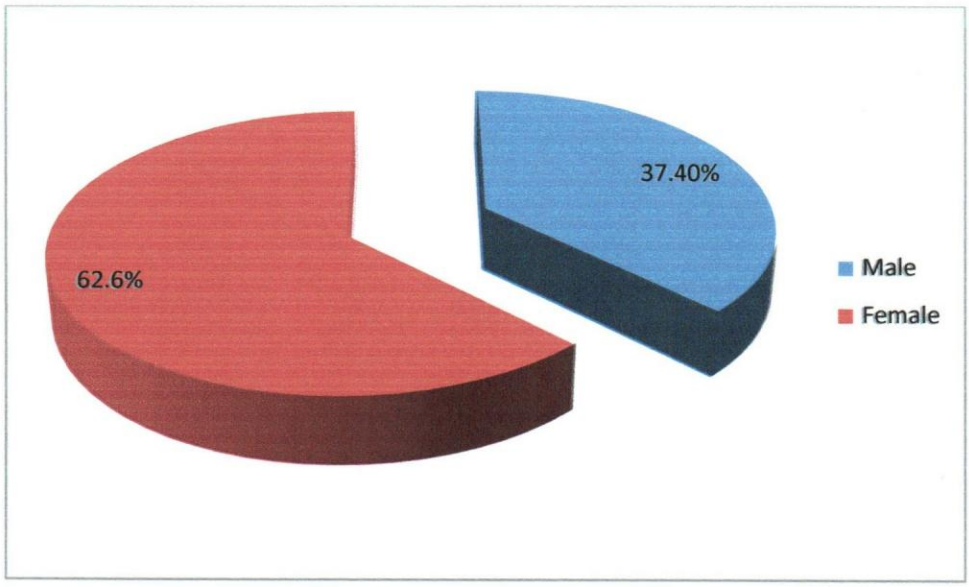

Figure 4.2 Source: Field Survey, 2013

Figure 4.3 paint the picture of the level of educational attainment of respondents. The study revealed that the level of education is encouraging since only 24.39% of the total respondents have never been to school. The rest of the respondents have some level of formal education. Those who had primary education were about 19%, senior high education about 18%, Junior

High or Middle school education constitutes about 17%, those have attained tertiary education make up about 16% and those have Arabic education making up 4%.

Level of Educational Attainment of Respondents

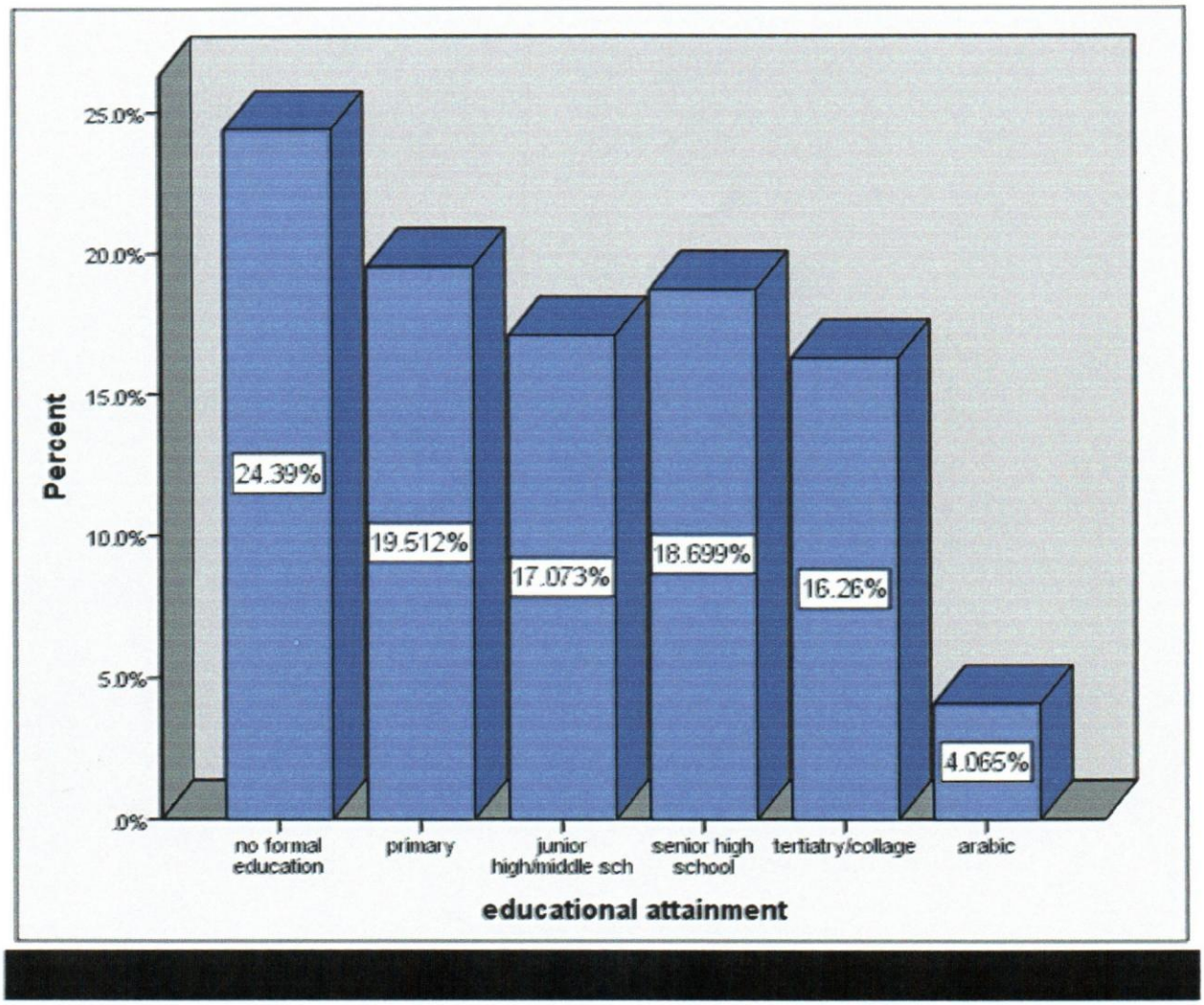

Figure 4. 3, Source: Field Survey, 2013

With this level of education, the people could be educated on hygienic solid waste management practices and also buy into the idea of patronizing the services of Zoomlion a private waste management Company.

4.2.4 Occupational Distribution of Respondents

The study revealed that the District is an agrarian economy with majority of respondents about 47% being farmers (figure 4.3).

Occupational Distribution of Respondents

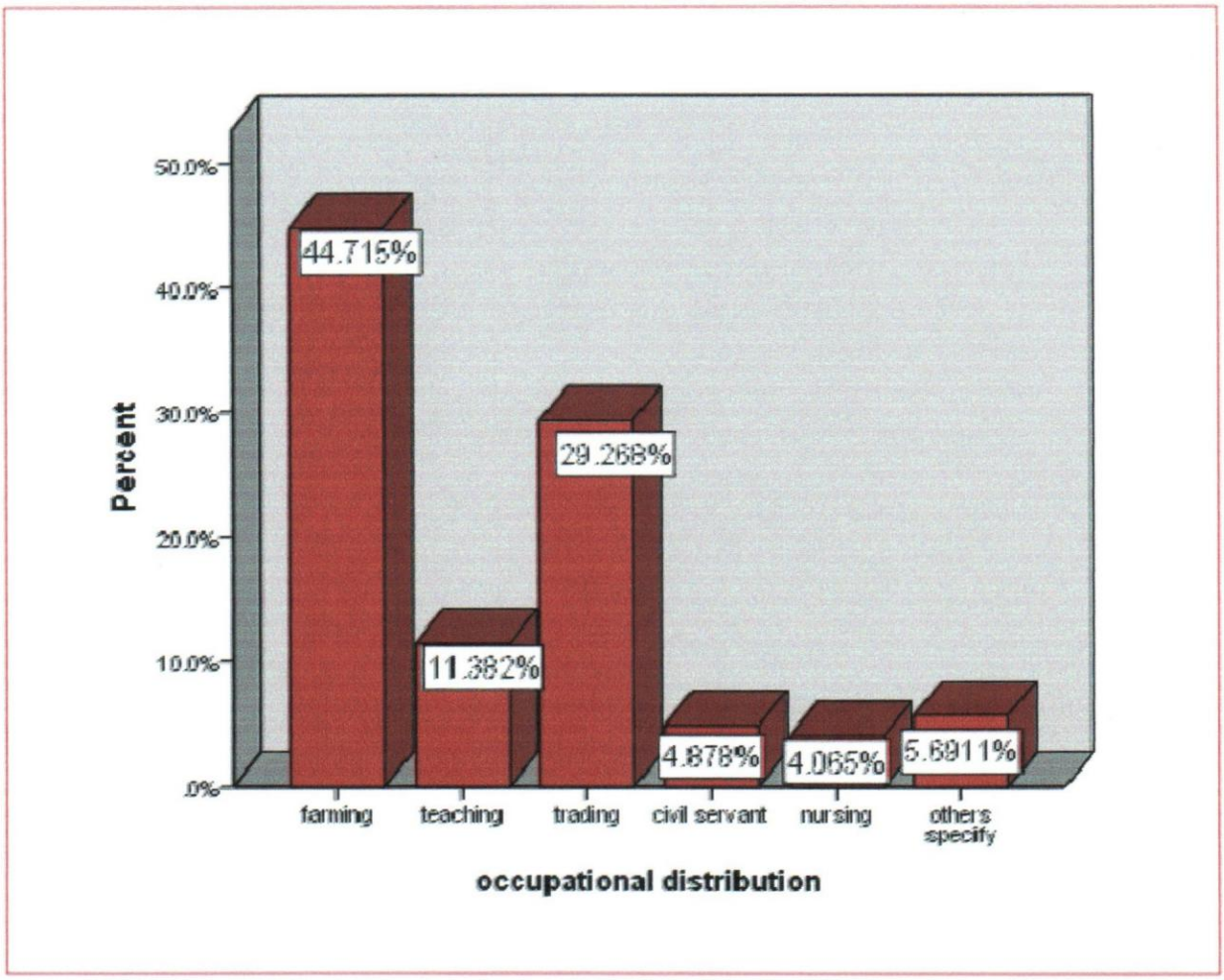

Figure 4.4, Source: field survey, 2013

The occupational distribution also revealed that about 29% of respondents engaging petty trading, 11% in teaching, about 5% are engaged in other activities and artisans such as carpentry, masonry among others and about 4% are civil servants and nursing each. The occupational distribution offers opportunity for private companies to take advantage of in managing solid waste management in the District. This is because the respondents would be able to pay for the services of the company.

4.2.4 Average Monthly Income of Respondents

The table below (table 4.1) highlights the average monthly income of respondents. Respondents who earn an average monthly income above GHC. 350.00 constitute 2.4% whiles those with an average income between GHC. 100.00 – 150.00 constitute the majority scoring 35%. Respondents who earn between GHC. 50.00 – 100.00 represent 27.6%, respondents with an average monthly income between GHC. 150.00 – 200.00 comprising 12% and respondents with an average income between GHC. 200.00 – 250.00 and between 250.00 – 300.00 represent about 8% each. Only about 5% of respondents earn between GHC. 300.00 – 350.00. The average monthly income distribution implies that private sector participation could be effective if the company determine charges with the residents of the area.

Average Monthly Income of Respondents

Average Monthly Income (GHC. 00)	Frequency	Percent
50-100	34	27.6
100-150	43	35.0
150-200	15	12.2
200-250	10	8.1
250-300	11	8.9
300-350	7	5.7
350+	3	2.4
Total	123	100.0

Table 4.1 Source: Field Survey, 2013

4.3 Household Solid Waste Management Practices

4.3.1 Ranking of Household Solid Waste Generation

The study revealed that plastic waste is the most prominent solid waste in the District. Out of the total of 123 respondents, 53.7% indicated that the largest solid waste generated is plastic materials. Out of the remaining respondents, about 22% indicated that paper constitute the largest part of solid waste generated in their households and 22% cited grass and leaves of plants as constituting the highest solid waste generated by their households. The table (table 4.2) below paints the picture of the situation.

Ranking of solid waste generated by households

Solid Waste	Frequency	Percent
Paper	28	22.8
Plastics	66	53.7
Grasses/Leaves	27	22.0
Cloths	2	1.6
Total	123	100.0

Table 4.2 source: field survey, 2013

4.3.2 Sorting of Household Solid Waste

The study revealed that about 73% of respondents do not sort their solid waste before disposal whiles only about 26% sort their solid waste. Respondents who do not sort their waste were of the view that they see no reason why they should sort solid waste since they are already waste. Some also say that the authorities have not in any way educated them on the need to sort their waste in components such as organic material and inorganic material. Respondents who sort their solid waste do so because they sometimes reuse some of the solid waste especially the plastic bags.

4.3.3 Household Solid Waste Disposal Practices

Solid waste disposal practices in the district include crude dumping, burning, burying, and disposal at the communal storage site among others. Among these practices, crude dumping is the commonest since it constitute about 44% (figure 4.3) of the total respondents who dispose off their solid waste by this method.

Household Solid Waste Disposal Practices

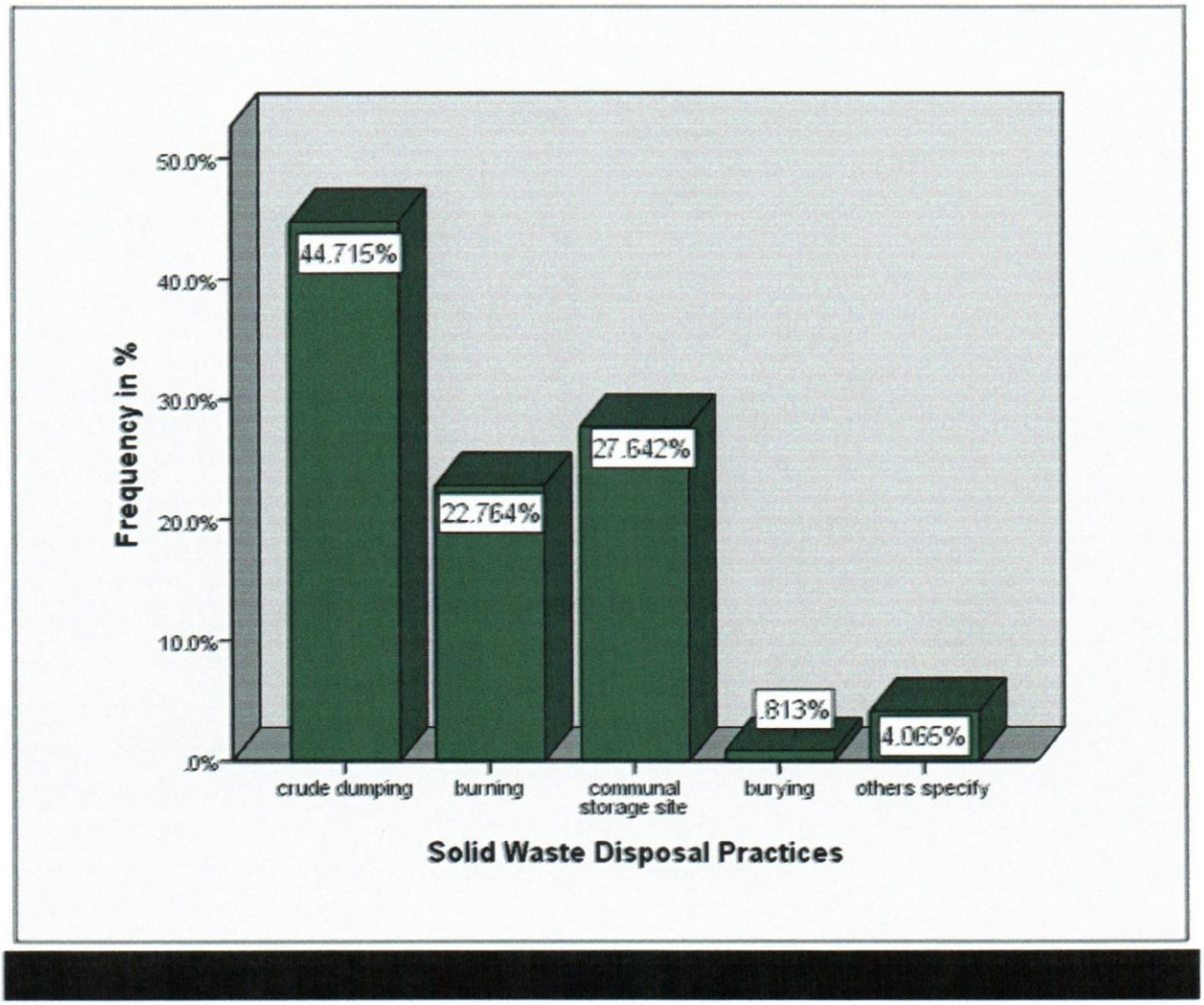

Figure 4.5 source: field survey, 2013

The next common solid waste disposal method is disposal at communal storage site which represents about 27% of respondents who dispose of their waste through this means. Burning and represent about 22% and burying and other methods constitute less than 5% of total respondents who practice these methods of solid waste disposal. The picture below portrays the real situation in the Walewale District.

Indiscriminate Solid Waste Disposal at Walewale

Plate 4.1 Source Field Survey, 2013

4.4 Private Sector Participation in Solid Waste Management

4.4.1 Private Institutions Involved in Solid Waste Management

The study reveals that Zoomlion Ghana Limited is the only private company involved in waste management services in Walewale. Institutions like World Vision Ghana, Chera Bissi Fari and Alternative Initiative for Development (AID) also offer some form of education on waste management geared towards obtaining a clean environment.

4.4.2 Awareness of the Services of Zoomlion Company in Walewale

The study revealed that Zoomlion, private waste management company popularity is pronounced. About 82% of respondents have heard about Zoomlion and the general services they render to the general public and only about 13% have never heard anything about the company. Respondents who have heard about the company however have very little knowledge about the actual services the company offer to clients. Respondent who have heard about Zoomlion

Company, 65.9% of them heard from the radio whiles about 26% heard from friends, seeing workers around and at school and work places.

4.4.3 Registration for the Services of Zoomlion Company Limited

The study revealed that about 74% of respondent have heard about the services of Zoomlion have not registered even though they have heard about it whiles only 26% of respondents have registered for the services of Zoomlion Company Limited. The 74% who have not registered for the services gave two main reasons for their non registration. Some say that their level of income could not permit the to patronize the service whiles others stated that they are close to the bush and therefore see no reason why they should pay for something they can easily throw into the bush. Figure 4.4 below gives the picture of the situation. Zoomlion Company Limited provides to interested clients waste management and other services to private individuals and cooperate organizations. On commercial basis the company offer Door- to- Door services, genitoral services (Corporate bodies), and fumigation for a fee. The company also engages in any activity that their equipment and capacity would allow them in order to generate revenue. The registration for the Door-to-Door services is free and the bin is also given to the client for no charge. Currently the company has 128 registered clients but only 28 are actively patronizing the Door-to-Door services and this is affecting their internal revenue generation efforts in the district. The company charge between GHC. 10.00- to- GHC.12.00 for the Door-to-Door services. It is however important to state that the charges were set without any consultation with the people and this might be the cause of the low patronage of the service.

Registration for Services of Zoomlion

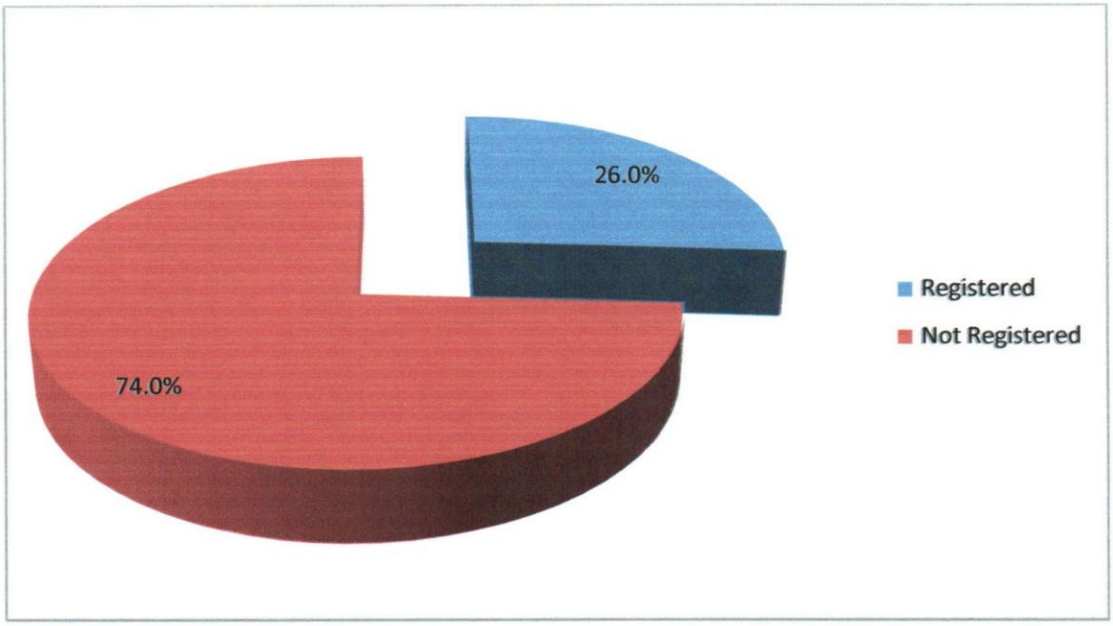

Figure 4.6 source: field survey, 2013

The respondents who have registered for the services have expressed satisfaction about the quality of services delivery and were full of praise for the company for its wonderful works.

4.4.4 Willingness to Pay for Waste Management Services

The research has brought to the fore the unwillingness of respondents to pay for waste management services. The study revealed that 74.8% of respondents think that they should not pay for waste management services. They are of the view that the central government must take care of such cost because taxes are paid to it. The 25.2% of respondents who agree that they have the obligation to pay for waste management services since it is not the central government which generates the waste in their houses. They contend that as responsible citizens it is their civic responsibility to ensure they keep their living environment clean and hygienic to prevent any outbreak of diseases. Thus waste management authorities has an uphill task to convince residents

that it is their duty to pay for waste management services if they are to enjoy any efficient and reliable waste management system.

4.5 Institutional Arrangement in Solid Waste Management

4.5.1 The Operations of Zoomlion Company Limited

Zooomlion Company Limited is a private waste management organization contracted by the Government of Ghana through the Ministry of Local Government and Rural Development to manage waste in the District as in other Metropolitan, Municipal and District Assemblies across the country. The company started operations in the district in October, 2006 and ever since it has continued to be the sole private company engaged in the management of waste in the district.

4.5.2 Contractual Arrangement between Zoomlion Company and the Walewale District Assembly

The contract to manage waste in the district for that matter Walewale Township by Zoomlion was entered into by the Ministry of Local Government and Rural Development on behalf of the district to offer waste and sanitation model, sanitation guard's model, malaria control and to keep the township clean and sweeping of ceremonial roads. The arrangement is such that Zoomlion do street sweeping, sweeping of public places such as lorry terminals and parks, markets, hospitals, provides Communal Refuse Containers, administers Malaria control and fumigation, Offers sanitation guards to support the environmental health officers to discharge their duties.

Payments for work done by Zoomlion are made under the instruction of Local Government and Rural Development Ministry to the Common Funds Administrator to make deductions at source and pay same directly to Zoomlion who in turn also pay its workers. This implies that even

though the Company is working in the district, the Assembly has no serious control over its activities and therefore could not sanction Zoomlion for non performance of its mandate.

4.5.3 Zoomlion Company's Engagement with the General Public in the Walewale District

The company has been engaging residents in radio educative programmes on waste and sanitations issues in the district at regular intervals since the start of operation in 2006. Zoomlion has engaged with religious and opinion leaders to assist to encourage cleanliness in churches and mosques to followers.

The company has also embarked on massive and vigorous education and sensitization of school children about waste management and sanitation issues through formation of zoom clubs at the lower primaries to inculcate in them the desire to practice good sanitation. The company in collaboration with a local radio station and other stakeholders has developed a radio discussion programme dubbed "Zoom Time" to educate the general public on the need to practices proper waste management and sanitation in their various houses.

4.5.4 Challenges of Zoomlion Company Limited in Walewale

One major challenge that confront Zoomlion company Limited in Walewale is Client's inability or refusal to separate liquid waste from solid waste thereby generating bad odor when kept for few days even though efforts have been made to discourage the practice the challenge still persist. The company in collaboration with the District Assembly has not relented on this since the education is still on-going to sensitize the public and more especially clients to separate liquid waste from solid waste. Sometimes residents put fire and hot ash into the container and this causes damage to it

Language is a barrier since not all the revenue collectors are from Walewale or its environs and do not understand the native language mampruli.

The company has only one compacter and forty tricycles in operation. Containers breaks when expose to the sunshine for a very long time and riders find it difficult to lift bin when its burned which is also a serious challenge as ashes are added sometimes to the refuse. Another challenge is when tricycle breaks down clients would not corporate with us for a temporal measure to convey their refuse to a communal container site.

There are no access roads to all sections of the town for the easy movement of the compacter.

There are challenges regarding payment as clients would normally decline payment when date of refuse is mixed up or delayed a little. The company has to pursue clients several days sometimes months before they payments are made. Legal measures are options opened to us under the agreement; however we engage clients in discussions and agree on a settlement arrangement to pay by spreading it over a reasonable length of time.

4.6 The Role of West Mamprusi District Assembly in Waste Management

The West Mamprusi District Assembly is charge with the responsibility of managing waste in the town. However due to the work load and financial constraints of the District Assembly, Zoomlion has been contracted by the central government to manage waste in the district on behalf of the district. There is too much load in the Assembly and Sanitation is not given due attention by local authority hence the coming in of Zoomlion has helped to relief aspects of sanitation in the district. Provision of resources and equipment for sanitation is not easily provided by the Assembly but the intervention of Zoomlion has helped the situation.

4.6.1 Monitoring of the Operations of Zoomlion Company

The Environmental Health and Sanitation Unit of the District Assembly monitor the activities of Zoomlion Company on behalf of the Assembly and report to the Chief Executive. The Unit also signs their reports, assigns places to their workers for cleaning and organizes and facilitates quarterly meetings with Zoomlion. The Assembly assigned to Zoomlion and reports daily on their activities.

The general public is not in any way involved in monitoring the activities of the company unless there is a problem then complains are lodge with the Environmental Health and Sanitation Unit for redress.

There are no specific sanctions to be exerted on the company except refusal to sign reports presented.

4.6.2 Challenges of the West Mamprusi District Assembly in Solid Waste Management

The main challenge of the Assembly is the absences of by-laws to regulate citizens' behavior regarding waste management and sanitation. The absences of bye-laws have made it difficult to strictly ensure that residents adopt appropriate waste management and sanitation practices. It is however important to state that bye-laws have been enacted but it is yet to be gazette in order to legitimize any enforcement.

The Assembly is confronted with irregular supply of fuel leading to irregular collection and transportation of communal refuse containers, inadequate tricycle to convey refuse. Also irregular supply of insecticides to malaria control and inadequate safety tools for workers are some of the challenges.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter focuses on the major findings of the research based on which some recommendations are offered and conclusions drawn. The study revealed a lot of issues about solid waste management in Walewale district.

5.2 Summary of Major Findings

5.2.1 Demographic and Socio-Economic Characteristics of Respondents

The study revealed that the age group of 36 – 40 years constitutes the majority with 19.52% followed by the age category of 31 – 35 years with 18.699%. The age's group of 18 – 25 years constituting 16.26%, 26 – 30 years with 15.447%, 41 – 45 years about 13%, 51+ years with 12% and 46 - 50 years constitutes just about 4%.

The study revealed that female constitutes the majority of respondents scoring about 62% and male representing 37%.

The study revealed that the level of education is encouraging since only 24.39% of the total respondents have never been to school. The rest of the respondents have some level of formal education.

The study revealed that the District is an agrarian economy with majority of respondents about 47% being farmers.

The study revealed that respondents who earn an average monthly income above GHC. 350.00 constitute 2.4% whiles those with an average income between GHC. 100.00 – 150.00 constitute the majority scoring 35%.

5.2.2 Household Solid Waste Management Practices

The study revealed that plastic waste is the most prominent solid waste in the District. Out of the total of 123 respondents, 53.7% indicated that the largest solid waste generated is plastic materials.

The study revealed that about 73% of respondents do not sort their solid waste before disposal whiles only about 26% sort their solid waste.

Solid waste disposal practices in the district include crude dumping, burning, burying, and disposal at the communal storage site among others. Among these practices, crude dumping is the commonest since it constitute about 44% of the total respondents who dispose off their solid waste by this method.

5.2.3 Patronage of Services of Zoomlion Company Limited

About 82% of respondents have heard about Zoomlion and the general services they render to the general public and only about 13% have never heard anything about the company.

The study revealed that about 74% of respondent have heard about the services of Zoomlion have not registered even though they have heard about it whiles only 26% of respondents have registered for the services of Zoomlion Company Limited.

The study revealed that 74.8% of respondents think that they should not pay for waste management services.

5.2.3 Institutional Arrangement in Solid Waste Management in the Walewale District

5.2.3.1 The Operations of Zoomlion Company Limited

The contract to manage waste in the district by Zoomlion was entre into by the Ministry of Local Government and Rural Development on behalf of the district to offer waste and sanitation model, sanitation guard's model, malaria control and to keep the township clean and sweeping of ceremonial roads. The arrangement is such that Zoomlion do street sweeping, sweeping of public places such as lorry terminals and parks, markets, hospitals, provides Communal Refuse Containers, administers Malaria control and fumigation, Offers sanitation guards to support the environmental health officers to discharge their duties.

On commercial basis the company offer Door- to- Door services, genitoral services (Corporate bodies), and fumigation for a fee. The company also engages in any activity that their equipment and capacity would allow them in order to generate revenue.

The registration for the Door-to-Door services is free and the bin is also given to the client for no charge.

There are 128 registered clients but only 28 are actively patronizing the Door-to-Door services and this is affecting their internal revenue generation efforts in the town. The company charge between GHC. 10.00- to- GHC.12.00 for the Door-to-Door services.

Zoomlion has formed zoom clubs at the lower primaries to inculcate in them the desire to practice good sanitation.

The company in collaboration with a local radio station and other stakeholders has developed a radio discussion programme dubbed "Zoom Time" to educate the general public.

One major challenge confront Zoomlion company in the district is Client's inability or refusal to separate liquid waste from solid waste.

Language is a barrier since not all de revenue collectors are from Walewale or its environs and do not understand the native language mampruli.

The company has only one compacter and forty tricycles in operation. Containers breaks when expose to the sunshine for a very long time and riders find it difficult to lift bin when its burned which is also a serious challenge as ashes are added sometimes to the refuse.

Another challenge is when tricycle breaks down clients would not corporate with us for a temporal measure to convey their refuse to a communal container site.

There are no access roads to all sections of the town for the easy movement of the compacter.

There are challenges regarding payment as clients would normally decline payment when date of refuse is mixed up or delayed a little.

5.2.3.2 The Role of the Walewale District Assembly

The Walewale District Assembly is charge with the responsibility of managing waste in the district. However due to the work load and financial and other constraints Zoomlion has been contracted by the central government to manage waste in the district on behalf of the District Assembly.

The Environmental Health and Sanitation Unit of the District Assembly monitors the activities of Zoomlion Company on behalf of the Assembly and report to the Chief Executive.

The general public is not in any way involved in monitoring the activities of the company unless there is a problem then complains are lodge with the Environmental Health and Sanitation Unit for redress.

There are no specific sanctions to be exerted on the company except refusal to sign reports when presented.

4.5.2.2 Challenges of the Walewale District Assembly

The main challenge of the Assembly is the absences of by-laws to regulate citizens' behavior regarding waste management and sanitation in Walewale.

The Assembly is confronted with irregular supply of fuel leading to irregular collection and transportation of communal refuse containers, inadequate tricycle to convey refuse.

Also irregular supply of insecticides to malaria control and inadequate safety tools for workers are some of the challenges.

The weak financial base of the West Mamprusi District Assembly; makes it difficult to provide adequate waste management facilities and equipment to empower the sanitation unit of the district in carrying its work.

5.3 CONCLUSION

The general public is uneducated on the need to practice good solid waste management practices even though Zoomlion and the Assembly claimed to have done some education. This situation stern from the general bad attitude of residents towards solid waste management.

The contract arrangement entered into by the Ministry of Local Government and Rural Development has rendered the district powerless since there is no clear instruction as to how the Assembly could monitor the activities of Zoomlion.

The attempt at private individuals to patronize the services of Zoomlion has been a huge failure on the part of the Company.

The Assembly has failed abysmally in the fight against solid waste management since it has not been able to enact and enforce by-laws to regulate the behavior of residents with regards to solid waste management.

5.5 Recommendations

The following recommendations are offered based on the data analyzed in the previous pages for the proper management of waste in the District.

The District Assembly in collaboration with Zoomlion should embark on a vigorous educational campaign on the dangers of improper Solid Waste Management. When the people are well informed, consultation and participation will be facilitated.

House-to-house collection should be encouraged on a commercial basis; same way as the use of neighbor bins (containers) which are frequently emptied.

The Assembly should provide bins for refuse collections at vantage points throughout the town.

All sachet water sellers, store owners and food sellers/venders should and must be made to provide dustbins by their stores for people to drop their empty sachets and other waste materials.

Neighborhood waste management committees should be formed to be responsible for all waste issues in each neighborhood. The committee will also be responsible for the collection of monthly household waste levy, which will be charged based on cost of operation.

The District has been zoned into three for waste management service delivery planning. All the zones have similar characteristics to ensure uniformity of service delivery and fair competition among service operators.

The recommended mode of contract is Franchise. The current contract with Zoomlion Ghana Ltd. is such that before the district assembly's share of the common fund arrives deductions are made at source and paid direct to Zoomlion Ghana Ltd. This arrangement makes it difficult for the Assembly to track the activities and expenses on the contract. No detailed report is submitted to the assembly on activities carried out to commensurate the money allocated to them. It is therefore envisioned that, this should be changed into a Franchise agreement

The Assembly should as a matter of urgency enact and enforce by-laws on solid waste management to regulate residents' behavior and attitude.

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Appendix 1

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Graduate School

Interview Guide for the Walewale District Assembly

1. How many private companies are contracted to manage solid waste in the District?.....
.....
2. What are the contract arrangements with Zoomlion?.....
.....
3. What is your observation of the performance of Zoomlion in the District?
.....
4. What are the shortcomings of their performance?.....
.....
5. Is the Assembly involved in any way in solid waste management?.....
.....
6. Have you made any effort to encourage other private individuals or groups to engage in solid waste management?.....
7. Why do you engage Zoomlion in solid waste management?.....
8. Do you monitor the activities of Zoomlion in the Municipality?.....
9. If yes, what is the mechanism?.....
10. If no, why not?.....
11. Is the public involved in monitoring activities Zoomlion?.....
12. What are the sanctions for non-compliance by Zoomlion?
.....
13. What are the bye-laws regarding solid waste in the District
.....
14. Are these bye-laws enforced?.....
15. If yes, to what extent?.....

16. If no, why?.....

17. What the challenges confronting the Assembly with regards to enforcement of the Bye-laws?

.....

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Interview Guide for Households

Socio-economic and demographic characteristics

1. Age of respondents

18-25	
26-30	
31-35	
36-40	
41-45	
46-50	
51+	

2. Sex of respondents male [ ] female [ ]
3. Educational attainment of respondent

No Formal Education	
Primary	
Junior High/Middle Sch.	
Senior High	
Tertiary	
Arabic	

4. Occupation of respondents

Farming	
Teaching	
Trading	
Civil servant	
Nurse	
Others specify	

5. Average monthly income of respondents

GHC. 50 - 100	
100 - 150	
150 – 200	
200 – 250	
250 – 300	
300- 350	
350 +	

6. Have you heard about Zoomlion? Yes..... No.....

7. If yes, How did you hear about it? .....

8. Registration for the services of Zoomlion? YES [ ] NO [ ]

9. If yes, are you satisfied with their services?

10. If no. why? Please explain .....

11. Rank in order of amount of waste generated

Paper	
Plastic	
Grass/leaves	
Cloth	
Others specify	

12. Is sorting done? YES [ ] NO [ ]

13. If no, why? .....

14. How do you disposed of your solid waste?

Crude dumping	
Burning	
Communal disposal site	
Burying	
Others specify	

15. Are you satisfied with services of Zoomliom? YES [ ] NO [ ]

16. Do you think you should pay for your waste disposal? Yes [ ] no [ ]

17. If yes, why? .....

18. If no why? .....

19. What suggestions do you have for Zoomlion for effective delivery of services?
.....

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Interview Guide for Zooolion

1. How long have you been operating in the Walewale Municipality? .....
2. What is your contract arrangement with the WMA?
   .....
3. Do you register clients for commercial services? .....
4. What services do you provide to your clients?
   .....
5. How many residents have registered for your services?
   .....
6. How many of the registered clients are actively patronizing your services?
   .....
7. How much to charge for your services? .....
8. Do you advertise your services to the general public?
   .....
9. Were residents consulted before the charges were set?
   .....
10. How does one get registered with your company for the services?
    .....
    What are the challenges you face in collecting charges from clients?
    .....

    What measures have you put in place to ensure that defaulters pay for services?
    .....
11. What other challenges do face in the delivery of services?
    .....

12. Is the district well planned to make accessibility to the various centers?
    .....

13. How regularly do you remove solid waste from the household?
    .....

14. What have you done to engage the public in solid waste management?
    .....

15. Have you given any education to residents on solid waste management?
    .....

16. What vehicles do you use to haul the garbage?.....

17. How many are in operation?.....

18. How many have broken down?.....

19. What other challenges do face in the delivery of your services?.....

20. What suggestions do you have for the public?.....

21. What advice/ suggestions do you have for the Assembly and other stakeholders?.....