

UNIVERSITY OF EDUCATION, WINNEBA

**DOMESTIC SOLID WASTE MANAGEMENT PRACTICES IN SENYA, IN
THE AWUTU SENYA WEST DISTRICT**

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DECLARATION

Student's Declaration

I Jehoiada Paa Kweku Tetteh, declare that this Thesis, with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

Signature:

Date:



Supervisor's Declaration

I hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision of Thesis as laid down by the University of Education, Winneba.

Supervisor's Name:

Signature:

Date:

DEDICATION

This piece of work is dedicated to my lovely son, Eliud Paa Kweku Tetteh. The work is also dedicated to my Wife Faustina Abena Bortsewah Ghunney and my lovely, caring and inspirational mother Madam Beatrice Efua Abiba Kassim for their unrelenting support and prayers towards a successful completion of this work



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GLOSSARY/ ABBREVIATION OF WORDS

ADB	African Development Bank
ASWD	Awutu Senya West District
CBO	Community Based Organizations
CED	Centre for Environment and Development
CSR	Corporate Social Responsibility
DSW	Domestic Solid Waste
DSWM	Domestic Solid Waste Management
DSWMP	Domestic Solid Waste Management Practices
EPA	Environmental Protection Agency
ESA	External Support Agencies
GIM	Ghana Innovation Market
GSS	Ghana Statistical Service
HWMP	Hygienic Waste Management Practices
MLGRD	Ministry of Local Government and Rural Development
MSWM	Municipal Solid Waste Management
MSW	Municipal Solid Waste
NEMA	National Environmental Management Authority
NGO	Non-Governmental Organizations
PPP	Public-Private Partnerships
PHS	Population and Housing Census
PSSP	Purpose, Structure, State and Performance
RCRA	Resource Conservation and Recovery Act
SPSS	Statistical Package for Social Sciences
SWM	Solid Waste Management
UNCHS	United Nation Conference on Human Settlement report
UNEP	United Nations Environmental Programme
USA	United States of America
USEPA	United States Environmental Protection Agency
WB	World Bank
WHO	World Health Organization
WMD	Waste Management Department
WRI	World Resources Institute

ABSTRACT

The study aims to research on the domestic solid waste management practices in Senya, in the Awutu Senya West district. The underlying factors affecting domestic solid waste practices in Senya was analyzed with suggested measures to tackle such problems. The survey research design was used for the study by the researcher. The study was concerned with findings on societal issues, problems or phenomena with some suggestions and recommendations aimed at improving, halting or curbing or minimizing the issue, phenomena or problem. The researcher generally made use of questionnaires as the instruments in the data collection. During the research activity, the following were the key findings established, inadequate containers or skip supply for storing waste, lack of regular and routine collection of waste, the peoples' attitudes towards domestic solid waste generation and its disposal was not the best. These attitudes give enough room for indiscriminate disposal of domestic solid waste and littering of the environment. The waste management institutions were faced with inadequate resources for effective collection of the waste generated in the district. To tackle the problem enumerated effectively, the following recommended measures must be considered: adequate provision of dustbins and skips, collection of waste regularly, proper managing of landfill, resources of waste management institutions must be adequate, regular monitoring and education of residents. Prosecuting residents who violate the laws on indiscriminate disposal of waste.



CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Domestic Solid Waste Management practices is an epidemic or among the major problems with great concern to local and urban governance in most developing and transitional economies, because of the environmental health effect especially in Africa. It is as result of rapid population growth which eventually leads to copious amounts of solid waste generated daily and the inefficient technical and financial resources from the Municipal Authorities in Africa to address the canker. Schübeler (1996 cited in Cointreau-Levine & Adrian, 2000) defined waste management as any activity that aims at minimizing the impacts of municipal solid waste on public health and the environment including characterization and measurement, collection and transportation, separation and resource recovery, processing as well as disposal.

The United Nations Conference on Human Settlement (UNCHS) (1996) reports that one-third to one-half of solid waste generated within most cities in low and middle income countries are not collected; but however end up as illegal dumps on streets, open spaces and waste lands. The African Development Bank (ADB) (2002) opines that Ghana generates about 3.6 million tons of solid waste per year which are mainly organic compostables such as food, yard and wood wastes as well as paper, plastic, glass and metal. Ghana as a developing country has over the years faced difficulties with regards to infrastructural and technical inefficiencies towards domestic solid waste management. Public-Private Partnerships (PPP) is being implemented to support the situation but proved less successful as a result of the financial obligations of the government to the private firms assigned to collect and dispose waste is inconsistent.

Problems associated with sanitary conditions in rapidly expanding urban and sub-urban areas cause the spread of a number of air and waterborne diseases (Benneh, Songso, Nabila, Amuzu, Tutu & Yaugyuorn, 1993). Malaria, diarrhoea, intestinal worms and acute upper respiratory tract infections which are examples of poor-sanitation related diseases constitute about 85 percent of the reported cases at outpatient facilities in the country with seasonal epidemic outbreaks of cholera (Ministry of Local Government & Rural Development (MLGRD), 2010). A study undertaken by Amoatey, Winter, and Kaempf (2006) in Teshie, a suburb of Accra in Ghana revealed that the type of solid waste collection method used and the incidence of malaria are moderately but significantly correlated. The unsanitary conditions render the suburb prone to malaria, thereby indicating relevance of the study and its findings. Though waste collection and transportation is the first in the waste management concept, it has proven to be a disorganized system. According to Mensah and Larbi (2005), only 80 percent of the waste generated in the Accra Metropolis is collected. This percentage falls to 35 percent in Kumasi (Ghana's second largest city) and close to 10 percent in the northern towns of Bolgatanga, Tamale and Wa.

Addaney and Oppong (2015) opine that, the national policy on domestic solid waste management practices, recommends small-scale incineration plants for the treatment and disposal of health care and hazardous wastes. Therefore, in most towns with health facilities, small incinerators have been built as part of the health provision infrastructure. The incinerators are simple designs built with lateritic bricks, cement blocks and metal with firewood as a source of energy and are easily operated and maintained. Mensah and Larbi (2005), asserts that many of such facilities have no environmental controls and often comprise of nothing more than combustion of medical and chemical waste in an oven or open pit. The three solid waste collection

methods practiced in Ghana are; kerbside, house-to-house and communal collections. Kerbside collection system involves collection of deposited waste on specific days at the kerbside. Waste collection crew picks up the waste from each household and community to be emptied into collection vehicles with bins returned thereafter in household and communal collection methods respectively. The level of service delivery is however different within income areas (Oteng-Ababio, 2014). Obirih-Opareh and Post (2002) opines that waste collection service delivery is generally very poor in low income areas while that of middle and high income areas are comparatively better since they pay more than the government who pays for low income areas.

Solid waste disposal and management is both an urban and rural problem. Every individual generates waste and also contributes to the existing domestic waste management problem. To generate waste is one thing, the type of waste generated is another and also the way the waste is managed or disposed of is entirely different. The pace at which solid waste is generated is far higher than its management. Waste is generated by, and from different sectors; domestic, commercial, industry among others.

Particularly, waste volumes have increased in urban areas due to the growing urban population, concentration of industries, consumption of residents, and inadequate finance and facilities to manage waste collection and disposal (NEMA 2007, p.276). This state of affairs has put immense pressure on the government and authorities leading to the accumulation of waste uncollected or ignored. One of the major factors that has contributed to poor waste collection and management in many countries is the limited community participation in solid waste management (NEMA, 2007). The limited participation has resulted from co-ordination and collaboration problems that

exist among the three stakeholders in solid waste management- the communities, the public (government) and the private sectors (NEMA, 2007).

Sustainable solid waste management uses a cyclical process to manage waste today without jeopardizing the prospects of future generations (Chirico, 2009). Which is a complete deviation from conventional waste management approaches towards waste management by seeking stakeholder participation (van de Klundert, 2000) and, with the purpose of ensuring environmental quality (Abila & Kantola, 2013). The new demand for sustainable solid waste management requires new paradigm (Gani, Chiroma & Gana, 2012) configured as „3Rs“ or „RRR“ in which the first „R“ stands for reduce, the next „R“ for reuse and the other „R“ for recycle (Moore, 2012 & Al-Maaded, Madi, Kahraman, Hodzic, & Ozerkan, 2012). With regards to utilization, the „3Rs“ could be used as policy tool and or assessment or analytical tool. The „3Rs“ represents policy directive of the government of Ghana; which validates a deprived or emerging municipality in Upper West Region of Ghana. According to Al-Maaded et al, (2012) the „3Rs“ model provides the basis for a comprehensive management strategy of municipal solid waste; with the principal aim fashioned to health, environmental, aesthetic, land-use, resource and economic concerns associated with improper disposal of waste (Henry, Yongsheng, & Jun, 2006, Nemerow, 2009 & Wilson, 2007). Wu, Shia, and Xiaa, (2014) and Zaman, (2014) stated that, proper implementation of the „3Rs“ strategy would engender conversion of solid wastes into new resources, reducing environmental pollution and optimizing natural resource utilization. Drawing on management tenets as involving responsibility, techniques, collective action, goals setting, and activities to achieve the goals, procedures, maintenance as well as monitoring and evaluation (Peprah, Amoah & Achana, 2015). Sustainable solid waste management depends solely on the stakeholder’s participation

which includes integrated and sustainable approaches to manage waste and consensus building among households, service providers and users, community based organizations (CBOs), non-governmental organizations (NGOs), formal and informal private sector, local and central governments as well as external support agencies (ESAs) (Schubeler, Wehrle & Christen, 1996)

However, many waste generators and producers avoid the responsibility of an effective and appropriate domestic solid waste management, but rather the entire burden is thrown on the shoulders of municipal authorities. The Municipal and District Assemblies spend almost half of their budget on the management of domestic solid waste which hinders development (Schubeler, Wehrle & Christen, 1996). Exacerbating the problem is the world's urban population increasing by two new people every second, and with 95 percent of such increases occurring in cities of developing World (Hoornweg & Perinaz, 2012; Oteng-Ababio, 2014). According to Al-Maaded et al. (2012), the fast-paced industrial growth, recent construction boom, increased population and urbanization, vastly improved life style and unsustainable consumption pattern have all contributed to the burgeoning municipal waste management problem. In Asia, day-to-day production of solid waste is about 760,000 tonnes (World Bank 1999). About 25 million tonnes of solid waste is generated annually in Nigeria (Ogwueleka, 2009). The rate of waste generation poses serious and disturbing threat to governments (Magutu & Onsongo, 2011). Driven by blight of uncollected solid waste in public places, smoke from burning of solid waste, the disgusting odour from decomposed waste, contamination of drinking water sources and outbreaks of diseases like cholera, the government of Ghana adopted the „3Rs“ model to provide policy directives to municipal authorities to solve the solid waste menace; enjoying legal backing following the promulgation of the Local Government

Act (Act 462) (MLGRD, 2012). Providing further support to the „3Rs“ policy tool, the national urban policy, *inter alia* entreats Municipal Assemblies to deal specifically with: mapping of the sources of waste in the municipalities, regular evaluation of waste producers, choice of waste management technology and engineering options, creation and use of landfill. Furthermore, observance of Environmental Protection Agency guidelines on landfill, public education on waste management through various campaigns, capacity enhancement of municipal authorities in waste management, involvement of the private sector in the provision of sanitation, and enforcement of legislation on waste management was acknowledged (Peprah, Amoah & Achana, 2015).

1.2. Statement of the problem

Despite the present effort and concerns of individuals and the government on waste management in Ghana, Senya in the Awutu Senya West District (ASWD) is still faced with serious domestic solid waste management problem. Figure 1 to Figure 3 below gives a clear picture of poor domestic solid waste management practices in Senya.

Figure 1: Domestic Solid Waste at the back of a building, Senya



Figure 2: Scene of Waste deposited on underdeveloped land at Senya



Source: Field survey: 2018

Figure 3: Domestic Solid Waste ending up in gutters at Senya



Source: Field survey: 2018

From observation and the pictures above domestic solid wastes are commonly found in Senya. Domestic waste comes from activities such as cooking and from human

excreta. Other waste includes trash from commercial establishments, small industries among others. Household wastes are empty tins, plastic products, and polythene bags which are not properly disposed off, reused and recycled. These form the greater part of the waste observed on the streets, in gutters, land that not developed and the back of houses in Senya. People normally store their domestic solid wastes in old buckets, baskets, plastic containers, boxes, sacks, and even polythene bags, which in most cases have no cover or scattered around their compounds. The District Assembly and stakeholders are faced with several challenges in their effort to streamline waste management services. A few of the pressing issues include, the attitudes of stakeholders (government, assembly, non-governmental organizations among others) and individuals towards domestic solid waste management practices, the generation, disposal and effect of domestic solid waste management practices in Senya. The rapidly increasing quantities and diverse characteristics of waste, the undesirable consequences of conventional methods of waste management, and less attention and focus placed on effective and appropriate management of the domestic solid waste, tapping the resource value of waste through reuse, recycling and reduction.

The above problems make it clear that the Awutu Senya West District Assembly is unable to cope with the problem. The study is to examine the domestic solid waste management practices in Senya in the Awutu Senya West District.

1.3. Purpose of the Study

The purpose of the study is to examine the attitudes towards domestic solid waste management practices in Senya, in the Awutu-Senya West District.

1.4. Objective of the Study

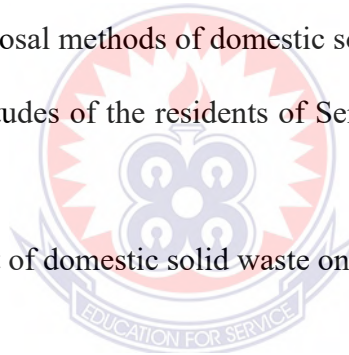
The objectives of this study were to:

1. Analyze how domestic solid waste is generated in Senya.
2. Outline the disposal methods of domestic solid waste in Senya.
3. Examine the attitudes of residence towards domestic solid waste practices in Senya.
4. Assess the effect of domestic solid waste on residence of Senya

1.5. Research Question

The research questions of the study were:

1. How is domestic solid waste generated in Senya?
2. What are the disposal methods of domestic solid waste in Senya?
3. What are the attitudes of the residents of Senya towards domestic solid waste practices?
4. What is the effect of domestic solid waste on residence of Senya?



1.6. Significance of the Study

The findings of this research intend to provide guidelines to the Awutu Senya West District Assembly and serve as guide to formulate policies on environmental protection. The findings may provide the Assembly with useful knowledge to design environmental educational programmes for the public.

The focus of the study is on domestic solid waste management practices in Senya which will direct the attention of the Assembly to formulate policies to motivate people to change their attitude on waste management practices. This will promote the effective ways of disposing domestic solid waste. It will reveal and throw more light

on people's attitudes and perception and provide effective planning opportunities and efficient implementation of solid waste management technologies.

It would also serve as a literature for other districts, municipalities, metropolitans and assemblies in general to promote the effective and efficient management of domestic solid waste towards good health and serene environment. Moreover, the finding will serve as basis for further research. It would add to knowledge or literature on effective solid waste management.

1.7. Justification for the Research

Despite the policies on domestic solid waste management provided by the government and the Awutu-Senya West District Assembly on Hygienic Waste Management Practices (HWMP), user cooperation is regarded as a major challenge. This is as a result of improper storage of household waste and disposal, waste separation, placement of household containers and discipline in the use of public collection points. This is due to a long period of neglect of the sector and the lack of attitudinal change that did not accompany economic development (EPA, 2007; p.5). The research may promote a healthy and serene environment towards the practice and management of domestic solid waste menace of Senya in Awutu-Senya West District and Ghana at large through regular education and prosecuting of offenders who violate the law on domestic solid waste management.

1.8. Delimitations of the Study

My study is limited to Domestic Solid Waste Management Practices (DSWMP) in Senya Township of the Awutu-Senya West District.

1.9. Limitations of the Study

There were difficulties in obtaining detailed and current information from the residents and some institutional heads. Some felt reluctant sharing their views with me because they said people always come around and seek for such information but with no avail. The institutional heads further confirmed that for confidentiality some information is withheld. When I sent a letter to ASWD to obtain permission, it took close to three months before a response was given. The main barrier was how to explain some questions to some residents of Senya since it was difficult translating the questions into their main language (Awutu).

To address the obstacles above, my respondents were assured that their participation is not going to disadvantage them in any way but will rather contribute in finding a long lasting solution to the domestic solid waste problem. However, on the issue of interpretation, a research assistant who understood and can speak the language fluently assisted in the data collection. In spite of these limitations, it could be said that the survey approach was appropriate for the study. It was suitable for answering the key research questions set out in the introductory chapter, and gave evidence to the domestic solid waste management practices in Senya, in the Awutu Senya West District.

The responsibility of managing waste has been left on the shoulders of government or administrative authorities alone. It is now time for the immediate stakeholders (the generators of waste), which are the residents or households to fully support and join hands with the authorities in dealing with the domestic solid waste management practice problems which has environmental and human health effects. The study was based on these four main objectives; Analysing how domestic solid waste is generated, outlining the disposal methods of domestic solid waste in Senya,

examining the attitudes of residence towards domestic solid waste practices and assessing the effect of domestic solid waste on residence of Senya.



CHAPTER TWO

LITERATURE REVIEW

2.0. Introduction

Domestic Solid Waste Management (DSWM) forms part of the basic urban services that calls for immediate and adequate attention. The production and accumulation of domestic solid waste generated results from activities of humans. Reducing or curbing this waste through different and continuous effort appears to have less or no solution in most of the cities of the developing countries (Gilbert, Stevenson, Giradet & Stren, 1996). This chapter reviews literature on the definition of waste, concept in waste management, generation of domestic solid waste and its disposal and management practices, perception and attitudes of people towards domestic solid waste, its effect on the environment and the conceptual framework for the study is also discussed. Issues such as definition and classification of waste and solid waste, solid waste management practices, challenges of solid waste management, public participation towards waste management and the effect of poor solid waste disposal in relation to the environment and health are discussed.

2.1. Definition on Waste

The concept of waste is easily understood by most individuals. However, there are different scholarly definitions making it impossible to get a clear, precise and general definition for the concept waste. Even though there have been numerous educative and problem solving research on the phenomena of waste, nevertheless less attention has been given to the definition for the concept of waste.

The perception on waste is relative in two main respects. First, something becomes waste when the primary function of the thing is no more useful to the owner or user. A waste is relative to this primary function. Waste can be defined as materials

considered as unwanted goods or seen as materials for which there are no further use (Peavy, Rowe, & Tchobanoglous, 1986). Wastes as opined by Oluwade (2009) are refuse (empty containers, papers rubbish) sewage (faeces, water urine) and industrial waste (chemical nuclear) that result from the manufacturing of certain substances, materials and equipment. Khatib, (2011) defines *waste* as "any material which has been used and is no longer wanted or useful, because the valuable or useful part has been removed". These definitions reflect and confirm the attitude of not recognizing waste resourceful.

However, with the second perspective, what is considered waste during its primary functions may be useful for a secondary function. In other words, what is considered waste is often somebody else's (secondary) raw material. Nature is an excellent example of this reality such that, the defecation of mammals (animals) is used as food by some insects and manure for agricultural purposes. This fact is independent of any specific definition one can draw. A waste is a discarded material, which has no consumer value and therefore disposed of. Once another person picks it up and puts it to use, it becomes a resource (Botkin & Keller, 2003).

United Nations Environmental Programme (UNEP), (2009) defined wastes as substances or objects, which are disposed off or are intended to be disposed off or are required to be disposed off by the provisions of national law. Waste also refers to "an item, material or substance you as an individual consider useless at a given time and place" (Mugambwa & Kizito, 2009: p.1). Waste is a dynamic concept which can be defined in different ways. Pongrácz (2009; p.93) introduces an innovative description of waste in what she refers to as "object-oriented modeling language, purpose, structure, state and performance (PSSP), which are object attributes". In most cases,

the definition of waste depends on the type or category of waste under consideration. Some of the dominant types of waste include; domestic solid waste, municipal waste, solid waste, hazardous waste and, electronic waste (Kumah, 2015).

From the above definitions and for the purpose of this study, it can rightly be deduced that, waste is any substance or object which is discarded or intends or is required to be discarded by the owner. These materials are discharged to, deposited in, or emitted to an environment through practices that causes harmful change in the environment.

2.1.1. Domestic Solid Waste

According to Tchobanoglous, Theisen, and Vigil (1993), domestic solid wastes comprise of all the wastes arising from human and animal activities that are normally discarded as useless or unwanted. Milter (2008), further explained it as any useless unwanted or discarded materials that are not liquid or gas. A great mixture of substances including fine dust, metal, textiles, glass, paper and cardboards, vegetable materials and plastic are classified as solid waste (Simmens, 2001). Waste is generated by domestic, commercial, industrial, healthcare, agricultural and mineral extraction activities and accumulates in streets and public places. The words “garbage”, “trash”, “refuses” and “rubbish” are used to refer to some forms of domestic solid waste”.

Zerbock (2003) opines that, domestic solid waste includes commercial, domestic and non-hazardous industrial waste such as; household organic trash, street sweepings, institutional garbage and construction wastes. The Ghana Innovation Market place (2009) popularly known as „GIM` defines domestic solid waste as neither wastewater discharges nor atmospheric emissions, arising from domestic, commercial, industrial, and institutional activities in an urban area. Domestic solid waste is any solid

material that comes from domestic, commercial, industrial, agricultural and demolition activities, which is regarded as unwanted by those who own it. Domestic solid waste, also known as garbage has no vast different from municipal waste. The State of the Environment Report for Uganda (NEMA, 2007; p.275) defines domestic solid waste as “organic and inorganic waste materials produced by households, commercial, institutional and industrial activities which are valueless in the sight of the initial user”. I found it prudent to adopt a definition and meaning of domestic solid waste that is in the context of the area of study. Domestic solid waste consist of any material generated from various human activities and which is normally disposed as useless and unwanted by the user, owner or originator.

Adu-Boahen, Atampugre, Antwi, Osman, Osei, Mensah, and Adu-Boahen, (2014) further stated that domestic solid waste includes, bulky household wastes, which can't be accommodated in the normal storage containers of households. For this reason they require special collection. In developed countries residential bulky wastes include household furniture and “white goods” appliances such as stoves, washing machines and refrigerators, mattresses and springs, rugs, TV sets, water heaters, tires, lawn mowers, auto parts, tree and brush debris, and so forth. Kumah, (2015) added that, other waste includes corrugated cardboard, and wood boxes, fiber, plastic and steel drums, loose and bundled paper (office, printouts), bundles of textiles and plastics, bales of corrugated and paper, furniture and equipment, and flat and wire banding. Industrial waste such as crates, cartons, pallets, skids; large and small steel, fiber, and plastic drums; bales and rolls of paper, plastics, and textiles; miscellaneous metal boxes, tubing, rod, punching, and skeleton; wire, rope, and metal banding; and paper, textile, and plastic streamers (Rohrschneider, 1988).

2.1.2 Waste Management

Waste management refers to the “collection, transportation, processing, recycling or disposal of waste materials” (Mugambwa & Kizito, 2009). It is appreciated that waste management practices differ from developed and developing countries, from urban and rural areas, and from residential and industrial producers. The volumes and types of waste in these different sources of waste justify the difference in the waste management practices. It therefore implies that the methods appropriate in one setting may be incompatible within another setting. It is imperative to take into consideration the context of the waste source, to arrive at an appropriate method. This category of waste comprises the solid wastes that originate from single and multi-family household units. These wastes are generated as a consequence of household activities such as cooking, cleaning, repairs, hobbies, redecoration, empty containers packaging, clothing, old books, paper and old furnishings.

2.1.3. Storage

Tchobanoglous, Theisen and Eliason, (1977) explain storage to mean where solid waste is stored before it is collected. It could be stored in a skip or dustbins and not thrown away indiscriminately. According to them, storage is of primary importance because of the aesthetic consideration. Storage is a system for keeping materials after they have been discarded and prior to collection and final disposal. Where on-site disposal systems are implemented, such as where people discard items directly into family pits, storage may not be necessary. In emergency situations, especially in the early stages, it is likely that the affected population will discard domestic waste on poorly defined heaps close to dwelling areas. If this is the case, improved disposal or storage facilities should be located where people are able to use them easily. Improved storage facilities include:

- i. small containers: household containers and plastic bins
- ii. larger containers: commercial bins and oil drums
- iii. shallow pits
- iv. commercial depots: walled or fenced in areas

2.1.4. The concept of Solid Waste Management

Municipal Solid Waste Management (MSWM) is major responsibility of local government. It is a complex task which requires appropriate organizational capacity and cooperation between numerous stakeholders in the private and public sectors (Schubeller, Wehrle & Christen, 1996). The concept of waste management has been defined differently by various scholars depending on their philosophical underpinnings and backgrounds. It can further be defines as, all activities that seek to minimize the health, environmental and aesthetic impacts of solid wastes. Kumah (2007; p.2) defines solid waste management as “the administration of activities that provide for the collection, source separation, storage, transportation, transfer, processing, treatment, and disposal of waste”. A much more comprehensive definition has been provided by Tchobanoglou *et al.*, (1993), which states that solid waste management is

“...that discipline associated with the control of generation, storage, collection, transfer and transport, processing and disposal of solid wastes in a manner that is in accord with the best principles of public health, economics, engineering, conservation, aesthetics and other environmental considerations and that is also responsive to public attitudes” (Tchobanoglous *et al.*, 1993: p.7).

This definition holds the solid waste management process, which includes wastes generation, storage, collection, transfer and transport, processing and disposal of the

wastes. Also included here is the way the wastes are handled until they are stored in storage containers.

Waste management is the collection, transport, processing or disposal, managing and monitoring of waste materials. The term usually relates to materials produced by human activity, and the process is generally undertaken to reduce their effect on health, the environment or aesthetics. The management of wastes treats all materials as a single class, whether solid, liquid, gaseous or radioactive substances, and try to reduce the harmful environmental impacts of each through different methods. It can rightly be said that waste management practices differ for developed and developing nations, for urban and rural areas, and for residential and industrial producers. Management for non-hazardous waste residential and institutional waste in metropolitan areas is usually the responsibility of local government authorities, while management for non-hazardous commercial and industrial waste is usually the responsibility of the generator (Kumah, 2015).

2.2. Generation of Domestic Solid Waste

The waste generated by a population is primarily a function of the people's consumption patterns and, thus, of their socio-economic characteristic. At the same time, waste generation is conditioned to an important degree by people's attitudes towards waste (Schübeleret *al.*, 1996). Waste generation encompasses those activities in which materials are identified as no longer being of value and are either thrown away or gathered together for disposal (Momoh & Oladebeye, 2010). Currently, world cities generate about 1.3 billion tonnes of solid waste per year. This volume is expected to increase to 2.2 billion tonnes by 2025. Waste generation rates will more than double over the next twenty years in lower income countries (Hoorweg & Bhada-Tata, 2012). Waste generation in sub-Saharan Africa is approximately 62

million tonnes per year. Per capita waste generation is generally low in this region, but spans a wide range, from 0.09 to 3.0 kg per person per day, with an average of 0.65 kg/capita/day. Although in low-income countries" solid waste generation rates average only 0.4 to 0.6 kg/person/day, as opposed to 0.7 to 1.8 kg/person/day in fully industrialized countries (Cointreau 1982: Hoornweg & Bhada-Tata, 2012).

Wastes generated can be classified into groups that pose similar risks to the environment and human health, either in the form of disposal or transporting. A number of criteria are usually employed to classify wastes generated into their sources, physical state, material composition and the level of risk associated with the waste substances. The Table 1 explains the forms and sources of waste generation (Adu- Boahen et al, 2014).



Table.1: Forms and sources of Waste Generated in Ghana

Source	Waste generators	Example of solid wastes
Residential	Single and multifamily Dwellings	Food wastes, paper, cardboard, plastics, textiles, leather, yard wastes, wood, glass, metals, ashes, special wastes (e.g. bulky items, consumer electronics, white goods, batteries, oil, tires), and household hazardous wastes
Commercial	Stores, hotels, restaurants, markets, office building	Paper, cardboard, plastics, wood, food wastes, glass, metals, special wastes, hazardous wastes
Construction and demolition	New construction sites, road repair, renovation sites, demolition of buildings	Wood waste, steel waste, concrete waste, dirt waste
Industrial	Light and heavy manufacturing, fabrication, construction sites, power and chemical plants	packaging, food wastes, construction and demolition materials, hazardous wastes, ashes, special wastes, scrap metals
Institutional	Schools, government center, hospitals, Prisons	Paper, cardboard, plastics, wood, food wastes, glass, metals, special wastes, hazardous wastes
Agricultural	Crops, orchards, vineyards, dairies, feedlots, farms	Spoilt food wastes, agricultural wastes, hazardous wastes (e.g. pesticides).
Processing (manufacturing ,etc)	Heavy and light Manufacturing, refineries, chemical plants, power plants, mineral extraction and processing	Industrial process wastes, scrap materials, off specification products, slay, tailings

Sources: Adu-Boahen, Atampugre, Antwi, Osman, Osei, Mensah and Adu-Boahen, (2014)

Adu-Boahen et al. (2014) further classified some major solid waste as: Municipal waste, commercial waste, garbage or rubbish, institutional waste, ashes, bulky wastes, street sweeping, dead animals, construction and demolition wastes, industrial wastes, hazardous wastes, sewage wastes, biomedical/hospital waste and plastics among others.

2.2.1. Municipal Waste

Cointreau-Levine and Coad (2000: p.4) take municipal waste to refer “to wastes from domestic, commercial, institutional, municipal and industrial sources, but excluding excreta, except when it is mixed with solid waste”. It is however necessary to note that in developing countries, many a times, it becomes difficult or even impractical to put a line between excreta and solid waste. In many instances, solid waste mixes with excreta to the extent of being potentially hazardous to human health. Municipal waste includes waste resulting from municipal activities and services such as street wastes, dead animals, market wastes and abandoned vehicles. However, the term is commonly applied in a wider sense to incorporate domestic wastes and commercial wastes.

2.2.2. Commercial Waste

These includes solid wastes that originate in offices, wholesale and retail stores, restaurants, hotels, markets, warehouses and other commercial establishments. Some of these wastes are further classified as garbage and others as rubbish (Adu-Boahen et al., 2014).

2.2.3. Garbage or Rubbish

Garbage is the term applied to animal and vegetable waste resulting from the handling, storage, sale, cooking and serving food. Such wastes contain putrescible

organic matter, which produces strong odours and therefore attracts rats, flies and other vermin. It requires immediate attention in its storage, handling and disposal. Rubbish is general term applied to solid wastes originating in households, commercial establishments and institutions, excluding garbage and ashes (Adu-Boahen et al., 2014).

2.2.4. Institutional Waste

Institutional wastes come from institutions such as schools, universities, hospitals and research institutes. It includes wastes, which are classified as garbage and rubbish, as well as wastes, which are considered to be hazardous to public health and to the environment (Adu-Boahen et al., 2014). Other waste can also be generated during clean-up exercise.

2.2.5. Construction and Demolition Wastes

Construction and demolition wastes are the waste materials generated by the construction, refurbishment, repair and demolition of houses, commercial buildings and other structures. It mainly consists of earth, stones, concrete, bricks, lumber, roofing materials, plumbing materials, heating systems and electrical wires and parts of general municipal waste stream, but when generated in large amounts at building and demolition sites, it is generally removed by contractors for filling low lying areas and by urban local bodies for disposal at landfills (Adu-Boahen et al., 2014)

While retrievable items such as bricks, wood metal are recycled, the concrete and masonry waste accounting for 50% of the waste from construction and demolition activities, are not been currently recycled in India. Concrete and masonry waste can be recycled by sorting, crushing and sieving into recycled aggregates. These recycled aggregates can be used to make concrete for road construction and building material (Adu-Boahen et al., 2014).

This category of waste is complex due to the different types of building materials being used but in general may comprise of major components like Cement concrete, Bricks, Cement plaster, Steel (from RCC, door/ window frames, roofing support etc., Rubble, Stone (marble, granite, sand stone), Timber/wood and a few minor components like Conduits (iron, plastic), Pipes (GI, iron, plastic), Electrical fixtures (copper/aluminium wiring, wooden baton, Bakelite, wire insulation, plastic switches), Panels (wooden, laminated), Others (Glazed tiles, glass panels) (Adu-Boahen et al., 2014).

2.2.6. Industrial Wastes

Adu-Boahen et al. (2014) opines that the discarded solid material of manufacturing processes and industrial operations are classified as industrial waste. They cover a vast range of substances which are unique to each industry. For this reason they are considered separately from municipal wastes. However, solid wastes from small industrial plants and ash from power plants are frequently disposed off at municipal landfills.

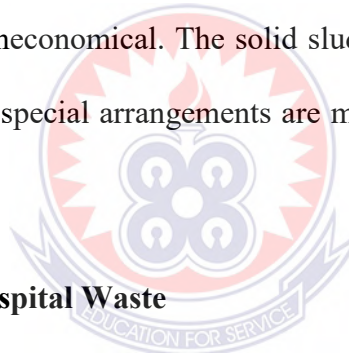
The major generators in the industrial solid wastes are the thermal power plants producing coal ash, the integrated Iron and steel mills producing blast furnace slag and steel melting slag, non-ferrous industries like aluminium, zinc, and copper producing red mud and tailings, sugar industries generating press mud, pulp and paper industries producing lime and fertilizer and allied industries producing gypsum. Adu-Boahen et al. (2014) further defined hazardous wastes as wastes from industrial, institutional or consumer, which because of their physical, chemical or biological characteristics are potentially dangerous to human and the environment. In some cases although the active agents may be liquid or gaseous, they are classified as solid waste because they are confined in solid containers.

Typical examples are solvents, paints and pesticides whose spent containers are frequently mixed with municipal wastes and become part of urban waste stream.

2.2.7. Sewage Wastes

The solid by-products of sewage treatment are classified as sewage wastes. They are mostly organic and derive from the treatment of organic sludge from both the raw and treated sewage. The inorganic fraction of the raw sewage such as grit is separated at a preliminary stage of treatment, but because it entrains putrescible organic matter which may contain pathogens, must be buried/ disposed off without delay.

The bulk of treated dewatered sludge is useful as a soil conditioner but invariably its use for this purpose is uneconomical. The solid sludge therefore enters the stream of municipal wastes unless special arrangements are made for its disposal (Adu-Boahen et al., 2014).



2.2.8. Biomedical or Hospital Waste

Hospital waste is generated during the diagnosis, treatment, or immunization of human beings or animals or in research activities in these fields or in the production or testing of biological. It may include wastes like sharps, soiled waste, disposables, anatomical waste, cultures, discarded medicines, chemical wastes, etc.

These are in the form of disposable syringes, swabs, bandages, body fluids, human excreta, etc. This waste is highly infectious and can be a serious threat to human health if not managed in a scientific and discriminate manner. It has been roughly estimated that of the 4 kg of waste generated in a hospital at least 1 kg would be infectious (Adu-Boahen et al., 2014)

Wastes can also be classified into other categories such as; Human anatomical waste (tissues, organs, body parts etc.) Animal waste, microbiology and biotechnology waste, such as, laboratory cultures, microorganisms, human and animal cell cultures, toxins etc and waste sharps such as, hypodermic needles, syringes, scalpels, broken glass etc , discarded medicines and cyto-toxic drugs, soiled waste, such as dressings, bandages, plaster casts, material contaminated with blood etc, solid waste (disposal items like tubes, catheters etc., excluding sharps) . Liquid waste generated from any of the infected areas, incineration ash and chemical waste

Surveys carried out by various agencies show that the health care establishments in India are not giving due attention to their waste management. After the notification of the Bio-medical Waste (Handling and Management), these establishments are slowly streamlining the process of waste segregation, collection, treatment and disposal. Many of the larger hospitals have either installed the treatment facilities or are in the process of doing so (Adu-Boahen et al., 2014).

2.2.9. Plastics

Adu-Boahen et al. (2014) explains that plastics, due to their versatility in use and impact on environment can be grouped under a different category of solid waste. Plastic with its exclusive qualities of being light yet strong and economical, has invaded every aspect of our day-to-day life.

It has many advantages viz., durable, light, easy to mould, and can be adapted to different user requirements. Once hailed as a „wonder material“, plastic is now a serious worldwide environmental and health concern, essentially due to its non-biodegradable nature. Plastics are use in all sectors of most economy-infrastructure, construction, agriculture, consumer goods, telecommunications, and packaging. The sources of generation of waste plastics are given in Table 2.

Table 2: Source of generation of waste plastics

Source	Examples of Plastic Waste
Household	Carry bags, Bottles, Containers, Trash bags
Health and Medicare	Disposable syringes, Glucose bottles, Blood and uro bags Intravenous tubes, Catheters, Surgical gloves
Hotel and Catering	Packaging items, Mineral water bottles, Plastic plates, glasses, spoons
Air/Rail Travel	Mineral water bottles, Plastic plates, glasses, spoons, Plastic bags

Sources: Adu-Boahen, Atampugre, Antwi, Osman, Osei, Mensah and Adu-Boahen (2014)

Kumah, (2015) opines that, there is a countrywide network for the collection of plastic waste through rag pickers, waste collectors and waste dealers and recycling enterprises have sprung all over our country over the last decade. More than 50% of the plastic waste generated in most countries are recycled and used in the manufacture of various plastic products. Impacts of plastics on the environment are extremely wide ranging. These include, careless disposal of plastic bags chokes drains, it blocks the porosity of the soil, it causes problems for groundwater recharge, plastic disturbs the soil micro and macro activity, once ingested, can kill animals and they contaminate foodstuffs due to leaching of toxic dyes and transfer of pathogens.

Major plastics approximately 60-80% of the plastic waste generated in many countries are collected and segregated to be recycled. The rest remains strewn on the ground, littered around in open drains, or in unmanaged garbage dumps. Though only a small percentage lies strewn, it is this portion that is concern as it causes extensive damage to the environment (Kumah, 2015).

2.3 Solid Waste disposal methods in developing Countries

According to United Nation Conference on Human Settlement report (UNCHS, 1996) opines that, one third to one half of solid waste generated within most cities in low

and middle income countries, (including Ghana) are not collected. The waste usually ends up on illegal dumps on street, open spaces and waste lands. Malombe (1993) argues that irregular services rendered to producers (thus households) of refuse by Municipal Councils compel them to dispose-off refuse indiscriminately. His argument is very pertinent in Ghana where waste management services are largely inefficient and ineffective. It is estimated that about 83% of the population dump their refuse in either authorized or unauthorized sites in their neighbourhood, and due to poor handling of solid waste, unsanitary conditions are created (Benneh, Songsore, Nabila, Amuzu, Tutu & Yaugyuorn, 1993). Onibokum and Kumuyi (1999) explained that efficient and effective service delivery depends on managerial and organizational efficiency, accountability, legitimacy, response to the public, transparency in decision making and pluralism of policy making and choice.

In the 1980's, a number of cities in Africa developed their municipal solid waste management strategies and programmes by the government agencies with no considerable public involvement. The common setbacks that confronted most of the cities were managerial and organizational inefficiencies and thus lack distribution of responsibility for different activities of waste management (Onibokum & Kumuyi, 1999). The consequences of waste disposal on the environment and health, and inappropriate disposal of waste have had major adverse impact on the natural environment and the lives of the people. The challenges associated with landfill include odour, pests and ground and surface water contamination from leachate. In the long run, landfills reach capacity and constructing a new landfill is costly and time consuming process. According to Karley (1993) the health status of a community is affected by its state of environment. Poor sanitary conditions reduce the protection and preservation of human health. When waste is improperly dumped into the

environment, it can lead to the destruction of the ozone layer and may cause disease such as cancer. Air pollution can often lead to the formation of acidic rain which is dangerous to crop life since it hastens the removal of soil fertility from the surface of the ground. It also affects drainage, when solid wastes are dumped in drainage channels and gutters they block the flow of the sewerage.

This may cause flooding which destroys human lives and properties. At the same time, wastes also affect soil drainage which hinders the growing of crops. Littering devalues the land around it and this has impacts on tourism, businesses and residents alike. Most at times, it causes harm to tourist industries of that particular area or country. Improper disposing of waste prevents resources from being recycled example, plastics, metals and paper, which affects the health and dangerous to aquatic life. It can also lead to high mortality of fish stock as well as diseases to man such as dysentery and cholera. When waste like broken bottles are dumped anywhere, they spread diseases because water collect in them and they become breeding ground for mosquitoes and other vectors. Waste like human excreta cause diseases when poorly dumped as the flies will carry the germ from the excreta to food and water.

Waste disposal data are the most difficult to collect. Many countries do not collect waste disposal data at the national level, making comparisons across income levels and regions difficult. Furthermore, in cases where data is available, the methodology of how disposal is calculated and the definitions used for each of the categories is often either not known or not consistent (Hoornweg & Bhada-Tata, 2012). In developing countries the prevalent methods of solid waste disposal is through uncontrolled dumping or burning on open ground or city streets (UNEP, 1994;

Cointreau-Levine, 1997). This often results in more pollution and loss of salvageable economic value (UNEP, 1994; Beede & Bloom, 1995 & Bartone, 2000).

According to Tchobanoglous *et al.*, (1993:pp. 17-18), the most commonly recognized methods for the final disposal of solid wastes were:

- dumping on land, canyons and mining pits
- dumping in water
- ploughing into the soil
- feeding to hogs
- reduction and incineration

Some of these unwholesome practices of solid waste identified during the early disposal practices still exist in cities, towns and villages today. Indiscriminate dumping on opened land and dumping in gutters particularly are clearly evident in towns and cities. 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; high seasonal or year-round rainfall would only compound these problems, presenting additional challenges with insect populations and conditions conducive to disease. It is estimated that about 83% of the population dump their refuse in either authorized or unauthorized sites in their neighbourhood, and due to weak capacity to handle solid waste, unsanitary conditions are created (Tchobanoglous *et al.*, 1993).

Burning of dumps is also common in peri-urban and rural communities in Ghana and in many other less developed countries. A study carried out in Ado -Akiti in Nigeria by Momoh and Oladebeye (2010) showed that, the methods of solid waste disposal include dumping of waste in gutters, drains, by roadside, unauthorized dumping sites and stream channels during raining season and burning of wastes on unapproved

dumping sites during the dry season. Another study conducted in Nairobi, Kenya by Muniafu and Otiato (2010) also revealed that, the end disposal of Nairobi's waste is open dumping at a site located at Dandora, in the Eastland's section of the city although there is a minimal amount of disposal by open burning and incineration, the ash also ends up in "Dandora" open dumpsite. This has gone to confirm that the practices of solid waste disposal in the 1950s still exist today. In the contemporary era, the methods of managing solid waste include source reduction, sanitary landfills, composting, recycling, and incineration (Denison & Ruston, 1990 cited in Puopiel, 2010).

2.3.1. Source Reduction

Source reduction, also known as waste prevention, means reducing waste at the source. It can take many different forms, including reusing or donating items, buying in bulk, reducing packaging, redesigning products, and reducing toxicity. Kreith (1994), source reduction focuses on reducing the volume and /or toxicity of waste generated. Hoornweg and Bhada-Tata (2012) gave an elaborated definition when they noted that, waste or source reduction initiatives (including prevention, minimization, and reuse) seek to reduce the quantity of waste at generation points by redesigning products or changing patterns of production and consumption. It is agreed that, source separation and resource recovery is an important method in waste management. This is because there is nothing like waste on this earth. Examples of possible reduction at the consumption level include reuse of containers (including bags), better buying habits and cutting down on the use of disposable products and packaging.

Waste Prevention also known as *source reduction* is the designs, manufacture, purchase, or use of materials and products to reduce the amount and/or toxicity of discarded waste.

Waste prevention also means, in simple terms, “reducing waste by not producing it” (USEPA, 2002: p.4). USEPA asserts that since it reduces the amount of waste that a community must manage, waste prevention is the preferred municipal solid waste management technique. According to USEPA (1998: p.2), source reduction involves reuse activities and “has come to be recognized as a commonsense approach with significant potential to use resources efficiently, save money, and reduce waste” and because of the various advantages it presents, many states in the United States of America (USA) have increasingly engaged in innovative ventures towards solid waste prevention. Grass cycling and backyard composting are taken to be “forms of source reduction or waste prevention because the materials are completely diverted from the disposal facilities and require no municipal management or transportation” (USEPA, 2002).

2.3.2. Recycling and Materials Recovery

Recycling is the first of the three “recovery” processes in the waste hierarchy. Recycling recovers materials, by preventing them from being disposed of, and makes them into new goods. This can involve turning the old materials into a new version of the same thing, or materials can be recycled into something completely different. For example, used glass bottle can be recycled into new bottles, or they can recycle into something different, such as materials used in road construction. According to Momoh and Oladebeye (2010: p.1) recycling has been viewed as a veritable tool in minimizing the amount of household solid wastes that enter the dump sites. It also

provides the needed raw materials for industries. According to them, it has been established that, it is the best, efficient and effective method of solid waste management system.

Recycling involves the reuse of materials that are potential waste but are rather turned into valuable resources. The most important advantage with recycling is that it reduces the production of greenhouse gases since there is diversion of the waste from the landfills.

Recycling also reduces the use of new resources, in a way contributing to sustainable development. Materials like paper, glass, steel, plastic, and aluminium can be recycled such that instead of disposing them of, they can be regained and thereby reused.

This functional element of the solid waste management process according to Tchobanoglous *et al.*, (1993), involves the recovery of separated materials, the separation and processing of solid wastes components, and the transformation of the solid wastes that occur primarily in locations away from the source of generation. In recent years there has been a surge of interest in waste recovery and recycling in both the developing and developed world. This functional element of the solid waste management process according to Tchobanoglous *et al.*, (1993), involves the recovery of separated materials, the separation and processing of solid wastes components, and the transformation of the solid wastes that occur primarily in locations away from the source of generation. The methods used for recovery of wastes materials that have been separated at source include curbside collection, drop-off and buy back centers. The separation and processing of these wastes usually occur at recovery centers, transfer stations, combustion facilities, and disposal sites.

Developing countries are still grappling with the basic task of collecting garbage, recycling of waste is carried out in direct response to industrial demand for materials to use as raw materials; that is what is being recycled has some commercial sale value (Cointreau & de Kadt, 1991). An important feature of waste recovery and recycling in low income, developing countries is the involvement of the informal sector. Studies reveal that this sector is mainly engaged in the recovery and re-sale of most of the recyclables and is highly labour intensive. But notwithstanding their significant contribution to waste recovery and recycling process, their role in urban waste management is not recognized and their earnings continue to be meager (Cointreau & de Kadt, 1991). Waste recovery and recycling processes in poorer developing countries are based on market considerations, in the sense that it helps to create economic value out of waste. In the resource poor developing countries, this has a positive impact on the economy. There is also the added benefit of providing a source of livelihood to many economically deprived persons who would otherwise be unemployed.

2.3.3. Aerobic Composting and Anaerobic Digestion

Composting process uses microorganisms to degrade the organic content of the waste. Aerobic composting proceeds at a higher rate and converts the heterogeneous organic waste materials into homogeneous and stable humus (Centre for Environment and Development, (CED) 2003). UNEP (2009) has also defined composting as a biological decomposition of biodegradable solid waste under controlled predominantly aerobic conditions to a state that is sufficiently stable for nuisance-free storage and handling and is satisfactorily matured for safe use in agriculture. Composting with windrows or enclosed vessels is intended to be an aerobic (with

oxygen) operation that avoids the formation of methane associated with anaerobic conditions (without oxygen).

When using an anaerobic digestion process, organic waste is treated in an enclosed vessel. Often associated with wastewater treatment facilities, anaerobic digestion will generate methane that can either be flared or used to generate heat and/or electricity. Generally speaking, composting is less complex, more forgiving, and less costly than anaerobic digestion. Methane is an intended by-product of anaerobic digestion and can be collected and combusted. Experience from many jurisdictions emphasizes that, composting source separates organics significantly and reduces contamination of the finished compost, rather than processing mixed MSW with front-end or back-end separation (Hoornweg & Bhada-Tata, 2012).

According to Zerbock (2003), a low-technology approach to waste reduction is composting. He further says that in developing countries, the average city's municipal waste stream is over 50% organic material. A studies in Bandung, Indonesia and Colombo, Sri Lanka have found residential waste composed of 78% and 81% compostable material, and market waste 89% and 90% compostable, respectively (Cointreau, 1982). Still, 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 (Cointreau, 1982).

Zurbrugg (2003), adds that many large and small composting schemes have failed because not enough attention was given to the marketing and the quality of the product. Current promising developments can be observed in Bangladesh where local

government authorities as well as the Ministry of Agriculture is supporting and promoting composting and the use of compost in agriculture. Composting activities are becoming more and more common as well as pilot plants for biomethanation of organic wastes, however the challenge to establish a market and demand for the compost product has yet to be tackled (Zurbrugg, 2009).

USEPA, (2002; p.4) opines that, “the controlled aerobic biological decomposition of organic matter, such as food scraps and plant matter, into humus- a soil-like material. Compost acts as a natural fertilizer by providing nutrients to the soil, increasing beneficial soil organisms, and suppressing certain plant diseases”. This implies that the need for chemical fertilizers will be reduced and composting would promote the reduction of greenhouse emissions from solid waste.

2.3.4. Incineration

In the views of Hoornweg and Bhada-Tata, (2012) incineration of waste (with energy recovery) can reduce the volume of disposed waste by up to 90%. These high volume reductions are seen only in waste streams with very high amounts of packaging materials, paper, cardboard, plastics and horticultural waste. Recovering the energy value embedded in waste prior to final disposal is considered preferable to direct land filling - assuming pollution control requirements and costs are adequately addressed. Typically, incineration without energy recovery (or non-autogenic combustion, the need to regularly add fuel) is not a preferred option due to costs and pollution. Open-burning of waste is particularly discouraged due to severe air pollution associated with low temperature combustion. Incinerators have the capacity to reduce the volume of waste drastically, up to nine fold than any other method (Kreith, 1994). According to him incineration can also recover useful energy either in the form of steam or electricity. He recognized that the main constraints of incineration are high cost of

operation, relatively high degree of sophistication needed to operate them safely and economically as well as the tendency to pollute the environment through emissions of carbon dioxide. Nonetheless, it must be noted that due to the composition of wastes in many developing countries (high organic and moisture content), and the high investment and operating costs of the sophisticated technology, incineration is rarely a viable option (Schübeler *et al.*, 1996).

Combustion is the controlled burning of waste in a bid to reduce the volume that has to go to landfills, and in some cases to generate electricity. Combustion can be employed for waste that cannot be prevented or recycled. There is also an element here of providing safer disposal methods for example through “improving the design and management of incinerators and landfills” (USEPA, 1993; p.2). Although “the combustion process can generate toxic air emissions, these can be controlled by installing control equipment such as acid gas scrubbers and fabric filters in combustors” (USEPA, 2002; p.4).

2.3.5. Landfill

The placement of solid waste in landfills is the oldest and definitely the most prevalent form of ultimate waste disposal (Zerbock, 2003). The waste or residue from other processes should be sent to a disposal site. Landfills are common final disposal site for waste and should be engineered and operated to protect the environment and public health. Proper landfilling is often lacking, especially in developing countries (Hoorweg & Bhada-Tata, 2012). An argument put forward by Zerbock (2003) suggests that, “landfills” are nothing more than open, sometimes controlled dumps. According to him the difference between landfills and dumps is the level of engineering, planning, and administration involved. Open dumps are characterized by

the lack of engineering measures, no leachate management, no consideration of landfill gas management, and few, if any, operational measures such as registration of users, control of the number of “tipping fronts” or compaction of waste (Zerbock, 2003: p.16).

Disposing of waste in a landfill involves burying the waste, and this remains a common practice in most countries. Landfills were often established in abandoned or unused quarries, mining voids or borrow pits. The open dump approach is the primitive stage of landfill development and remains the predominant waste disposal option in most of the countries (Johannessen & Boyer, 1999). A default strategy for municipal solid waste management, open dumps involve indiscriminate disposal of waste and limited measures to control operations, including those related to the environmental effects of landfills. As this is not an upgrading solution to landfill waste, the open dump approach will be mentioned, but not discussed further in this report. A properly designed and well-managed landfill can be hygienic and relatively inexpensive method of disposing of waste materials. At the most basic level landfill involves placing waste in a hole in the ground and covering it with soil. Today, the engineering of a modern landfill is a complex process, typically involving lining and capping individual “cells” or compartments into which waste is compacted and covered to prevent the escape of polluting liquid or gases. In newer landfill sites, systems are installed to capture and removed the gases and liquids produced by the rotting rubbish. Hoornweg and Bhada-Tata, (2012) have stated that, landfilling usually progresses from open-dumping, controlled dumping, controlled landfilling, to sanitary landfilling.

2.3.6. Waste collection

People's attitudes influence not only the characteristics of waste generation and disposal, but also the effective demand for waste collection services, in other words, their interest in and willingness to pay for collection services (Schübeler *et al.*, 1996). In most industrialized countries, waste collection services have expanded to the extent that over 90 percent of the population (and 100 per cent of the urban population) have access to waste collection. This is not the case in developing countries (UNEP, 1991). The failure to provide adequate collection services poses a serious threat to human health in many developing countries (WHO, 1992). In most developing countries, urban SWM comes under the auspices of the local municipal bodies who are the main formal stakeholders responsible for the collection, removal and disposal of garbage from public places and for the maintenance of dumping grounds. Waste collection is the collection of solid waste from point of production (residential, industrial commercial, institutional) to the point of treatment or disposal (Hoornweg & Bhada-Tata, 2012). According to them, MSW is collected in several ways which include;

1. House-to-House: Waste collectors visit each individual house to collect garbage. The user generally pays a fee for this service.
2. Community Bins: Users bring their garbage to community bins that are placed at fixed points in a neighbourhood or locality. MSW is picked up by the municipality, or its designate, according to a set schedule.
3. Kerbside Pick-Up: Users leave their garbage directly outside their homes according to a garbage pick-up schedule set with the local authorities (secondary house-to house collectors not typical).
4. Self-Delivered: Generators deliver the waste directly to disposal sites or transfer stations, or hire third-party operators (or the municipality).

5. Contracted or Delegated Service: Businesses hire firms (or municipality with municipal facilities) who arrange collection schedules and charges with customers. Municipalities often license private operators and may designate collection areas to encourage collection efficiencies.

The percentage of Municipal Solid Waste (MSW) collected varies by national income and by region. Higher income countries tend to have higher collection efficiency although less of the solid waste management budget goes towards collection. In low-income countries, collection services make up the bulk of a municipality's SWM budget (as high as 80 to 90% in many cases), yet collection rates tend to be much lower, leading to lower collection frequency and efficiency typically one to two thirds of the solid waste generated is not collected (World Resources Institute (WRI), 1996; Hoornweg & Bhada-Tata, 2012). In high income countries, although collection costs can represent less than 10% of a municipality's budget, collection rates are usually higher than 90% on average and collection methods tend to be mechanized, efficient, and frequent. While total collection budgets are higher, they are proportionally lower as other budget items increase (Hoornweg & Bhada-Tata, 2012).

Transport of waste from households, factories, and other generation sites is a growing problem. The rapid urbanization of much of the developing world leaves little space 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 disease, odour and frequent fires (in some cases) would ideally be located on suitable land away from the most densely populated areas. These areas are becoming harder to find as population urbanize and municipal traffic increases; the transport of waste becomes longer and more time-consuming, therefore more expensive and less efficient. Many cities employ neighbourhood-level collection points, where households bear the

responsibility for transport to the transfer point and the municipal or private enterprise transports the waste from there to the ultimate disposal location. The waste content in developing countries is highly organic and susceptible to rapid decay, the emphasis of the SWM process in these countries should be on the collection process. Studies have shown that expensive collection trucks and compactors developed and used in industrialized countries are difficult to operate and maintain, and are unsuitable for narrow lanes, the high traffic density and the nature of waste in developing countries (Begum: online). Transport also depends on operational vehicles, and frequent breakdowns coupled with shortage of parts can immobilize collection vehicles for extended periods of time. Hoornweg & Bhada-Tata, (2012) estimates that in cities in West Africa, up to 70% of collection or transfer vehicles may be out of action at any one time. There are others methods of disposal.

2.4. The Principles of Waste Management

Schubeller *et al.*, (1996) are of the view that, waste management should be approached from the perspective of the entire cycle of material use, which includes production, distribution and consumption as well as waste collection and disposal.

Whilst immediate priority must be given to effective collection and disposal, waste reduction and recycling should be pursued as equally important, longer-term objectives. They further identified three principles that should guide a sustainable and integrated solid waste management programme. According to their scheme, such a programme should:

1. minimise waste generation
2. maximise waste recycling and reuse, and
3. ensure the safe and environmentally sound disposal of waste.

Solid waste management goals cannot be achieved through isolated or sectoral approaches. Sustainable waste management depends on the overall effectiveness and efficiency of urban management, and the capacity of responsible municipal authorities (Schubeller *et al.*, 1996; p.19).

2.4.1. Solid Waste Management Practices in Developing Countries

Developing countries need socially desirable low-cost, labour-intensive municipal solid waste management solutions that create income opportunities that reduce poverty, especially among the weaker sections of the society. The physical characteristics of cities in developing and industrialized countries differ significantly. Third World cities have large areas with substandard conditions like slums, narrow and unpaved streets. Many immigrants who cannot afford to purchase land occupy vacant land and become squatters. Most of the areas that lack refuse collection service are slum and squatter settlements as local authorities decline to provide refuse collection to squatters as they do not pay taxes and also due to poor road conditions.

Municipal Solid Waste Management (MSWM) is major responsibility of local government. It is a complex task which requires appropriate organizational capacity and cooperation between the numerous stakeholders in the private and public sectors. Although it is essential to public health and environmental protection, solid waste management in most cities of developing countries is highly unsatisfactory (Schübeler *et al.*, 1996). Municipal solid waste (MSW) management has become a major issue of concern for many under-developed nations, however, especially as populations increase. Since the early 1970s SWM in developing countries has received increasing attention from researchers and policy makers concerned to establish a sustainable management system (Gerlagh, Goossen-van de Geijn, Fokkema, & Vereijken, 1999).

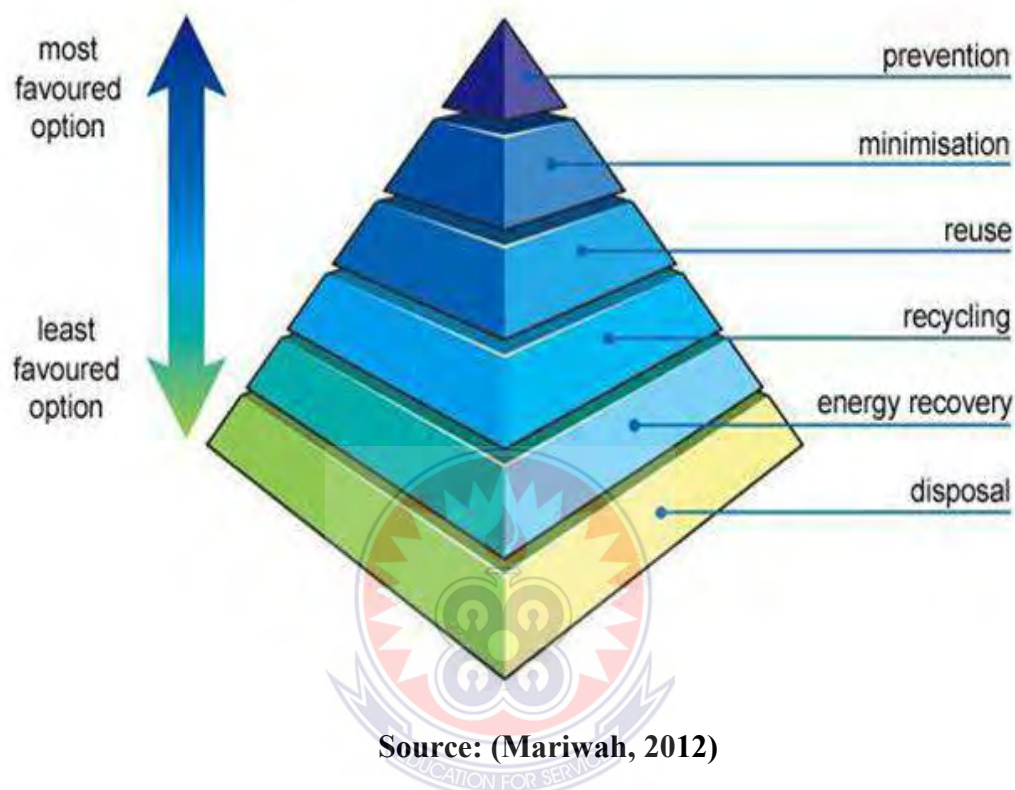
The problem is compounded as many nations continue to urbanize rapidly (Thomas-Hope, 1998). Although developing nations do spend between 20 and 40% of municipal revenues on waste management (Schübeler et al., 1996; Thomas-Hope 1998; Bartone 2000), this is often unable to keep pace with the scope of the problem. In fact, when the governments of African countries were asked by the World Health Organization to prioritize their environmental health concerns, the results revealed that while solid waste was identified as the second most important problem (after water quality), few people who are the urban populations have access to “proper and regular garbage removal. Experiences and lessons can be drawn from the different management measures adapted across the world – based on three perspectives: waste generation, collection and disposal, recovery and recycling.

Solid waste management is the collection, transportation, processing, recycling or disposal and monitoring of waste materials. The term usually relates to materials produced by human activity, and is generally undertaken to reduce their effect on health, the environment or aesthetics. Waste management is also carried out to recover resources from it and it involves solid, liquid, gaseous or radioactive substances with different methods and fields of expertise for each.

The United States Environmental Protection Agency (USEPA) (1993, 1994) outlines and explains three main components in an integrated municipal waste management strategy- that is; waste prevention, recycling including composting and, combustion. In a review of these components, USEPA (2002: p.4), categorically introduces and defines five main activities (in a hierarchy) classified under integrated solid waste management (waste prevention, recycling, composting, combustion and landfilling), and the similarity is noticeable between the former components and the later

activities. The Figure 4 (pyramid) below further explains the disposal methods of domestic solid waste.

Figure 4: Ideal waste management pyramid



2.5. Attitudes towards Domestic Solid Waste Management

Attitude about waste management is the principle or perception that people have on how they deal with the waste that they produced. This attitude can predict the potential behaviour that residents want to perform. According to Kumar and Nandini (2013), attitude is a hypothetical construct that represents an individual's like or dislike for an item. People can also be „Ambivalent Towards“ a target, meaning that they simultaneously possess a positive and a negative bias towards the attitude in question. In his opinion, Kendie, (1999: p.4) maintains that, the recent upsurge in waste disposal problems stems from the fact that, „...attitudes and perceptions towards

wastes and the rating of waste disposal issues in peoples' minds and in the scheme of official development plans have not been adequately considered".

There has been a tendency to concentrate on the design of waste management technologies and how to apply them in context. According to him, the waste disposal practices of the authorities have also encouraged improper attitudes regarding waste management programmes and payments towards improved waste disposal services (Kendie, 1999).

Attitudes of residents can be critical in either ameliorating or exacerbating the waste situation. Schubeller *et al.*, (1996) throw more light on this issue when they posit that "people's attitudes influence not only the characteristics of waste generation, but also the effective demand for waste collection services, in other words, their interest in and willingness to pay for collection services" (Schubeller *et al.*, 1996: p.35).

Environmental knowledge and attitudes of households should be examined in order to understand their behaviour and how to encourage the waste separation and recycle at waste generating sources. Knowledge of people on environment in general and waste management in particular has long been recognized among the most crucial factors influencing household waste disposal (Burn & Scamp, 1986; Nixon & Saphores, 2009). The erroneous perception about solid waste in Ghana has pushed us much deeper into the abyss we find ourselves currently. While other countries like Singapore, Philippines, Sweden and others are making money out of solid waste, Ghanaians regard all forms of solid waste to be fated for the landfill site. Consequently, most waste management companies, which are supposed to benefit from converting useful resources in our solid waste stream into valuable products, have just become waste collection companies. They only collect all the solid waste

generated to the landfill site. However, solid waste management goes way beyond just collecting the solid waste generated to a landfill site (Monney, 2014).

Belief plays an important role in pro-environmental behaviour (Cary, 1993). In the words of Monney, (2014), dumping of rubbish indiscriminately is one of the extreme bad habits of Ghanaians toward cleanliness. It is very easy for people to create a dumping ground right beside their home or residence, due to lack of an official dumping ground, or to prevent them from walking a distance. Many gutters in the cities and towns are choked due to people making them dumping sites, some people deliberately, especially those who sell by the road side, sweep and dump their rubbish into nearby gutters. This always results in frequent flooding in many parts of Accra during the rainy season. Traders and street hawkers, who accumulate rubbish at the end of the day, dump their rubbish in nearby bushes, eventually making it a dumping site for all the traders, and even residents around. Littering of the environment is an act almost every Ghanaian fall culprit to. The reckless littering attitude among the populace in the country is inimical to improving the current environmental sanitation situation across the country. Due to blatant disregard for the environment, people litter the environment indiscriminately. It is not uncommon for one to see passengers throwing waste onto the streets while in a vehicle or people discarding waste shamelessly at lorry stations and other public places (Monney, 2014).

The sachet water, which is meant to give Ghanaians a safe drinking water on the street, is gradually turning the whole city of Accra into a dumping ground. Moreover, the black polythene bag used for selling, popularly known as the “take away,” also accounts for the immense nature of litter on the environment. It has become the habit of many people to litter the environment with these rubber sachets and black polythene bags when they are through with its purpose. Irrespective of where they are,

they litter the environment even when they are in buses, instead of leaving them in the buses for the drivers to clear them after work. The nature of littering the street is evident when wind blows, as these polythene bags will be flying in the air, with one not knowing where they are coming from. The question, however, remains whether residents in Ghana and Senya, have knowledge of the effects of indiscriminate dumping of waste and what prevents them from changing their attitudes.

Municipal Solid Waste Management (MSWM) is a major responsibility of local government. It is a complex task which requires appropriate organizational capacity and cooperation between numerous stakeholders in the private and public sectors (Schubeller et al., 1996). The concept of waste management has been defined differently by various scholars depending on their philosophical underpinnings and backgrounds. Furthermore, waste can be defined as all activities that seek to minimize the health, environmental and aesthetic impacts of solid wastes. Kumah (2007; p. 2) defines solid waste management as “the administration of activities that provide for the collection, source separation, storage, transportation, transfer, processing, treatment, and disposal of waste”. A much more comprehensive definition has been provided by Tchobanoglous *et al.*, (1993), which states that solid waste management is;

“...the discipline associated with the control of generation, storage, collection, transfer and transport, processing and disposal of solid wastes in a manner that is in accord with the best principles of public health, economics, engineering, conservation, aesthetics and other environmental considerations and that is also responsive to public attitudes” (Tchobanoglous *et al.*, 1993; p.7).

This definition holds the solid waste management process, which includes wastes generation, storage, collection, transfer and transport, processing and disposal of the wastes. Also included here is the way the wastes are handled until they are stored in storage containers.

Waste management is the collection, transport, processing or disposal, managing and monitoring of waste materials. The term usually relates to materials produced by human activity, and the process is generally undertaken to reduce their effect on health, the environment or aesthetics. The management of wastes treats all materials as a single class, whether solid, liquid, gaseous or radioactive substances, and try to reduce the harmful environmental impacts of each through different methods. It can rightly be said that waste management practices differ from developed and developing nations, from urban and rural areas, and from residential and industrial producers. Management for non-hazardous waste residential and institutional waste in metropolitan areas is usually the responsibility of local government authorities, while management for non-hazardous commercial and industrial waste is usually the responsibility of the generator.

2.5.1. Waste Management Practices

There are several factors that have facilitated increase in the volume of solid waste generated. One of the factors that have led to increased solid waste generation is rapid urbanization (UNEP, 2007). Urbanization comes with expansion of towns which manifests through the growth of social and economic infrastructure/services and industrialization. The growth in such services warrants the increase in population in such areas. An increased population automatically means increased demand for not

only social services but also consumables which potentially present a larger base for waste generation-in most cases solid waste.

The increase in the volumes of waste generated has also been proved to be synonymous with the “new lifestyles associated with greater affluence” which convert into higher consumption levels, thus generating more waste amidst changes in waste composition (UNEP, 2007; p.224). Affluence influences people to adopt superfluous demand and purchase patterns making people acquire more of what is not very necessary for their wellbeing. When people possess more than what they actually need, failure to consume all that they affluently have, eventually leads them to get rid of the useless excess which turns into solid waste. In most cases more purchases also mean more packaging material- which readily translates into solid waste especially for the manufactured products. The manufactured products contain materials which are very difficult to decompose, for example plastics, thus increasing waste volumes uncontrollably (Bournay, 2006). In a capitalistic world, the ultimate aim of the manufacturers is to make as much profit as the market can permit.

Because of this line of thought, the manufacturers are more concerned about suiting the product to the consumer. Little or even no effort is made to package the products in an environmentally sensitive way and those that make an effort, are still very few. Usually, the burden is left to the consumer to dispose off the waste packaging material by their own means. In doing so, the manufacturers actually externalize the costs of solid waste management by extending it to the consumers. The problem here is that in most cases the manufacturers do not even bother to give any instructions to the end user on how to manage the waste appropriately. This complicates the solid waste management process as those who “manufacture” the solid waste have not considered

internalization of the cost of solid waste management, say as a way of doing Corporate Social Responsibility (CSR).

Generally, there is a tendency for development to come with increased waste generation. Data from Asia confirms that the more developed countries like Japan, Laos and Thailand, have more municipal waste generated per capita. Interestingly also, there have not been signs of abating the increasing amounts of waste generated (UNEP, 2007; p.224). The rapid increase in waste generation has therefore made effective waste management in many countries, challenging. Consequently, it has put human life and the environment at stake. Some countries in Asia have taken on eco-labelling as a market-based tool or strategy to deal with the waste problem (UNEP, 2007; p.225). On top of eco-labelling, the 3-R approach: (reduce, reuse and recycle) is also becoming popular in Asia (and other parts of the world).

There is an indication that the ways in which solid waste is managed, are as diverse as the human race itself. Some methods of waste management are proper and environmentally sound, while some are not. Conventionally, solid waste (in most cases referred to as garbage) is usually collected as a bundle of trash by local authorities or by private firms to be taken to a transfer station and then to a landfill (sometimes collected and taken straight to the landfill).

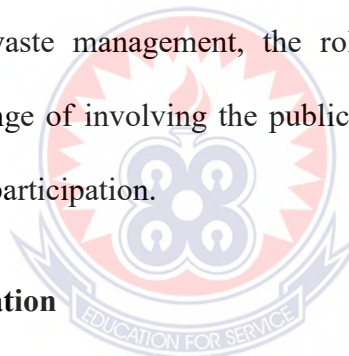
However, considering the fact that there are not always enough resources and infrastructure for waste management, especially in developing countries, this scenario ultimately implies that some waste will not be collected, or will be improperly disposed of (UNEP, 2002). As a result, landfills, burning waste, rodents and odours which are very common in developing countries have made residential areas susceptible to health hazards (UNEP, 2007). In agreement, the United States Environmental Protection Agency (USEPA) (2002) affirms that improper disposal of

solid waste exposes the environment and human life to danger by way of emission of green house gasses and contamination of ground water, respectively.

Therefore, solid waste, if not well managed, can cumulatively have long-lasting and difficult to reverse negative effects on the environment. There have been efforts to improve on the management of solid waste. One of the suggestions has been the application of an integrated waste management strategy.

2.5.2. Significance of Public Participation in Solid Waste Management

This subsection details the different relevant literature on public participation in solid waste management including; whether public participation could be the missing link, the role of public participation in solid waste reduction, social capital and participation in solid waste management, the role of the public in solid waste management, the challenge of involving the public in solid waste management and, the strategies for public participation.



2.5.2.1. Public Participation

According to the Mariam-Webster online Dictionary, (2013) opines that, participation is “the action or fact of partaking, having or forming a part of”. Participation as a concept came to the lime light as a result of rising advocacy for the end of the top-down strategies to development action, in favour of greater inclusion of the subjects of the development programs. Oakley and Marsden (1984) agree that participation is a process and not just a solid product; however, they are also quick to note that it is very difficult to establish a universal definition for participation. This indicates that different scholars, authors and organizations define and understand participation differently. Their definitions and understanding is often guided by the orientation and

intent of the individual or organization defining participation, given the circumstances.

Although participation is widely known to be a free process, in some instances it practically requires that people are dragged into getting involved in operations that are of no interest to them, but they are coerced in the name of participation. Oakley and Marsden (1984), look at participation as a concept that is closely linked to rural development. They also explain that very often, participation is seen as some kind of ingredient that can be added to the recipe for rural development so that the results from the development project are palatable (Oakley & Marsden, 1984; p.17). The conception that participation is an important ingredient in development presents a temptation to force participation at any cost. However, it is perhaps helpful to note that there is what Oakley and Marsden (1984) refers to as authentic participation, which is described as a result of a bottom-up process of development. The concept of participation requires clear interpretation and careful comprehension before it is adopted for any given purpose. Oakley and Marsden (1984) try to explain the different interpretations of the concept of participation by use of four “terms”, that is; collaboration-input-sponsorship, community development, organization, and empowering. These terms are used to explain the different orientations in the participation discourse, and the different terms represent different intentions or purposes for which participation is adopted by the implementers. According to Oakley and Marsden (1984), participation can be looked at as a means as much as it can be looked at as an end in itself. Participation can be perceived as a means if it is adopted as a method of achieving success in a development program. It can also be an end in itself if it is seen as “a process the outcome of which is meaningful participation” (Oakley & Marsden, 1984; p.27).

In contemporary practice of participation, the former perception is more prominent. Participation is adopted as a catalyst to success of a beneficial undertaking in a community. (Barnes, 2005), advises that there is no need to look for a model of participation that is a one-size- fits- all; thus this study takes on the perspective of participation as a means of curbing domestic solid waste.

2.5.2.2. Role of the Public in Solid Waste Management

The role of the public in waste management and in solid waste management in particular, has become indispensable and, can be through various ways. According to Tsai (2007: p.54), a society that is willing to work together presents an opportunity for “creativity and innovation” in dealing with the waste problem. Tsai’s observation brings out the importance of the will of the people/public to work together on matters of waste. Mutual understanding and agreement is vital in having the members of the public to work together. When solidarity is achieved, it presents fertile ground for the germination of creative ways of handling waste in a sustainably agreeable manner. It therefore becomes a responsibility of the public to be willing to work together in solid waste management, among other things.

Bekin, Carrigan, and Szmigin, (2007) recommended that, purchasing second-hand items as a way of waste reduction is important before people can resort to recycling and composting. This can go a long way in having potential waste kept at the minimum. It is a form of re-use of items which implies that less new items on top of the already under-use items will be purchased. The developing countries have been operating within this kind of arrangement, however with different push factors like inability to afford first-hand, new items.

When the waste aspect of these items is put into perspective, one could easily arrive at the conclusion that to a larger extent, the importation and use of second-hand items has actually accelerated the solid waste burden. Despite the emphasis on waste reduction and recycling as compared to disposal, avoiding or even reducing disposal is easier said than done specifically in developing countries (Chung & Poon, 2001). The developing countries especially in Asia and Africa usually import second-hand items from Europe and America, though a number of affluent Asian countries also export some of their second-hand items to Africa for reuse. A large volume of these second-hand items are either obsolete thereby ending up as waste sooner than expected, or they just have a very short lifespan remaining and thus becoming out of use. This scenario is not very different from the argument that rich countries negatively contribute to the waste burden in the developing countries by exporting second-hand items (Bournay, 2006). The appropriateness of this suggestion as a way of waste reduction is brought under check, especially in the poor countries which may not have adopted effective and efficient recycling systems.

2.5.2.3. Challenge of involving the Public in Solid Waste Management

Governments, whether central, federal or decentralized, have been a bit obstinate to public involvement in development projects and social service planning and implementation. From a political point of view, it is expected that the authorities possess the mandate to think and take decisions on behalf of the electorate, besides, it may save time to technically exclude the public in such processes. It is not uncommon, however, to find many of such projects that neglect public participation, failing to yield the planned gains. Provision of solid waste management and disposal services is no exception. The process of public participation in solid waste

management is challenged by several factors, depending on the method chosen for this purpose as well as the characteristics of the public in a particular location.

Tsai (2007; p.45) notes for example that “attitudes towards recycling are influenced by appropriate opportunities, facilities, knowledge and convenience”. People are diverse in terms of the knowledge base they possess as well as in what they feel is convenient for them. This automatically makes their attitudes to differ. Reaching consensus on the most convenient system of managing solid waste around a particular facility becomes challenging.

Goulay, (1992) argued that “development is not a cluster of benefits given to people in need, but rather, a process by which a populace acquires a greater mastery over its own destiny”. His argument emphasizes the importance of people’s participation in development ventures and projects that concern them. This does not go without caution, though. It is dangerous to leave the people with the power to decide for themselves what they want and how they want it, without any guarantees that the people possess the basic requisite knowledge for analysis and subsequent informed decision-making. The information, knowledge and awareness gaps among the members of the public make their involvement a challenging option. In their study on waste minimization in Local Governments in the United Kingdom, Read, Adam, Phillips, Paul and Murphy, (1998) found out that there was low awareness about the best practices in waste minimization across different administrative areas or Local Governments. For public participation to yield optimum benefit, prior arrangements to close or at least narrow the knowledge and awareness gaps ought to have been made. Involving the public with their knowledge gaps, may only lead to a challenging process of participation in solid waste management.

Solid waste management is a matter influenced by policy. Ideally, policy acts as an engine that gives direction and impetus to the solid waste management system. However, due to the absence of clear public policies as well as the economic in viability of investments in municipal waste segregation and recycling, such activities have not thrived in most parts of the developing world (Joardar & Souro, 2000; p.322). To effectively involve the public in solid waste management within a structure that does not provide clear public policies becomes very cumbersome. There has also been a tendency to localize the nature of the waste concern and thus looking at it as a mere “nuisance rather than a health and environmental hazard” (Joardar & Souro, 2000; p.329). This has translated into low political will and the reluctance of the public to respond to the problem.

The absence of clear and specifically outlined legislation and mandate makes it difficult to achieve quality solid waste management practices. This is because it “deprives local bodies of transparent tools to regulate activities of individuals, firms, or organizations towards effective solid waste management” (Joardar & Souro, 2000; p.323). The participation of the private sector in solid waste management also most often than not concentrates on municipal “contracting-out” of secondary waste collectors in form of transferring the waste to disposal sites (Joardar & Souro, 2000; p.327).

The participation of the public as individuals is still virgin and provides a lot of potential for doing more about solid waste management. This therefore calls for strategies that will help to enlist the participation of the entire public for their attention to sustainable solid waste management practices.

2.5.2.4. Strategies for Public Participation

Participation of people in any kind of project needs careful planning by way of laying down strategies to encourage it. Tsai (2007), recommends that in order to encourage households to participate in waste recycling, there is the needs to be “a well-informed waste collection regime, good quality of environmental education and attitudes, an effective enforcement scheme from social norms, proper economic incentives and promotion from local communities” (Tsai, 2007; p. 44-45). This is what many authorities have not been able to do especially in the developing world. Waste collection regimes do not seem to receive enough attention and environmental education has almost not been taken seriously. For the public to be interested and associated with a project, and put in their efforts, they need to be assured that their efforts will yield success and progress, and the best way to do this is by presentation of a clear and easy-to-understand system of operation.

These efforts notwithstanding, there is need for consideration of some other factors. The social and economic status of the people also has a connotation on whether or, and how the people will participate in solid waste management. The authorities need to keep such factors at the back of their mind as they plan strategies for ensuring quality participation of the public. Tsai, (2007) gives evidence that higher incomes and higher education levels elicit the will to participate in waste management programmes like recycling in order to protect the environment. However, he does not show whether the influence of the income and education level goes only as far as recycling is concerned. Recycling is different from other activities in solid waste management. The authorities could easily take advantage of such factors to begin recycling programmes in areas where high income earners reside and or work and the successes that may be registered in such areas may form a basis for rolling it out to

other areas. It could be a resource-cutting measure to start with such a group as it is believed that the rich and middle-class households organize themselves to privately collect and transfer their waste to centers where the authorities can pick it from. This assumption is premised on the belief that it is very rare that the municipal or city authorities will engage in door-to-door collection of the waste, especially in the developing world (Joardar & Souro, 2000). The limited resources within which the authorities in developing countries operates, makes it hard to embark on door-to-door waste collection on daily basis. If the households can collect their waste to a particular centre designated by the authorities, this can make the work easier.

In India, Non-governmental Organizations (NGOs) have helped in civic campaigning, arranging for door-to-door collection of waste as well as assisting in the establishment of cooperatives for “rag pickers” (Joardar & Souro, 2000; p.329). NGOs, especially those that have an environment orientation, need to be supported to mobilize the community to participate in solid waste management as a sustainability measure. NGOs have been instrumental in promoting popular participation in the developing world. The people believe in them, and the voluntary nature of their work, gives authenticity and virtue to their programs. Besides, their membership is widely civic and thus qualifying their interventions as self help, with a higher chance for success and sustainability.

Joardar and Souro, (2000) suggested that, the introduction of a “user charge based on door-to-door collection” can support waste sorting and recycling. The „user charge“ can also work as a stimulus for item reuse thus reducing on the rate of waste generation at the source. The charges can be levied on both residential and commercial establishments but with consideration of household size and with “built-

in cross-subsidization in favour of slum dwellers and petty traders” (Joardar & Souro, 2000; p.327). This arrangement may not necessarily be implementable without clashes between the authorities and the low-income households, but it may be worth the efforts because a financial instrument is more flexible than a legal one since the financial instrument provides a choice for the consumers and at the same time makes the polluter incur the cost of environmental management (Joardar & Souro, 2000). The effectiveness of such a program is determined by the form of governance in a particular area whether it is centralized or decentralized. Where taxation is centralized activity, it may be tricky to have the taxes specifically form waste charges to be remitted in order to meet the costs at the local level.

Chung and Poon, (2001) agrees that having a clear structure of charges for waste collection and disposal in place, may even work as an incentive for waste reduction. They believe that there is the need to change the approach for waste reduction from the “command-and-control” to the use of economic incentives and “polluter-pays” (Chung & Poon, 2001; p.102). This can be a step in involving the public in solid waste management and also forms an impetus for innovative thinking to devise cheaper and more convenient ways of managing solid waste.

On the part of government, employing the waste management hierarchy may be a viable strategy. Production of materials that are less likely to become waste can be emphasized. Before the products are disposed of, consideration for reuse, recycling, composting and energy recovery can be encouraged before materials are finally disposed off (Barr, 2004; p.33) It can be seen that the public has a big stake in most of these processes or activities in solid waste management. It is the public that can decide or not, to buy products that produce less waste. They are the ones who have to

play the basic waste sorting role at household level, before the waste can be conveniently collected for recycling or composting purposes. Therefore, in order to cultivate sustainable waste management, there is need to do more than just creating awareness and disseminating knowledge (Barr, 2004). There is a dire need to strategically involve the public in solid waste management.

2.5.2.5. Social Capital and Participation in Solid Waste Management

Barr, (2004) argues that it is not the role of the product producers alone, to reduce waste but also a duty of the general public to manage waste in a sustainable manner. This argument is valid because the will for involvement of the public needs to be guaranteed so that the roles of the producers and the consumers in waste reduction can reinforce each other. It should be appreciated that success of participation relies strongly on collective action by group or community or society members. Implicitly, the members in the group need to have cohesion as a basis for their collective operation in solid waste management. Tsai, (2007; p.45), emphasizes the importance of social capital in waste management. Social capital in this case offers an opportunity to the people to collectively construct meaning and vision, consequently reducing probability of divergence in belief and ideology. They instead are most likely to share a common vision and thus able to work together to attain it.

Community institutional structures are also of importance in managing solid waste. In their study, Bekin et al. (2007), note that in the absence of appropriate institutional structures, it becomes difficult to ensure solid waste reduction at an individual level. They continue to emphasize that waste reduction may only be viable in a community with some control over production and consumption of some items (Bekin et al, 2007: p.279). This kind of arrangement is bound to give power to the existing structure to

operate in a manner within their own choice of means. Waste reduction begins at the stage of production when there is deliberate effort to prevent production of waste material, but this can be very difficult if the structure within which production is made does not deliberately support the prevention of such materials at production stage. When this is ensured by the structure, it simplifies the solid waste management system at the next level- of consumption. It is very clear that without community support and involvement at least at sorting stage (which has to be done at the source before waste collection), even recycling may be very costly to undertake. Here, the community manifests as a very important stakeholder in solid waste management and the level of their participation counts on the success of recycling in particular and solid waste management in general. Notably, the costs of collection, transportation and land for landfills, are high; however, engaging the community serves to reduce such costs. In a way, this proves to be a sustainable mode of waste management. For example: in Dhaka where community-based solid waste management and composting projects have been implemented, a lot of such costs have been reduced (UNEP, 2007: p.225). The projects have been able to save the municipalities from the costs of collection while at the same time reducing the need for landfills (UNEP, 2007). Diversion of costs from the municipalities allows them to invest in other services that benefit the community.

Apart from cutting costs of management and disposal, since waste collection, sorting and processing is in most cases labour intensive, it serves to employ a substantial number of people. It is revealed that in India, over one million people are employed in the waste sector (Gupta, 2001, in UNEP, 2007; p.225). Potentially, a number of otherwise would-be unemployed people can gainfully engage in the process of sorting and collecting especially recyclable waste materials either on a private individual

(informal) basis or at (formal) company level. In so doing, financial gains would permeate to those who engage in sustainable waste management practices, and thus encouraging sustained participation.

2.6. The Goals of Waste Management

According to Baabereyir, (2009: p.18-19) the United States Congress in 1976, enacted the Resource Conservation and Recovery Act (RCRA) which mandated the EPA to regulate waste management and disposal practices. The goals of waste management that were set by the RCRA included:

- 1 the protection of human health and the environment from the hazards posed by waste disposal
2. the conservation of energy and natural resources through waste recycling and recovery
3. reducing or eliminating the amount of waste generated, and
4. ensuring that wastes are managed in an environmentally-safe manner (RCRA, 1976)

Other writers agree with these objectives of waste management. For example, Schubeller *et al.*, (1996) mentioned that the goals of municipal solid waste management (MSWM) are

1. To protect environmental health,
2. To promote the quality of the urban environment
3. To support the efficiency and productivity of the economy
4. To generate employment and income.

The first goal of domestic solid waste is to protect the health of the urban population, particularly that of low-income groups who suffer most from poor waste management. Secondly, aim to promote environmental conditions by controlling pollution

(including water, air, soil and cross media pollution) and ensuring the sustainability of ecosystems in the urban region. The third goal of MSWM supports urban economic development by providing demanded waste management services and ensuring the efficient use and conservation of valuable materials and resources. The last but not the least aim is to generate employment and incomes in the sector itself (Schubeller *et al.*, 1996).

Similarly, the Ghana Environmental Protection Agency has noted that waste management is essential in the present day context for the following reasons:

1. To protect human health against waste-related hazards and risks
2. To prevent pollution of the environment and its natural resources like air, water and land
3. To produce energy that could be an alternative for the fast depleting fossil fuels and other conventional sources of energy
4. To make optimum use of the waste generated
5. For a better and sustainable future.

(Ghana EPA, 2002 cited in Baabereyir, 2009)

It can, therefore, be concluded from the above that the main objective of waste management is to protect public health against waste-related hazards and risks, and to maintain ecosystem services by preventing the pollution of the natural environment and its resources such as land, water and air as well as the aesthetic quality of the environment.

To achieve the above goals, it is necessary to establish sustainable systems of solid waste management which meet the needs of the entire urban population, including the poor. The essential condition of sustainability implies that waste management systems must be absorbed and carried by the society and its local communities. These systems

must, in other words, be appropriate to the particular circumstances and problems of the city and locality, employing and developing the capacities of all stakeholders, including the households and communities requiring service, private sector enterprises and workers (both formal and informal), and government agencies at the local, regional and national levels (Schubeller *et al.*, 1996: p.19) . This means that there is a need for different approaches to handling waste, which will accommodate for both the rich and the poor areas but it is not supposed to be different solutions but one that is all embracing and takes into account contextual factors operating in rich and poor areas alike.

2.7 Effect of Domestic Solid Waste Management

The management of solid waste has proven to be a daunting task for many towns and cities in developing countries. This is evidenced by the large number of uncontrolled dumps, gutters choked with garbage to various degrees and the irregular collection of waste among many others. According to a United Nations Conference on Human Settlement report, one third to one-half of solid waste generated within most cities in low-and middle-income countries, of which Ghana is of no exception, are not collected. They usually end up as illegal dumps on streets, open spaces, and waste lands (UNCHS, 1996).

In Ghana, Boadi and Kuitunen, (2004) pointed out some of the problems affecting solid waste management. These include: weak institutional capacity and lack of resources; both human and capital. They also indicated that, home collection of waste is limited to high and, some middle income areas while the poor are left to contend with the problem on their own. This leads to indiscriminate disposal of waste in surface drains, canals and streams, creating unsanitary and unsightly environments in

many parts of the city. Furthermore, MLGRD (2010) summarizes the challenges of solid waste management in Ghana as follows: poor planning for waste management programmes; inadequate equipment and operational funds to support waste management activities; inadequate sites and facilities for waste management operations; inadequate skills and capacity of waste management staff; and negative attitudes of the general public towards the environment in general. 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.

According to Malombe (1993), irregular services rendered to producers of refuse by municipal councils compel them to find ways of disposing of refuse. He observed that the main methods adopted by the producers are burning, composting, or indiscriminate dumping. Again according to Sule (1981), the main cause of the problem of Nigerian City's poor environmental condition can be ascribed to improper management of solid waste and lack of seriousness in the enforcement of solid waste disposal code. This is very pertinent in Ghana where waste management services are largely inefficient and ineffective. It is estimated that about 83% of the population dump their refuse in either authorized or unauthorized sites in their neighbourhoods, and due to weak capacity to handle solid waste, unsanitary conditions are created (Benneh et al, 1993).

Generally, the poor state of waste management is clearly not only an engineering problem. Rapid urbanization, poor financing capacity of local authorities, low technical capacity for planning and management of solid waste, weak enforcement of environmental regulations - which allow local authorities to flout environmental regulations without any sanctions - have all contributed to compound the problem.

The Ghanaian experience shows that within the existing socio-economic context, manual systems are appropriate. The challenge is to develop and promote disposal systems that require a minimum level of mechanical equipment. It is clear that the main problem facing the proper management of MSW in many developing countries are administrative, financial, technical (this has to do with the equipments used) and institutional. This affects the amount of solid waste collected and managed and how well the management practices meet standard methods. There is no clear reliable framework by which the solid waste sector is administered from the collection, transformation to disposing or treatment phases. This situation is usually coupled with limited investment allocated for the MSW sector with complications of collecting or raising proper service fees. The management activities of MSW are considered public services which are directly controlled by governmental institutions. Such management arrangement is considered weak as it lacks the market mechanisms, and in this case economical incentives cannot be used to improve and develop the MSW management services (Khatib, 2011). A related common problem is the absence of effective and comprehensive legislative frameworks governing the solid waste sector and the inadequate enforcement mechanisms, which are no less important than the legislations themselves.

As urbanization continues to take place, the management of solid waste is becoming a major public health and environmental concern in the urban areas of many developing countries. The concern is serious, particularly in the capital cities, which are often gateways to the countries for foreign diplomats, businessmen, and tourist visits and foreign investment. Again according to Sule (1981), the main cause of the problem of Nigerian City's poor environmental condition can be ascribed to improper management of solid waste and lack of seriousness in the enforcement of solid waste

disposal code. This is very pertinent in Ghana where the enforcement of solid waste disposal code is not effective at the local levels. Karley (1993), in an article entitled, “Solid Waste and Pollution,” in the Daily Graphics (October 9, 1993) identified the main problem facing Ghana as the lack of suitable sites for disposal of solid waste, of which we attributed to the failure of social and economic development to keep pace with the natural population increase and rural-urban migration.

In sum, the challenges facing access to improved sanitation including solid waste disposal include the following:

- poor development planning/poor infrastructure (population growing faster than waste management development)
- inadequate funding for logistics, infrastructure and landfills
- attitudes of the general public towards sanitation
- Ineffective coordination of sanitation delivery agencies at the regional and district levels.

They can be categorized into technical and financial constraints. Each of these constraints is discussed in relation to the sustainability of solid waste collaborative projects below.

2.7.1. Technical Factors

Ogawa, (1996) posits that, in most developing countries, there is typically lack of human resources at both the national and local levels with technical expertise necessary for solid waste management planning and operation. Many officers in charge of solid waste management, particularly at the local level, have little or no technical background or training in engineering or management. Without adequately trained personnel, a project initiated by external consultants could not be continued.

Therefore, the development of human resources in the recipient country of external support is essential for the sustainability of the collaborative project.

Another technical constraint in developing countries is the lack of overall plans for solid waste management at the local and national levels. As a result, a solid waste technology is often selected without due consideration to its appropriateness in the overall solid waste management system. In some cases, foreign assistance is given to a component of a solid waste management's system for which the use of resources may not be most cost-effective. For instance, an external support agency provided its support to improve a general disposal site. However, the coverage of solid waste collection service is so low that solid waste generated is dumped at many undesignated sites (e.g., open areas, water channels, streets, etc.). As a result, improving the disposal site, although it may not be a bad project, would have little impact on the overall solid waste management effectiveness. In such a case, the low collection coverage is a bottleneck in the overall solid waste management system in the city, and it would be most cost effective to provide resources to upgrade the collection service (Ogawa, 1996).

2.7.2. Financial Factors

In general, solid waste management is given a very low priority in developing countries, except perhaps in capital and large cities. As a result, very limited funds are provided to the solid waste management sector by the government and the levels of supervisors required for protection of public health and the environment are not attained.

In the words of Bartone, (1995) the problem is acute at the local government level where the local taxation system is inadequately developed and, therefore, the financial basis for public services, including solid waste management, is weak. This weak financial basis of local government can be supplemented by the collection of user service charges. However, users' ability to pay for the services which are irregular and ineffective is not high either.

In addition to the limited funds, many local government in developing countries lack good financial management and planning. The lack of financial management and planning, particularly cost accounting, depletes the limited resources available for the sector even more quickly, and causes the solid waste management services to halt for some periods, thus losing the trust of service users (Ogawa, 1996).

2.7.3. Effects of poor Solid Waste Disposal on the Environment and Health

Inappropriate disposal of solid waste can have a major adverse impact or consequences on humans in the society on both the natural environment and health.

2.7.3.1. Human Health Risks

There are some human health risks associated with solid waste handling and disposal in all countries to some degree, but certain problems are more acute and widespread in underdeveloped nations. Cointreau (1982) has classified these into four main categories:

1. presence of human fecal matter,
2. presence of potentially hazardous industrial waste,
3. the decomposition of solids into constituent chemicals which contaminate air and water systems, and
4. the air pollution caused by consistently burning dumps and methane release.

There could also be outbreak of diseases like cholera, typhoid fever, and other diseases, in severe forms causing death, especially in children ages 0-15 years, whose immunity is not as strong as the adult population (Olokor, 2001). Bassis (2004) claimed that serious and devastating outbreak of diseases and epidemics had been recorded owing to indiscriminate dumping of waste. Such diseases include, cholera, typhoid and paratyphoid fever, diarrhoea and vomiting leading to serious health implications, unnecessary and unavoidable spending and in some cases, death of the victims. There appears to be an epidemic of typhoid and cholera in many communities in Ghana now. This is evident in the recent outbreak of cholera in some major cities in Ghana which has so far claimed about 200 lives out of about 10,000 reported cases (Daily Graphic, 2014). Most refuse dumping sites are also close to streams and rivers that are being employed for domestic use like cooking, washing and drinking. If this unhealthy trend is not checked, the risk-factors of indiscriminate disposal of waste may continue to increase (Ajayi, 2004). In a related issue, Moronkola and Okonlawon (2003) claimed that indiscriminate dumping of refuse will give rise to offensive odour which is a source of nuisance to human existence as excessive intake of this polluted air can lead to choking of the lungs and breathing difficulty.

2.7.3.2. Environmental Issues

According to Karley, (1993) the health status of a community is affected by its state of environment. Poor sanitary conditions militate against the protection and preservation of the environment. The decomposition of waste into constituent chemicals is a common source of local environmental pollution. A major environmental concern is gas release by decomposing garbage. There is a risk-factor of air pollution in the event of accidental or spontaneous combustion of refuse. Air pollution signifies the presence in the atmosphere of substances generated by the

activities of man that interfere with human health, safety or comfort. It is injurious to vegetation and animals and other environmental media, resulting in chemicals entering the food chain or being present in drinking water, causing health problems to man. Discharge of carbon monoxide by open burning of waste contributes to air pollution (Ayodele-oni, 2007).

Current practices in the developing world range from absolutely no leachate management (unofficial dumps or those operating continuously for years without „sanitary“ specifications) to discharge into municipal sewer and sewage systems, direct discharge into surface water systems (rivers), multi-pond aeration and settlement systems, chemical treatment facilities, and recirculation systems (Johannessen, 1999). Achalu and Achalu, (2004) discovered that indiscriminate dumping of waste hinders free flow of erosion and floods when it rains causing blockage of drainages, diversion of flood to various places like living houses, farm lands leading to over-flooding, which results in destruction of lives and properties. Refuse dumped along streams and river courses cause flooding which can result in natural disasters. It can also result in outbreak of diseases and plagues. Many people were killed due to floods in parts of Accra Ghana on June 3, 2015. This was partly linked to waste being dumped in the Odornaa River (Kumah.2015).

Accumulated garbage and rubbish become eyesore in the community and pollute the air, acting as breeding grounds for mosquitoes and other harmful insects, especially where a foreigner has to be welcomed to the nation with huge accumulation of refuse (Akindutire & Alebiosu, 2014). Ajayi, (2004) also asserted that if an environment is polluted with filthy things like broken bottles, heaps of hazardous things, children and adults could receive injuries from the materials and if not quickly attended to, can

lead to tetanus infection, which in turn, can kill the host. Heaps of refuse along motor parks or motor pathways can lead to road traffic accidents which could destroy lives and properties especially, when driving in the night and the driver is not aware of the heaps of refuse ahead.

2.8. Identification of probable gaps in the existing Literature

Though most of the literatures read so far explains the various forms of managing domestic solid waste in many places. However, not much have been said about the positive attitudes of people towards domestic solid waste practices and the effective uses of domestic solid waste, its contribution towards development, how it can generate employment and put food on peoples table.

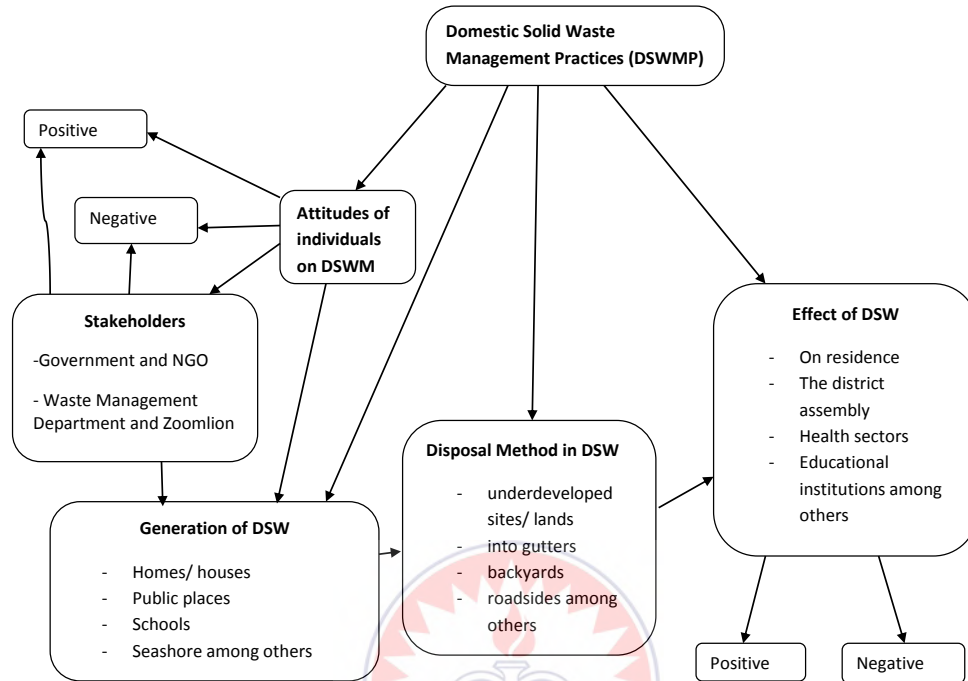
2.9. The Conceptual Framework

A conceptual framework on Domestic Solid Waste Management practices in Senya, in the Awutu Senya West District is designed by the author. The framework describes the four main scope of domestic solid waste, which includes the generation, disposal and effects of domestic solid waste management (DSWM) on residence. It further explains the attitudes of individual as positive or negative towards domestic solid waste management. The attitudes of stakeholders which includes the government such as (Chiefs, Metropolitan, Municipal and District Chief Executives and Assembly Members), Non-Governmental Organization and private waste collectors are further considered whether negative or positive towards domestic solid waste management. The disposal method of DSWM is also captured in the framework. The dumping places that are common to residence include gutters, underdeveloped sites or lands, roadsides among others. The effect on the management of DSW is further classified in the framework, as well as the causes of poor DSWM leading to the outbreak of

diseases such as malaria, cholera among others. The Figure.5 below further explains it,

Figure 5: Conceptual Framework

Figure 5: The conceptual framework



Source: Design by Author (2018)

Literatures on domestic solid waste management practices were reviewed in this chapter. From my own point of view, domestic solid waste can be defined as any substance or object which has no value to the owner and therefore are discarded or intends to be discarded by the owner. These materials are materials from our domestic activities which includes cloths, leftover foods, plastics, metals among others. Managing of waste includes segregation. That is separation of waste (plastics from metals, leftover foods from sand and many more). Waste generated can be classified into groups such as residential waste which is generated by single and multifamily dwelling. These group people generate domestic solid was such as food waste, paper, plastics, textiles among others. Other sources of waste come from commercial activities, institutions, agricultural and construction sites. Most of the effect of poor domestic solid waste management includes outbreak of diseases, stagnant water, choked gutters and breeding of mosquitoes and reptiles. The research was based on the concept of domestic solid waste management practices in Senya. It focused on the individual, stakeholders and their role towards generation, disposal, attitudes and effects on domestic solid waste management practices.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter describes the research procedures and techniques for the study. The issues include a description of Senya in the Awutu Senya West District in order to accumulate more information about domestic solid waste management, the research approach, design, population and sample and sampling technique, instruments for data collection, data collection procedures and how the data was analyzed. The validity and reliability of the work was considered.

3.1. Description of Study Area

The study took place at Senya Township, a suburb of Awutu Senya West District. The Awutu Senya West District forms part of the twenty-two (22) Metropolitan, Municipalities and Districts in the Central Region. The Administrative Capital of the District is Awutu Bereku and it covers a surface area of 244.473sq.km. The Gomoa East District has dotted enclaves within the district. The Southern part of the district is bounded by the Gulf of Guinea, to the East by Awutu Senya Municipal, to the West by Gomoa East and Agona East Districts, and the North-Eastern part by West Akim District. The population of the district according to 2010 population and housing census stands at 86,884 with 40,903 male, representing 47.08 percent (47.08%) and 45,981 female, representing 52.92 percent (52.92%) respectively (GSS, 2012).

There are forty (40) communities in the Awutu Senya West District. Other big settlement in the district includes Senya, Bereku, Bonsuako, Akoti, Ojobi, Fetteh, Ayensuako, Mfadwen, Nkuadum among others. Senya is mainly made up of fishermen and fish mongers with a few of them being farmers. Due to their fishing

activities, they do not get enough time to cook or buy food and enjoy them but rather buy foods packaged in polythene bags, leaves and papers. After eating they leave the polythene bags on the streets indiscriminately and even at the beaches. Dustbins are also not provided at vantage points in the township and most of the beaches, therefore, encouraging indiscriminate disposal (GSS,2012). Senya is like a dormitory town where most people spend the night and leave for work at Akoti, Kasoa, Winneba and even Accra. The traffic situation in our country today makes people already tired when they get home and, therefore, go in for prepackaged foods. This situation is also contributing to the worsening waste situation in Senya (GSS, 2012). The population of Senya according to the Ghana Statistical Service (2012) is over 40,000. Males are about 10,000 representing 25 percent (25%) of the population while the female forms about 30,000, representing 75 percent (75%) of the entire population of Senya. Senya covers a surface area of about 70,000 acres with about 30,000 occupied and about 40,000 unoccupied.

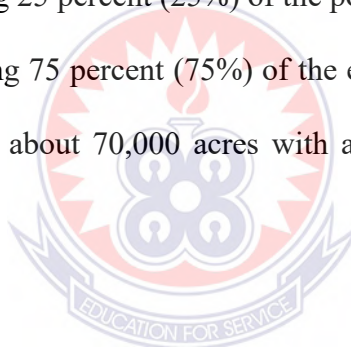


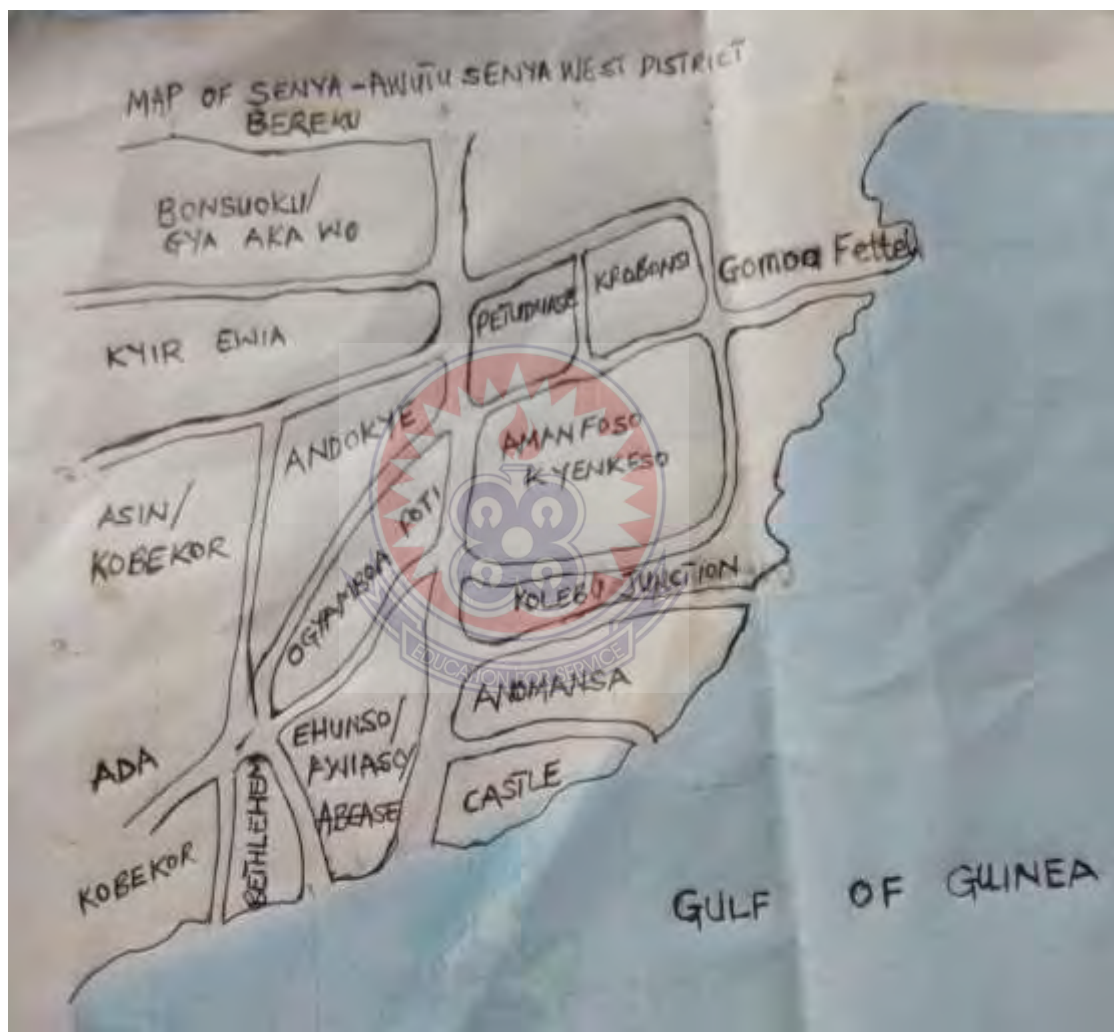
Table 3: Population by age, sex and type of locality

Age Group	Sex			Sex ratio	Type of locality	
	Both Sexes	Male	Female		Urban	Rural
All Ages	86,884	40,903	45,981	89.0	48.0	52.0
0 - 4	13,414	6,664	6,750	98.7	46.7	53.3
5-9	11,587	5,801	5,786	100.3	46.8	53.2
10-14	10,960	5,550	5,410	102.6	47.2	52.8
15 - 19	9,542	4,831	4,711	102.5	48.1	51.9
20 - 24	7,478	3,375	4,103	82.3	50.3	49.7
25 - 29	6,498	2,813	3,685	76.3	49.9	50.1
30 - 34	5,252	2,373	2,879	82.4	50.1	49.9
35 - 39	4,594	2,109	2,485	84.9	49.0	51.0
40 - 44	3,867	1,724	2,143	80.4	47.7	52.3
45 - 49	3,178	1,435	1,743	82.3	46.8	53.2
50 - 54	2,902	1,214	1,688	71.9	45.8	54.2
55 - 59	1,767	770	997	77.2	45.4	54.6
60 - 64	1,767	780	987	79.0	44.6	55.4
65 - 69	1,129	455	674	67.5	51.5	48.5
70 - 74	1,074	389	685	56.8	48.4	51.6
75 - 79	669	239	430	55.6	53.8	46.2
80 - 84	561	179	382	46.9	52.8	47.2
85+	645	202	443	45.6	56.3	43.7
0 - 14	35,961	18,015	17,946	100.4	46.9	53.1
15 - 64	46,845	21,424	25,421	84.3	48.5	51.5
65+	4,078	1,464	2,614	56.0	52.0	48.0
All Ages	86,884	40,903	45,981	89.0	48.0	52.0
Age-dependency ratio		85.5	90.9	80.9		

Source: Ghana Statistical Service, 2010 Population and Housing Census

The youthful population of the residence of Awutu Senya West District which Senya is part, as seen in Table 3.1 is high with low educational background. Therefore, these youths dispose of waste indiscriminately with less or know consideration of the health hazards and its implication. The Figure 6. below also indicates the map and settlements in Senya respectively.

Figure 6: A map showing the study area (Senya Bereku)

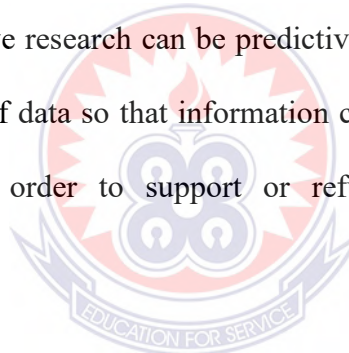


Source: Surveyor Emmanuel Akwa-Ando (2019)

3.2. Research Approach

The researcher employed quantitative method as the main and only research approach. The quantitative approach is said to be mostly numerical and is designed to ensure objectivity, generalizability and reliability (Creswell, 2003).

According to Cohen (1980), quantitative research is defined as social research that employs empirical methods and empirical statements. He states that an empirical statement is defined as a descriptive statement about what “is” the case in the “real world” rather than what “ought” to be the case. In the same context Creswell, (2003) states that quantitative research employ strategies of inquiry such as experimental and surveys, and collect data on predetermined instruments that yield statistical data. The findings from quantitative research can be predictive, explanatory, and confirming. It involves the collection of data so that information can be quantified and subjected to statistical treatment in order to support or refute alternate knowledge claims (Creswell, 2003: p.18).



The benefits associated with a quantitative approach include numerical data obtained. This approach facilitates comparisons between organizations or groups, as well as allowing determination of the extent of agreement or disagreement between respondents (Yacht & Strudel, 2003). Quantitative researchers think about variables and convert them into specific actions during a planning stage that occurs before and separate from gathering or analyzing data. They develop techniques that can produce quantitative data (i.e., data in the form of numbers). Thus, the researcher moves from abstract ideas to specific data collection techniques to precise numerical information produced by the techniques (Neuman, 2007).

Although it has these benefits, there were some shortcomings which included employing a larger sample size. As Dudwick, Kuehnast, Jones and Woolcock, (2006) rightly opine, effective quantitative research usually requires a large sample size sometimes several thousand households. However, lack of resources sometimes makes large scale research of this kind impossible. In many settings particularly developing countries, interested parties (e.g., governments, non-governmental organizations and public service providers) may lack the skills and, especially the resources needed to conduct a thorough quantitative evaluation.

3.3. Research Design

The design for this research was a descriptive survey. The reason is that this research is non-experimental and it is intended to study a natural setting and the description of an existing phenomenon. Alhassan (2007), defines a descriptive survey as a method which describes and interprets what exist in its present form or condition; practice and process; trend and effect and attitude or belief. Descriptive survey is a study aimed at collecting data on and describing in a systematic manner, the characteristics and facts about a population and are also well suited to gathering demographic data that describe the composition of the sample (Nworgu 1991; McIntyre, 1999). Similarly, Quartey and Awoyemi (2002) described descriptive research as a research aimed at producing an accurate description of a particular on- going situation or real life setting. Isaac and Michael, (1997) gave an insight as to what a survey seeks to achieve when they stated that a survey research is used: to answer questions that have been raised, to solve problems that have been posed or observed, to assess needs and set goals, to determine whether or not specific objectives have been met, to establish baselines against which future comparisons can be made, to analyze trends across time, and generally, to describe what exists, in what amount, and in what context.

This type of research method uses questionnaires and observation to collect information about people's attitudes, beliefs, feelings, behaviours, and lifestyles (O'Leary, 2010). This was considered as the best design since the research sought to investigate residents of Senya attitudes towards domestic solid waste management and disposal practices. Surveys are capable of obtaining information from large samples of the population. Surveys require minimal investment to develop and administer, and are relatively easy for making generalizations (Bell, 1996). The only way to find out the attitudes of people is by asking them, a survey was, therefore, employed to elicit information about attitudes of Senya residents towards waste disposal that otherwise would have been difficult to measure using only observational techniques (McIntyre, 1999). It is important to note, however, that surveys only provide estimates for the true population, not exact measurements (Salant & Dillman, 1994).

Bell (1996), observed that biases may occur, either in the lack of response from intended participants or in the nature and accuracy of the responses that are received. Other sources of error include intentional misreporting of behaviours by respondents to confound the survey results or to hide inappropriate behaviour. Finally, respondents may have difficulty assessing their own behaviour or have poor recall of the circumstances surrounding their behaviour. This goes to confirm the experience on field investigations, some residents may be uncomfortable sharing their views on the waste situation because they felt it is disgraceful.

3.4. Population

Since all residents of Senya generate waste or require waste disposal services or are affected by waste disposal, the entire populations of Senya were regarded as the study population for this research. During the 2010 Population and Housing Census, Senya

recorded total populations of about 40,000 (GSS, 2012). The target populations for the study were residents of Senya Township, a suburb of the Awutu Senya West District. The area is a fast growing urban community.

3.5. Sample Size and Distribution

A sample size of one hundred and fifty (150) residents participated as the study population. This was a reflection of a research on “Waste Disposal Practices at Winneba: An Investigation into Residents Attitudes”, Kumah (2015). The participants involve ordinary residents whose activities related indirectly or directly to waste generation, disposal and management, some officials of the Awutu Senya West Assembly, ZoomLion and a health worker. A hundred and fifty-six (156) residents and officials were given questionnaires and one hundred and fifty (150) was retrieved. Questionnaire and observation were the main methods of the data collection. The data was collected through fieldwork. Prolonged observations were used because the study sought to collect data at both factual and meaningful levels. Two officials each from the Awutu Senya West Assembly and ZoomLion whose work related to overseeing waste management were given questionnaire. The researcher conducted a non-participant observation of everyday waste disposal practices at different times of the day and at different times of the week.

3.6. Sampling Techniques and Procedure

One hundred and fifty (150) residents and officials were selected using strata sampling to answer questionnaires. A stratified sample is a probability sampling technique in which the researcher divides the entire target population into different subgroups, or strata, and then randomly selects the final subjects proportionally from the different strata. This type of sampling is used when the researcher wants to

highlight specific subgroups within the population (Babbie, 2001). The specific subgroups that was highlighted were the underdeveloped communities vis-à-vis the residential or developed communities. The main aim for using strata sampling is to reduce the potential of human bias in the selection of cases to be included in the sample. As a result, the stratified random sample provides me with a sample that is highly representative of the population being studied.

Purposive sampling technique was then used to select two officials each of the Awutu Senya West Assembly and ZoomLion to answer the questionnaire. Purposive sampling is a form of non-probability sampling in which decisions concerning the individuals to be included in the sample are taken by the researcher, based upon a variety of criteria which may include specialist knowledge of the research issue, or capacity and willingness to participate in the research. This enabled the researcher intentionally select participant and sites to learn or understand the central phenomenon because of the information they possess and give fair chance to other respondent to be represented (Creswell, 2009).

3.7. Nature of Data for the Study

The data was collected from different sources but were mainly from a secondary and primary source. Secondary data were obtained from books, articles, newspapers and internet sources to review literature. Primary data were collected through preliminary field investigation, questionnaires and structured (**non-participant**) observation. These are further discussed in the sub-sections below.

3.8. Research Instruments

The instruments for the data collection were questionnaire guide and observation schedule. The questionnaire guide was used as a major instrument and the observation schedule as supplementary instruments.

3.9. Data Collection Procedure

Data collection was facilitated through the administration of questionnaire guide and observation checklist.

3.9.1. Questionnaire Administration

The questionnaire consisted of thirty (30) open ended and close ended questions. This was administered to the 156 individuals and officials selected for the study. The questionnaire consisted of four sections. The first section focused on their background information such as age and sex. The second section was to describe the solid waste disposal situation in the Senya Township. The third section focused on causes and effects of indiscriminate waste disposal. The fourth section was based on the perception and attitudes of residents towards waste disposal. The questionnaire was used to determine the extent of agreement or disagreement on some issues raised by the researcher. A five point likert scale was used to solicit their views on some of the issues pertaining to the study. The purpose of the study was explained to respondents. They were also assured of their anonymity and were encouraged to participate.

3.9.2. Structured Observation

Cohen, Manion and Morrison, (2000) opines that, “a structured observation is very systematic and enables the researcher to generate numerical data from the observations”. Since this is a study that partly employs strategies of inquiry such as surveys, it was preserved that the behaviour of the respondents would most likely be

inferred; direct observation of people's behaviour with regard to their responses was therefore, done to check the accuracy of their responses (Bryman, 2004). Structured observation was particularly used with the help of an observation schedule as a data collection tool (Bryman, 2004). Notably also, unobtrusive observation is non-participatory in the interest of being non-reactive and can be done in an informal way (Robson, 2002; Leedy and Ormrod, 2005), and that was reason for using observation schedule alongside the administration of questionnaire guide. Residents, traders and market vendors were regularly observed, to confirm the data for this study.

3.10. Data Analysis

Quantitative method of data was employed for this survey; the analysis was aimed at the attitudes of residents and the domestic solid waste management practice practices. Taped data and field notes from observation and interviews were reviewed repeatedly to discern patterns (Bauer, 1996)

- they were sorted
- categorized and analysed using descriptive analysis.

Each questionnaire was scored based on likert scale type. Each item was scored according to the weight of the ratings. Administered questionnaires were examined to check completeness, accuracy and consistency of responses in order to detect and eliminate errors. The Statistical Package for Social Sciences (SPSS) was used to calculate frequencies, percentages, and charts which was used to describe and summarized data.

3.11. Validity and Reliability

The validity and reliability of numerical/statistical data is important to conclude efficient results. In this context Leedy and Ormrod, (2001) argue that validity and reliability are important components that affect correlation coefficients. In order to

have any effect upon educational theory or practice, educational research studies must be rigorous and present results that are acceptable to other educators and researchers (Merriam, 1998). To accomplish this task, studies must be of high quality and results must be trustworthy and dependable.

Internal validity refers to establishing results that are credible or believable from a participant's perspective (Trochim, 2000). The researcher used three instruments to collect data. Joppe, (2000) provides the explanation of what validity is in quantitative research, as validity determines whether the research truly measures that which it was intended to measure or how truthful the research results are.

This helped to offset the limitations associated with using one method to collect data (Creswell, 2003; Punch, 2005) and to determine the veracity of information gathered.

Domestic solid waste data should be considered with a degree of caution due to global inconsistencies in definitions, data collection methodologies, and completeness. The reliability of the data is influenced by:

- Undefined words or phrases
- Inconsistent or omitted units
- Dates, methodologies, or sources of data not indicated
- Estimates made without basis
- Incomplete or inconsistent data (Hoornweg & Bhada-Tata, 2012)

Reliability, refers to the ability of research results to be replicated or repeated (Merriam, 1998). According to Bryman and Bell, (2007) reliability means whether or not the results of a study are repeatable. Similarly, Joppe, (2000) defines reliability in quantitative research as the extent to which results are consistent over time and an accurate representation of the total population under study is referred to as reliability

and if the results of a study can be reproduced under a similar methodology, then the research instrument is considered to be reliable. To make sure these inconsistencies do not affect the data, clear questions were asked to reduce bias and subjectivity during data collection. To ensure consistency and reliability of findings the researcher employed the procedures of triangulation. The instruments were first discussed with some colleagues and lecturers of Department of Social Studies. Some items were removed, others reframed before being handed over to my supervisor for scrutiny. Questions that were similar were deleted from the questionnaire after consideration. Objectivity concerns itself with the ability of research findings not to be „contaminated“ by any individual involved. The researcher ensured that the results weren“t influenced by personal feelings, interpretations of the results, or personal prejudices but purely based on facts, and is unbiased.

The description of the study area guided me to choose an appropriate research approach which was the quantitative method. This method of research is numerical or uses numbers and gives room for many views and suggestions from sizeable number of people. The research design used was descriptive survey, this studies a natural setting and it is non-experimental. The entire population of Senya were considered but a sample size of 156 was used for the research. The instruments that was used is questionnaire. The questionnaire was distributed to the 156 participants through stratified sampling and purposive sampling.

CHAPTER FOUR

FINDINGS

4.0 Introduction

This chapter presents data findings from the respondents; officials of the WMD of ASWD, ZoomLion Ghana Ltd., and the general public in Senya on domestic solid waste management practices. The questionnaire was divided into five categories with a total of thirty questions. The first section presented the background information of the respondents. Section two was to establish the generation of domestic solid waste in Senya. The third section covered the disposal situation of domestic solid waste in Senya. The fourth section dealt with the effect of indiscriminate domestic solid waste disposal practices. Section five was based on the attitudes of residents towards domestic solid waste management. The data collected were scrutinized and linked to the appropriate research questions and presented accordingly.

4.1. Demographic Characteristics of Participants

The demographic characteristics of the participants centered on sex (male and female), age, highest educational level and major occupation. The participants selected to respond to the questionnaire were one hundred and fifty-six (156). Five (5) officials which include officers of ZoomLion and officers of the Waste Management Department in the ASWD were also selected. Questionnaires were administered to all five officials; all the five had tertiary education. The outcome of the data as presented in Table 5 indicated that a higher percentage of people who engage in domestic solid waste management in the Senya locality were males. About 80 participants with a percentage rate of 53.3% recording the highest percentage of partaking in the research.

		Frequency	Percentage	Cumulative Percentage
Gender	Male	80	53.3	53.3
	Female	70	46.7	
	Total	150	100	100
Age	under 20 years	43	28.7	28.7
	21-30 years	53	35.3	64.0
	31-40 years	29	19.3	83.3
	over 40 years	25	16.7	100.0
	Total	150	100.0	
Highest educational level	Never attended school	16	10.7	10.7
	Primary	22	14.7	25.3
	Middle school/ JHS	48	32.0	57.3
	SHS/ Technical	35	23.3	80.7
	Tertiary	29	19.3	100.0
	Total	150	100.0	
Major occupation	Farming	18	12.0	12.0
	Trading	38	25.3	37.3
	Fisherman	26	17.3	54.7
	Fishmonger	15	10.0	64.7
	Public servant	16	10.7	75.3
	Civil Servant	15	10.0	85.3
	Banking Sector	1	0.7	86.0
	Religious leaders among others	21	14.0	100.0
	Total	150	100.0	

Table 4: Demographic Characteristics (Gender, Age, Highest Educational level) and Major Occupation)

Source: Fieldwork (April, 2019)

The table below further explains the demographic characteristics by comparing or cross tabulating gender to age, highest educational level and major occupation in Table 5 below.

Table 5: Demographic Characteristics comparing Gender to Age, Highest Educational level and Major Occupation

Gender	Item	Male	Female	Total
Age	under 20 years	18	25	43
	21-30 years	33	20	53
	31-40 years	16	13	29
	over 40 years	13	12	25
	Total	80	70	150
Highest educational level	Never attended school	7	9	16
	Primary	14	8	22
	Middle school/ JHS	18	30	48
	SHS/ Technical	20	15	35
	Tertiary	21	8	29
	Total	80	70	150
	Major Occupation	Farming	13	5
Trading		13	25	38
Fishermen		22	0	22
Fishmonger		0	19	19
Public Servant		12	4	16
Civil Servant		8	7	15
Banking Sector		1	0	1
Religious leaders among others		11	10	21
Total		80	70	150

Source: Fieldwork (April, 2019)

From Table 5, out of a total number of 150 respondents sampled to respond to the questionnaire, 53.3% were males and 46.7% females. The age characteristics of respondents were; over 41 years (16.7%) males were 13 and females were 12 respectively, 31-40 years (19.3%) constituting 16 males and 13 females, 21-30 (35.3%) with 33 males and 20 females respectively. Respondents under 20 years of age were 28.7%, males were 18 and females were 25.

The major occupation of the residents in Senya were fishing activities including fishermen and fishmongers which constituted 27.3% (17.3 and 10.0 percent) respectively. Trading was the next occupation that was common in Senya with 25.3%, farming activities were also common with farmers constituting 12.0%, public servant

and civil servants was (10.0 % and 10.0%), and others including the banking sector, religious leaders among others 14.7%.

The majority of respondents sampled (32.0%) had their highest education up to the Middle School/ JHS level, SHS/ Technical were (23.3%), 19.3% Tertiary and (14.7 and 10.7 percent) were Primary and others Never attended school respectively.

4.2. Generation of Domestic Solid Waste in Senya

This section outlines the generation of domestic solid in Senya, the sources of domestic solid waste in Senya, how waste is managed and the institutions and personnel responsible for the collection and management of domestic solid waste in Senya.

4.2.1. Description of the Waste Situation in Senya

Since the nature of the waste problem depicts how people are concerned with waste management and practices, respondents were asked to describe the general waste situation in their neighbourhood. Table 6 below further explains the general waste situation in the Senya locality

Table 6: Description of the general waste situation in Senya neighbourhood

	Frequency	Percent	Cumulative Percent
Very satisfactory	19	12.6	12.7
Satisfactory	24	16.0	28.7
Poor	46	30.7	59.3
Very poor	61	40.7	100.0
Total	150	100.0	

Source: Fieldwork (April, 2019)

As indicated in Table 6, 61 respondents which represents 40.7 percent of the residents held the view that the nature of the waste situation in their various neighbourhoods was very poor, 46 people representing 30.7 percent were also of the view that the

general waste situation in Senya is poor, however 24 individuals representing 16 percent held the view that the situation was satisfactory and only nineteen respondents representing 12.6 percent thought that the situation was very satisfactory.

4.2.2. The sources of Domestic Solid Waste Generation in Senya

Resident's knowledge and practices of where they always or normally generate waste can help seek the intervention of finding a solution to the problem. The Table 7 below further explains it.

Table 7: Sources of Domestic Solid Waste Generation in Senya

	Frequency	Percent	Cumulative Percent
Home/ house	57	38.0	38.0
Office	17	11.3	49.3
School	8	5.3	54.7
Public place	16	10.7	65.3
Seashore	36	24.0	89.3
Passers-by	16	10.7	100.0
Total	150	100.0	

Source: Fieldwork (April, 2019)

As indicated in Table 7, the major sources of domestic solid waste generated in Senya were from the homes or houses which constitute 38% representing 57 respondent's views. This was as a result of the homes being the resting places for the residents, other people also perform such activities like trading (petty stores), restaurants or bar, fitting or mechanics shops, clay molded stoves for smoking of their fishes among others in their homes or houses. The seashore was the next major source of generating waste due the fishing business, all kinds of foodstuff and other items were sold at the beach during bumper harvest when the fishermen return from fishing which constitute 36 respondents (24%). The office was also another source of generating domestic solid waste, it constituted 17 respondents (11.3%). Public place and passer-byers were 16 respondents each representing 10.7% each. The respondents who generated few

domestic solid wastes in Senya were waste generated in School which was 5.3% (8 respondents).

4.2.3 The Managing of Domestic Solid Waste in Senya

Respondent responses would indicate their knowledge on the importance of managing domestic solid waste generated through their daily activities. This is shown in Table 8

Table 8: Managing of Domestic Solid Waste in Senya

	Frequency	Percent	Cumulative Percent
Strongly agree	94	62.7	62.7
Agree	39	26.0	88.7
Not sure	6	4.0	92.7
Disagree	7	4.7	97.3
Strongly disagree	4	2.7	100.0
Total	150	100.0	

Source: Fieldwork (April, 2019)

Majority of the respondent strongly agree to the fact that, “domestic solid waste should be well managed”, they constitute 94 people representing 62.7% as indicated in Table 8 above. 39 individuals representing 26% further agreed to the assertion. Those who disagreed that domestic solid waste should be well managed were 7 people (4.7%). The respondents who were not sure whether domestic solid waste should be well managed or not constituted 4 percent, representing 6 people. Respondents who strongly disagree to the assertion that, domestic solid waste should be well managed were 4 people constituting 2.7% respectively.

4.2.4. The Role/ Responsibility of Waste Management Institution.

This section would indicate respondent knowledge on the waste management institutions responsible for waste collection in Senya. Table 9 below further explains that.

Table 9: Waste Management Institution Responsible for Waste Collection.

	Frequency	Percent	Cumulative Percent
Waste Management department (of the municipal assembly)	19	12.7	12.7
ZoomLion limited	76	50.7	63.3
None	28	18.7	82.0
Don't know	27	18.0	100.0
Total	150	100.0	

Source: Fieldwork (April, 2019)

Table 9 clearly indicates that many respondents agree to the fact that the Zoomlion Waste Management is responsible for the collection of waste in Senya. They constitute the highest percentage of 50.7% representing 76 respondents. 28 respondents representing 18.7% were people who categorically stated that, none, that there is no agency or organization that is responsible for the collection of waste in Senya. The respondents who were not sure there was any waste agency or organizations responsible for waste collection in Senya were 27 representing 18%. 19 respondents said the Waste Management department (of the district assembly) was responsible for waste collection representing 12.7 percent.

4.2.5. Duties and Importance of the Waste Management Personnel

The section explains the duty or responsibility of the waste personnel and its importance. Table 10 below illustrates it,

Table 10: The Role of the Waste Management Personnel and its Important

	Frequency	Percent	Cumulative Percent
Strongly Agree	74	49.3	49.3
Agree	53	35.3	84.7
Not Sure	9	6.0	90.7
Disagree	8	5.3	96.0
Strongly Disagree	6	4.0	100.0

Total	150	100.0
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Source: Fieldwork (April, 2019) .

Table 10, illustrates that many respondents value the role, responsibility and the work of the waste personnel as very important. About 74 respondents representing 49.3% strongly agree to the statement that, the work of the waste management personnel is very important. The respondents who agreed that the work of the waste personnel is very important were 53 people, which represent 35.3%. Respondents who said they were not sure whether the work of the waste management personnel is important or not were 9, representing 6%. 8 respondents representing 5.3% disagreed to the statement that, the work of the waste personnel was very important. Only few respondent out the entire population strongly disagreed to the statement and were implying that, the work of waste personnel is of no use or not important. They represent 4% (6 people).

4.3. Disposal of Domestic Solid Waste in Senya

This section deals with the disposal situation in Senya. It also explains resident's knowledge on the disposal situation in Senya and need for stakeholders and residents to improve on it. It further explains disposal practices and how waste is managed and collected by residents.

4.3.1. Waste Disposal Problem

The nature of waste disposal is a problem in Senya indicating how people are concerned and ready to find solutions to it. Respondents were asked to give their views on waste disposal in their community.

Majority of the individuals strongly agreed and agreed that waste disposal is a problem in their community. They represent 73 and 52 respondents (50% and 34.7%).

Only 11 people disagreed and 3 people strongly disagreed representing 7.3% and 2% respectively. About 9 respondents (6%) were not sure whether waste disposal was a problem in their community as shown in Table 11 and the picture below. This is evidence at Figure 7 below.

Table 11 Problems Associated with Waste Disposal in Senya Communities

	Frequency	Percent	Cumulative Percent
Strongly Agree	75	50.0	50.0
Agree	52	34.7	84.7
Not Sure	9	6.0	90.7
Disagree	11	7.3	98.0
Strongly Disagree	3	2.0	100.0
Total	150	100.0	

Source: Fieldwork (April, 2019)

Figure 7: Domestic waste dumped on footpath



(Source: Fieldwork: April, 2018)

4.3.2 Dumpsite or Disposal Site

This section really shows a relative comparison (cross tabulation) of respondents' educational level and where they dump their domestic solid waste. The table 12 below further explains it.



Table 12: Highest Educational Level Compared with where their Domestic Solid Wastes are Dumped?

Educational level/ Optional answers	Roadside	Backyard	Nearby gutters	Public Dumpsites	Underdeveloped land / site	Holes/ Pits	Personal/ home dumpsites	Total
Never attended school	2	0	2	10	2	0	0	16
Primary	2	0	1	12	6	1	0	22
Middle School/ JHS	8	11	9	15	4	0	1	48
SHS/ Technical	5	5	6	10	7	1	1	35
Tertiary	3	6	6	8	3	0	3	29
Total	20	22	24	55	22	2	5	150

Source: Fieldwork (April, 2019)



Table 12 indicates that majority of the residents who had middle school or junior high school education and dumps their waste at the public dumpsite constituted 15 people, 11 people said they dump their waste at their backyards. 8 respondents said they dump their waste by the roadside, 4 said their wastes are dumped on underdeveloped land or sites and only one person said he dumps his waste in a pit constituting 48 individuals who do not manage their waste well respectively. Those who had primary certificate were 35 respondents. 12 people dump their waste at the public dumpsite, 6 and 2 people dump their waste on underdeveloped land or sites and by roadsides respectively. Respondents who had tertiary education and took their waste to the public dumpsites, nearby gutters and roadsides were 8, 6, and 6 respectively. 3 respondents each said they either dump their waste by the roadside, on underdeveloped land or site and personal or home dumpsite respectively constituting 29 individuals.

With the respondents that had never attended school before and those who had senior high school education were 10 respondents each who dump their waste at the public dumpsite. Wastes that are dumped into gutters constituted 2 and 6 respondents. This is evidence at Figure 8 & 9 below.

Figure 8: Domestic Solid Waste Dumped at the Roadside



(Source: Fieldwork: April, 2019)

Figure 9: Waste at the Backyard of a Building



(Source: Fieldwork: April, 2019)

4.3.3. The number of times Waste is collected

This section throws more light on the relative comparison (crosstabulation) of respondents' age and the number of times waste is collected in a week. The table 12 below gives highlight on that.

Table 13: Comparison of respondents' age range and number of times Waste is collected in a week

Age / Optional answers	Not at all	Four times	Once	Five times	Twice	Throughout the week	Thrice	Total
Under 20 years	28	6	2	2	2	2	1	43
21-30 years	32	4	5	4	2	6	0	53
31-40 years	16	5	2	2	0	4	0	29
Over 41 years	14	2	2	1	1	5	0	25
Total	90	17	11	9	5	17	1	150

Source: Fieldwork (April, 2019)

Majority of respondents as shown in Table 12 who were between the ages of 21 and 30 years were 53 people. 32 said refuse dumps in their areas were never collected, 4 people said it was off loaded 4 times in the week, 5 said once a week, 4, 2 and 6 respondents said five times, twice and throughout the week respectively. Out of the 43 people who were below the age 20 years, 28 of them said, domestic solid wastes in their area are not collected at all, 6 people said their waste is collected four times in the week. 2 respondents each said their wastes are collected once, twice, five times, throughout the week respectively and only one person said his waste is collected thrice in a week. Respondents between the ages of 31 and 40 years and those over 41 years were 29 and 25. 16 and 14 respondents said, the wastes in their areas were never collected. 90 respondents said waste are not collected in their areas at all. 17 people said either four times or throughout the week. 11, 9, and 5 respondents said their waste are collected once, five times, and twice a week respectively. Only one person said, her waste is collected thrice a week.

4.3.4. Mode of collection

This section deals with the mode of collecting waste in Senya. The Table 13 further explains the comparison between gender and the mode of collecting waste in Senya.

Table 14: Cross tabulation of Gender of participants with their mode of collecting domestic solid waste in various communities in Senya

Count	What is the mode of collection of waste in your area?					Total
	Door-to-door	Communal	By waste trucks	Don't know	Zoomlion	
Gender of participant						
Males	8	8	46	18	0	80
Female	3	17	28	17	5	70
Total	11	25	74	35	5	150

Source: Fieldwork (April, 2019)

As shown in Table 13, majority of males constituting 46 respondents and 28 females said their waste is being collected by waste trucks. 18 males and 17 females said they don't know. 8 males and 17 females further said their waste is collected by communal (community members selecting and managing a community dumpsite). 8 males and 3 females outline that their wastes is collected by waste collector through door-to-door. 5 females said Zoomlion is responsible for the collection of waste in their area but none of the male mention Zoomlion.

4.3.5. Quality of Waste Disposal Services

This section deals with the description of the quality of waste disposal services in Senya. It further explains the responses between gender and the description of the quality of waste disposal services in Senya as shown in Table 14 below,

Table 15: Comparison of gender of participants with their description of the quality of waste disposal service received in their various communities in Senya.

Count	How will you describe the quality of waste disposal service you receive?				Total
	Very satisfactory	Satisfactory	Poor	Very poor	
Gender of participants					
Male	10	20	17	33	80
Female	6	16	27	21	70
Total	16	36	44	54	150

Source: Fieldwork (April, 2019)

The majority of respondents in Table 14 who are males constitute 33 and 21 females who said the quality of waste disposal services in Senya is very poor. 17 males and 27 females further said there was poor quality of waste disposal services in Senya. 20 males and 16 females also said they were satisfied with the quality of waste disposal service in Senya. Only 10 males and 6 females said the quality of waste disposal services was very satisfactory.

4.3.6. Disposal of Domestic Solid Waste

This section explains how residents disposed off their waste in their various household.

Table 16 and pictures below further elaborate on it.

Table 15: Disposal of Domestic Solid Waste in various Household

	Frequency	Percent	Cumulative Percent
On the street	9	6.0	6.0
backyard of building	76	50.7	56.7
Into gutters	19	12.7	69.3
In stream/ rivers/ sea	12	8.0	77.3
On abandoned/ under-developed land	34	22.7	100.0

Total	150	100.0
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Source: Fieldwork (April, 2019)

The majority of respondent who constitute 76 people (50.7 percent) said their wastes are thrown on the backyards of their buildings as indicated in table 4.13. 34 people (22.7 percent) also said their wastes are deposited on abandoned or under-developed land as indicated in Figure 10 below. 19 and 12 respondents constituting (12.7 and 8 percent) said their wastes are deposited into gutters, streams, rivers and sea respectively. Only 9 people (6 percent) said they throw their waste onto the street, as indicated by Figure 11 below.

Figure 10: Waste Dumped on Undeveloped Land or Site



(Source: Fieldwork: April, 2019)

Figure 11: Waste Dumped by the Roadside



(Source: Fieldwork: April, 2019)

4.4. Availability of Resources for Managing Waste

This section deals with the availability of resource personnel which includes the technical staffs. It further indicates the tools that are available and needed for effective domestic solid waste management.

4.4.1. Equipment Base of Waste Management Institutions in ASWD

A questionnaire to the WMD and ZoomLion Ghana Ltd. revealed the equipment base of the two waste management institutions in the Municipality. The equipment used for storing and collecting domestic solid waste by the two institutions is explained in Table 16. The Table 16 below further explains it;

Table 17: Equipment Base of Waste Management Institutions (WMD and ZoomLion)

Equipment	WMD (number available)	Number required	ZoomLion (number available)	Number required	Total available	Total required
Skip Trucks	-	2	2	1	2	3
Shovels	10	10	11	15	21	25
Obofo tricycle	-	25	25	35	25	60
Skips	15	10	12	8	27	18
Dustbins	250	400	550	750	800	1150
Wheelbarrow	10	8	10	11	20	19
Graders	1	1	-	1	1	2
Compaction Truck	-	1	1	1	1	2
Rake	15	10	15	10	30	20
Picking Rod	30	10	35	15	65	25

Source: WMD and ZoomLion, ASWD, June, 2019

From Table 16, the equipment base of the two institutions responsible for managing waste in Senya is grouped into their respective uses namely storage, collection and transportation. With domestic solid waste disposal, eighteen (18) extra skips were needed by both ZoomLion Ghana Ltd. and WMD for supply in both the middle and low class residential areas respectively. Even though twenty- seven (27) skips were available for the storage of waste in the district especially Senya, if these extra skips

were not supplied on time, it would result in people dumping their waste indiscriminately such as underdeveloped sites. Furthermore, about 1150 dustbins are needed for the storage of waste in the high class and middle class residential areas for effective domestic solid waste services Senya. This is as a result of dustbins being the main equipment for storing waste at the household level and the residential areas for collection by either ZoomLion or WMD.

On waste collection and transportation in the district, Oboafu tricycle and skip trucks were mostly used. The Oboafu tricycle was used for the primary transfer of waste collected into a compaction truck for the final disposal. Their effort was not enough to ensure regular collection and transportation of waste to the landfill. At the moment about 60 Oboafu tricycles were needed by the waste management institutions for the door-to-door collection. Also, the compaction truck which was used for the door-to-door collection was only one (1) for the entire district. There was, therefore, the need for two additional compaction trucks and two graders.

4.4.2. Technical Staff of Waste Management Institutions

The questionnaire revealed the staffing situation of the two institutions in the district. Table 17 below clearly shows the staffing situation of WMD and ZoomLion Ghana Ltd.

Table 18: Technical Staff of Waste Management Institutions in ASWD

Institution	Personnel	Number	Qualification
ZoomLion Ghana Ltd	Municipal Operations Supervisor	1	B.Sc Business Administration
Sanitation Guards		18	Certificate
Core Staff		6	Certificate
WMD	District Environmental Health and Sanitation Director	1	Engineering BSc Civil
Technical Supervisors		2	Dip. Environmental Health
Supervisors		2	Certificate

Source: WMD and ZoomLion Ghana Ltd., June, 2019

From Table 17, it was evident that both the District Operations Supervisor of ZoomLion and the District Environmental Health and Sanitation Director of the ASWD do not have any background in waste management, which is challenge for dealing with waste situation in the district.

4.5. Effects of Domestic Solid Waste disposal practices

This section elaborates on the effects of domestic solid waste practices in Senya. It further gives knowledge on the impact of domestic solid waste on residents' health.

4.5.1. Vantage Point for the Collection and Disposal of Waste

The presence of vantage point or an area selected for waste to be collected and a disposal site for the people of Senya. Table 18 below further explains the cross tabulation between the genders of respondents, highest educational level and whether there is a vantage point for the collection and disposal of waste.

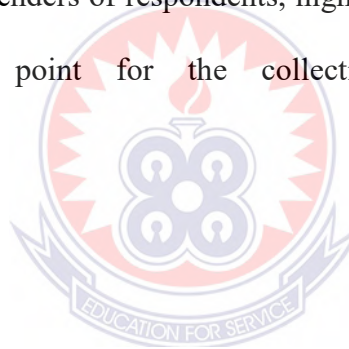


Table 19: Comparison of Gender of Participants with highest Educational level and the allocation and Presents Domestic Solid Waste Disposal Container and its Collection

Count			Highest educational level					Total
There is a vantage point for the collection and disposal of waste			Never attended school	Primary	Middle school/ JHS	SHS/ Technical	Tertiary	
SA	Gender of participants	Male	1	2	3	3	3	12
		Female	4	5	7	3	1	20
Total			5	7	10	6	4	32
A	Gender of participants	Male	2	2	3	8	5	20
		Female	1	2	7	4	4	18
Total			3	4	10	12	9	38
NS	Gender of participants	Male	2	5	2	7	5	21
		Female	4	1	9	4	1	19
Total			6	6	11	11	6	40
D	Gender of participants	Male	1	2	4	1	5	13
		Female	0	0	3	1	0	4
Total			1	2	7	2	5	17
SD	Gender of participants	Male	1	3	6	1	3	14
		Female	0	0	4	3	2	9
Total			1	3	10	4	5	23

Source: Fieldwork (April, 2019) Generated from SPSS

As indicated in Table 18 the majority of people who said they were not sure whether there is a vantage point for the collection and disposal of waste were 40 respondents, males were 21 and females were 19 respectively. 38 respondents further said they agree to the statement that there is a vantage point for the collection and disposal of waste, 20 were males and 18 were females. 32 respondents said they strongly agree to the statement that there is a vantage point for the collection and disposal of waste. About 12 males and 20 females respectively. About 23 and 17 respondents strongly disagreed and disagreed to the statement that there is a vantage point for the collection and disposal of waste respectively.

4.5.2. Our Food is more Important than our Waste

This section seeks the view of respondents on whether there is a vast difference and importance between our food we eat and the waste created daily in Senya. The Table 19 and picture below outline the correlation between age of participants, gender and the statement, our food we eat are more important than the waste we dispose off.

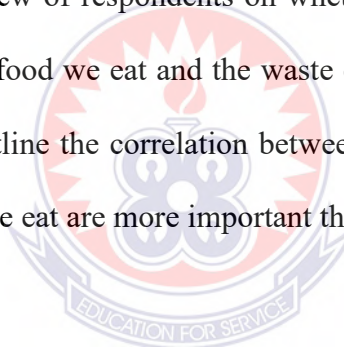


Table 20: The Age and Gender of Participants compared with the Importance of our Food and how we dispose of our Domestic Solid Waste

Count			Gender of participants		Total
Our food we eat are more important than the Waste we dispose off			Male	Female	
SA	Age	under 20 years	8	5	13
		21-30 years	15	5	20
		31-40 years	5	5	10
		over 40 years	3	2	5
	Total		31	17	48
A	Age	under 20 years	3	4	7
		21-30 years	8	4	12
		31-40 years	2	2	4
		over 40 years	2	3	5
	Total		15	13	28
NS	Age	under 20 years	3	5	8
		21-30 years	4	5	9
		31-40 years	3	3	6
		over 40 years	4	2	6
	Total		14	15	29
D	Age	under 20 years	2	6	8
		21-30 years	3	3	6
		31-40 years	2	3	5
		over 40 years	2	4	6
	Total		9	16	25
SD	Age	under 20 years	2	5	7
		21-30 years	3	3	6
		31-40 years	4	0	4
		over 40 years	2	1	3
	Total		11	9	20

Source: Fieldwork (April, 2019)

As shown in Table 19 above 48 respondents, constituting 31 males and 17 females strongly agreed to the statement that, our food we eat are more important than the waste we dispose off. About 29 respondents said they were not sure of the statement that, our food we eat are important than the waste we dispose off. 14 were males and 15 were females. 15 males and 13 females constituting 28 respondents said they agreed to the statement that our food we eat are more important than the waste we

dispose off, as indicated by Figure 12 below. 25 and 20 respondents disagreed and strongly disagreed to the statement that, our food we eat are more important than the waste we dispose off respectively.

Figure 12: Waste Dumped into a Gutter where Food is Sold



(Source: Fieldwork: April, 2019)

4.5.3. Rules and Regulations on Domestic Solid Waste Disposal in Senya

This section seeks to find out whether citizens in Senya are aware of any rules and regulations on domestic solid waste. The table 4.18 further elaborates on the correlation between the gender of participants, age and whether there are rules and regulations on domestic solid waste disposal as follow;

Table 21: The Gender of participants and Age compared with the rules and Regulations on Domestic Solid Waste Disposal

There are rules and regulations on domestic solid waste disposal			Age				Total
			under 20 years	21-30 years	31-40 years	over 40 years	
SA	Gender of participants	Male	4	7	4	2	17
		Female	2	6	4	2	14
	Total	6	13	8	4	31	
A	Gender of participants	Male	6	8	3	3	20
		Female	8	4	4	1	17
	Total	14	12	7	4	37	
NS	Gender of participants	Male	1	8	7	3	19
		Female	5	4	3	7	19
	Total	6	12	10	10	38	
D	Gender of participants	Male	0	1	0	3	4
		Female	5	2	2	1	10
	Total	5	3	2	4	14	
SD	Gender of participants	Male	7	9	2	2	20
		Female	5	4	0	1	10
	Total	12	13	2	3	30	

Source: Fieldwork (April, 2019)

The table 20 above shows that 38 respondents constituting 19 people for both males and females each made it clear that they are not sure whether there are rules and regulations on domestic solid waste disposal. 20 males and 17 females representing 37 people said they agree to the statement that, there are rules and regulations on domestic solid waste disposal. 31 and 30 respondents said they strongly agree and strongly disagree to the statement that, there are rules and regulations on domestic solid waste disposal. Only 14 respondents disagreed to the statement that there are rules and regulations on domestic solid waste disposal.

4.5.4. Inadequate Information on Domestic Solid Waste Management

Respondent's knowledge on the availability of adequate information on domestic solid waste managements. The Table 21 below further elaborates on the cross tabulation of gender and highest level of education with the statement, information regarding domestic solid waste management practices at Senya is not adequate is as follows,

Table 22: The Gender of participants and their highest Educational level compared with their level of Information regarding Domestic Solid Waste Management Practices at Senya.

	Information regarding domestic solid waste management practices at Senya is not adequate	Gender	Highest educational level					Total
			Never attended school	Primary	Middle school/ JHS	SHS/ Technical	Tertiary	
SA	Gender of participants	Male	2	1	7	7	15	32
		Female	7	2	13	6	2	30
	Total		9	3	20	13	17	62
A	Gender of participants	Male	3	7	2	8	4	24
		Female	0	4	9	4	4	21
	Total		3	11	11	12	8	45
NS	Gender of participants	Male	2	5	4	1		12
		Female	2	1	0	3		6
	Total		4	6	4	4		18
D	Gender of participants	Male		1	2	3		6
		Female		1	6	2		9
	Total			2	8	5		15
SD	Gender of participants	Male			3	1	2	6
		Female			2	0	2	4
	Total				5	1	4	10

Source: Fieldwork (April, 2019)

As shown in the Table 21 above the majority of participants constituting 62 people, 32 were males while females were 30 strongly agreed to the statement that, information regarding domestic solid waste management practices at Senya is not adequate. About 45 people representing 24 males and 21 females further agreed to the statement that, information regarding domestic solid waste management practices at Senya is not adequate. 18 respondents were not sure of the statement whether there is enough information regarding domestic solid waste management practices at Senya is not adequate. 15 and 10 respondents said they disagree and strongly disagree to the statement that, information regarding domestic solid waste management practices at Senya is not adequate.

4.5.5. Inadequate Knowledge about rules and Regulations in Senya

This section explains whether respondents have limited or no knowledge about the rules and regulation of domestic solid waste in Senya. The Table 22 further explains it.

Table 23: The Gender of participants and their Age compared with adequate access of Information, Rules and Regulation on Domestic Solid Waste in Senya.

I have limited or no knowledge about the rules and regulation on domestic solid waste in Senya.			Age				Total
			under 20 years	21-30 years	31-40 years	over 40 years	
SA	Gender of participants	Male	1	12	5	2	20
		Female	8	3	3	2	16
	Total	9	15	8	4	36	
A	Gender of participants	Male	4	8	6	7	25
		Female	8	6	5	3	22
	Total	12	14	11	10	47	
NS	Gender of participants	Male	4	5	4	2	15
		Female	4	6	3	3	16
	Total	8	11	7	5	31	
D	Gender of participants	Male	2	1	1	2	6

	participants	Female	2	4	2	2	10
	Total		4	5	3	4	16
SD	Gender of	Male	7	7		0	14
	participants	Female	3	1		2	6
	Total		10	8		2	20

Source: Fieldwork (April, 2019)

About 47 respondents representing 25 males and 22 females were the highest respondents as shown in table 4.20 agreed to the statement that, they have limited or no knowledge about the rules and regulation on domestic solid management in Senya. 20 males and 16 females representing 36 respondents strongly agreed to the statement that, they have limited or no knowledge about the rules and regulation on domestic solid management in Senya. 31 respondents said they were not sure about the statement that, they have limited or no knowledge about the rules and regulation on domestic solid management in Senya. 16 and 20 respondents disagreed and strongly disagreed to the statement that, they have limited or no knowledge about the rules and regulation on domestic solid management in Senya respectively.

4.5.6. The Spread of Diseases

This section indicates the need to manage waste well. Since poor management of domestic solid waste could lead to the spread of diseases. The Table 23 below further explains respondents' knowledge as follows,

Table 24: Poor Waste Disposal Practices can lead to the Spread of Diseases

	Frequency	Percent	Cumulative Percent
SA	102	68.0	68.0
A	28	18.7	86.7
NS	7	4.7	91.3
D	4	2.7	94.0
SD	9	6.0	100.0
Total	150	100.0	

Source: Fieldwork (April, 2019)

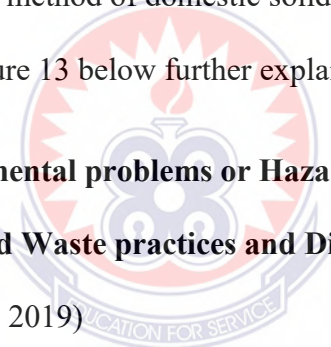
As shown in the Table 23 shows that 47 respondents, representing 31.3% said they agreed to the statement that, poor waste disposal practices can lead to the spread of diseases. 24 % representing 36 respondents further said that, poor waste disposal practices can lead to the spread of diseases. 20.7% which represents 31 people said they were not sure of the statement that; poor waste disposal practices can lead to the spread of diseases. 16 and 20 respondents representing 10.7% and 13.3% respectively further concluded that, they disagreed and strongly disagreed to the statement that, poor waste disposal practices can lead to the spread of diseases.

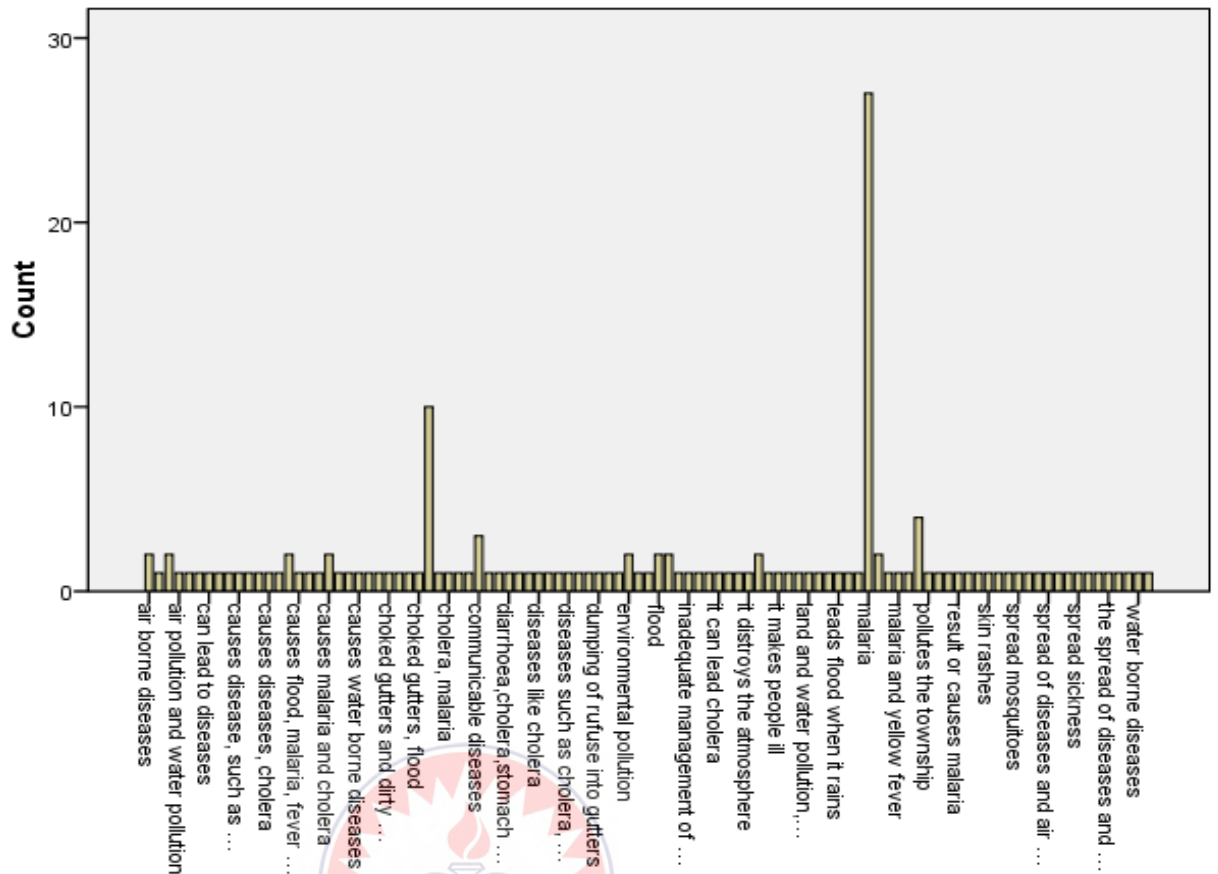
4.5.7. Environmental problem and Hazards on Domestic Solid Waste

This section deals with whether respondents can mention any environmental problem or hazard as a result of the method of domestic solid waste practices and disposal. The bar chart representing Figure 13 below further explains this,

Figure 13: The Environmental problems or Hazards that occur as a Result of the Method of Domestic Solid Waste practices and Disposal

(Source: Fieldwork: April, 2019)





(Source: Field Work 2019)

Figure 13 further indicates that majority of the residence believe and responded that, the environmental problems and hazards that occurs as a result of domestic solid waste include the following; air borne disease, air pollution and water pollution, it further causes diseases, cholera, flood, malaria, water borne disease. Others include skin disease, the spread of disease and sickness. Other respondents also said it causes communicable disease, environmental pollution, air borne disease among others. About 20 participants according to the chart said some of the environmental problem and hazards includes malaria.

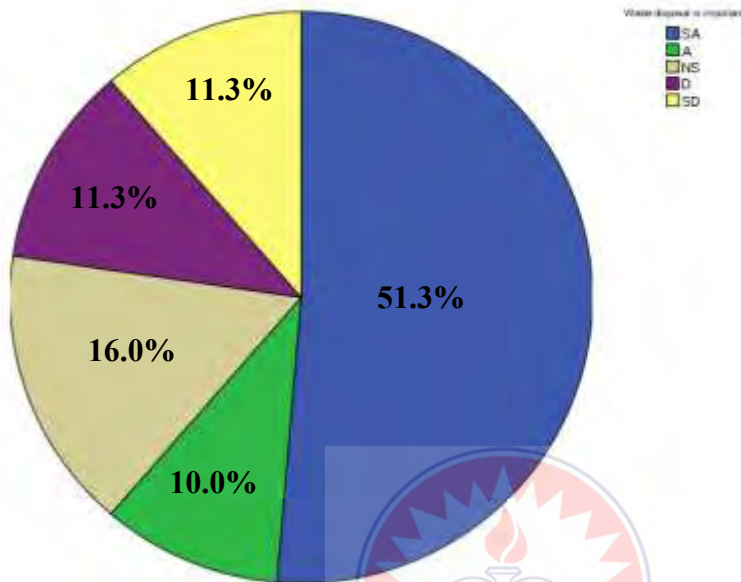
4.6. Attitude of residents towards Domestic Solid Waste Management

This section seeks the knowledge of respondents on their attitudes towards domestic solid waste management. Respondents' attitude towards waste disposal, waste management, generation and the role of waste personnel was being solicited for.

4.6.1. Importance of Waste disposal

The knowledge of respondents on the importance of waste disposal is sought for from this section. The pie chart representing figure 4.8 below further explains the data,

Figure 14: Importance of Waste disposal



Source: Fieldwork (April, 2019) Generated from SPSS

From the data presented in Figure 14 states that 51.3% strongly agreed to the statement, waste disposal is important. 16 % of the respondent made it clear that they are not sure about the statement, waste disposal is important. 10% made it clear that they agree to the statement, waste disposal is important. Other respondents had negative response towards the importance of disposal of waste, representing 11.3% who said they disagree and strongly disagree to the statement, waste disposal is important respectively.

4.6.2. Concern of waste situation in Senya

The data below further explains the concern of respondents about waste situation in Senya. The Table 24 explains it,

Table 25: Concerns of Waste Situation in Senya

	Frequency	Percent	Cumulative Percent
SA	18	12.0	12.0
A	30	20.0	32.0
NS	20	13.3	45.3
D	32	21.3	66.7
SD	50	33.3	100.0
Total	150	100.0	

Source: Fieldwork (April, 2019)

The data stated in the Table 24 above indicates that the majority of residents which is 50 respondents representing 33.3% strongly disagree to the statement, I am not concern about the Waste Situation in Senya. 32 respondents representing 21.3% disagreed to the statement; I am not concern about the Waste Situation in Senya. 13.3% resenting 20 respondents further said they were not sure of the statement; I am not concern about the Waste Situation in Senya. 30 and 18 respondents representing 20% and 12% negatively responded to the statement, I am not concern about the waste situation in Senya, with the response agree and strongly agree respectively.

4.6.3. Indiscriminate disposal of Waste

This data explains respondents' attitudes towards indiscriminate waste disposal, whether it is common in their locality or Senya. The Table 25 further explains it;

Table 26: Indiscriminate Waste disposal practices in Senya

	Frequency	Percent	Cumulative Percent
SA	74	49.3	49.3
A	43	28.7	78.0
NS	20	13.3	91.3
D	4	2.7	94.0
SD	9	6.0	100.0
Total	150	100.0	

Source: Fieldwork (April, 2019)

About 74 people representing 49.3% as shown in table 4.23 above indicates that those respondents strongly agree to the statement, indiscriminate waste disposal is common in Senya or your locality. 43 respondents representing 28.7% also agreed to the statement, indiscriminate waste disposal is common in Senya or your locality. 13.3% representing 20 people said they were not sure about the statement; indiscriminate waste disposal is common in Senya or your locality. 4 and 9 respondents representing 2.7% and 9% said they disagree and strongly disagree to the statements; indiscriminate waste disposal is common in Senya or your locality respectively.

4.6.4. Assistance in Domestic Solid Waste Management activity.

This section explains the data on domestic solid waste management activity. The table 4.24 below explains it;

Table 27: Individual's responsibility towards domestic solid waste management activity in Senya

	Frequency	Percent	Cumulative Percent
SA	20	13.3	13.3
A	26	17.3	30.7
NS	19	12.7	43.3
D	35	23.3	66.7
SD	50	33.3	100.0
Total	150	100.0	

Source: Fieldwork (April, 2019)

50 respondents representing 33.3% as shown in Table 26 strongly disagreed to the statement, it's not my responsibility to assist in any domestic solid waste management

activity. 35 (23.3%) respondents also agree to the statement that, it's not my responsibility to assist in any domestic solid waste management activity. 19 respondents said they were not sure of the statement, it's not my responsibility to assist in any domestic solid waste management activity. 20 and 26 (13.3% and 17.3%) respondents said they strongly agree and agreed on the statement, it's not my responsibility to assist in any domestic solid waste management activity respectively.

4.6.5. Regular Environmental clean-up exercise

This section explains residents' knowledge on whether clean-up exercise is organized in Senya. The table 4.25 below further throws more light on it;

Table 28: Involvement of Residents towards Regular clean-up Exercise Organized in Senya.

	Frequency	Percent	Cumulative Percent
SA	33	22.0	22.0
A	37	24.7	46.7
NS	22	14.7	61.3
D	19	12.7	74.0
SD	39	26.0	100.0
Total	150	100.0	

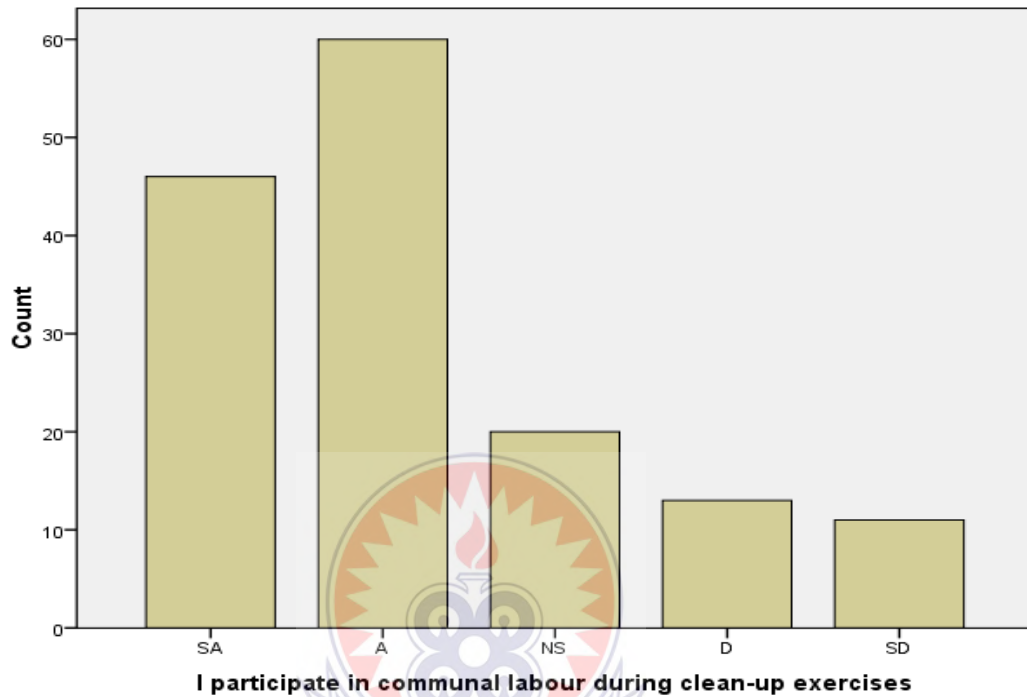
Source: Fieldwork (April, 2019)

The Table 27, above indicates that 39 respondents representing 26% respectively strongly disagreed to the statement, regular clean-up exercise are organized in Senya to make the environment clean. 24.7% and 22% representing 37 and 33 people further agreed and strongly agreed to the statement, regular clean-up exercise are organized in Senya to make the environment clean. 22 respondents representing 14.7% were not sure of the statement, regular clean-up exercise are organized in Senya to make the environment clean. 19 people disagreed to the statement, regular clean-up exercise are organized in Senya to make the environment clean, representing 12.7% respectively.

4.6.6. Participation in Communal labour

This section indicates whether participant engage in communal labour during clean-up exercise or not. The bar chart representing Figure 14 below further explains it;

Figure 15: Participation in Communal labour during clean-up Exercises



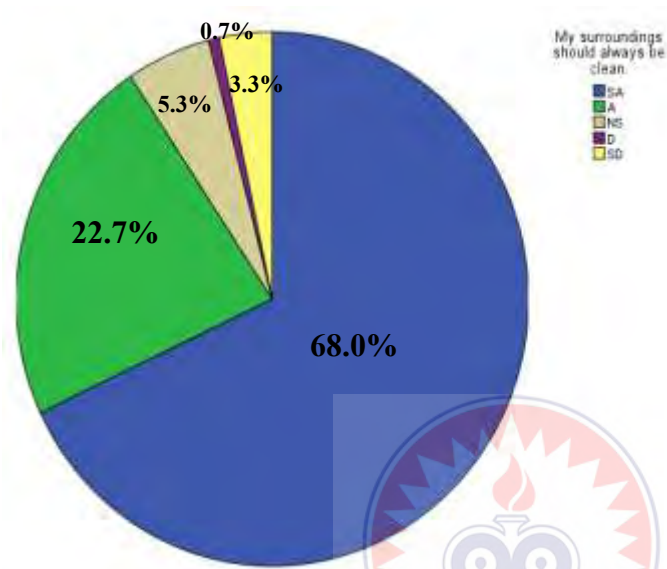
Source: Fieldwork (April, 2019)

As shown in Figure 15 above, almost 60 participants agreed to the statement and said they participated in communal labour during clean-up exercises in their neighbourhood. Between 40 and 50 respondents further said they strongly agree to the statement, I participate in communal labour during clean-up exercises. About 20 respondents said they were not sure of the statement, I participate in communal labour during clean-up exercises between 15 and 12 respondents said they disagree and strongly disagree to the statement, I participate in communal labour during clean-up exercises respectively

4.6.7 Clean Surrounding

This section will bring out the views of resident on whether they want their surroundings clean or unclean. The pie chart representing Figure 15 below elaborates more on that;

Figure 16: Cleanliness of Surroundings.



Source: Fieldwork (April, 2019) Generated from SPSS

The Figure 16 above shows that more than half of the respondents representing 68% strongly agree to the statement that their surroundings should always be clean. Respondents that agreed to the statement that, their surroundings should always be clean represented 22.7%. 5.3% of the respondents were not sure about the statement, that their surroundings should always be clean. 3.3% and 0.7% representing the smaller and smallest group of people, they were those who strongly disagreed and disagreed to the statement that their surroundings should always be clean respectively.

4.6.8. Waste disposal Department (officers)

This section sought resident's response whether they pay for the services of the waste department or officers in their various communities. The Table 28 below further explains it;

Table 29: The Gender of participants compared to their regular payment to authorities on the waste they generate.

		Do you normally pay the waste disposal department (officers) for their services			Total
		Yes	No but I am willing to pay	I don't pay and I am not willing to pay	
Gender of participants	Male	15	45	20	80
	Female	24	33	13	70
Total		39	78	33	150

Source: Fieldwork (April, 2019)

As shown in the Table 28 above indicates that out of the 80 males, 15 said yes to the statement, do you normally pay the waste disposal department (officers) for their services, while 45 respondents said no, but they are willing to pay. 20 males further said they don't pay and they are not willing to pay. 24 females also said they yes to the statement, do you normally pay the waste disposal department (officers) for their services. 33 respondents said no but they are willing to pay and 13 respondents said they don't pay and their not willing pay respectively.

The research findings were based on the generation of domestic solid waste, the disposal methods, attitudes of residents towards domestic solid waste and its effects on the individual and nations as a whole. The responses and views of the respondents was what was captured in this chapter.

CHAPTER FIVE

DISCUSSION OF FINDINGS

5.0. Introduction

Chapter four highlighted the major themes and presented the research findings to explain the data. This chapter analyses the data critically with reference to relevant literature to explore the important meanings of responses from respondents and to understand the concept and phenomenon. The purpose of this study was to examine the domestic solid waste management practices in Senya, in the Awutu Senya West District. This section analyzes the data collected from the study areas in the district through field investigation, observation and questionnaire. In all, 156 respondents were given questionnaire to answer and 150 was retrieved with five (5) key respondents including institutional heads were also given questionnaire. The data were collected on the following issues:

- How domestic solid waste is generated in Senya.
- How domestic solid waste is disposed off in Senya.
- The effects of domestic solid waste disposal practices in Senya.
- Attitude of residents towards domestic solid waste management.

5.1. Generation of Domestic Solid Waste in Senya

As part of the objectives for the study describes the generation of domestic solid waste situation in Senya, this section emphasizes on nature of the waste situation in the study area, problems faced by residents on the management of generated waste, as well as the role they need to play towards waste management and the duties of the waste management agencies or department in the study area. Objective one of the research was to analyze how domestic solid waste is generated in Senya.

As indicated in table 4.3 (p. 83 and 84), 61 respondents which represents 40.7% of the residents held the view that the nature of the waste situation in their various neighbourhoods was very poor, 46 people representing 30.7% were also of the view that the general waste situation in Senya is poor, however 24 individuals representing 16% held the view that the situation was satisfactory and only nineteen respondents representing 12.6% thought that the situation was very satisfactory. This confirms the assertion that majority of the residents have the view that the waste situation in Senya is very poor, confirms the statement made by Schübeler *et al.*, (1996), stating, although MSWM is essential to public health and environmental protection, domestic solid waste management in most cities of developing countries is highly unsatisfactory.

Hoornweg and Bhada-Tata, (2012) further added that, waste generation rates will be more than double over the next twenty years in lower income countries. Residence knowledge and practices of where they always or normally generate waste will highly contribute to the intervention of finding a solution to the problem. As indicated in table 4.4 (p. 84 and 85), the major sources of domestic solid waste were generated from the homes or houses which constitute 38% representing 57 respondents respectively. This is as result of the homes being the resting places, other people also perform such activities like trading (petty stores), restaurants or bar, fitting or mechanics shops, clay molded stoves for smoking of their fishes among others in the homes or houses. The seashore was the next major source of generating waste due the fishing business, all kinds of foods and items are sold at the beach when the fishermen return from fishing and this constitute 36 respondents (24%) respectively. Domestic solid waste should be well managed to promote serene and disease free environment, which can also serve as the hallmark of residence of Senya. Majority of the

respondent strongly agree to the fact that domestic solid waste should be well managed, they constitute 94 people representing 62.7% as indicated in table 4.5 (p.85). 39 individuals representing 26% further agreed to the assertion that domestic solid waste should be well managed respectively.

Domestic Solid Waste Management (DSWM) is major responsibility of local government through the metropolitan, municipal and district assemblies. This is a complex task which requires appropriate, consistent, reliable and dedicated organizational capacity and cooperation between the numerous stakeholders in the public and private sectors. Resident's knowledge on the presents of waste management institutions in their community would also help them collaborate well with them to manage their DSW. Table 4.6 (86) clearly indicates that many respondents witness the presents of the private waste management institution, Zoomlion as the only institution responsible for the collection of waste in Senya, constituting the highest percentage of 50.7 representing 76 individuals who agreed their presents. 28 respondents representing 18.7% were people who categorically stated that, none, that there is no agency or organization that is responsible for the collection of waste in Senya because they have never seen, felt or witness the presence of any waste management institution in their neighbourhood. The role or work of the waste management personnel would promote easy collaboration and support if residents have knowledge about them their importance or value. Table 4.7(p.87), illustrates that many respondents value the role, responsibility and the work of the work of the waste personnel as very important. 74 and 53 individuals representing 49.3% and 35.3% strongly agreed and agreed to the statement that, the work of the waste management personnel is very important and contributes to clean, serene, and disease free environment respectively.

5.2. Disposal of Domestic Solid Waste in Senya

Domestic solid waste disposal practices in a developing country has numerous challenges and problems which includes poor or low collection methods and coverage as well as irregular collection services, crude open dumping and burning of waste without air and water pollution control, the breeding of flies, mosquitoes and vermin are predominant.

It is very clear that the main problems facing the poor management of DSW in many developing countries are as a result of poor administrative, financial, technical (that is inadequate equipment) and institutional personnel. This affect the effectiveness of managing DSW as well as the amount of domestic solid waste collected and how well the management practices meet standard methods. Majority of the individuals strongly agreed and agreed that waste disposal is a problem in their community. They represent 73 and 52 respondents (50 and 34.7 percents). Only 11 and 3 people disagreed and strongly disagreed representing 7.3% and 2% respectively. This clearly indicates that DSW is an epidemic in most developing countries as indicated in table 4.7 (p.88). This confirms the research of UNEP, (1994) and Cointreau-Levine, (1997), stating that, in developing countries the prevalent methods of solid waste disposal is through uncontrolled dumping or burning on open ground or city streets. As shown in Table 4.8 (89 and 90), the commonest place for waste disposal was the public dump site. Majority of the residents who had middle school or junior high school education and dumps their waste at the public dumpsite constituted 15 people, 11 people said they dump their waste at their backyards. 8 respondents said they dump their waste by the roadside, 4 said their waste are dumped on underdeveloped land or sites and only one person said he dumps his waste in a pit constituting 48 individuals who do not manage their waste well respectively. Those who had primary certificate were 35

respondents. 12 people dump their waste at the public dumpsite, 6 and 2 people dump their waste on underdeveloped land or sites and by roadsides respectively. Respondents who had tertiary education and took their waste to the public dumpsites, nearby gutters and roadsides were 8, 6, and 6 respectively. 3 respondents each said they either dump their waste by the roadside, on underdeveloped land or site and personal or home dumpsite respectively constituting 29 individuals. From observation residents of Bonsuoko, Abiase, Kyenkyeso, and Kroboshie normally dump their DSW into gutters, by roadsides, and underdeveloped lands or sites while residents in Anokye, Amanfoso, Bethlehem, and Asikafo- Abantan dump their waste at the public waste bins, pits or holes, or private/ personal dumpsites respectively. Momoh and Oladebeye (2010) in the literature, clearly pointed out that, the methods of solid waste disposal included dumping of waste in gutters, on underdeveloped sites or lands, drains, by roadside, unauthorized dumping sites and stream channels during raining season and burning of wastes on unapproved dumping sites during the dry season. This was evident in Figures 4.8 (p. 89 and 90) where residents dumped waste on underdeveloped sites, on the streets and in gutters respectively. It results in littering and heaping of domestic solid waste making the environment filthy, which could lead to possible outbreak of cholera, breeding of mosquitoes that causes malaria and the outbreak and spread of (airborne and water borne) environmentally related diseases. Majority of respondents as shown in table 4.9 (p.91 and 92) who were between the ages of 21 and 30 years were 53 respondents, 32 said refuse dumps in their areas were never collected, 4 people said it was offloaded 4 times in the week, 5 said once a week, 4, 2 and 6 respondents said five times, twice and throughout the week respectively. Out of the 43 people who were below the age 20 years, 28 of them said, domestic solid wastes in their area are not collected at all, 6 people said their waste is

collected four times in the week. 2 respondents each said their wastes are collected once, twice, five times, throughout the week respectively and only one person said his waste is collected thrice in a week. Respondents between the ages of 31 and 40 years and those over 41 years were 29 and 25. 16 and 14 respondents said, the wastes in their areas were never collected. 90 respondents said waste are not collected in their areas at all. 17 people said either four times or throughout the week. 11, 9, and 5 respondents said their waste are collected once, five times, and twice a week respectively. Only one person said, her waste is collected thrice a week.

Table 4.10 (p.92 and 93) indicates that majority of males constituting 46 respondents and 28 females said their waste is being collected by waste trucks. 18 males and 17 females said they don't know the mode of collecting waste in their area. 8 males and 17 females further said their waste is collected and managed through communal labour (community members selecting and managing a community dumpsite). 8 males and 3 females outline that their wastes are collected by waste collector through door-to-door. 5 females said Zoomlion is responsible for the collection of waste in their area but none of the male mention Zoomlion as the company responsible for the collection of domestic solid waste in their area. Majority of respondents in table 4.11 (p.93) who were males constituted 33 and females were also 21, complained that the quality of waste disposal services in Senya is very poor. 17 males and 27 females further supported what the earlier respondents said that the waste disposal services in Senya were very poor. 20 males and 16 females also said they were satisfied with the quality of waste disposal service in Senya. Only 10 males and 6 females said the quality of waste disposal services was very satisfactory to them.

Most of the respondent constituting 76 people (50.7%) said their wastes are thrown on the backyards of their buildings. 34 people (22.7%) also said their wastes are

deposited on abandoned or under-developed land. 19 and 12 respondents constituting (12.7 and 8 percent) said their waste are deposited into gutters, streams, rivers and sea respectively. Only 9 people (6 percent) said they throw their waste onto the street indicated in table 4.12 (p.94)

Furthermore, the challenges of solid waste management in Ghana is as follows: poor planning for waste management programmes; inadequate equipment and operational funds to support waste management activities; inadequate sites and facilities for waste management operations; inadequate skills and capacity of waste management staff; and negative attitudes of the general public towards the environment in general (MLGRD, 2010). All these challenges were common in Senya. The major technical constraint in Senya was the lack of overall plans for solid waste management. This resulted in cases and situation where solid waste technologies are chosen or selected without seriously considering its effectiveness and effect towards domestic solid waste management.

5.3. Effect of Domestic Solid Waste Disposal Practices

Senya in particular, environmental issues and problems that are associated with waste disposal are of big concern that the local government need to deal with. There is visible evidence existing to demonstrate how „ordinary“ citizens in Ghana are contributing to the filth and choked gutters as a result of indiscriminate waste disposal practices.

As indicated in table 4.13 (p.96) it is clear that there are few waste bins or containers for collecting of waste as majority of the people constituting 40 respondents clearly indicated. They made their opinion clear that they were not sure whether there is a vantage point for the collection and disposal of waste, the males were 21 and females were 19 respectively. 38 respondents further said there is a vantage point for the

collection and disposal of waste, since have some closer to their houses, 20 out of them were males and 18 were females. 32 respondents supported the response of the 38 people above and said they strongly agreed that there is a vantage point for the collection and disposal of waste. The males were 12 and females were 20 respectively. 23 and 17 respondents also challenged the opinions of the earlier respondent by saying they strongly disagreed and disagreed that there is a vantage point for the collection and disposal of waste in their area or neighbourhood. This is as a result of them never seeing at least one waste bin in the entire community of Senya, not to talk of their neighbourhood. This has further contributed to the indiscriminate disposal of domestic solid waste in Senya. As shown in table 4.14 (p.98) 48 respondents, constituting 31 males and 17 females said they strongly agreed that, our food we eat are more important than the waste we dispose off, which clearly indicate their ignorance on the importance of domestic solid waste management and therefore are not aware that the food they eat may be contaminated as a result of poor waste management or filthy environment. About 29 respondents further said they were not sure that, our food we eat are important than the waste we dispose off and cannot give a definite answer. 14 were males and 15 were females. 15 males and 13 females constituting 28 respondents were also in agreement with the first response above that, our food we eat are more important than the waste we dispose off. 25 and 20 respondents disagreed and strongly disagreed that our food we eat are more important than the waste we dispose off and therefore our environment should always be clean. They further made it clear that with clean environment or surroundings our food would always be clean and healthy, prepared under clean, serene and disease free environment and personnel.

The data stated at table 4.15 (p.99) indicates that 38 respondents constituting 19 people for both males and females each made it clear that they are not sure whether there are clear rules and regulations on domestic solid waste disposal. Therefore, the residents dispose off their domestic solid waste indiscriminately without any discipline and persecution. 20 males and 17 females representing 37 people said they were aware that, there are rules and regulations on domestic solid waste disposal but residence don't abide by them. 31 and 30 respondents said they strongly agree and strongly disagree that, there are rules and regulations on domestic solid waste disposal. This indicates that, even though many respondents are aware of the rules and regulations, others are unconcerned and therefore are not aware of the rules and regulations on DSW disposal. But only 14 respondents disagreed to the responses above and said, they are not and have never heard of any rules and regulations on domestic solid waste disposal.

As shown in the table 4.16 (p.100 and 101) the majority of participants constituting 62 people, 32 being males while females were 30 strongly agreed that, information regarding domestic solid waste management practices at Senya is not adequate. This is what makes residents to dispose off their waste indiscriminately, including dumping waste into gutters, roadsides respectively. 45 people representing 24 males and 21 females further agreed and supported the response above that, information regarding domestic solid waste management practices at Senya is inadequate. 18 respondents said they were not sure whether or not there is enough information regarding domestic solid waste management practices at Senya and are not concerned about that since that gives them room to dispose their DSW anywhere they like. 15 and 10 respondents said they disagree and strongly disagree to the responses above and are aware that, information regarding domestic solid waste management practices at Senya is

adequate, but the residents are those that are not law abiding and therefore do not respect and regard those laws. They further said these people are those who litter the environment indiscriminately.

47 respondents representing 25 males and 22 females were the highest respondents as shown in table 4.17 (p.101 and 102) said they agreed that, they have limited or no knowledge about the rules and regulation on domestic solid management in Senya and therefore manage their waste with their own discretion. 20 males and 16 females representing 36 respondents strongly agreed and supported the response above that, they have limited or no knowledge about the rules and regulation on domestic solid management in Senya and they have to find their own way of managing their DSW. 31 respondents said they were not sure whether there are limited or no knowledge about the rules and regulation on domestic solid management in Senya and therefore do not show any concern of finding out whether there are rules and regulation so that their DSW can be disposed-off indiscriminately. 16 and 20 respondents disagreed and strongly disagreed and made it clear that there are enough or more knowledge about the rules and regulation on domestic solid management in Senya respectively but the people of Senya are not dynamic and needs rigid, good laws and regulation that can bin them to promote a clean, serene and disease free environment. As indicated in table 4.18 (p.102) shows that 47 respondents, representing 31.3% agreed and said, poor waste disposal practices can lead to the spread of diseases, such as cholera and malaria. 24 % representing 36 respondent further supported the response above by saying that, poor waste disposal practices can lead to the spread of diseases. 20.7 percent which represented 31 people said they were not sure if poor waste disposal practices can lead to the spread of diseases at all. 16 and 20 respondents representing 10.7% and 13.3% respectively further concluded that, they disagreed and strongly

disagreed that, poor waste disposal practices can lead to the spread of diseases and therefore others factors can contribute to that. The bar chart 4.1 (p. 103) further indicates that majority of the residents believe and are aware that, the environmental problems and hazards that normally occur as a result of domestic solid waste includes the following; air borne disease, air pollution and water pollution, it further causes diseases, cholera, flood, malaria, water borne disease among others. Other causes that were also mentioned included skin disease, the spread of disease and sickness. Despite the above causes mentioned, many other respondents also said it causes communicable disease, environmental pollution, and air borne disease among others. About 20 participants according to the chart said some of the environmental problem and hazards includes malaria respectively.

5.4. Attitudes of Residents towards Waste Disposal

Kendie, (1999) opine that whilst there are some substance to claims of rapid and unplanned urbanization, inadequate funding and economic decline as justification for the most promising economies in sub-Saharan Africa the same argument cannot be put forward in recent times. This is as a result of the recent increase in waste disposal problems that stems from the problem of, attitudes and perceptions towards waste disposal have adequately not been considered. Waste management programmes normally fail to address the most important and remote cause of the problem. The attitudes of people and how it affects their waste disposal patterns are not really tackled.

Attitudes to waste and public awareness can affect the population's willingness to cooperate and participate in appropriate and adequate waste management practices. Information on health risks due to poor and inadequate domestic solid waste management are important factors which must be continuously communicated to

everyone and in all sectors of the population as well as general environmental awareness. The information or data gathered from the questionnaire as indicated in figure 4.8 (p. 105), reveals that 51.3 percent strongly agreed that, waste disposal is important to prevent indiscriminate dumping. 16 % of the respondents made it clear that they are not sure whether waste disposal or dumping waste anywhere is important or not. 10 percent supported the earlier response and agreed that, waste disposal was very important. Other respondents had negative response towards the importance of the disposal of waste and they represented 11.3 percent who disagreed and strongly disagreed that waste disposal is important respectively. This really indicates that most of the residents dispose their DSW anywhere and litter their environment as well. The data stated in the table 4.19 (p.105 and 106) outline the view of the majority of respondents which is 50 people representing 33.3 percent who strongly disagree and said their concern about the Waste Situation in Senya and therefore the assembly has to deal with that. 32 respondents representing 21.3% disagreed and supported the response made earlier by saying, their concern about the Waste Situation in Senya, since cleanliness is next to Godliness. 13.3% resenting 20 respondents further said they were not sure whether their concern or not concern about the Waste Situation in Senya. 30 and 18 respondents representing 20% and 12% negatively responded agreed and strongly agreed to the statement and further said their not concern about the Waste Situation in Senya respectively. 74 people representing 49.3% as shown in table 4.20 (p.106) indicates that majority of respondents strongly agreed and said, indiscriminate waste disposal is common in Senya or their locality. 43 respondents representing 28.7 percent also agreed to the earlier response and confirmed with the statement, indiscriminate waste disposal is common in Senya or my locality. 13.3% representing 20 people said they were not sure about the statement; indiscriminate

waste disposal is common in Senya or your locality and are not concern about such laws. 4 and 9 respondents representing 2.7% and 9% respectively said they disagree and strongly disagree to the statements that, indiscriminate waste disposal is common in Senya or their locality, leading to DSW ending up in gutters, by roadsides among others. 50 respondents representing 33.3% as shown in table 4.21 (p.107) strongly disagreed to the statement and said it's their responsibility to assist in any domestic solid waste management activity. 35 representing 23.3% of the respondents also agreed and supported the response above by saying that, it's their responsibility to assist in any domestic solid waste management activity and are therefore willing to participate in any DSW activity. 19 respondents said they were not sure of the statement; it's not my responsibility to assist in any domestic solid waste management activities and they are not interested in any DSW activity. 20 and 26 (13.3% and 17.3%) respondents said they strongly agree and agree that it's not their responsibility to assist in any domestic solid waste management activity and are not willing to assist. The table 4.22 (p.108) indicates that 39 respondents representing 26% respondent strongly disagreed and said regular clean-up exercise are not organized in Senya to make the environment clean. 24.7% and 22% representing 37 and 33 people further agreed and strongly agreed to the statement and said regular clean-up exercise are organized in Senya to make the environment clean. 22 respondents representing 14.7% were not sure and unconcern about regular clean-up exercise that are organized in Senya to make the environment clean. 19 people disagreed and said regular clean-up exercises are not organized in Senya to make the environment clean, and they represents 12.7 percent.

As shown in the figure 4.9 (p.109), almost 60 participants agreed to the statement and said they participated in communal labour during clean-up exercises in their

neighbourhood. Between 40 and 50 respondents further said they strongly agree to the statement and confirmed the statement above and said, they participate in communal labour during clean-up exercises. About 20 respondents said they were not sure of the statement and do not participate in communal labour during clean-up exercises. Between 15 and 12 respondents said they disagree and strongly disagree to the statement, and therefore participate in communal labour during clean-up exercises in Senya to promote cleanliness in Senya. The figure 4.10 (p.110) shows that more than half of the respondents representing 68% strongly agreed and said their surroundings should always be clean. Respondents that agreed and supported the statement above by saying their surroundings should always be clean, they represented 22.7 percent. 5.3% of the respondents were not sure about the statement, that their surroundings should always be clean, since their unconcern. 3.3% and 0.7% representing the smaller and smallest group of people, were those who strongly disagreed and disagreed and said, their unconcern about clean surroundings respectively. The attitudes of residents play an important role in curbing environmental problem as Schubeller *et al.*, (1996) rightly opines that waste generation is conditioned to an important degree by people's attitudes towards waste: their patterns of material use and waste handling, their interest in waste reduction and minimization, the degree to which they separate wastes and the extent to which they refrain from indiscriminate dumping and littering.

As shown in the table 4.15 (p.111) indicates that out of the 80 males, 15 said yes to the statement and confirmed that they normally pay the waste disposal department (officers) for their services, while 45 respondents said no, but they are willing to pay. 20 males further said they don't pay and they are not willing to pay. But 24 females also said they yes to the statement, and they normally pay the waste disposal

department (officers) for their services. 33 respondents said no but they are willing to pay for the services of the waste department. 13 respondents said they don't pay and their not willing pay any services or the waste department for their services respectively.

The willingness to pay for waste management services or facilities is very important and contributes to the success of the Private Sectors' Participation (PSP) in Domestic Solid Waste Management program. The willingness to or not to pay have direct impact positively or negatively on the success and liability of any solid waste management strategy (Epp & Mauger, 1989; Rahman, Salequzzaman, Bahar, Uddin, Islam & Al Hrun, 2005). Attitudes of residents can be critically determines the beauty of a particular town. Schubeller *et al.*, (1996) posit that "people's attitudes influence not only the characteristics of waste generation, but also the effective demand for waste collection services, in other words, their interest in and willingness to pay for collection services".

This confirms the self-interest model which holds that citizens favour strict environmental regulations if their local environment is polluted (Rohrschneider, 1988). From the survey residents were willing to pay fees for waste collection provided they will receive better, quality and satisfactory services. This further confirms the "Theory of Planned Behaviour (TPB)". Within TPB, the attitude measure refers to the individual's favourable or unfavourable evaluation of performing the behaviour, and is usually operationalized by asking the individual their feelings about performing the behaviour, for example, whether the behaviour in question is good, rewarding, useful, and responsible. The theory also suggests that a person's Imbided behavioural patterns are cultural in origin. This confirms the relationship between humans and environment as a function of culture, the level of

society's technological development, the perceived magnitude of existing environmental problems and the level of education (Agbola, 1993).

The analyses of the views and responses from respondent indicates that most of them are concerned about the generation, disposal, attitudes and effect of domestic solid waste management practices in Senya. But they follow what their other neighbours are doing, others were scared of criticism, while others felt reluctant carrying their domestic solid waste to the dumpsite and felt it was a normal behavior dumping their waste indiscriminately.



CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.0. Introduction

This chapter of the study presents the summary of the research findings, conclusions and provides recommendations on how to effectively improve the waste disposal services in Senya. The aim of the research was on the domestic solid waste management practices in Senya, in the Awutu Senya West District. Knowledge on peoples' attitudes towards generation and disposal of domestic solid waste and the opportunities for effectively planning and implementing efficient solid waste management technologies. Out of the one hundred and sixty-five (165) individuals who constituted the sample size, one hundred and fifty-six (157) were given questionnaires to respond to and one hundred and fifty (150) was retrieved. The other five (5) individuals who were officials of WMD and ZoomLion were also given questionnaire.

6.1. Summary of the Research Findings

Through the analyses, the following are the key findings of the study. These are discussed below;

6.1.1. Generation of Domestic Solid Waste in Senya

The study reveals the general waste situation in Senya as very poor, especially in the underdeveloped areas and communities. Most of the DSW is being generated from the homes or houses, schools, seashore, offices, public places and most the time passer-byers also litters the town. Residents supported the arguments and responded confidently that DSW should be well managed. They further mentioned the waste management institutions that are responsible for waste collection as only two namely, the district waste department and the private waste management (Zoomlion Limited).

The work of the waste personnel was viewed as very important and therefore they need to be respected and supported so that they can deliver effectively. Waste that generated are mostly managed by the residents of Senya themselves (Fieldwork: April, 2019).

6.1.2. Disposal of Domestic Solid Waste in Senya

The study revealed that there was irregular or lack of routine collection of waste by WMD of ASWD and ZoomLion Ghana Ltd. especially in areas and communities or villages that are underdeveloped within Senya. Waste collections were mostly not carried out in the neighboring villages. Residents then developed the habit, behaviour and routine of dumping waste at backyards of their buildings, into pit or holes, into nearby gutters, by roadside, opened spaces and other unapproved and underdeveloped sites or land (Fieldwork: April, 2019).

The landfill is closer to Fetteh and therefore did not meet the requirement of a standardize sanitary landfill and could be described as an open dump. Wastes are disposed off indiscriminately in the Senya Township. Additionally, waste was not usually separated into their various components before final disposal. As a result of not separating DSW before disposal valuable resources are buried and disposed off which could have been otherwise re-used as raw materials and therefore loses its relevance (Fieldwork: April, 2019).

6.1.3. Effect of Domestic Solid Waste Disposal Practices in Senya

The study clearly shows that, there were not enough vantage points for the collection and disposal of waste. As result of that most of the residents in Senya never regarded DSW as important and therefore made it clear that, the food they eat was more important than the waste they dispose off indiscriminately. This response clearly shows that respondents lacks knowledge on the effect of poor DSW and its

implications. Their food may easily be contaminated if the environment is filled with filth, gutters are choked, stagnant waters produces odour and flies as well as mosquitoes (Fieldwork: April, 2019).

Rules and regulations regarding waste disposal were not effective. Most people did not know or have little or no knowledge on the existence of such rules and regulations on DSW.

The waste management institutions were also unable to deliver efficient services as they were under resourced. The study also showed that inadequate skips was a major factor affecting the disposal of waste in Senya especially among the low class residential areas. The survey established that most skips when carried away are not replaced immediately. This contributed indiscriminate disposal of DSW. There was clear evidence revealed that the two waste management institutions were under staffed and also those in charge of operations in these institutions had little or no background in waste management (Fieldwork: April, 2019).

Respondents were further asked if they knew any environmental problems associated with their methods of waste disposal. The responses that were given on the environmental problems included air and water borne diseases, flooding, water pollution, air pollution, littering among others. It was further noted that most of the diseases that were reoccurring in the Senya Township as a result of poor or improper disposal practices included malaria, typhoid and cholera respectively (Fieldwork: April, 2019).

6.1.4 Attitude of Residents towards Waste Disposal

The participation of individuals have direct impact and bearing on proper waste disposal practices. Despite this, the Awutu Senya District authorities have failed in mobilizing the community members and educating these citizens on the advances and

opportunities of proper practices of waste disposal which include segregating waste in their own bins at the household level to generate income, example is the plastics or sachet water and scraps. These are items that can be considered waste but yet people buy them for recycling. Some dumping bins were more than 200 meters away from the houses of residents as well as the absents of a basic facility of collection of waste which resulted or give room for residents to dump their waste on the streets, open spaces, drains or gutters, and water bodies in the vicinity which at the end creates unhealthy and insanitary conditions in the environment. More often, it was due to households lacking knowledge and incentives to keep to the rules of the collection system, and operators lacking sanctions and authority. Furthermore, most residents don't see the need to participate regularly in clean-up exercises as well communal work to promote serene, healthy and disease free environment. There were also irregular or lack of routine education or information regarding waste management by ASWD, WMD, ZoomLion Ghana Ltd. especially in the fishing communities or beach areas in Senya (Fieldwork: April, 2019).

6.2. Conclusion

Every Ghanaian has the responsibility of making the environment clean, since everyone is the direct beneficiary of its consequences, effects and benefits. The development of every country depends greatly on the sanitation or environmental level within the various cities, districts as well as the communities among others. This development slows down when people do not make it an obligation to observe good sanitation habits. Unkempt environment is the possibility of the outbreak of an epidemic, which in the long run burdens the government coffers in spending huge amount of money to cure or control the epidemic.

Conclusively, attitudes, beliefs and perceptions are learned, inherited and therefore can be changed through regular, effective, and consistent education. The data suggests that general environmental knowledge can significantly predicts ones behaviour. Even though past behaviours can have a sizeable effect on predicting subsequent behaviour, suggesting that attitudinal change plus knowledge will go a long way to help promote and predict proper waste disposal practices in Senya Township. Effective waste management infrastructure should be available to enable the public to properly dispose their waste as obligation and crucial part of any waste management initiative including other motivational factors to encourage individuals to make good use of that infrastructure. These motivational factors (Facilities, regular collection, incentives) is essential and very important if proper waste disposal practice would be a reality and can be attained fully, as well as our everyday individual routine and responsibility in the town. It is hoped that, if these suggestions are well considered for action by the local authorities and the people themselves would promote and address the domestic solid waste management problem and its related issues in Senya.

6.3. Recommendations

As a result of the findings of the study, the following measures were recommended for effective and efficient disposal of waste in Senya. These are discussed as follows.

6.3.1. Provision of Adequate Dustbins and Skips

The ZoomLion Ghana Ltd should provide enough and adequate dustbins and skips in (Senya) through the collaboration with the WMD and the District Assembly for the storage of DSW by the residents in Senya. Approximately over fifteen (15) skips should be available or supplied. It should be situated in communities and areas whose residents engages mostly in fishing activities and businesses to avoid dumping of waste in open spaces, backyards, gutters, underdeveloped sites or land and roadside.

These should be placed at least within 30 metres radius and at most 50 metres radius in the fishing communities or areas. This would reduce the time spent by residents on the disposal of their DSW at the skip site. Furthermore, over 1100 dustbins should be supplied by ZoomLion Ghana Ltd. particularly for the areas that have highly educated residents as well as the middle class area or communities

6.3.2. Regular Collection of Waste

Regular collection of DSW should be the hallmark of ZoomLion Ghana Ltd. Particularly in highly populated areas such as Kolebu junction, Bonsuoku, Abease or Awiaso, Assin or Kobekor, Castle, Anomansa, Ogyamboa poti, Amanfoso Kyenkeso and Krobonso to avoid heaping of waste and over flowing of skips with solid waste. Moderately, waste should be collected three times in a week within these areas and twice in the Middle and high class residential areas respectively. Regular monitoring of waste collection should be done by the District Assembly. This will promote cleanliness and prevent or reduce any possible outbreak of communicable and air borne diseases such as cholera, typhoid and skin disease among others.

6.3.3. Proper Management of Landfill

The heaping of waste and burning should be avoided through proper management of the landfill site. The following should be revived for the landfill to work effectively. These include the leachate collection system, weighbridge and gas recovery system. The presents of adequate leachate system present, the possibility of waste polluting groundwater in Senya will be highly prevented. The weighbridge will give the accurate quantity of waste that goes into the landfill. Furthermore, domestic solid waste dumped on the landfill should be spread, compacted and covered with enough soil to prevent the breeding of flies and mosquitoes as a result of reducing and prevent the heaping of DSW in the landfill. The management team for the landfill must

always ensure that waste that are carried to the landfill do not contain fire. All the containers that have fire should be separated or isolated and they should quench the fire before waste is dumped, this will prevent the burning of waste in the landfill. The landfill site should also be relocated if possible due to its negative environmental impact on the lives and health of the people in the nearby community. This relocation will prevent the community from being constantly engulfed by smoke from the landfill. This will further prevent the possibility of the DSW in landfill especially hazardous waste from polluting the water sources within the community through percolation.

6.3.4. Adequate Education and Monitoring of Individuals' attitudes towards Domestic Waste Management Practices

Education is one major way of bringing proper waste disposal practices and awareness creation, which is still not effective. Since education is a major way of changing the attitudes of individuals, there should be regular and constant education for the residents of Senya on DSWM. This will create the awareness of the regulations and rules on domestic solid waste management in Senya. Changing behaviours or attitudes and cultures towards DSW and sanitation requires new personality that is stripping of our old indecent behaviour and putting up a new attitude. It also requires putting away our old unsustainable ways and replacing them with modern approaches of managing waste that are environmentally and culturally friendly. The older population who seem not to have acquired any information on proper waste disposal practices should also be educated on the need to practice an environmentally safe waste disposal practice. The public's attitudes and awareness on the uses as well as the effect of DSW can improve the population's willingness to cooperate and participate in adequate waste management practices. Regular

environmental awareness and information on health risks due to poor and inadequate solid waste management are very critical factors which need to be continuously communicated to all sectors of the population.

The creation of a sustainable society requires a critical mass and constant positive behaviour to take up sustainable lifestyles toward development. However, constant efforts are needed to involve the public in the policy-formation, development of plans, and implementation of waste management programs. The support of the public is essential for the success of such decisions. Whilst attitudes towards solid waste may be positively influenced by public information and educational measures, improved waste handling patterns can hardly be maintained in the absence of practical waste disposal options (Schübeler *et al.*, 1996). Awareness-building measures should always be coordinated with improvements in waste collection services through public or community management. The population can participate effectively by carrying waste to the appropriate containers, by segregating waste to assist recycling activities, or even by paying for waste management services.

The Environmental Protection Agency (EPA) and the Waste Management Department of the ASWD which are the regulatory authorities on sanitation should ensure regular routine monitoring of households and management of the landfill site.

6.3.5. Strict Implementation of Environmental laws and Prosecutions of

Offenders

The laws on environmental cleanliness should be enforced and implemented; those who bridge it should prosecute and published in the electronic and print media to serve as deterrent to others. This has given people the chance to dump solid waste at their convenience, anywhere they please. Lack of enforcement of the law has made the power of the law dormant, making the existence of the law irrelevant. If the

people refuses to realize the benefit of a clean and serene environment, then it is the duty of the law makers to implement the law to protect and save the environment and as well as the people in it.

6.3.5. Adequate Resourcing of Waste Management Institutions

The waste management institutions should be adequately resourced by the District Assembly to ensure efficient and effective waste management in Senya. The District Assembly should liaise with other corporate bodies in the district including the financial institutions such as banks to assess financial resources that can support institutions in charge of managing waste especially WMD and ZoomLion Ghana Ltd. With these supports, adequate dustbins, skips and core waste management equipment such as compaction trucks, roll on/roll off trucks, skip loaders would be purchased to ensure effective waste collection and disposal in the district. Residence should be made to pay for disposing their waste particularly those in the low class residential areas. This is because they are those who generate most or more waste. The „pay as you throw principle“ should be introduced in such communities. Education should be the major hallmark among all these, to encourage and motivate these residents on the importance of environmental cleanliness as part of their daily life and activities. The financial base of the waste management institutions will then be greatly supported through this

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APPENDIX A

INTRODUCTORY LETTER



UNIVERSITY OF EDUCATION, WINNEBA
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DEPARTMENT OF SOCIAL STUDIES EDUCATION

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9th April, 2019

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

LETTER OF INTRODUCTION: MR. JEHOIADA PAA KWEKU TETTEH

We write to introduce to your outfit **Mr. Jehoiada Paa Kweku Tetteh**. He is a second year M. Phil. Social Studies student with registration number 8170140012 from the above named Department.

As part of the requirements for the award of the Masters' degree, he is undertaking a research on the topic "*Domestic Solid Waste Management Practices in Senya, in the Awutu Senya West District*".

We wish to assure you that, any information provided would be treated confidential.

Thank you.

Yours faithfully,



Margaret G. Nyala (Mrs.)
For: Head of Department

APPENDIX B

DEPARTMENT OF SOCIAL STUDIES EDUCATION

SCHOOL OF GRADUATE STUDIES

UNIVERSITY OF EDUCATION, WINNEBA

M.PHIL SOCIAL STUDIES

DOMESTIC SOLID WASTE MANAGEMENT PRACTICES IN SENYA, IN THE AWUTU SENYA WEST DISTRICT

Questionnaire

The aim of this questionnaire is to examine the domestic solid waste management practices in Senya and their attitudes towards waste disposal. Please share your honest views on how waste is generated, managed and disposed off. Your personal opinions are being sought. Your response will completely be anonymous. Thanks for your assistance.

SECTION A: BACKGROUND INFORMATION:

Please tick (✓) the appropriate box.

1. Gender: Male Female
2. Age: under 20 years 21-30 years 31-40 years over 41 years
3. What is your highest educational level?
 - a. Never attended school
 - b. Primary
 - c. Middle school/JSS
 - d. SHS/Technical
 - e. Tertiary
4. What is your major occupation?
 - a. Farming
 - b. Trading
 - c. Fisherman
 - d. Fishmonger
 - e. Public servant
 - f. Civil Servant
 - g. Health Personnel
 - h. Banking Sector
 - i. Religious leaders among others

SECTION B: GENERATION OF DOMESTIC SOLID WASTE IN SENYA.

The following questions outline your knowledge on Domestic Solid Waste generation in Senya.

5. How will you describe the general waste situation in your neighbourhood?
 - Very satisfactory
 - Satisfactory
 - Poor
 - Very poor
6. What are the sources of domestic solid waste generation?

- . Homes / Houses . Offices
 . Schools . Public places
 . Seashore . Passers - bye

7. Domestic Solid Waste generated should be well managed.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

8. Which waste management institution is responsible for waste collection in Senya?

Waste Management department (of the municipal assembly)

ZoomLion None Don't know

9. The work of the waste management personnel is very important

Strongly Agree Agree Not Sure Disagree

Strongly Disagree

SECTION C: DISPOSAL OF DOMESTIC SOLID WASTE IN SENYA.

This section further ask questions on domestic solid waste disposal in Senya

10. Waste disposal is a problem in my community.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

11. Where are your domestic solid waste dumped?

Roadside Backyard Nearby gutters Public
 Dumpsites Undeveloped lands/ site

Small holes Small/ home dumpsites

12. How many times is the waste collected in a week?

Not at all Four times Once Five times

Twice Throughout the week Thrice

13. What is the mode of collection of waste in your area?

Door-to-door Communal By waste trucks Don't know
 Zoomlion

14. How will you describe the quality of waste disposal service you receive?

• Very satisfactory • Satisfactory • Poor • Very poor

15. How is waste disposed off in your household?

• On the street • backyard of building • into gutters
 • In stream/ rivers/ sea • on abandoned/ under-developed land

SECTION C: EFFECTS OF DOMESTIC SOLID WASTE DISPOSAL PRACTICES

The following statement may best describe your knowledge on the effects of domestic solid waste disposal practices and management in your locality. Please indicate your answer by ticking (✓) one of the appropriate columns. Strongly Agree: SA, Agree: A, Not Sure: NS, Disagree: D, Strongly Disagree: SD

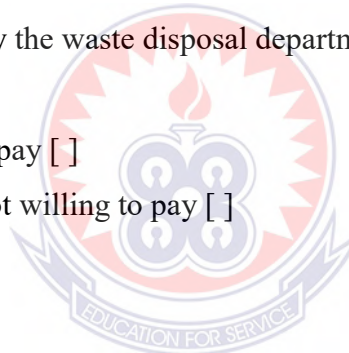
No.	STATEMENT	SA	A	NS	D	SD
16.	There is a vantage point for the collection and disposal of waste					
17.	Our food we eat are more important than the Waste we dispose off					
18.	There are rules and regulations on domestic solid waste disposal					
19.	Information regarding domestic solid waste management practices at Senya is not adequate					
20.	I have limited or no knowledge about the rules and regulation in Senya.					
21.	Poor waste disposal practices can lead to the spread of diseases					
22.	Can you mention any environmental problem or hazard as a result of the method of domestic solid waste practices and disposal?					
					
					
					

SECTION D: ATTITUDES OF RESIDENTS TOWARDS DOMESTIC SOLID WASTE MANAGEMENT

The following questions further elaborate your knowledge on the attitudes of residents towards domestic solid waste management practices.

Strongly Agree: SA, Agree: A, Not Sure: NS, Disagree: D, Strongly Disagree: SD.

No.	STATEMENT	SA	A	NS	D	SD
23.	Waste disposal is important					
24.	I am not concern about the Waste Situation in Senya					
25.	Indiscriminate waste disposal is common in Senya or your locality					
26.	It's not my responsibility to assist in any domestic solid waste management activity					
27.	Regular clean-up exercise are organized in Senya to make the environment clean.					
28.	I participate in communal labour during clean-up exercises					
29.	My surroundings should always be clean.					
30.	Do you normally pay the waste disposal department (officers) for their services? Yes [] No but I am willing to pay [] I don't pay and I am not willing to pay []					



APPENDIX C

DEPARTMENT OF SOCIAL STUDIES EDUCATION

SCHOOL OF GRADUATE STUDIES

UNIVERSITY OF EDUCATION, WINNEBA

M.PHIL SOCIAL STUDIES

DOMESTIC SOLID WASTE MANAGEMENT PRACTICES IN SENYA, IN THE AWUTU SENYA WEST DISTRICT

Questionnaire for Department in charge of Waste Management Department and Ziomlion Ghana Ltd.

The aim of this questionnaire is to examine the domestic solid waste management practices in Senya, their attitudes towards collection and disposal of domestic solid waste. Please share your honest views on how waste is generated, managed and disposed off. Your personal opinions are being sought. Therefore, answers given will be treated as confidential. Thanks for your assistance.

AVAILABILITY OF RESOURCES FOR MANAGING WASTE

These questions below elaborate more on the availability of resources, personnel and equipments to manage domestic solid waste in the Awutu Senya West District.

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

Equipment	Number available	Number requirement
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2. The availability of qualified personnel for domestic solid waste management (Technical Staff)

Qualified Staff	Available Number	Required Number