UNIVERSITY OF CAPE COAST

HOUSEHOLD WASTE MANAGEMENT PRACTICES IN TAIN DISTRICT

BONAVENTURE BAYOR

2019

UNIVERSITY OF CAPE COAST

HOUSEHOLD WASTE MANAGEMENT PRACTICES IN TAIN DISTRICT

BY

BONAVENTURE BAYOR

Thesis Submitted to the Department of Health, Physical Education and Recreation of the Faculty of Science and Technology Education, College of Education Studies, University of Cape Coast, in Partial Fulfilment of the Requirements for the Award of Master of Philosophy Degree in Health Education

MAY 2019

DECLARATION

Candidate's Declaration

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

Candidate's Signature…… Date……..

Name: Bonaventure Bayor

Supervisor's Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature……. Date……

Name: Dr. Edward Wilson Ansah

Co-Supervisor's Signature…… Date……...

Name: Dr. Charles Domfeh

ABSTRACT

The purpose of the research was to investigate how households in the Tain district manage waste and to determine whether their waste management practices are appropriate to reducing environmental and sanitation related challenges. The population included all permanent residents in Tain District. The sample size for the study was 1,037. Female heads in each household were selected using the convenient sampling technique. A questionnaire and observation checklist, developed by the researcher was used to collect the data. Results indicated that the abundant type of waste generated in the district was food Scraps (41%). Moreover, majority (76.37%) used public dumpsite as waste disposal place. Also, majority (50.05%) of the participants were dissatisfied with waste management institutions in Tain District. Furthermore, majority of the participants have adequate knowledge on perceived health effects of indiscriminate waste management practices. Participants call for the provision of waste collection bins / containers to help properly manage the district waste. There is adequate knowledge on perceived health effects of indiscriminate waste disposal. The study concluded that waste generated at home was largely food scraps. Some community members practiced crude dumping in any available space, including gutters, streets and backyard. Some recommendations that were made included, there should be provision of enough dustbins/ public waste containers and employment of more Zommlion workers by the Tain District Assembly and Zoomlion.

ACKNOWLEDGEMENTS

I wish to register my sincere acknowledgement to Almighty God and to the Department of Health, Physical Education and Recreation, University of Cape Coast, especially, my academic supervisors, Dr. Edward Wilson Ansah and Dr. Charles Domfeh for the interest, guidance, suggestions and encouragement that greatly helped me to complete this work. Finally, I wish to thank my family and friends for their support, especially my brother Bayor Fredrick and my wife Bayor Matilda.

DEDICATION

To my son, Bayor Brian

TABLE OF CONTENTS Page

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATONS / ACRONYMS

UNEP	United Nation Environmental Protection
GSS	Ghana Statistical Service
UNSD	United Nation Statistical Division
US-EPA	United State Environmental Protection Agency
EMP	Environmental Management Plans
MLGRD	Ministry of Local Government and Rural Development
MMDAs	Metropolitan, Municipal and District Assemblies
WMD	Waste Management Department
EHSD	Environmental Health and Sanitation Department
TPA	Theory of Planned Behavior
TRA	Theory of Reasoned Action
CBSM	Community Based Social Marketing
ISWM	Integrated Solid Waste Management
CBM	Community Based Management of Waste

CHAPTER ONE

INTRODUCTION

Background to the Study

Sanitation is critical for human health and development. Therefore, waste management becomes an inevitable aspect of life (McAllister, 2015). It required that the process from generation to disposal be observed critically. Addressing these critical areas would improve sanitation and health of individuals and communities (McAllister, 2015). According to EPA (2018), household wastes are materials generated from homes or used for the purposes of living accommodation which are unwanted or unusable and are to be thrown away. There are several forms of household waste including solid, liquid and gas. Solid wastes are the non-liquid and non-gaseous products of consumption and production activities of human beings. It takes the form of refuse, garbage and sludge. Liquid waste includes water from food and agricultural processing. Gaseous wastes are product in gas form resulting from various household activities such as fire and manufacturing. These wastes can cause many health effects if left unattended. Thus, proper management of such waste becomes more essential. Households waste management involves activities and actions required to manage waste from its generation to its final disposal site (Rouse, 2008). This includes generation, collection, transport, treatment and disposal, monitoring and regulation (Rouse, 2008).

Tsiboe and Marbel (2004) observed that waste such as solid, liquid or gaseous have become a major consequence of modernization and economic development. Tsiboe and Marbel added that, in the quest for 'Western-styled' development, humanity did not budget for the problems related to the

management of waste. Further, Shafiul and Mansoor (2003) observed that previously waste disposal did not pose difficulty as habitations were sparse and land was plentiful. However, it became issues of concern with increase in the number of towns and cities coupled with population increase. These large numbers of people started to congregate in relatively small areas in pursuit of livelihoods. While the population densities in urbanised areas and per capita waste generation increased, the available land for disposal decreased proportionately. Thus, effective waste management emerged as an essential, specialised sector for keeping cities healthy, liveable and promotes health (Shafiul & Mansoor, 2003).

There are several methods of household waste disposal and management practices such as composting, recycling, reuse, incineration and controlled dumbing (Thompson, 2010). Composting deals with turning organic household waste into fertilizer through aerobic fermentation for agricultural purposes (Dreschel & Kunze, 2001). Recycling involves turning waste materials into new product for use or reuse (Aderemi,& Falade, 2012). For example, Aderemi and Falade observed that recycling of waste results in saving natural resources, reduction in harmful emission of air and pollution of water, saving money and creating jobs. Incineration deals with using heat to about 1000^{oc} to turn combustible materials contained in the waste into ashes for the purpose of generating energy (Molnar, 2002). Pyrolysis is another form of incineration that chemically decomposes organic materials by heat in the absence of oxygen. Pyrolysis typically occurs under pressure and at operating temperatures above 430°C (Leal-Quirós, 2014). In addition, controlled dumbing refers to the use of landfills as terminal endpoints for refuse. It is the

most common disposal systems applied in developing countries and rural communities because it is the most affordable and requires the least maintenance and engineering (Thompson, 2010).

Human wastes are great contributors of environmental health hazards. They are vectors for both viral and bacterial diseases, increasing the burden of infection and diseases among citizens (WHO, 2012). An estimated 12.6 million people die globally each year as a result of poor sanitation, nearly one in four of total global deaths (WHO, 2012).

Additionally, nearly 700,000 children die each year from diarrhoea due to poor sanitation from human activities such as contamination of drinking water from faecal matter and poor waste disposal. This is because large amount of wastes are generated from homes and are managed poorly (Fewtrell et al., 2005).

About 2.01 billion metric tons of municipal solid waste are produced annually worldwide (World Bank, 2018). The World Bank estimates overall waste generation will increase to 3.40 billion metric tons by 2050. Moreover, a significant percentage of the waste would be produced in large economic countries such as China and India (Sakai et al., 2014). Miezah, Obiri-Danso, Kádár, Fei-Baffoe, and Mensah (2015) conducted a study in Ghana and observed that the rate of waste generation in Ghana was 0.47 kg/person/day. This translates into about 139,120,000kg of waste produced daily, per the current population of Ghana 29.6 million (Miezah et al., 2014). Therefore, waste management strategies need to be scaled up to reduce any identified challenge.

Mosler and Martens (2006) identified lack of strategy to educate and inform the community on attaining improved waste behavioural patterns, poor systematic environmental education campaigns, insufficient socio-cultural community involvement, lack of material resources required to support environmental education, lack of appropriate waste management awareness by the population and poor level of knowledge on the relations between waste management and health as some key barriers to waste management. Furthermore, they observed that the absence of waste bins with tight fitted covers and absence of drainage systems in some houses promote littering of refuse within the immediate surroundings. Even where the drains are available they are either constructed without a gradient or not properly maintained as they are clogged or blocked with sand or other debris, thus preventing sewage drainage. Oteng-Ababio (2010) added that the heap of uncontrolled households waste is as a result of lack of planning by District Assemblies in areas of provision of infrastructures to serve the increasing population. For example, Manga, Forton and Read (2008) further observed that waste management services are rudimentary. The practice is primarily concerned with collection and dumping of waste without proper management methods. Zhu, Asnani, Zurbrugg, Anapolsky and Mani (2008) added that this form of waste management is due to factors such as inadequate financial resources, low levels of law enforcement, as well as poor governance and lack of human resource.

Moreover, current regulations do not adequately address waste handling or disposal system. Inefficient implementation of waste management policy and documentation is affected by a duplication of functions and

responsibilities between several governmental agencies and the local councils (Manga et al., 2008). Thus households waste management practices have remain a public health concern. Therefore, there is the need to manage households waste through acceptable, systematic and environmentally friendly manner that human and environmental health is not affected, rather protected and promoted.

Statement of the Problem

Rapid urbanisation, population growth and changes in lifestyles in rural communities contribute to the increase in per capita domestic waste generation (Singh & Sharma, 2002). Therefore, waste management constitutes one of the most crucial health and environmental problem in most towns and cities in all communities. Waste management has become one of the biggest challenges confronting Ghana (Badoe, 2014). This is due to a long period of neglect of the sector and the lack of resources to serve the increase economic development (Tamakloe, 2000). Where waste collection services are provided by municipal authorities, user cooperation is essential regarding proper storage of household waste, waste separation, placement of household containers and attitude in the use of public collection points (Narayana, 2009).

Concern has been expressed by many stakeholders including the president, governmental and non-governmental organizations and the public at large. These stakeholders are concerned about the increasing sanitation challenges of both urban and rural communities (Akologo, 2017). Therefore, there is the need to find a solution to this problem to save the environment and human health. In view of the waste management issues, the President of the Republic of Ghana, Nana Addo Danquah Akufo-Addo in November 2017

launched the Sanitation Brigade meant to employ graduates who will enforce the sanitation laws in Ghana. The aim is to promote environmental sanitation and reduce health problems associated with such condition (Ofosu, 2019).

The population of the Tain District has increased tremendously in recent years. The average household size in Tain District is 5.3 persons per household (GSS, 2014). Tain District population growth rate stands at 2.6% annually. The estimated population of Tain District is 105,391, with a household population of 19,885 (Tain District Assembly planning Unit, 2018). The high population has resulted in an increase in the tons of waste generated on a daily basis in the district. Besides, the sanitation report in Tain District revealed that 70% of the total population uses open dumping as their system of disposing waste (Tain District Assembly, 2014). Also, 27.9% disposed their solid waste improperly while only 2% use the public container. Apart from Nsawkaw, the district capital which has 16.12% of the population having access to public container, the rest of the people in the district disposed off solid waste either improperly or open dumping system (Tain District Assembly, 2014). Mostly, waste which are improperly dumped in open places includes left over food, broken bottles, garbages, faeces and bath water.

Ghana Statistical Service (2014) pointed out that about one in ten households (11.8%) dump their solid waste indiscriminately in the community. The most widely used method of waste disposal is by public dump in the open space, accounting for 72.2%. It is evident from the statistics that Tain District is overwhelmed by the waste situation. A study by Bekoe-Nketia (2015) in Tain District on solid waste and its effect on public health and the environment, tackles only solid waste in some selected towns in the

district. The author concluded that improper solid waste management has devastating effects on the physical environment which consequently affects public health such as increase in diseases. However the author on tackle solid waste using only quantitative approach. This study is to fill the contextual gap by looking at all forms of household waste using the mixed method. According to Tain District Hospital (2017), the following Malaria- 7718, Upper Respiratory Tract Infection- 4600, Diarrhoea-3427, Urinary tract infection- 1682 and Skin infection- 1626, were the top five reported cases. Most of these diseases are linked to poor environmental health. Therefore, waste management is seen as a major environmental and health issue in Tain District. However official information on household waste management is scarce.

Purpose of the Study

The purpose of the study was to investigate how households in the Tain district manage waste and to determine whether their waste management practices are appropriate to reducing environmental and sanitation related challenges.

Research Questions

The following research questions guided the study:

1. What types of waste do residents in the Tain District generate?
2. What waste management practices are employed by households in the Tain District?
3. What strategies improve waste management practices in the Tain District?
4. What are the perceived health effects of indiscriminate households waste disposal practices in the Tain District?

5. What factors influence households waste disposal practices in the Tain District?

Significance of the Study

The results, findings and conclusions from this study may inform Zoomlion and Tain District Environmental Health and Management Officers so that proper waste management strategies can be adopted to improve sanitation situation in the district. The recommendations if employed by authorities in Tain District would help improve waste management in communities and households, therefore reducing environmental and health burdens. The study would also create knowledge on proper waste management methods for better public health and sustainable environment. The study would also serve as a reference material to Tain District at large.

Delimitation

The study was delimited to permanent residents in Tain District. These are people who are believed have appreciable knowledge about the waste situation in the district. Also, the study only focused on household waste management practices in Tain District.

Limitations

Out of the determined sample size of 1,047 participants, 10 participants refused to answer the questionnaire accurately to warrant their participation. There was a non-response rate of 0.96%. Therefore, a sample size of 1,037 was used for the study. The non-response rate did not statistically affect the results of the study because the percentage is negligible. The data yielded important descriptive information about household waste management practices in Tain District. Also, the qualitative data collected through

observation was used to augment the quantitative data to give quality to the research.

Definition of Terms

Household - A household is defined as a person or group of persons who live together in the same house or compound and share the same house-keeping arrangements and recognized one person as the head of household (GSS, 2014).

Waste- Waste is defined as materials identified as no longer being of value and are either thrown away or gathered for disposal (Momoh & Oladebeye, 2010).

Waste Management- All the activities and actions required to manage waste from its inception to its final disposal. This includes the collection, transport, treatment and disposal of waste, together with monitoring and regulation of the waste management process (UNSD, 2017).

Organization of the Study

The study is organized into five different chapters, one, two, three, four and five. Chapter one focuses on introduction including, background to the study, statement of the problem, purpose of the study, research questions, significance of the study, delimitations, limitations and definition of terms. Chapter two deal with review of related literature. It specifically looks at the theoretical framework and empirical review on areas such as concept of waste, classification of waste, various waste management practice, sources and type of waste. Chapter three describes the research methods and procedures employed in the study. It covers research design, population, sampling procedure, instrument for data collection, data collection procedures and data

processing and analysis. Chapter four presents the results and discusses the findings from the analysis. Finally, chapter five presents the summary, findings, conclusions and recommendations.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

The purpose of the research was to investigate how households in the Tain district manage waste and to determine whether their waste management practices are appropriate to reducing environmental and sanitation related challenges. This chapter reviews literature related to households waste management practices. To make the review easy to read and understand, the related literature has been reviewed on the following subheadings:

1. Overview of waste disposal in Brong-Ahafo Region and rural Ghana
2. Concept of waste
3. Classifications of waste
4. Sources and types of waste
5. Challenges of waste management in Ghana
6. Health effects of improper waste disposal practices
7. Attitude of community members towards waste disposal
8. Waste management processes
9. Strategies to improve waste management
10. Community based management of solid waste
11. Theories of waste management
12. Conceptual framework
13. Summary

Overview of Waste Disposal in Brong Ahafo and Rural Ghana

Household wastes are often generated from several sources where human activities are encountered. Several studies indicate that much of the waste from developing countries are generated from households (55–80%),

followed by commercial or market areas (10–30%) with varying quantities from streets, industries, institutions among others (Nabegu, 2010). Waste generation varies as a function of affluence, however, regional and country variations can be significant. Waste generation in sub-Saharan Africa is approximately 62 million tonnes per year (Stanford, 2000). In Ghana, the high socioeconomic class areas generated the highest quantity of waste 0.56 kg/person/day followed by the middle class areas, 0.49 kg/person/day and the low class areas 0.47 kg/person/day (Miezah et al., 2015).

In Brong Ahafo, 10% of rural communities dispose off liquid waste into the gutter, with the exception of Sunyani, the capital, where 17% of households dispose off liquid waste into gutters (Ghana Statistical Service, 2012). Also, in Sunyani only 2.7% households that dispose off liquid waste use proper sewerage system. However, all the other districts have less than 2.0 % of their households using the sewerage system to dispose off liquid waste (GSS, 2012). It is estimated that 92.9% of the solid waste generated in the region are either disposed off in public dump or dumped open spaces. Burning of waste (3.4%) is rather rare in the region. The high proportion of persons disposing off liquid waste in gutters in Sunyani, typifies an increasing but unacceptable phenomenon in virtually all rural and urban towns in the country as a whole. This is very pertinent in Ghana where waste management services are largely inefficient and ineffective. Further, it is estimated that about 83% of the population dump their refuse in unauthorized sites in their neighbourhood due to weak capacity to handle waste. This situation lead to creation of unsanitary environmental conditions (Oteng-Ababio, 2010).

The Concept of Waste

Momoh and Oladebeye (2010) defined waste as materials identified as no longer being of value and are either thrown away or gathered for disposal. Furthermore, Momoh and Oladebeye added that waste is more easily recognised than defined. George (2008) also explained that waste is something that fails to fulfill its primary purpose or is no longer useful to the primary owner. Another perspective of waste is been described as anything with well-defined purpose, and acceptable performance, but their users fail to use them for the intended purpose (Pongr´acz & Pohjola, 2004).

Waste is basically classified into two main types, liquid and solid (George, 2008). According to UNEP (2004), waste is also classifies as either controlled waste or non-controlled waste. Controlled waste includes waste generated from households, commercial and industrial organizations and from construction and demolition. Non-controlled waste includes waste generated from agriculture, mines and quarries operations. Ogwueleka (2009) added that wastes include refuse (empty containers, papers and rubbish), sewage (faeces, water, urine) and industrial waste (chemical nuclear) including manufacturing of certain substances, materials and equipment. These materials are expected to be discharged to, deposited in, or entitled to an aftercare in such a manner that are less harmful to health.

Classification of Waste

There are several kinds of waste produced by humans. Basically, household wastes are of two types, solid and liquid waste (George, 2008). Solid waste according to Tchobanoglous, Theisen and Vigil (2002), is any material that arises from humanor animal activities and discarded as useless or

unwanted. These materials include non-hazardous industrial, commercial and domestic waste. Zerbock (2003) added that solid waste includes street sweepings, construction, institutional and household organic trash. Solid waste is composed of combustibles and non-combustible materials. Examples of combustible materials include food waste, wood, textiles, yard debris and plastics. Non-combustible materials are bones, metals, leather, aluminium, glass (Zerbock, 2003). Also, solid waste comprised of materials that are a mixture of liquids, gases, and solids. Solid waste consists of many different things including food and garden waste, paper and cardboard, glass, metals, plastics and textiles (Economist, 2009).

Solid waste has also been classified based on the origin (rubbish, food waste, residues and ashes, demolition, construction, and agriculture waste), characteristics (biodegradable and non-biodegradable) and risk potential (Tharme, 2003). Miezah, Obiri-Danso, Kádár, Fei-Baffoe, and Mensah (2015) estimated that the rate of waste generation in Ghana was 0.47 kg/person/day per current population. It is estimated that the total waste generated in Ghana as at 2018, was approximately 139 million tonnes, whereas that of the Sunyani is approximately 1 million tones, with Tain District being approximately, 45,269 tones.

Liquid waste assume any form of residue that is hazardous for human and environmental health such as waste-water, fats, oil or grease (Oteng-Ababio, Arguello, & Gabbay, 2013). There are two major categorization of liquid waste water, including grey water and black water (Chartier, 2014). Chartier further explained that grey water is the wastewater generated from bathing, general cleaning, laundry, as well as the community stand post, well

and hand pumps. It may also include standard water that is not being used for drinking purposes. Black water is the wastewater generated from toilet containing faecal matter. Such water contain very high amount of pathogen compared to grey water (Chartier, 2014). There is further disintegration of liquid waste when collected in pit, septic tank and other sources and can be termed as follow, sludge, effluent and scum.

Sludge is the settled solid matter in semi-solid condition in any collection system. The term sewage is generally used to describe residuals from centralized wastewater treatment, while the term seepage is used to describe residuals from septic tanks. Settled content in pit latrines and septic tanks are also known as faecal sludge (US EPA, 2012), effluent are the wastewater that flows out of a treatment system (septic tank in this module) which is partially treated (Chartier, 2014). Scum is impure matter like oil, hair, grease and other light material that float at the surface of the liquid in septic tank (Maharashtra, 2013).

Characteristics of wastes

Corrosive wastes include acids or bases that are capable of corroding metallic objects. Ignitability waste can create fires under certain condition, e.g. waste oils and solvents. Reactive are inflammable materials that easily cause explosions and toxic fumes when heated. Toxicity waste is harmful or fatal when ingested or absorb (Moeller, 2005).

Sources and Types of Waste

According to Pidgeon et al (2003), wastes are generated from various sources including agriculture activities, treatment plants, construction and demolition activities, municipal services, institutions and industries. The types

are classified as rubbish, trash, food waste, yard waste, ashes, special waste and hazardous waste (Tchobanoglous et al., 2002).

Rubbish: Rubbish consists of combustible and non-combustible wastes of households, institutions and commercial activities. Typically, combustible rubbish consists of materials such as paper, cardboard, plastics, textiles, rubber, leather, wood, furniture, and garden trimmings which can easily be decompose and may leachate in waste bodies and non-combustible rubbish consists of glass, tin cans, aluminum cans, ferrous and other nonferrous metals which does not decompose easily. They contribute to loss of anesthetic beauty of the environment (Tchobanoglous et al., 2002).

Trash: Trash is defined as all non-putrescible waste that would normally be in a residential household including brush and waste from minor household repairs that are non-combustible. Such waste include stones, brick, rubble concrete and waste parts occasioned by major demolitions, installations and repairs, sinks, toilets, bathtubs, plumbing parts, automobile or truck parts, vehicle batteries, machinery, tree logs and limbs exceeding 6 inches in diameter and tree stumps. Trash does take lot of time to decompose causing environmental effects such as soil pollution (Akafia, 2014).

Food waste: Food wastes are any food substances, raw or cooked, which are discarded, or intended or required to be discarded. Food wastes are the organic residues generated by the handling, storage, sale, preparation, cooking and serving of food (Ogwueleka, 2009). In addition, food waste includes uneaten portions of meals and trimmings from food preparation activities in kitchens, restaurants and cafeterias. Food waste easily decompose and cause foul odour contributing to respiratory tract infections (Miller, 2011).

Yard waste: This referred to as waste resulting from landscaping and yard maintenance. They may include pruning and dropping of plant parts such as brush, tree limbs and leaves. They do not easily decompose and may be carried away by wind leading to unsanitary environment, clogging of drains and pollution of water bodies (Ogwueleka, 2009).

Ashes and residues: Household solid waste combustion creates a solid waste called ash, which contains any of the elements that were originally present in the waste. However, because ashes and other residues from municipal solid waste operations may contain toxic materials too, the wastes should be safely disposed off to prevent toxic substances from migrating into ground-water supplies (Troschinetz, & Mihelcic, 2009). Thus, burning is not advisable, as the fly ash, toxic gases and acidic gases pose a much greater health and environmental threats. They can easily be decompose and leach into water bodies, carried away by wind leading to eye diseases and food pollution due to the toxic substances (Knausenberger, Booth, Bingham, & Gaudet, 2002).

Special waste: Special waste is any waste material which, because of its physical characteristics, chemical make-up, or biological nature requires special handling procedures to dispose it such as electrical transformers, oil filter and fluorescent bulb. Such waste poses an unusual threat to human health, equipment, property, or the environment. They take time to decompose causing injuries, loss of aesthetic beauty of the environment (Miller, 2011).

Hazardous waste: They are wastes of industrial, institutional or consumer origin 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 wastes because they are confined in solid containers. Typical examples are solvents, paints and pesticides whose containers are frequently mixed with municipal wastes and become part of the urban waste stream. Certain hazardous wastes cause explosions in incinerators and fires at landfill sites. Others, such as pathological wastes from hospitals and radioactive wastes, require special handling at all time. The leachate from a landfill may be dangerous as well. The level of toxicity is directly related to the quantity and toxicity of hazardous materials mixed in with other solid waste. They are difficult to decompose and may leach into the soil, explosion and air pollution contribute to disease occurrence (Knausenberger et al., 2002).

Another form of waste based on their types, source and origin are comprehensively classification as, municipal waste, residential, commercial, garbage, ashes, bulky, institutional, dead animals, street sweeping, hospital and demolition waste (MULB, 2000).

Municipal Waste: Municipal waste includes waste resulting from municipal activities and services such as street wastes, market wastes and abandoned vehicles. However, the term applied in a wider sense to incorporate domestic and commercial wastes. Some of the wastes are not easily decompose, while others such as market waste are easily decomposed. They cause foul odour and unsanitary environment (MULB, 2000).

Residential Waste: This category of waste comprises the solid wastes that originate from single and multi-family house hold units. These wastes are generated as a consequence of house hold activities such as cooking, cleaning,

repairs, hobbies, redecoration, empty containers packaging, clothing, old books, paper and old furnishings. They are easily decompose causing respiratory tract infections from foul odour, breeding place for flies and mosquitoes (Essays, 2018).

Commercial waste: They are solid wastes that originate in offices, wholesale and retail stores, restaurants, hotels, markets, warehouses and other commercial establishments. They cause foul smell, clogging of drains, pollution of waste bodies (Essays, 2018).

Garbage: 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 odours and therefore attracts rats, flies and other vermin. It requires immediate attention in its storage, handling and disposal (Essays, 2018).

Ashes: Ashes are the residues from the burning of wood, charcoal and other combustible materials for cooking and heating in houses, institutions and small industrial establishments. When produced in large quantities at power generation plants and factories, these wastes are classified as industrial wastes. They are easily decomposed and carried away by wind causing air pollution, food contamination (Bandela & Tare, 2009).

Bulky Wastes: It comprises household wastes, which cannot 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 appliances such as stoves, washing machines and refrigerators, mattresses and springs. They take longer time to decompose

causing environmental pollution, clogging of drains, loss of aesthetic beauty of the environment (Essays, 2018).

Institutional Waste: Institutional wastes are those arising 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 such as used swaps, syringes and body fluid. They have different level of decomposition and can contribute to disease such as viral disease, foul smell, respiratory tract infections, leachate into water bodies causing water borne disease (Bandela & Tare, 2009).

Street sweeping: This term applies to wastes that are collected from streets, walkways, alleys, parks and open spaces. Street wastes include paper, cardboard, plastic, dirt, dust, leaves and other vegetable matter. They can decompose at different time interval. They can clog drains; pollute waste bodies as well as loss of aesthetic beauty of the environment (Ramachandra, 2011).

Dead Animals: This is term applied to dead animals that die naturally or accidentally killed. This category does not include carcass and animal parts from slaughterhouses, which are regarded as industrial wastes. They easily rot causing respiratory infections and foul odour (Ramachandra, 2011).

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 (Tchobonglous et al., 2002).

Industrial Wastes: In this category are the discarded solid material of manufacturing processes and industrial operations. 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 of at municipal landfills (Miller, 2011).

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, the waste are buried or disposed off without delay. They easily cause foul odour if decompose (Phelps et al., 1995).

Biomedical/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. They easily serve as breading places for micro-organism causing infections such as diarrhoea, cholera (Essays, 2018). Another classification and source of waste

outlined by Mosler (2005) include, agriculture, demolition, commercial, mining, radioactive and electronic sources.

Agricultural sources of wastes: Waste generated by agricultural activities, including horticulture, livestock breeding, market gardens and seedling nurseries. Wastes generated from this source include empty pesticide containers, old silage wrap, out of date medicines, used tires, cocoa pods and corn husks. Waste from this categories take time to decompose and can give rise to itching of the skin, eye infection and pollution of water bodies (Mosler, 2005).

Wastes from Construction or Demolition: Concrete debris, wood, huge package boxes and plastics from the building materials comprise construction waste, which is yielded as a result of the construction of roads and building. Demolition of old buildings and structures also generate wastes and these are called demolition waste. They cause blockage of drains leading to flooding and loss of human life (Sasikumar & Sanoop, 2012).

Commercial Sources: As a result of the advancement of modem cities, industries and automobiles, wastes are generated daily on a large scale from commercial enterprises. These may include food items, disposable medical items and textiles (Sasikumar & Sanoop, 2012).

Mining Sources: Mining activities also generate wastes that have the potential to disturb the physical, chemical and biological features of the land and atmosphere. The wastes include the overburden material, mine tailings, harmful gases released by blasting (Mosler, 2005).

Radioactive Sources: Radioactive sources of wastes include nuclear reactors, mining of radioactive substances and atomic explosions (Mosler,

2005). Waste from these sources can be very hazardous to both the environment and human health.

Electronic sources of waste: Music players, Television set, Telephones, computers, vacuum cleaners and all the other electrical stuff at home, which are of no more use, are electronic wastes. These are also called e-waste, e-scrap, or waste electrical and electronic equipment. Some e-waste (like TV) contains lead, mercury and cadmium, which are harmful to humans and the environment (Sasikumar & Sanoop, 2012).

Challenges of Waste Management in Ghana

Proper and scientific management of waste has been a challenge to most countries in the developing world. Mensah and Larbi (2005) revealed that key problems with waste management in Ghana are principally related but not limited to improper dumping, increasing difficulties with acquiring suitable disposal sites, difficulties with conveyance of waste by road due to worsening traffic problems coupled with lack of alternative transport options, and the weak demand for composting as an option for waste treatment and disposal. Boadi and Kuitunen (2003) further established some of the challenges affecting waste management. Accordingly, they observed that there is limitation of waste collection to high and middle income people are regular, while the poor are left to contend with the problem on their own as major obstacle. This leads to improper disposal of waste in surface drains, canals and streams, creating unsanitary and unsightly environments in many parts of cities and other communities.

Furthermore, many other systemic factors pose barrier to waste management in the country. For example, Agyem-Atta (2013) summarizes the

challenges of waste management in Ghana as poor planning for waste management programmes, inadequate equipment and operational funds to support waste management activities, inadequate, well managed sites and facilities for waste management operations. Besides, inadequate skills, motivation and capacity of waste management staff and negative attitudes of the general public towards the environment in general challenge and continue to limit improved waste management in the country. In addition, Ogwueleka (2009) illustrated the challenges of waste management into, financial, technical, institutional, logistic, legislation and source segregation constraints

Financial constraints: There are limited funds to the waste management sector by the governments, and the levels of services required for the protection of public health and the environment are not achieved. This weak financial basis of local governments can be supplemented by the collection of user service charges. However, user's ability to pay for the services is very limited in rural communities, and their willingness to pay for the services are ineffective. An assertion made by Zurbrugg (2003) further indicated that, the lack of financial resources to cope with the increasing amount of waste generated by rapid developing cities is one of the main reasons populations living in rural areas are without waste collection services. Often inadequate fees charged and insufficient funds from a central municipal budget are not able to adequately finance the levels of service. It is evidence from a survey conducted by UNCSD (1997) that households earn less amount as monthly income, hence they do spend on waste management services and developing countries have weak economic bases, hence, insufficient funds for

development of sustainable solid waste management systems (United Nations Commission on Sustainable Development, 1997).

Technical constraints: Human workforce is needed in every country for prudent management of waste. Ogwueleka (2009) asserted that there are inadequate human resources at both national and local levels with technical expertise necessary for waste management planning and operation in most developing countries. Most of the resource personnel responsible for waste management have little or no technical training in waste management. Operational inefficiencies of solid waste services such as deficient management capacity of the institutions and inappropriate technologies also affect effective waste management. To buttress this argument, Zavodska, (2003) revealed that there is ineffective waste collection and unreliable waste collection service. The study showed that the coverage of waste collection service is very low, that waste generated is dumped at many undesignated sites due to lack of trained personnel. Without adequately trained personnel sustainable waste management planning and implementation is not realizable (Zavodska, 2003).

Institutional constraints: There are often no clear roles or functions of the various national agencies defined in relation to waste management. In some cases, several agencies are brought together to coordinate waste management activities (Ogwueleka, 2009). This brings about interference of duty as there is no clear cut role each agency is to performing. The Local Government, Environmental Health Department and Zoomlion have the responsibility of picking up and transportation of solid waste from public place (Schwarz-Herion et al, 2008). However there is no body coordinating

these activities. The lack of coordination among the relevant agencies often results in duplication of efforts, wastage of resources, and unsustainability of waste management programs. This institutional misshape bring about littering of the environment (Schwarz-Herion et al, 2008).

Awareness to enhance segregation: Ecological awareness and citizen participation to segregate waste at source, door-to-door collection, and disposal in appropriate collecting bin is imperative. The awareness plays an important role in waste management and augments the efficiency of waste management stream. It is the critical phase in the whole process of waste management, which helps in handling waste leading to ultimate success. However, there is almost no segregation of garbage at source which leads to various environmental problems and it becomes very difficult to segregate waste at transfer station or in landfill or treatment site (Joshi & Ahmed, 2016).

Characterization of municipal solid waste: Ghana as a country is divided into different regions, different food habits, and different living standard thereby producing waste of different types. There are less comprehensive studies conducted to cover almost all cities and towns to characterize the waste generated and disposed on landfill. The policy-makers rely on the limited source of information available from few places thereby are unable to provide appropriate solutions for the kind of waste produced for a particular region. Therefore waste continues to pileup with limited information on how to deal with the waste (Joshi & Ahmed, 2016).

Logistics constraints: However, logistics are very essential elements of every contemporary management of waste. According to Burntley (2007), waste management institutions are faced with financial difficulties,

understaffing and poor logistics, and social impediments. Puopiel and Owusu-Ansah (2014) also asserted that lack of skips and dustbins was major problem in most Municipal, Metropolis and District Assemblies. Zoomlion Ghana Ltd. which was the main company in charge of waste collection in Ghana has been unable to supply skips and dustbins to areas they served. The leads to unconcern attitude towards waste disposal and residents dispose off waste any available space (Puopiel & Owusu-Ansah, 2014).

Legislation Constraints: Regulations, rules and by-laws and enforcement of such are many ways community waste could be properly managed. Public Health, Local Government and Environmental Protection Act related to waste management in developing countries is usually fragmented (Ogwueleka, 2009). In the developing world, waste collection schemes of cities generally serve only a limited part of the urban population. However, people remaining without waste collection services are usually the low-income population living in rural areas (Zurbrugg, 2003).The agencies responsible to enforce these rules on one hand are lacking adequate power and on the other hand there is no commitment. As a result, most people are not complied with these rules and hence indiscriminately litter the environment without any fear. Even the regulatory authorities have to take the blame for not doing enough to ensure implementation (Dwivedi et al., 2009).

Source segregation constraints: segregation waste at the source of generating could be an effective way of initial management of waste. However, segregation waste at source can be another challenge for sustainable waste management system in developing countries where waste disposal takes place unscientifically without proper planning. This is because inhabitants

rarely segregate waste and sorting is mainly performed by waste collectors and rag pickers (informal sector). Due to this, segregation efficiency is very poor in developing countries. For example waste collectors and rag pickers segregate only those things which have high economic value in recycling industry leaving the remains and throwing the rest of waste away indiscriminately (Srivastava, Ismail, Singh, & Singh, 2015).

Cultural Constraint: materials such as dead animals, food items, used clothes, leaves and part of plants used for sacrifice are often observed at t road junctions and by the road side. The practice of dumping material for sacrifices such as animal parts or full dead bodies of animal at road junctions and by the road side is a cultural norm acceptable in certain part of Ghana. Such norms affect designs and implementation of sustainable solid waste management systems. Such waste are often not collected for fear of been harm. It therefore litter the environment and cause contribute to disease (Igbinomwanhia & Ohwovoriole, 2012).

Linden et al. (1997) identified ten common constraints that militate against waste management efforts in Asian countries includes the following, inappropriate technologies or processes, enforcement inefficiencies, illegal dumping, lack of financing, lack of training/human resource, lack of political support, lack of legislation, policy conflict or overlapping responsibilities among levels of government, rapid increase in waste generation, lack of awareness among public, and limited land areas and land tenure issues. These factors, according to the report, frustrated the waste management efforts of municipal authorities in Asia and made it difficult for them to keep their city environments clean and safe for the populations. Kironde (1999) has also

attributed the performance of the waste sector to resource constraints including the scarcity of financial, physical, human and technical resources for the organization of waste management operations. Negligence on the part of authorities responsible and the citizenry to deal with waste as a priority issues in society, unavailability of properly engineered disposal sites and waste treatment plants, inadequate haulage equipment and the lack of expertise and appropriate technical knowhow (Neizer, 2014). These have posed serious constraints to the waste sector and dampened efforts towards waste management in the city.

Perceived Health and Environmental Effects of Improper Waste Disposal Practices

According to United Nation Conference on Human Settlement report (UNCHS, 1996) one third to one half of solid waste generated within most cities in low and middle income countries are not collected. The waste usually ends up on illegal dumps, street and open space. According to Malombe (1993), irregular services rendered to households of refuse by municipal councils compel them to dispose off refuse indiscriminately. In Ghana, waste management services are largely inefficient and ineffective. It is estimated that about 83% of the population dump their refuse in unauthorized sites in their neighbourhood, and due to poor handling of waste, unsanitary conditions are created (Bennah et al., 1993). The consequences of waste disposal indiscriminately have adverse impact on the natural environment and the lives of the people. The challenges associated with landfill include odour, pests, 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. Wastes also affect soil drainage which hinders the growing of crops. 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. 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 prevent resources from being recycled example, plastics, metals and paper, health, are dangerous to aquatic life (Bennah et al., 1993). It can 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 became 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 (Bennah et al., 1993).

A large tonnes of refuse in African cities are disposed by dumping in open spaces, water bodies and surface drains as a result of inadequate infrastructure and ignorance of inhabitants (UNEP, 2009). There are several implications when wastes are not properly managed. The effects are harmful

and poses risk to our environment, health, social and psychological life, infrastructure and aesthetic beauty of our communities. The lack of adequate waste collection and disposal systems caused public health problems resulting in diseases, which aggravates poverty and leads to negative consequences such as low income due to illness, increased spending on health care and the deprivation of the community access to live in a safer environment (Prabu, 2009).

Cointreau (2006) observed that the accumulation of waste creates breeding ground for disease causing agent to thrive and outbreak of diseases such as cholera, diarrhoea, malaria, tetanus and hookworm occur. Cointreau added that improper waste disposal promotes faecal contamination of the hands, food and water that can result to faecal-oral transmission of diseases like typhoid. Cointreau again stated that wastes that are not properly managed especially solid waste from households, serious health hazards and lead to the spread of infectious diseases. Further, Cointreau added that unattended waste lying around attracts flies, rats, and other creatures that, in turn, spread diseases such as diarrhoea. Moreover, such environment serves as a feeding place for dogs and cats which can transmit diseases to human such as typhoid. Unattended waste when decomposed serve as a source of infections to nearby residents such as respiratory tract infections (Aatamila et al., 2010). Aatamila et al. added that pollutants deposited on dumpsite can enter the body through contaminated crops, fruits, food products, animals and water. Respiratory diseases, irritation of the eyes, nose and skin, gastrointestinal problems, allergies and psychological disorder have also been attributed to unregulated dumpsite and improper waste disposal (Aatamila et al., 2010).

UNEP (2009) pointed out that human beings are faced with the problem of disposal of waste. The effects of improper waste disposal in man are numerous as the flora on the environment caused health problems in the form of dermatitis, irritation of nose, throat, anaemia and death. Also, Achalu and Achalu (2004) observed that improper dumping of waste clog drains that could result in floods when it rains causing resulting into destruction of lives and properties.

Mazhindu, Gumbo and Gondo (2010), added that waste disposal method such as open dumping, burning of waste, dumping at sea, burying, unsanitary landfill have effects on environmental health status of dwellers.Some of these effects include increase in the concentration of pathogenic organisms in the environment, contaminating land and soil. Besides, this situation may affect crop yield and production, destroy the aesthetics of the physical environment and oxygen depletion in aquatic environment (Mazhindu, Gumbo & Gondo).

Kalesanwo et al. (2013) illustrated that the dangers of improper waste disposal cause negative effects to inhabitants and the environment. The rate of health retrogression related to waste disposal are alarming as it leads to health hazards i.e. disease, environmental hazard, social and economic effects. It is empirical that the top five causes of morbidity in the country are malaria, pneumonia, respiratory tract infection, anaemia and diarrhoea (Tain District Hospital, 2017) which are link to environmental health originating from improper waste disposal. According to Bekoe-Nketia (2015), malaria, diarrhoea, cholera and skin diseases are the common diseases resulting from improper handling of waste. Also, USAID (2009) outline the following as

perceived health effects of improper waste management, soil contamination, air contamination, animal and marine life, injury to people and property, discourage tourism, water contamination.

Soil Contamination: waste such as plastic, paper materials can release a type of carcinogen that can cause reproductive problems, liver issues and weight loss. This carcinogen can leach into the soil and cause contamination that can could also danger plant and animal life as well as water sources. If such waste is dumped or not properly managed in a landfill, it can contaminate the surrounding ground (USAID, 2009).

Air Contamination: When disposing of waste that contains harmful chemicals such as bleach, acid or oil it is important that it is disposed off in approved containers and labeled correctly. Paper, plastics and other materials that are burned can contaminate air that could lead to respiratory disease when inhaled. Over time the chemicals can build up in the ozone which could pollute air that people breathe and cause a public health risk. Improperly managed waste release methane gases (Bekoe-Nketia, 2015). Garbage is often burned in residential areas and in landfills to reduce volume and uncover metals, this creates smoke that contains carbon monoxide and nitrogen oxide, which are hazardous to human health and degrade urban air quality. Sitting dumps or landfills in sensitive ecosystems may destroy or significantly damage these valuable natural resources and the services they provide (UNEP 2009).

Animals and Marine Life: Untreated sewage can threaten marine life, human and animals who come in contact with the water. When waste forms a cluster, the area can suffocate and contaminate sea bottom habitats such as

coral and fish reducing causing death. This contamination not only destroys aquatic habitat, it can also affect human through consumption. Old fishing lures, plastic bottles, rope, cigarette butts and fishing lines can be consumed by marine animals leading to their death (USAID, 2009).

Ground and surface water contamination: Waste streams can spread toxic materials and pathogenic organisms into the leachate of dumps and landfills. If the landfill is unlined, this runoff can contaminate ground or surface water, depending on the drainage system and the composition of the underlying soils. When organic wastes are disposed off in deep dumps or landfills, they undergo anaerobic degradation and become significant sources of methane (USAID, 2009).

Discourages tourism and other business: The unpleasant odor and unattractive appearance of piles of uncollected solid waste along streets and in fields, forests and other natural areas, can discourage tourism and the establishment and or maintenance of businesses (Phelps et al., 1995).

Occupational hazards: Workers handling wastes are at risk of accidents related to the nature of material and lack of safety precautions. The sharp edges of glass, metal and poorly constructed storage containers may inflict injuries to workers. The infections associated with waste handling include, chronic respiratory infections, eye infections and intestinal infections (Igbinomwanhia & Ohwovoriole, 2012).

Noise pollution: Undesirable noise is a nuisance associated with operations at landfills, incinerators, transfer stations and sites used for recycling. This is due to the movement of vehicles, the operation of large

machines and the diverse operations at an incinerator site (Igbinomwanhia & Ohwovoriole, 2012).

Measures for Reduction of Perceived Health Effects on Environment and Human Health

Proper waste management have to be undertaken to ensure that it does not affect the environment and cause health hazards to the people. At the household level, proper segregation of waste has to be done and it should be ensured that all organic matter is kept aside for composting. This could be the best method for disposal of household waste (Pervez & Kafeel, 2013). The organic part of the waste that is generated decomposes more easily, attracts insects and causes disease. Organic waste can be composted and then used as a fertilizer (Drechsel & Kunze, 2001).

Generation of waste should be decreased, this can be enhance through promoting the production of goods which minimize waste generation after use. Recycling and recovery should be increased, this can be done through promoting the use of plastic recycling and labels in order to make sorting and recycling of plastic packaging easier. Education of producers, the public and people who work in the waste sector should be intensified and promoting the use of less hazardous alternatives to hazardous chemicals during production of goods, legislation in the waste sector should be improved (Pervez & Kafeel, 2013).

Attitude of Community Members towards Waste Disposal

The perception people have on waste may constitute their attitude to waste management. Kumar and Nandini (2013) explained that attitude can predict potential behaviour that residents want to perform. Kumar and Nandini added that attitude is a hypothetical construct that represents an individual's

like or dislike for an item. Most people have unconcern attitude toward waste disposal. Perhaps such people could be perceived as those who litters the environment. People do not consider the need to talk to neighbourhoods about changing their negative attitude toward waste disposal. For instance, if an individual is seen littering with papers or any form of waste anywhere it is incumbent to inform the person (Mazhindu et al., 2010).

Nixon and Saphores (2009) espoused that having knowledge on environmental issues and waste management in particular has long been recognized as crucial factors influencing households waste disposal practices. Monney (2014) observed that Ghanaians have erroneous attitude about waste that has pushed the citizenry into throwing refuse improperly. Community dwellers see waste management as a sole responsibility of waste management companies and turns to litter the environment. While countries like Sweden, Philippines, Singapore and others are making money out of waste, but waste management companies in Ghana have become waste collection companies (Monney, 2014). The waste management companies are supposed to convert useful resources in waste stream into valuable products. Additionally, Monney believed that the work of these companies goes beyond just collecting the waste generated to a landfill site. Instead, such waste could be recycled or composite for further usage which will benefit residents.

Chekole (2006) espoused that residents do not consider living in a clean environment as essential aspect of human existence, hence they litter the environment. They play passive role in sanitation activities and refuse to co-operate with others in cleaning up residential surroundings because of their negative attitude. Chekole, further added that the main reason for the incessant

increase of waste volume in our urban centers is as a result of the ignorance of some residents towards the impact of improper dumping of refuse and the care free attitude of most residents who knows what should be done but do not. Monney (2014) added that it is a normal scene for motorists and other road users to throw waste at lorry stations and other public places especially during community gathering. Afangideh et al. (2012) revealed in their study that residents do not consider living in a clean environment as essential hence they cannot keep clean environment. Residents drop waste on road side, this was common among the youth.

Community participation has a direct bearing on efficient waste management. Yet, the municipal authorities have failed to mobilize the community and educate citizens on the rudiments of handling waste and practices of storing it in their own bins at the household, shop and establishment level (Asnani, 2006). In the absence of a basic facility of collection of waste from source, citizens are prone to dumping waste on the streets, open spaces, drains, and water bodies in the vicinity creating insanitary conditions. Citizens assume that waste thrown on the streets would be picked up by the municipality through street sweeping (Asnani, 2006).

Muller and Schienberg (1997) propound that women were regarded as responsible for waste and its disposal in households. Women concern in matters of waste management are perceived to be neglected since men are in higher offices that handle waste management issues and have different views regarding these issues. Gender inequalities contribute to attitudes and men and women differ in their attitudes towards public health and community cleanliness.

Waste Management Processes

Waste management is critical for the purposes of communities and environmental health**.** Sthiannopkao and Wong (2013)defined waste management as the collection, transport and disposal of waste, including after-care of disposal sites. Proper management of waste eliminates negative impacts on the environment, supports economic development and improves health.

Early practices of waste management

According to Tchobanoglous et al. (1993), the most commonly recognized methods for the final disposal of wastes were: dumping on land, mining pits, dumping in water, sloughing into the soil and feeding to hogs. Some of these improper practices of waste identified during the early disposal practices still exist in cities, towns and villages. Indiscriminate dumping on opened land and dumping in gutters evident in towns and cities, while dumping in water especially people living in coastal towns is common place.

Burning of dumps is also common in rural communities in Ghana and developing countries. A study carried out in Ado-Akiti in Nigeria by Momoh and Oladebeye (2010) observed that, the methods of waste disposal include dumping of waste in gutters, drains, roadside, unauthorized dumping sites and stream channels during raining season and burning of wastes on unapproved dumping sites during the dry season. This has gone to confirm that the practices of waste disposal in the past still exist today.

Another form of waste management which is inappropriate is open dumping. Often, the way people dispose off waste is to simply drop it at open place. Unregulated dumps are still the predominant method of waste disposal

in most developing countries (Cunningham & Cunningham, 2004). The problem of illegal dumping is likely to become worse as acceptable site for waste disposal become more and more scarce and cost of legal dumping escalates (Cunningham & Cunningham, 2004).

Contemporary methods of waste management

A number of processes are involved in effectively managing waste. The conventionally applied procedures of dealing with waste such as the collection of waste without a proper integrated approach from other sectors have been unproductive, resulting in the pollution of water, air and land (UNEP, 2009). According to Giusti (2009), waste management practices are not uniform among countries (developed and developing), and sectors (residential, commercial or industrial). Some waste management practices include, waste hierarchy, thus the 3Rs of waste management including reduce, reuse and recycle (Abdul-Rahaman, 2014). This aspect of waste management strategies are classified according to their desirability in terms of waste minimization. The aim of waste hierarchy is to extract the maximum practical benefits from products and to generate the minimum amount of waste (Adul-Rahaman, 2014).

In addition, Rouse (2008) explained that the basic concept of waste management practices comprises the "collection, storage, transportation, processing, treatment, recycling, and final disposal of waste". Rouse added that, the proper management system should be simple, affordable, sustainable, economical but efficient, environmentally sound and socially acceptable. The waste management concept should provide services for rural and urban, poor and rich households equally (Rouse, 2008).

Waste generation is the first process in the concept of managing waste. This is simply the gathering of materials considered as no longer being of value and are either thrown away or gathered together for disposal (Momoh & Oladebeye, 2010). Mensah and Larbi (2005) explained that waste generation is increasing at a faster rate globally. Globally, 1.7-1.9 billion metric tonnes is generated annually (UNEP, 2009), in sub-Saharan African, 62million tonnes of waste are generated annually (Stanford, 2000), in Ghana, 139,120,000kg of waste is generated annually and Sunyani is 1 million tonnes (Miezah et al., 2015).

Kumar and Nandini (2013) cited storage as the next process of waste management. This is where waste is stored before they are collected for final disposal. The waste is stored in a skip or dustbins to be carried by biger transporters. Proper storage of waste is of primary importance to avoid littering and preserve the aesthetic value of the environment and human health. This process is mostly observed at the household level. The third stage of waste management process has to do with gathering and hauling of waste after collection to the location where the collection vehicle is emptied (Kumah, 2007). Concrete bins and containers are provided at various locations from where waste is to be collected for disposal. Individual bins and containers placed alongside shops in certain areas are emptied directly into the track/tippers.

Transfer is the next level of waste disposal. Transfer of wastes is from smaller collection vehicle to the larger transport equipment over short distance. Transport is the stage where waste is transported to the final disposal site through various medium such as tricycle and car (Tchobanoglous et al.,

2002). The final stage is disposal. This is where the waste is dispose off at a safe place where associated risk are minimal such as landfilling, composting and incineration (Tchobanoglous et al., 2002).

Plasma gasification is another form of waste management. Plasma is a primarily an electrically charged gas. Lighting is one type of plasma which produces temperatures that exceed 12,600°F. During the treatment of waste by plasma gasification, the waste molecular bonds are broken down as result of the intense heat in the vessels and the elemental components (Leal-Quirós, 2014).

Another method of waste management is composting. Composting is the natural bio-degradation process that turns organic wastes such as plants, garden and kitchen waste into nutrient rich food for plants (manure) (Leal-Quirós, 2014). Composting, normally used for organic farming, occurs by allowing organic materials to sit in one place for months until microbes decompose it. Composting is one of the best methods of waste disposal as it can turn unsafe organic products into safe compost (Leal-Quirós, 2014).

Also, waste to energy management of waste involves converting of non-recyclable waste items into useable heat, electricity, or fuel through a variety of processes. This type of source of energy is a renewable energy source as non-recyclable waste can be used several times to create energy. It can also help to reduce carbon emissions by offsetting the need for energy from fossil sources (Leal-Quirós, 2014).

Moreover, waste reduction is another form of waste management. Waste reduction can be done through recycling old materials like jar, bags, repairing broken items instead of buying new one, avoiding use of disposable

products like plastic bags, reusing second hand items (Pipatti & Svardal, 2006).

Waste minimisation and recycling or reusing policies have been introduced to reduce the amount of waste generated and serve as alternative waste management practices to waste disposal on land. This has been implemented to reduce the environmental impacts of waste management. Also, landfill gas recovery has become more common as a measure to reduce emissions from solid waste disposal sites (Pipatti & Svardal, 2006).

Strategies to Improve Waste Management

Sustaining effective waste management practices is crucial to both developed and developing countries. Waste management practices differ significantly from developed and developing countries, urban and rural areas, and for residential, commercial, and industrial producers (Oteng-Ababio, 2010). The complete functional elements of waste management are generation, onsite storage, collection, transfer and transport, disposal, processing and recovery. However, these are not been met in Ghana because the focus is only on collection and disposal (Amoah & Kosoe, 2014).

Waste management has been the responsibility of local authorities. However, the changing technology brings to the realization that leaving waste management solely to local authorities is unsustainable hence cities and towns end up with endless heaps of waste (Sniehotta, Schwarzer, Scholz, & Schüz, 2005). Thus management of waste should involve other related sectors with clear cut function, adding to their technical expects to manage waste (Andrew, 2009). The important and significant factors that affect household attitudes toward waste management include household size. Therefore using “waste

hierarchy" approach is beneficial to households. It is the order of priority of actions to be taken to reduce the amount of waste generated, and to improve overall waste management processes and programmes. Adopting the 3Rs in managing waste will also help to reduce the amount of waste disposed off, conserve natural resources, landfill space and energy, save land and money which communities use to dispose of waste in landfills (Abdul-Rahman, 2014).

Source reduction- is the process and the policy of reducing the amount of waste produced by a person or a society. This step helps to minimize waste at homes. Waste minimization involves efforts to minimise resource and energy use during manufacturing. For the same commercial output, usually the fewer materials are used, the less waste is produced. Reuse includes conventional reuse where the item is used again for the same function and different one. Recycling measures involves the breaking down of the used item into raw materials which are used to make new items. The advantage and disadvantage of these strategies include, environmental conservation and protection, reduce air and water pollution and save money, emission at treatment and disposal sites are reduced. On the contrary, it brings about increased processing cost, result in pollutant and good products are not guaranted (Tchobanoglous et al., 2002).

The District Assemblies are the main institutions in charge of management of sanitation and waste at the community and local levels. They are however, supported by other institutions and organizations. For example, the Environmental Protection Agency (EPA) gives technical sustenance to the District Assemblies by setting environmental standards and guidelines on

proper and effective waste management, oversight of environmental assessment regulations undertaking environmental education and sentience programmes and monitoring environmental quality (EPA, 2017). Ghana Environmental Assessment Regulations, 1999 (LI 1652) make provisions for prevailing undertakings, which are obligated to submit Environmental Management Plans (EMPs). If the above explanations are put into force and maintain, it will enhance waste management situation.

Waste management, like many other environmental issues, is multi-sectorial in nature and encompasses policy making in areas of legal, institutional, financial, and administrative frameworks. It will also involve functional design, implementation, operation and management of waste handling facilities in the country (MLGRD, 2004). Although within the region there are excellent examples of integrated waste management systems (including the policies and strategies), most districts have not developed and if, have not implemented the necessary waste management policies and strategies, legislation and institutional frameworks. The Ministry of Local Government and Rural Development (MLGRD, 2004), reported that general waste management in Ghana is the responsibility of the MLGRD. The ministry also supervises the Decentralized Metropolitan, Municipal and District Assemblies (MMDAs) but the regulatory authority is vested in the Environmental Protection Agency (EPA). The MMDAs are responsible for the collection and final disposal of waste through their Waste Management Departments (WMDs) and their Environmental Health Management and Sanitation Departments (EHSD). There are various Acts guiding the

management of each type of waste in Ghana. It is hope that if the above is implemented will help curb this menace (Abdallah, 2014).

Functions of the Municipal /District Assembly

District Assemblies functions include waste management, public health management, environmental monitoring, planning and public relation. Waste Management Department within the Health Department of the Assembly carries out the waste management function and the services that these bodies provide may be direct or indirect through private contractors or franchises. Assembly is responsible for providing at least 20% of the service directly (MLG & RD, 1999).

According to Obirih-Opareh (2002), in more recent times, efficient collection and disposal of waste is recognized not just as critical for maintaining a healthy environment but also as an important indicator of the level of development of a nation. Accordingly, cities in the developed world have devised complex procedures for handling waste and have established a variety of institutional mechanisms under Local Government to ensure that these procedures are adhered to. Doan (1997) also pointed out that many cities have adopted stringent regulations to govern their waste management. These include the kinds of materials that can be thrown away by a household or business, the type of storage containers and the kind of equipment to use to pick up waste. It also indicates the exact procedure for disposing waste in a sanitary landfill, the proportion of cost of this service to be paid by the consumer are supervise by Local Government or District Assembly.

Community-Based management of wastes (CBM)

According to Bernstein (2004), community participation in waste management encompasses several forms of local involvement including: awareness and teaching proper sanitary behaviour, contributing labour and participating in consultation. With greater public participation, the community can cooperate with public or private entities to set payment rates for service charges. Community management gives the community authority and control over operation, management and/or maintenance services benefiting its members. Community management may come about through partnership with governmental agencies and NGOs. Community-based waste management (CBM) projects require institutional support and recognition in order to be successful (Bernstein, 2004). An integrated system including waste separation at the source, resource recovery and composting of organic waste requires representation of waste pickers, and integration of the community to work with all stakeholders, including representatives of waste pickers (Bernstein). It is the responsibility of CBM to address the following,

Low participation of households: Households may not participate in waste management programmes because they may view solid waste management as a low priority (UNEP, 2009). They may be unwilling to participate in collection systems or in keeping public spaces clean, or they are unwilling to pay for service. Community provision for education is necessary to overcoming the best counter to these barriers. Community based solutions input from the community to generate a list of desired services, appropriate incentives for households and systems for cleaning streets and other public places (UNED, 2009).

Management problems: Problems with waste management schemes include ineffective, inefficient, or unrepresentative management, as well as lack of community accountability. CBM can introduce performance control techniques, share management with an NGO, adjust or by-pass an existing management committee, and provide incentives for managers, such as training and exchange visits (Oteng-Ababio, 2010).

Adequate space for waste facilities and equipment is another potential operational issue. Space problems can be resolved by lobbying municipalities and local leaders, as well as conducting media campaigns in the neighborhood (Bernstein, 2004).

Financial difficulties: Public and private management plans often face financial difficulties caused by inadequate fee collection and inability to pay for service in low-income neighborhoods. CBM gives community input into plans for fee collection payments, incentives and sanctions for non-payment. Community input can also help waste management providers find lead to additional revenue generating services (Afangideh et al., 2012).

Lack of municipal cooperation: If waste collection between the municipal government and private operators is badly coordinated, the community may lose interest in trying to improve the waste situation. Extending service, mobilizing communities to lobby the municipality for assistance, involving local authorities, and structuring formal and informal opportunities for cooperation all improve municipal performance and community support for waste management plans and programs (Tchobanoglous, 2002).

Capacity Building: Insufficient capacity is a fundamental impediment to sound waste management programs in much of the developing world. Operating an efficient, effective, environmentally sound waste management program requires building administrative capacity for government and private sector players and technical capacity for designing, operating, maintaining, and monitoring each part of the process (Igbinomwanhia & Ohwovoriole, 2012). Private companies, NGOs, and government entities lack the technical and financial knowledge to operate efficiently (Bernstein, 2004). Training that builds human resource and institutional capacity at appropriate levels is essential. Peer- to-peer training for everyone from waste picker to local government officials has proven effective in extending and sustaining these programs (Bernstein, 2004).

Theories of Waste Management

Several theories and models have been put forward to either explain or predict behavioural change among individuals. Most of these theories tend to use internal and external factors to explain or predict how an individual's behaviour is influenced either by the introduction of an intervention or the absence.

Common theories use in waste management include Schwartz's Norm Activation Model (Van Liere, & Dunlap, 1978), the Theory of Reasoned Action (Ajzen & Fishbein, 1980), and the Theory of Planned Behaviour (Ajzen, 1991). Ajzen theory of planned behaviour was used to demonstrate how people engaged in household waste management practices. Theory of Planned Behaviour (TPB) is an extension of the TRA because it includes an additional construct known as the perceived behavioural control (Rimer, &

Glanz, 2005). This theory (TPB) provides a theoretical framework to systematically examine factors that affect behavioural change. According to the TPB, a person's behaviour is based on his/her readiness to perform a given behaviour (i.e. intention), which is based on attitudes toward the behaviour (the degree to which performance of the behaviour is positively or negatively valued). In this case, if a person value waste management as positive to health, he/she will practice proper waste management and vice versa, Subjective norms is the perceived social pressure to engage or not to engage in behaviour. Thus, if majority of community members are practicing proper waste management system, the few who are not practicing proper households waste management would be influenced to do so to avoid social pressure from the majority. Perceived behavioural control is people's perceptions of their ability to perform a given behaviour (Ajzen, 1991).

The TPB has been used for waste management behaviour among households (Bortoleto, Kurisu, & Hanaki, 2012), university students and contractors (Ramayah, Lee, & Lim, 2012). In an empirical review of the TPB literature, it was revealed that strong intention is not sufficient to performing a given behaviour (Sheeran, 2002). Action planning was therefore introduced to bridge the intention-behaviour gap (Sniehotta et al., 2005). Action planning is a self-regulation strategy that translates good intention into action by specifying when, where, and how to act. Action planning is considered to be a post-intentional volitional process that helps to initiate an intended action (Ajzen, 1991).

Several studies have shown that action planning has an effective influence on performing a given behaviour (Pakpour et al., 2014). Despite the

strength of TPB in the prediction of intentions and behavior, the TPB has not been as widely used for developing interventions aimed at changing behaviour (Fishbein & Ajzen, 2011). The TPB can be useful for obtaining data on individuals' beliefs, attitudes, perceptions and intentions to determine possible internal barriers to behaviour. Once internal and external barriers (programme availability; driving distance to a drop-off facility) have been identified, a Community-Based Social Marketing (CBSM) strategy can be developed to address and reduce barriers to the promoted behaviour. CBSM offers tools and techniques to motivate behaviour, thereby potentially serving as a useful approach to applying the TPB to interventions designed to modify behaviour.

For example Pakpour et al. (2014) examined factors associated with household waste management behaviour in the context of the theory of planned behaviour (TPB) among a community sample of Iranians that included data collection. The waste generation rate was estimated to be 709 g/person/day for Qazvin city where the study was conducted. Two thousand households were contacted in person by the researcher to complete a self-report questionnaire. All measures were presented to the participants in a mixed order in areas of attitude, subjective norms, behavioural intention, and perceived behavioural control. Participants in the study scored high for perceived behavioural control. This indicate that waste management practices with particular reference to recycling was generally not perceived to be a difficult or inconvenient task. The study concluded that attitude, subjective norms, perceived behavioural control, moral obligation, self-identify, intention, action planning, and past behaviour significantly predicted household waste behaviours in Iran.

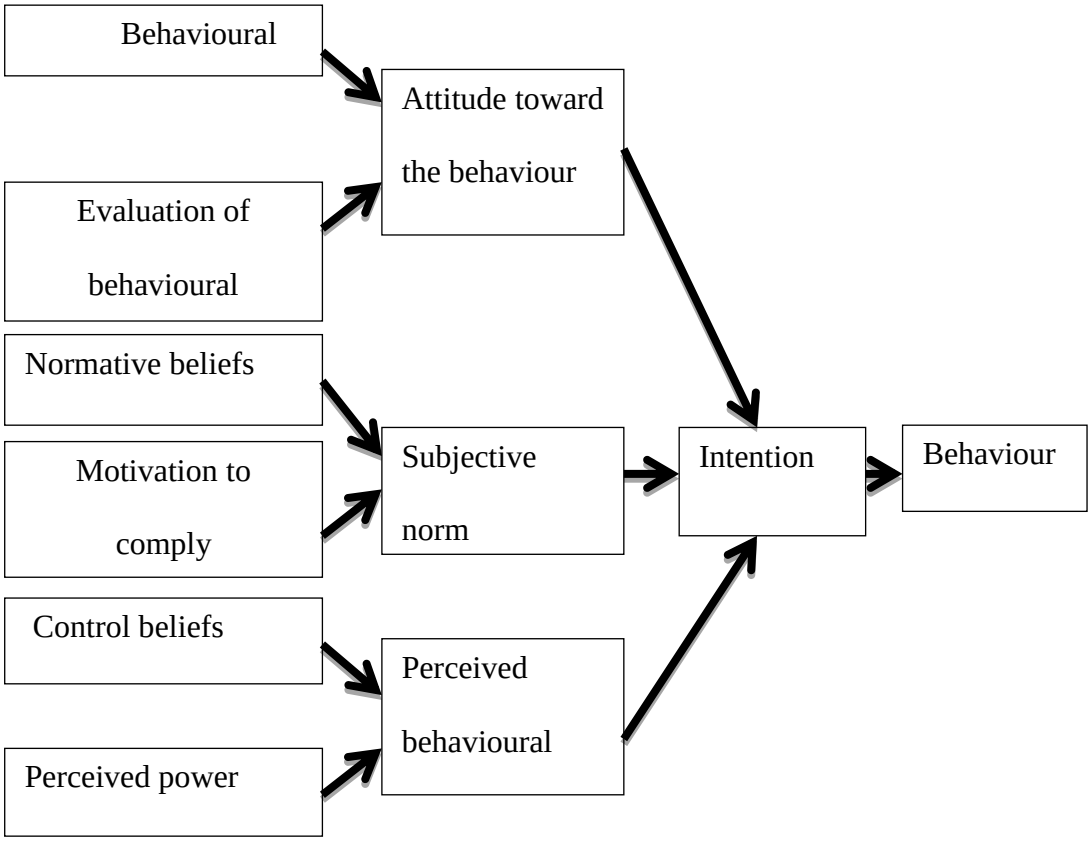


Figure 1: Theory of planned behaviour (Rimer & Glanz, 2005)

Conceptual Framework

The problem of managing waste should be looked at in terms of assessment of the various methods with cost and benefit. This assessment should be in line with how such management option can be implemented and financed. This involves an economic approach to waste management, including the assessment of environmental impact of the various management options for a better waste management practice such as Integrated Waste Management (IWM).

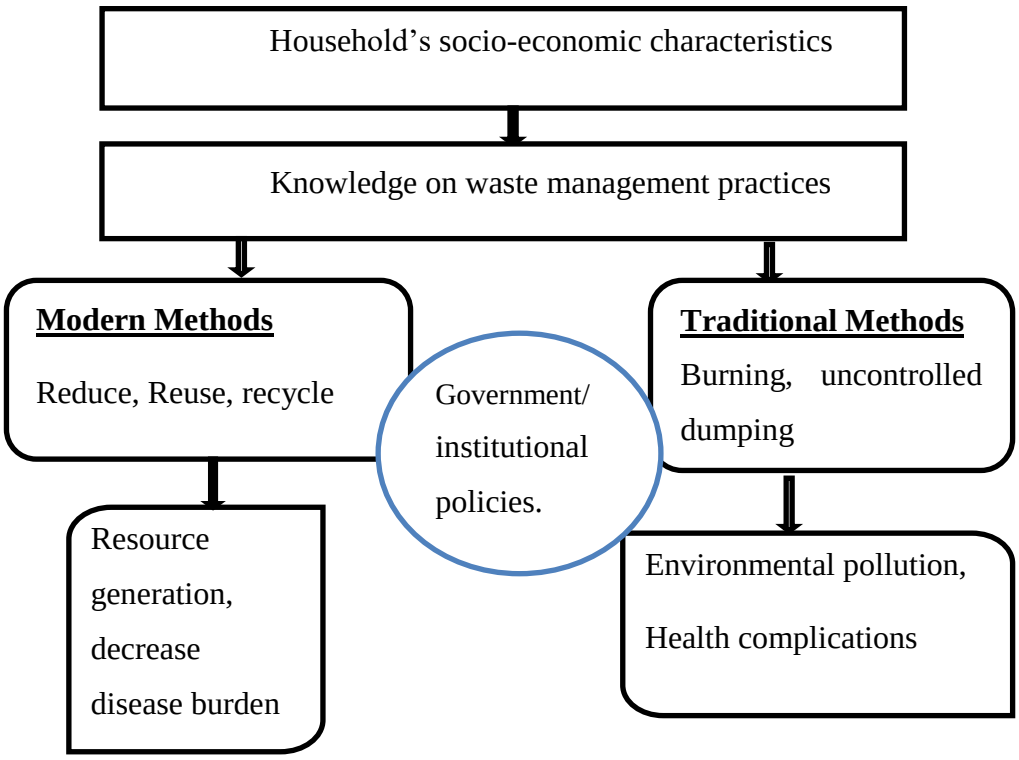
The conceptual framework is driven toward the "Zero Waste" approach and the waste management hierarchy concept. The aim is to promote sustainable solid waste management practices from generation to disposal and promotes resource generation for poverty alleviation (Troschinetz & Mihelcic,

2009). Though there are other sources of waste generation, this study focused on household waste management practices which can turn waste into resources for poverty alleviation.

The socio-economic characteristics of households (income level, educational level and household size) influence knowledge of both traditional and modern waste disposal methods. The IWM approach driven towards "Zero Waste" concerns the volume of waste that is generated and properly managed. It also deals with the analysis of the cost and benefit of the various disposal options in order to adopt environmentally "correct" and analytically sound policies which can be sustained. Cost in this approach offers a coherent structure for waste management. The approach, as noted, considers how much waste should be produced at source. Further it involves and also involves making judgments on balancing of cost and benefits of the various management options like recycling, reuse and reducing.

Modern waste disposal methods such as recycling, reuse, composting and segregation offer avenues for people to convert waste into resource to earn additional income and reduce poverty (UNEP, 2009). On the other hand, continuous use of the traditional methods such as burning, uncontrolled dumping, imposes continuous costs to society, accelerates the pace of environmental pollution and degradation, and health hazards (Achalu & Achalu, 2004). Institutional support factors (i.e. dumping site, receptacles used to store household waste and policies supporting waste management practices) influence household waste management practices. Hence, an understanding of factors influencing the choice and use of modern methods of disposal is important to advance socio-economic development.

The contribution of this study is through the identification of the factors that influence the choice of modern methods. It has been elaborated that with appropriate segregation and recycling system significant quantity of waste can be diverted from landfills and converted into resource (UNEP, 2009). Similarly, Troschinetz and Mihelcic (2009) has said that if a state or local government wants to plan for and implement ISWM, they have to consider a hierarchy of methods which are reduce, recycle and reuse.



Adapted from UNEP (2009).

Summary

The chapter addresses key issues such as definition of waste and its management process. It also outlined some types of waste and sources, effects of improper waste management, traditional and modern waste management processes. The literature described household waste management hierarchy and integrated waste management approach. Theory of planned behavior was

reviewed. The literature pointed out some harmful effects of improper waste disposal. One flaw of the literature was that most existing theoretical studies fail to address comprehensively households waste management problems. Another flaw was that most literature did not cite sensitizing the public on regulations governing waste management, and the punishment when defaulted. Most of the theories dwells much only on solid waste management. It was find out that not too many studies included many attitudinal variables and do not have access to detailed individual data on actual waste flows (e.g. generation, storage, transfer).

CHAPTER THREE

RESEARCH METHODS

The purpose of the study was to investigate how households in the Tain district manage waste and to determine whether their waste management practices are appropriate to reducing environmental and sanitation related challenges. This chapter explains how the study was conducted and consisted of the research design, population of the study, sampling procedure, data collection instrument, data collection procedure and data processing and analysis.

Research Design

A mixed method design was employed in this study (Bernard & Bernard, 2012). A mixed method design is a combination of both quantitative and qualitative methodologies for the purpose of one particular research or study. For this study, a descriptive research that comprise qualitative and a quantitative design were employed. Descriptive research attempts to describe systematically a situation, problem, and phenomenon such as waste management situation using both quantitative and qualitative data (Blanche et al., 2006). Quartey and Awoyemi (2002) describe a descriptive research as one that aimed at producing an accurate description of a particular on-going situation or real-life setting. The goal of a descriptive research is to describe and interpret what exist in its present form or condition, practice, effect and attitude, as well as provide information regarding the nature of a situation, thus waste management situation in a given area (Kumar & Phrommathed, 2005).

Furthermore, quantitative research is used to quantify the problem by way of generating numerical data or data that can be transformed into usable

statistics and generalize results to a larger population. Qualitative research on the other hand, gains an understanding of underlying reasons, opinions, and motivations for which a given situation occurred or is occurring. It provides insights into the problem or helps to develop ideas or hypotheses for potential quantitative research (Monfared & Derakhshan, 2015).

The strength of quantitative studies is providing data that is descriptive. For example, it allows the researcher to capture a snapshot of a user population. The weakness of quantitative study is that the researcher encounters difficulties when it comes to their interpretation. Also, quantitative research requires the standardization of data collection through structured questionnaires to allow statistical comparison which respondents may not answer appropriately. On the other hand, the strength of qualitative research studies is that it can provide you with details about human behavior, emotion, and personality characteristics that quantitative studies cannot match. Weakness of qualitative studies includes lack of generalizability and presenting multiple perspectives makes it difficult to reach consensus. It also employed small number of respondents (Demetrius, & Bryan, 2012). In view of the limitations inherent in the two approaches, it is best to combine the two approaches to reduce the limitations and thereby increase the quality of the data and outcomes (Creswell, 2013).

Population

Polit and Hungler (2004) refer to the population as an aggregate or totality of all the objects, subjects or members of a larger group that conform to a set of specifications defined by the sampling criteria established by the researcher. It is the group in focus of a research study. The target population of

this study comprised all permanent residents of Tain District. These residents are people who generate waste, require waste disposal services and are affected by current waste disposal and management practices in the district.

Tain District is one of the 22 districts of the Brong Ahafo Region of Ghana, with its capital at Nsawkaw. The population of Tain District in 2018 was estimated as 105,391 (Tain District Assembly Planning Unit, 2018), representing 3.8% of the total population of Brong Ahafo. The district has a household of 19,885 with an average household size of approximately 5.3 persons (Tain District Assembly Planning Unit, 2018). The district has a fairly youthful (40.3%) population with a small number of elders (5.8%). The total age dependency ratio for the district is 85.5%, with that of males slightly lower (85.2) than the females (85.9). About 80.8% of the residents in the district are engaged as skilled agricultural, forestry and fishery workers, 6.2% in service and sales, 5.6% in craft and related trade, and 3.9% are engaged as managers, professionals, and technicians (GSS, 2014).

Sampling Procedures

Identifying the target population and selecting sample is recognized as the most critical stage of research path because the quality of the sample determines the validity of the results and its applicability and generalizability to the whole population (Asiamah, Mensah, & Oteng-Abayie, 2017). Tain District has 15 communities with different ethnic groups. The research was conducted in four communities in the district namely Seikwa, Debibi, Badu and Nsawkaw. Purposive sampling was used to select these four communities because they are the major urban centers in the district with diverse characteristics and proximity. Hence, they were chosen to ensure the presence

of maximum variability within the primary data. Also, waste management is very important in these selected communities because of their larger population. The researcher used Slovin (1960) formula to calculate for the sample size. The formula is given as n=N÷ (1+Ne^2), where n = Number of samples, N = Total population and e = Error tolerance (0.03). This formula is used when nothing is known about the behavior of a population. n=19,885 ÷ (1+19,885(0.03)^2). n=19,885÷19=1,047. Therefore, the estimated sample size for the study was 1,047.

Firstly, total population for the four selected towns was Badu-5165, Seikwa-4153, Debibi-1667 and Nsawkaw-2515 all total=13,500.

Secondly, ratio for the selected communities was calculated as follows, Badu was $\frac{5,165}{13,500}x100 = 38.3\%$ Where 5,165 is total population for Badu, 13,500 is the total population for the four selected communities and 100 is constant. Seikwa was calculated as $\frac{4,153}{13,500}x100 = 30.7\%$. Debibi was calculated as $\frac{1667}{13,500}x100 = 12.3\%$ and Nsawkaw was calculated as $\frac{2515}{13,500}x100 = 18.6\%$.

Lastly sample size for each town out of 1,047 was calculated as Badu $\frac{38.3}{100}x1,047 = 401$, Seikwa$\frac{30.7}{100}x1,047 = 322$, Debibi $\frac{12.3}{100}x1,047 = 129$ and Nsawkaw $\frac{18.6}{100}x1,047 = 195$ (401+ 322+ 129+ 195=1,047). The actual sample size used was 1,037 which gave a response rate of 99.04%.

Female heads in each household were selected using the purposive and convenient sampling techniques. Female heads were used because they are responsible for household waste management in rural communities. (Nyatsanza & Ndebele, 2016).

Data Collection Instruments

The instruments for collection of data for the study were structured questionnaire and observation. I designed and constructed the questionnaire and observational checklist. The items for the instruments were derived from the literature review in accordance with the purpose of the study.

The main issues that were addressed in the design of the questionnaire included the respondents' educational and socioeconomic background, knowledge level on waste management, frequency of emptying storage receptacles, perceived health effects of improper waste disposal, place of refuse disposal, attitude of community members and availability of community storage receptacles.

A structured observation is very systematic and enables the researcher to generate numerical data from the observations (Cohen, Manion & Morrison, 2000). Questionnaire as a data collection tool is widely used in descriptive research. It is effective for acquiring factual information about practices and conditions of which the participants are presumed to have knowledge (Twumasi, 2001). The use of a questionnaire is also employed for inquiring into the opinions, views, feelings and behaviours of subjects (Ogah, 2013).

To ensure validity and reliability of the study, pre-testing of data collection instruments was embarked using 10 particpants from Banda Boase Community. Banda Boase community was chosen because dwellers share common characteristics with the Tain District such as culture, population, occupation. The purpose for pre-testing was to enhance the reliability and also make replication of the study possible. It also enhances the validity of the study thus, ensuring accuracy of the study.

Validity of an instrument has to do with whether the instrument is measuring what it is intended to measure (Ogah, 2013). To ensure face validity of the instrument, the researcher discussed the questionnaire with a statistician and colleagues. For content and construct validity, the instrument was discussed with my supervisors to make sure that the instrument sufficiently measures the construct with the smallest number of items.

The questionnaire is in two sections, A and B. Section A has the background information eliciting information on bio-data of participants while section B is the enquiry part soliciting information from participants based on the purpose of the study.

Data Collection Procedures

Ethical clearance was sought from the Institutional Review Board (IRB), of the University of Cape Coast. In addition, my supervisor gave approval after reviewing the questionnaire and observational checklist. Introductory letter was obtained from the Head, Department of Health, Physical Education and Recreation of the University of Cape Coast and presented to the chiefs and the District Chief Executive to seek for their permission to carry out the study. Confidentiality of participants was assured by anonymity and the pieces of information gathered were used for the purposes of the study. Participants were asked to sign or thumbprint a consent form to serve as evidence of participation.

The administration of the questionnaire was hand delivered by I and my four assistants chosen for the study. The research assistants were chosen from the communities and trained to assist the researcher in collecting the data. They were taken through the questionnaire and observational checklist,

interpretation of questions, establishment of good rapport with participants, neutrality and accurate recording of responses. The questionnaire was administered at the various homes of the respondents. The administration of questionnaire was done in the morning and evening because most of the participants are farmers, traders and civil servants and thus were busy during the afternoon session. Some of the items in the questionnaire were elaborated to participants who could not understand. The questionnaire raised were pre-tested prior to the actual data collection. The research assistants were rewarded with sum of money. I and my four assistants took two weeks to complete the data collection procedure. Meanwhile, the participants were intrinsically motivated and assured of anonymity.

Data Processing and Analysis

Osuala (2001) describes data analysis as the ordering and breaking down of data into constituent parts and performing of statistical calculations with the raw data to provide answers to the research questions which initiate the research. The first step of data analysis in this study was to check for accuracy, consistency and completeness of questionnaire items. Data were first checked manually for completeness and then coded and entered into Microsoft excel and processed. Descriptive and inferential statistics were used to describe the factors that influence household waste management practices by summarizing them into percentages and frequencies.

Research question 1 was meant to examine the type of waste generated by participants in Tain District. Here, only one question was asked for participants to tick the kind of household waste they generate in order of abundant. Frequency and percentages, using bar chart, was drawn to depict the

various types of waste generated. Research question 2 assessed the waste management practices employed by households in the Tain District. To address this question, frequency and percentage was used to determine the dominant waste management practices of the respondents.

Research question 3 has an opened ended question seeking respondents' views on strategies that help improve the waste management practices in the Tain District. A frequency and percentage distribution table was used to analyse this research question. Research question 4 outlined knowledge on perceived health effects of indiscriminate households waste disposal practices in the district. Likert scales containing seven items were listed for the participants to tick the appropriate responses. Frequency and percentage was employed to determine knowledge level on perceived health effects.

Research question 5 examined factors influencing household waste disposal practices in the Tain District. Binary regression analysis was employed to determine whether the independent variables (Age, Houshold size, Knowledge and Education) could predict the odds of dependent variable. The observational checklist which contains 16 items was used by way of reporting through incorporation into data analysis at each research question.

Summary

The study employed mixed method for the study. Questionnaire and observation were used as means of data collection tools. Purposive sampling was used to select 4 major towns in the district and female household head were administered questionnaire. The responses from the data collection tools were coded into Microsoft excel and SPSS and analysed. The total population

for the study was 19,885. The estimated sample size for the study was 1,047. The questionnaire has 29 items, and the observation checklist has 16 items. The data collection procedure took two weeks to be completed. SPSS was used to analysis the data.

CHAPTER FOUR

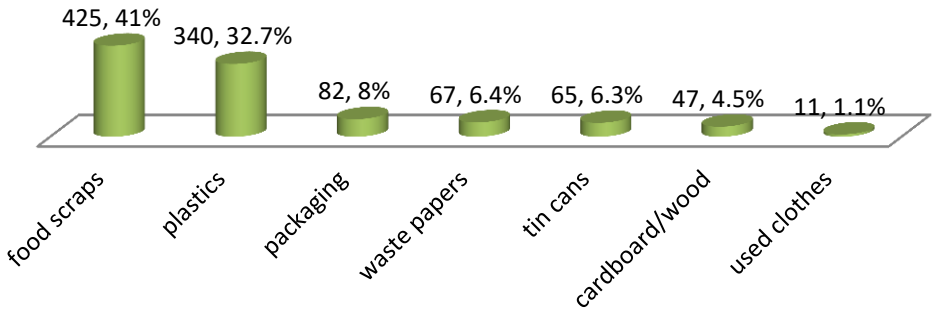
RESULTS AND DISCUSSION

The purpose of the research was to investigate how households in the Tain district manage waste and to determine whether their waste management practices are appropriate to reducing environmental and sanitation related challenges. This chapter presents the results and the discussion of the findings.

Research Question 1: What Types of Waste do Residents in the Tain District Generate?

Frequency and percentage distribution was used to determine the types of household waste generated in the Tain District. The generated waste included food scraps 425 (41%), plastic waste 340 (32.7%), packaging materials 82 (8.0%), waste papers 67 (6.4%), tin cans 65 (6.3%) and card board/wood 47 (4.5%). The least amount of waste participants generate in the district was used clothes 11 (1.1%). The finding indicated that the abundant type of waste generated in the Tain District was food scrap.

Figure 3: Frequency and percentage distribution of types of waste generated in Tain District



Source: Field survey, Bayor (2018)

The finding showed that the major waste generated in the district included food scraps, plastic waste and packaging materials. The finding may be related to the major occupational activities in the Tain District, linked to the generation of high volumes of household wastes. This finding agreed with

Denteh et al. (2018) that the high percentage of bio-degradable organics depend mostly on organic foods and this could be as a result of the rural occupational nature of the areas. The Tain District is predominantly a farming community hence they produce more of food waste (Tain District Analytical Report, 2010). This finding is understood because the district is not an urban area hence no serious manufacturing activity goes on that may contribute to waste such as gaseous and industrial waste.

Plastic waste also accounted for a large volume of waste generated. This could be as a result of change in lifestyle and modernization occurring in the district. This finding is consistent with that of Singh and Sharma (2002), suggesting that the increase in plastic usage is as a result of increased in population growth and change in lifestyle in which plastic packaging replaces other forms of packaging such as using bowls. This call for education and increase in knowledge to be able to manage waste appropriately in communities.

This study espoused that food debris disposed off indiscriminately could give rise to choked drains which create the possibility of flooding during the rainy season (Yusof et al., 2002). Also, the food debris have the potential of serving as breeding grounds for rodents and insects that could increase the spread of parasitic and zoonotic diseases (Abeyewickreme et al., 2012). The Tain District Assembly (2014) sanitation reports revealed that wastes which are improperly dump in open places includes leftover food, broken bottles, garbage, faeces and bath water.

Research Question 2: What Waste Management Practices are employed by Households in the Tain District?

The disposal of household waste is one of the functional elements in the management of waste. The management of waste range from waste generation to final disposal including aftercare of disposal site. This section briefly illustrate how often house waste is collected weekly, place of disposal of waste such as dumpsite, nearby gutters, open space and level of satisfaction with waste management companies in the district. It is presented using frequency and percentages as below.

Place of waste disposal

Frequency and percentage were calculated to determine waste disposal places used by the participants in the study area. The results showed that more than half, 792 (76.37%), of participants disposed their waste in dumpsites whiles 129 (12.44%) used the backyard. Thirty six (3.47%) of the participants resorted to using roadside as the place of waste disposal. Another 33 (3.18%) of the participants indicated they used skip as place of waste disposal. The remaining participants (4.54%) indicated they use nearby gutter, open space and others places as they dispose off their waste (See Table 1). The finding indicated that majority of participants used dumpsite as their place of waste disposal.

The findings revealed that many at the households use the crude dumpsite as place of waste disposal. The finding is supported by Dhanuja's (2006), that the most common method of waste disposal in developing countries is dumping site. The rest of participants resorted to dumping waste either on the roadside, open spaces, nearby gutter or backyard.

Table 1: Frequency and percentage of places of waste disposal

Place of disposal	Frequency	Percentage
Dumpsite	792	76.37
Backyard	129	12.44
Roadside	36	3.47
Skip	33	3.18
Open spaces	26	2.50
Nearby gutter	21	2.03
Total	**1,037**	**100**

Source: Field survey, Bayor (2018)

Also, this finding is supported in literature by Adu-Boahen et al. (2014), as majority (47.2%) of the households population responded that disposing refuse at a refuse dump as the most appropriate method. Therefore, the possibility of outbreak of cholera and other environmental related diseases, pollution of water bodies are high if such practice continues.

The result further showed that residents of the Tain District still practice open dumping. The reason may be because waste management companies existed in the district which were expected to properly collect and dispose off waste. Therefore, they litter the environment expecting the waste management companies to take care of the waste. This practice raises some public health concern as it encourages breeding of houseflies, mosquitoes, rats and other vermin (Aderemi & Falade, 2012). The practice also aids the spread of infectious diseases among other hazards that present threats to human health and the environment. This implies that instead of using ideal sanitary

landfill, most of the waste generated in the study area is deposited in environmentally unsafe sites.

Observation from the house- to- house data collection also showed that most of the households had a little refuse dump sited behind their houses where they dumped their waste and burnt it from time - to - time. Boadi and Kuitumen (2004) observed burning to be very common among rural households without proper waste disposal facilities. Adepoju and Salimonu (2010) also indicate that large number of participants in Osun State, Nigeria burned their waste. The waste burning in the study areas could be attributed to the high cost of monthly charges for the collection of waste, long distance between public skip containers and households as well as irregular collection of waste by management institutions.

Knowledge on environmental issues and waste management in particular has long been recognized as crucial factor in influencing household waste disposal practices (Nixon & Saphores, 2009). The plausible reason is that most of participants in the district have little knowledge on household waste management. Perhaps, there is a need for demarcated site for the collection and disposal of waste so that residence would not deposit their refuse indiscriminately. These sites could be managed and monitored by the community. By so doing, the community members will be included in waste management issues and not to leave it to only waste management companies. In that case community members may not litter the environment indiscriminately because they will be the same people to pick the waste if they litter. Indeed, Lilliana et al. (2012) have buttressed this argument by indicating that waste management in communities should involve active participation of

citizens, therefore, community members should be included in waste management.

Waste collection and disposal

Frequency and percentage was again calculated to determine weekly collection and disposal of waste in the study area. The results revealed that majority of participants, 595 (57.38%), collected and disposed off their waste throughout the week, whiles 143 (13.79%) of participants collected and disposed off their waste once per week. One hundred and thirty two (12.73%) indicated they collected and disposed off their waste at other intervals such as when cooking or waste collection bin is full. Fifty five (5.30%) of the participants asserted that they do not generate much waste, so they collected and stored for about 2 weeks (See Table 2). Findings showed that majority of participants collect and disposed their waste throughout the week.

Table 2: Frequency and percentage of waste collection and disposal times in a week

Number of times	Frequency	Percentage
Daily	595	57.38
Once	143	13.79
Others	132	12.73
Twice	82	7.91
Not at all	55	5.30
Thrice	30	2.89
Total	**1,037**	**100**

Source: Field survey, Bayor (2018)

The finding showed that majority of residents collected and disposed off their waste daily throughout the week. This finding support a similar study

by Eshun (2013) that majority of the participants in Komenda-Edina-Eguafo-Abirem (KEEA) Municipality, emptied their refuse every morning. This is normally done to avoid potential adverse impacts on personal, household, public health and the consequences on the environment. Moreover, due to the high content of degradable organic if the waste is kept for longtime decomposition may occur. The decomposition could produce foul odour and other related health issues like cholera, diarrhea. It could also serve as breeding places for disease causing organisms like mosquitoes, houseflies and cockroaches. Zhu et al. (2008) indicated that one major impact of storing waste for long period of time is that it attracts rodents and vector insects. This shows that there is the need to empty dustbins throughout the week. The daily collection of waste throughout the week protects the waste from direct exposure to flies, vermin, scavengers and prevents odour and unsightliness (Adepoju & Salimonu, 2010).

Satisfaction with waste management companies

Frequency and percentage distribution was used to analyse residents' satisfaction level of waste management institutions in the Tain District. Frequency data revealed that 518 (49.95%) of the participants were either satisfied or very satisfied with the work of waste management institution (Zoomlion) and Environmental Health Officers in Tain District. However, 519 (50.05%) of participants were either "unsatisfied" or "very unsatisfied" with the work of waste management institutions (See Table 3). Finding indicated that the waste management services provided by the private sector such as Zoomlion and Environmental Health and Sanitation Management Department are unsatisfactory.

Table 3: Frequency and percentage distribution of level of satisfaction with the work of the waste management companies

Level of satisfaction	Frequency	Percentage
Unsatisfied	438	42.24
Satisfied	397	38.28
Very satisfied	121	11.67
Very unsatisfied	81	7.81
Total	**1,037**	**100**

Source: Field survey, Bayor (2018)

The finding showed that the waste management services provided by the Zoomlion Company and the Environmental Health Management Department are unsatisfied. The finding could be because of the poor quality of waste collection and disposal services that characterised the waste management system in the Tain District. The findings support that of Burntley (2007) that most participants complained of irregular patterns in waste collection by waste management departments, hence were not satisfied with their services. This finding also echoes a similar study by Yoada et al. (2014), they concluded that overall, majority of households were not satisfied with the waste management services even in urban Accra. Most respondents complained of irregular patterns in waste collection and the high cost of contracting private collectors. Perhaps, it is because of the privatization of the Waste Management Services in the district.

Waste management services used to be under the full responsibility of the Metropolitan, Municipal and District Assembly in Ghana (Yoada et al., 2014). The waste collection service in the Tain District is partly performed by

the private sector (Zoomlion) and the Environmental Health Management and Sanitation Department under various agreements with the District Assembly. In addition, communal bins are provided by Zoomlion in collaboration with the Tain District Assembly (Tain District Assembly/ Zoomlion, 2018).

During the field investigation it was also observed that lot of skips were overflowing with waste uncollected for days, in the district. The residents are more likely to be dissatisfied because of such waste condition in the community. This has the tendency of breeding diseases such as typhoid and cholera. The finding is also in support of EPA (2002), which states that waste management services in most developing countries generally do not satisfy the full demand of communities. Manga, Forton and Read (2008) also observed that waste management services are rudimentary. The practice is primarily concerned with collection and dumping of waste without proper management methods. In contrast to the findings of this study, Denteh et al. (2018) revealed that households are satisfied with waste management companies in Vittin as they collect household waste regularly. The difference in findings could be the operational inefficiencies of waste services attributed to deficient management capacity of waste management institutions and inappropriate technologies with little resources (Ogwueleka, 2009). Another possible explanation is the challenges waste management institutions in Ghana faced as results of inadequate equipment, inadequate skills, staff and negative attitudes of the general public towards the environment and health issues (Agyem-Atta, 2013).

Research Question 3: What Strategies could Improve Waste Management Practices in the Tain District?

Frequency and percentage distribution was calculated to determine the perceived strategies to improve waste management situation in the Tain District. The results showed that 488 (47.1%) of participants believed provision of waste collection bin and public waste collection containers were the "best" strategies to manage waste in the district. Meanwhile, 217 (20.8%) of participants believed more Zoomlion workers be hired by waste management companies and the Tain District Assembly to manage the waste. Another 150 (14.5%) believed sanitation education and enforcement of sanitation bye-laws would be most appropriate. The remaining participants, 182 (17.6%), thought otherwise (See Table 4). The finding indicated that most of the participants want the provision of more waste collection bins and public waste containers to be the strategies to improve waste management practices in the Tain District. The field observation data also showed that the skip ratio to the population in the Tain District was low, as only four public waste bins were available, as opposed to the acceptable standard of 1:700 (as indicated by Zoomlion). This means that the average population a skip served was far greater than the standard maximum population to a skip.

Most of the participants believed that provision of more waste collection bins and public waste containers would be appropriate for effective waste management in the district. The non-availability of waste collection equipment could explain why close to 80% of the participants resorted to dumping waste at dump sites and other open spaces. This finding supports that of Cointreau (2006) that the absence of waste bins was the reason for littering the streets with waste. Similarly, study by Puopiel and Owusu-Ansah (2014)

revealed that skip ratio to the population in the rural residential areas was low compare with acceptable standard.

Table 4: Frequency and percentage distribution of strategies to improve waste management situation Tain District

Measures	Frequency	Percentage (%)
Provision of waste collection bins/ containers	488	47.1
Employ more Zoomlion worker / technical expects	217	20.8
Sanitation education and apply bye-laws	150	14.5
Daily sweeping and collection with Zoomlion vehicles	62	5.9
Daily burning of house waste	31	3.0
Regular organizing communal labour	26	2.5
Supervise waste management companies	11	1.1
Allocate dumpsites away from town	24	2.3
Minimize waste generation/ use of polythene bagat home	9	0.9
Motivate waste management workers	8	0.8
Provide enough toilet facilities to community	8	0.8
Waste management companies should work harder	2	0.2
Free collection of waste by Zoomlion workers	1	0.1
Total	**1,037**	**100**

Source: Field survey, Bayor (2018)

This means that the average population a skip served was about far times greater than the standard maximum population per a skip. In

collaborating this finding, Adu-Boahen et al. (2014) revealed that most of the people prefer the provision of dustbins and waste containers as best way to improve the waste management situation in their areas. Momoh and Oladebeye (2010) in their study recorded that containers for waste collection were not sufficient, a situation which contributed to poor sanitation. Therefore, in the absence of waste bins at vantage points along the streets, people could dispose waste into gutters and on streets. On the contrary, adopting the 3Rs in managing household waste would solve waste management situation in the Tain District (Abdul-Rahman, 2014).

The participants also want more workers to be hired by waste management companies to augment the current under staff workers in the district. During the field work, it was also observed that majority of residents carried their waste to public waste containers and dumpsite provided. This activity could contribute largely to indiscriminate dumping especially by residents far from the containers and dumpsites. Probably, because the waste Management Company and Department did not have enough workers, and that the bye-laws are not being effectively enforced. According to Boadi and Kuitunen (2004), lack of human resources coupled with the absence of enabling policies, make it impossible to operate and maintain disposal sites at minimum sanitary standards. Moreover, waste collection services may not be adequate due to human resource to cover a large part of the cities, particularly poor squatter settlements and inaccessible neighbourhoods. Boadi and Kuitunen further explained that due to the low human resource waste containers are not removed in time, and this causes people to dump waste in unauthorized places. They further argued that the solid waste management

system in Accra for example, is constrained by a lack of competent personnel with the requisite technical expertise for planning, operation and monitoring, and landfill design. Besides, many of the workers, particularly among the small-scale firms may have little or no training in waste management.

Participants also want the Tain District Assembly to intensified sanitation education and enforce sanitation bye-laws to control indiscriminate disposal of waste. This finding echoes a similar one by Asomanin and Worlanyo (2015), that weak enforcement of sanitation laws is a factor responsible for improper disposal of waste. Also, Obiageli et al. (2016) asserted that apparently absence of policies and laws to prosecute offenders on improper waste disposal led to the littering of the environment. It was reported in Obiageli study that "the only language that the residents in Nigeria understand is task force" (p. 20).

It is important to mention that few participants want free collection of waste by Zoomlion Company and Waste Management Department in the district. The assumption is that user fees are high, as they charge about Gh₵20 per household per month in the district which many people cannot afford hence they litter the environment. The finding support that of Asomanin and Worlanyo (2015) that the cause of improper disposal of wastes in public spaces and inappropriate places in Gbawe was the high fees charged by private waste collection service providers and managers of the public dump containers. Accordingly, this situation compel residents to dispose waste in open space since they cannot afford such high levies.

Research Question 4: What are the Perceived Health Effects of Indiscriminate Households Waste Disposal Practices in the Tain District?

Frequency and percentage was calculated to determine perceived health effects associated with indiscriminate waste management practices among the participants. Results showed that majority (825) of participants have high knowledge on the health effects of improper waste management practice while 212 of them recorded little knowledge. The results also revealed that 99.2% of participants agreed that throwing waste around could be responsible for reported epidemic like cholera, malaria and diarrhoea. In addition, 96.06% of the participants agreed that rodents and birds scavenging waste dumps may spread diseases, while 3.94% disagreed. Furthermore, 96.6% reported that improper disposal of waste leads to clogging of drains, meanwhile 3.4% disagreed. Accordingly, 87.3% of participants agreed that improper management of waste leads to contamination of food and water bodies (See Table 5). The finding indicated that majority of participants have high knowledge that indiscriminate waste management leads to negative health effects on the participants and their environment.

Table 5: Analysis of knowledge on waste management practices and subjective health effects

Variables	Improper waste management N=212		Proper waste management N=825	
	N	%	N	%
Throwing waste around leads to unsanitary conditions.				
Agree	211	99.52	819	99.3
Disagree	1	0.48	6	0.7
Improper management of waste is responsible for epidemic like malaria, diarrhoea.				
Agree	208	98.11	819	99.24
Disagree	4	1.89	6	0.76
Rodents, animals and birds scavenging through waste dumps spread diseases.				
Agree	200	94.34	793	96.06
Disagree	12	5.66	32	3.94
People living near waste dumps suffer more from respiratory problems, eye diseases and water borne diseases.				
Agree	210	99.1	823	99.75
Disagree	2	0.9	2	0.25

Cont' Table 5

Throwing waste around leads to clogging of drains in my community.				
Agree	202	95.28	797	96.6
Disagree	10	4.72	28	3.40
Improper disposal of household waste can lead to contamination of food and water.				
Agree	188	88.7	720	87.3
Disagree	24	11.3	105	12.7
Improper management of waste can lead to pollution of water bodies.				
Agree	204	96.22	643	78.0
Disagree	8	3.78	182	22.0

Source: Field survey, Bayor (2018).

The finding revealed that majority of the residents recorded high level of knowledge of the health effects of improper waste management. This high level of knowledge could have contributed to participants practicing proper waste management to avoid outbreak of diseases in the community. This finding collaborates that of Okechukwu et al. (2012) that the knowledge of household heads in relation to health effects of poor waste disposal is high. That is majority of the household heads were aware of the health implications of poor waste disposal. Knowledge of diseases in relation to poor waste disposal by household heads includes, cholera, malaria, diarrhoea, typhoid and dysentery. Again, the finding is similar to that of Sujayita (2018) that participants in Mariami reasoned with the important to dispose off household

waste properly. Also, this finding support that of Sisay et al. (2017), majority of participant had good knowledge on health and environmental hazard of waste disposal practices. However, this level of knowledge did not resonate with the level of waste management practices in the district. The gap in knowledge and practice among the residents may be largely due to attitude.

Also, the findings of the observation data revealed that participants were aware of the importance of proper waste management, but they are lacked in the practice of proper waste management due to unconcern attitude. The finding is consistent with Adeyemo et al. (2013), that greater percentage of participants have positive attitude towards waste management in their study area but do not practice. Most of the respondents agreed that their attitude could lead to surroundings becoming unhealthy and disastrous to health. The participants revealed that it is the responsibility of government to manage waste in the metropolis. The finding is also supported by Maharaj and Nemaram (2017), in their study on attitude and practice regarding household waste management, it was found that majority of the adolescents had unsatisfactory attitude and practices regarding household waste management which leads to effects on environmental and public health.

Meanwhile, observation during data collection showed that responses from the participants do not correspond with their observed practices. The household heads have several reasons for properly disposing of waste, including cleanliness, fear of fines from environmental sanitary inspectors and experience of foul odour. During the observation, it was seen that the environment was bushy with no waste collection bins and containers. This could be as a result of lack of access to information on waste management and

sanitation in the district. Also, it could be attributed to the inability of the District Assembly and Waste Management Institutions to carry out adequate public awareness and education by means of workshops, durbars, or other mediums of communication on the importance of proper waste management and sanitation in the district. This finding is similar to that of Pussadee et al. (2018) which indicated that participants' knowledge of waste management and it effects is high, but their levels of attitude and practice are low. Also, this finding collaborates that of Nikmah et al. (2017) that public knowledge about the management of basic sanitation is low, as it was observed that the field of public access to basic sanitation management in the society such as excreta disposal site (toilet), landfills and drain waste permanently in the city of Kupang City is still far from community expectations.

Research Question 5: What Factors Influencing Waste Disposal Practices of Households in the Tain District?

The aim of this analysis was to determine the variables that could predict the odds of indiscriminate waste disposal practices in the Tain District. The logistic regression model showed that knowledge, age, education and household size predicted waste disposal and made significant contributions to the prediction. Knowledge independently and significantly predicted waste management practices (*sig.*=0.001, *OR*=1.19). Thus, participants with high knowledge were about 1.2 times more likely to practice proper waste management (*OR*= 1.19, x^2=6.27, *sig.*=0.001, *OR*=1.19, 95%, *CI*=1.13 - 1.25) as compared to those with low knowledge. (See Table 6). Hence, knowledge is a strong predictor of identifying factors influencing indiscriminate waste disposal practices among the residents of Tain District.

Table 6: Logistic regression analysis for factors influencing indiscriminate waste disposal practices

Variable	*Wald*	*df*	*Sig.*	*OR*	*95% CI*
Knowledge on waste disposal practices	6.28	1	0.001	1.19	1.13 - 1.25
Age	1.42	1	0.155	1.01	1.00 - 1.02
Education					
None	Ref				
Primary	-2.33	1	0.020	0.54	0.32 - 0.91
MSLC/JSS	-1.98	1	0.048	0.63	0.40 - 1.00
SHS/Technical	-0.86	1	0.388	0.76	0.41 - 1.42
Tertiary	-0.81	1	0.415	0.76	0.40 - 1.47
Household size					
1-5	Ref				
6-10	1.95	1	0.052	0.70	0.49 - 1.00
11+	0.18	1	0.855	1.06	0.58 - 1.93

Source: Field survey, Bayor (2018)

Knowledge about a given issue has been recognized as one of the major determinants that shape the attitude, and practice of a community. A positive prediction between resident's levels of knowledge about issues related to waste management, the environment and their attitude have been supported by literature (Sisay et al. 2017). The finding indicated that knowledge on waste management is a strong predictor of waste management practices among the residents. This finding is consistent with a similar study by Sisay et al. (2017) that majority of participants have good knowledge on waste management practices, therefore, are able to determine some factors that may influence indiscriminate waste disposal practices.

The finding collaborated on a similar study by Haile (2011) in Ethiopia. Thus participants who have no knowledge on waste management practice were nearly two times more likely to practice indiscriminate waste disposal and are unlikely to identify factors influencing indiscriminate waste disposal when compared with those recording higher knowledge. Again, Haile found that the trends of households head knowledge level and the proper waste management at household level have a positive correlation. When the household knowledge level improves, the properness of household waste management level also improves because they are able to identify factors influencing indiscriminate waste disposal. The finding supports that of Pussadee et al. (2018), indicating that participants had a high level of waste management knowledge and practices. Most participants had moderate level of practice on proper waste management.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The purpose of the research was to investigate how households in the Tain district manage waste and to determine whether their waste management practices are appropriate to reducing environmental and sanitation related challenges. This chapter presents the summary, main findings, conclusions, recommendations and recommendations for further studies.

Summary

Waste management is crucial for human health and development. In view of the waste management menace, the study sought to investigate how households in the Tain district manage waste and to determine whether their waste management practices are appropriate to reducing environmental and sanitation related challenges. Community members understand that poor management of waste contribute to environmental and human health such as outbreak of cholera, diarrhoea, eye infections, contamination of food, clogging of drains and pollution of water bodies.

Five research questions were raised to help address the objective of the study. Literature was reviewed based on the purpose of the study. The study employed mixed method, with concurrent approach. A total of 1,037 participants were involved in the study. A questionnaire, developed by the researcher, was used to collect the data. Observation was also made to solicit firsthand information on waste management practices in the selected communities. The analysis was done using frequency and percentage analysis and binary logistic regression.

Main Findings

1. The abundant type of waste generated by households in the Tain District was domestic waste (food scraps), followed by plastics, packaging, waste papers, tin cans, cardboard or wood and used clothes.
2. The dominant waste management practices employed by household in the Tain District included dumping in public dumpsite.
3. Participants call for the provision of waste collection bins/ containers to help properly manage households waste in the Tain District.
4. Majority of the participants have adequate knowledge on perceived health effects of indiscriminate waste management practices.
5. Knowledge is a strong predictor for influencing households waste disposal practices.

Conclusions

The following conclusions were drawn based on the findings of the study:

1. Food scraps is the abundant type of waste generated in Tain District, which is mainly disposed off without separation from other waste in Tain District.
2. The study indicated poor waste management practices in Tain District such as open dumping and burning of waste
3. The study indicated inadequate waste collection bins and containers in the Tain District.
4. There is adequate knowledge on waste management practices and perceived health related outcomes in Tain District.
5. There is the need to provide sanitary landfill by Tain District Assembly.

Recommendations

The following recommendations were drawn based on the conclusion:

1. The Tain District Assembly need to improve on sanitation education, and enforcement of sanitation bye- laws to curb the state of illegal disposal of waste in the district.

2. All unauthorized dumpsites near public gatherings need to be relocated to outskirt of the town.

3. Tain District Assembly and Zoomlion need to provide more waste collection bins and containers in the district.

4. Regular collection of waste by Zoomlion in Tain District to avoid heaping of waste and over flowing of waste containers.

5. There is the need for education to raise knowledge of the community members towards proper household waste management practices in Tain District.

Recommendation for further studies

The following could be explored by researchers in the field:

1. An investigation into waste reduction strategies in the Tain District.
2. Household willingness to pay for waste disposal services in the Tain District.

REFERENCES

Aatamila, M., Verkasalo, P. K., Korhonen, M. J., Viluksela, M. K., Pasanen, K., Tiittanen, P., & Nevalainen, A. (2010). Odor annoyance near waste treatment centers: A population-based study in Finland. *Journal of the Air & Waste Management Association, 60*(4), 412–418.

Abeyewickreme, W., Wickremasinghe, A. R., Karunatilake, K., Sommerfeld, J., & Axel, K. (2012). Community mobilization and household level waste management for dengue vector control in Gampaha District of Sri Lanka; An intervention study. *Pathogens Global Health*, *106*(8), 479-487.

Abdallah, S. (2014). *Modeling the transportation of solid waste from the transfer stations to the disposal sites in Tamale Metropolis*. Unpublished master's thesis presented Department of Environmental Science, Kwame Nkrumah University of Science and Technology, Kumasi.

Achalu, E. I., & Achalu, O. E. (2004). *Environmental health and pollution control*. Lagos: Simarch Nigeria Limited.

Adu-Boahen, K., Atampugre, G., Antwi, K.B., Osman, A., Osei, K.N., Mensah, E. A., & Adu-Boahen, A.O. (2014). "Waste management practices in Ghana: Challenges and prospect, Jukwa Central Region", *International Journal of Development and Sustainability*, *3*(3), 530-546.

Adepoju, A. A., & Salimonu, K. K. (2010). *Household willingness to pay for improved solid waste management in Osun State, Nigeria*. A paper presented at the 4th International Network on Appropriate Technology held from 24th to 27th November, 2010, Accra Ghana.

Aderemi, A. O., & Falade, T. C. (2012). Environmental and health concerns associated with the open dumping of municipal solid waste: A Lagos, Nigeria experience. *American Journal of Environmental Engineering*, *2*(6), 160–165.

Adeyemo, F. O., Oluyemi G. G. O., & Ayafegbeh A. J (2013). Knowledge, attitude and practice on waste management of people living in the University area of Ogbomoso, Nigeria. *International Journal of Environment, Ecology, Family and Urban Studies* (IJEEFUS), *3*(2), 51-56.

Afangideh, A. I., Joseph, K. U., & Atu, J. (2012). Attitude of urban dwellers to waste isposal and management in Calabar, Nigeria. *European Journal of Sustainable Development*, *1*(1), 22-34.

Agyem-Atta, F. (2013). *Integration of informal solid waste collectors into mainstream solid waste management in Adentan Municipality*. Unpublised masters thesis. Department of Environmental Science, Kwame Nkrumah University of Science and Technology, Kumasi

Ajzen, I. (1991). *The theory of planned behavior. Organizational behavior and decision processes*. University of Massachusetts at Amherst: Academic Press.

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behaviour*. New Jersey: Prentice-Hall.

Akafia, D. A. (2014). *Solid waste collection and willingness to pay for better service.* Tema: Ghana.

Akologo, S. (12th November, 2017). President launches sanitation brigade. (*Daily graphicAccra*). Issue no. 38721. p. 15.

Amoah, S. T., & Kosoe, E. A. (2014). *Solid waste management in urban areas of Ghana*: *Issues and experiences from Wa*. Unpublised masters thesis. Department of Environmental and Resource Studies, University for Development Studies, Tamale.

Andrew, M. (2009). Destiny Africa's Green Africa plastics recycling. Kenya. *Journal of Environmental Pollution and Human Health, 2*(5), 110-117.

Anomanyo, D. E. (2004). *Integration of municipal solid waste management in Accra*, Ghana: Bio factor treatment technology as an integral part of the management process. Lund University, Sweden.

Asiamah, N., Mensah, H. K., & Oteng-Abayie, E. (2017). General, target, and accessible population: Demystifying the concepts for effective sampling. *The Qualitative Report*, *22*(6), 1607-1621.

Asnani, P. U. (2006). *Solid waste management in India*. Infrastructure report, New Delhi, Oxford.

Asomanin, A. K, & Worlanyo, B. N (2015). Analysis of improper disposal of solid wastes in low-income areas of Accra, Ghana. *Applied Economics and Finance*, *2*(1), 66-75.

Badoe, C. (2014). The challenges of waste management in Ghana: EPA's perspective.

Bandela, N. N., & Tare, D.G. (2009). *Municipal solid waste management*. Delhi: B.R. Publishing Corporation.

Bayor, B. (2018). *Household waste management practices in Tain District*. Unpublished masters thesis. Department of Health, Physical Education and Recreation (HPER). University of Cape Coast, Ghana

Benneh, G., Songsore, J., Nabila, S. J., Amuzu, A. T., Tutu, K. A., & Yaugyuorn, P. (1993). *Environmental problem and urban household in Greater Accra Metropolitan Area*, Ghana, M.A.C. Stockholm.

Bernard, H. R., & Bernard, H. R. (2012). *Social research methods: Qualitative and quantitative approaches* (2nded.). United State: Sage Publication.

Bernstein, J. (2004). *Toolkit for social assessment and public participation in municipal solid waste management*. Urban environment thematic Group, The World Bank, Washington, D.C.

Bekoe-Nketia, F. (2015). Solid waste here and there: The effects on public health and the environment. *International Journal of Innovation and Scientific Research,17*(2), 264-270.

Blanche, M. T., Durrheim, K., & Painter, D. (2006). *Research in practice*: *Applied methods for the social sciences*. Cape Town: UCT Press

Boadi, K., & Kuitumen, M. (2003). Municipal solid waste management area in Ghana. Capital projects through municipal borrowing and other market-based financing. Environment and social impact statement final report. *Journal of Environment and Planning*, *23*(3), 211-218.

Bortoleto, A. P., Kurisu, K. H., & Hanaki, K. (2012). Model development for household waste prevention behaviour. *Waste Management*, *32*(12), 1-13

Burntley, S. J. (2007). A review of municipal solid waste composition in the United Kingdom. *Journal of Waste Management, 27*(10), 1274-1285

Bundela, P. S., Gautam, S. P., Pandey, A. K., Awasthi, M. K., & Sarsaiya, S. (2010). Municipal solid waste management in Indian cities-A review. *International Journal of Environmental Sciences, 1*(4), 591-606.

Chartier, Y. (2014). *Safe management of wastes from health-care activities*. Geneva: World Health Organization.

Chekole, Z. F. (2006). *Controlling the informal sector: Solid waste collection and the Addis Ababa city administration*, 2003-2005. Unpublished Master thesis, University of Science and Technology, Norwegian.

Cohen, L., Manion, L., & Morrison, K. (2000). *Research methods in education* (5th ed.). London: Routledge Falmer.

Cointreau, S. (2006). *Occupational and environmental health issues of solid waste management*. *Special emphasis on middle and lower income counties.* World Bank: Urban Papers.

Creswell, J. W. (2013). *Qualitative inquiry and research Design: Choosing among five approaches* (3rd ed.). Washington DC: Sage Publications.

Cunningham, W. P., & Cunningham, M. A. (2004). *Principles of environmental science. Chicago*, Brown Publishers.

Demetrius, M., & Bryan, M., (2012). *Strengths and weaknesses of quantitative and qualitative research.* Available at: http://www.uxmatters.com/mt/archives/2012/09/strengths and weaknesses of quantitative and qualitative research. php.

Denteh, S. N., Cobbina, S. J., Adam, W., & Aboka, E. Y. (2018). Household solid waste management: Compositional analysis, storage and collection in the Vittin Target Area, Tamale-Ghana. *UDS International Journal of Development*, *5*(2), 105-116.

Dhanuja, U. (2006), *Sustainable solid waste management*. New Delhi: Sage Publication.

Doan, P. L. (1997). Institutionalizing household waste collection. The urban environmental management project in Cote d'Ivoire. *Habitat International*, *22*(1), 27-39.

Drechsel, P., & Kunze, D. (Eds.) (2001). *Waste composting for urban and peri-urban agriculture: Closing the rural-urban nutrient cycle in Sub-Saharan Africa*. Colombo, Sri Lanka: International Water Management Institute; Rome, Italy: FAO; Wallingford, UK: CABI.

Dwivedi, A. K., Pandey, S., & Shashi, G. (2009). Fate of hospital waste in India. *Biology and Medicine*, *1*(3), 25-32.

Economist. (2009). The waste business smells of money. *A special report on waste.*

Environmental Protection Agency. (2017). *Manual for the preparation of District Waste Management Plans*. Accra: Ghana: EPA.

Environmental Protection Agency (EPA). (2018). *Characterisation of Municipal Waste*. Final Report.

Eshun, I. (2013). Solid waste management: The Case of Komenda-Edina-Eguafo Abirem (KEEA) Municipal in the Central Region of Ghana. *Journal of Environment and Earth Science, 3*(8), 2224-3216.

Essays, UK. (2018). *The classification of solid waste environmental sciences essay*. Retrieved from https://www.ukessays.com/essay.

Fewtrell, L., Kaufmann, R. B., Kay, D., Enanoria, W., Haller, L., & Colford Jr, J. M. (2005). Water, sanitation, and hygiene interventions to reduce diarrhoea in less developed countries: A systematic review and meta-analysis. *The Lancet Infectious Diseases*, *5*(1), 42–52.

Fishbein, M., & Ajzen, I. (2011). *Predicting and changing behavior: The reasoned action approach.* New York: Taylor and Francis Psychology Press.

George, F. (2008). *Problems of solid waste management in Nima, Accra*. Masters thesis, University of Ghana, Legon.

Ghana Statistical Service. (2014). 2010 *Population and Housing Census*: *District Analytical Report*. Tain District.

Ghana Statistical Service. (2012). *2010 population and housing census*: *Summary report of final results*. Accra: Ghana.

Giusti, L. (2009). A review of waste management practices and their impact on human health. *Waste Management*, *29*(8), 2227–2239.

Haile, A. (2011). Determinants of effective household solid waste management practices: The Case of Ambo Town – West Showa Zone, Ethiopian. *Journal of Health Development*, *26*(2), 133-149.

Igbinomwanhia, D. I., & Ohwovoriole, E. N. (2012). A Study of the constraints to residential solid waste management in Benin Metropolis, Nigeria. *Journal of Emerging Trends in Engineering and Applied Sciences (JETEAS), 3*(1), 103-107.

Joshi, R., & Ahmed, S. (2016). Status and challenges of municipal solid waste management in India. *Cogent Environmental Science*, *2*, 1-18.

Kalesanwo, O. O., Kayode, O., & Okufuwa, O. A. (2013). Perceived health consequences of indiscriminate waste disposal by the market women. *Mediterranean Journal of Social Sciences*, *4*(14), 553-560.

Karley, N. A. (1993). *Solid Waste and Pollution*. People's (daily graphic) October 9, pp.5.

Kironde, J. M. L. (1999). Dares Salaam, Tanzania. Managing the "Monster" *Urban Waste and Governance in Africa*, Ottawa, IDRC.

Knausenberger, W. I., Booth, G. A., Bingham, C. S., & Gaudet, J. J. (2002). *Environmental guidelines for small-scale activities in Africa*. USAID Bureau for Africa: Office of Sustainable Development, SD Technical Paper, 18.

Kumar, M., & Nandini, N. (2013). Community attitude, perception and willingness towards solid waste management in Bangalore city, Karnataka, India. *International Journal of Environmental Sciences*, *4*(1), 87-95.

Kumar, S., & Phrommathed, P. (2005). *Research methodology*. United State: Springer Publication.

Kumah, A.M. (2007). The situation of solid waste in Ghana, Accra. *Journal of Environment and Earth Science, 4*(17), 2224-321687.

Leal-Quirós, E. (2014). Plasma processing of municipal solid waste. *Brazilian Journal of Physics*, *34*(4b), 1587-1593.

Lilliana, A., Guerrero, G. M., & William, H. (2012) Solid waste management challenges for cities in developing countries. *Waste Management*, *33*(2013), 220-232.

Linden, O., Gomez E. D., & Ngoilie, M. A. K. (1997). *Common constraints to waste management programs on the East Asian Seas Region*. Top Ten Constraints, National profiles for Brunei, Darussalam, Cambodia, China, Indonesia, Japan, Malaysia, Philippines, and Singapore.

Malombe, D. J. (1993). Water, sanitation, environment and development. *Sanitation and Solid Waste Disposal in Malindi*.

Manga, V. E., Forton, O. T., & Read, A. D. (2008). Waste management in Cameroon: A new policy perspective. *Resources, Conservation and Recycling*, *52*(4), 592–600.

Maharaj, S., & Nemaram, G. (2017). Knowledge, attitude and practice of adolescents towards household waste management. *International Journal of Multidisciplinary Research*, *2*(III), 125-130.

Mazhindu, E., Gumbo, T., & Gondo, T. (2010). Living with environmental health risks, the case of Addis Ababa. *Ecohydrology & Hydrobiology*, *10*(s2–4), 281–286.

McAllister, J. (2015). *Factors influencing solid-waste management in the developing world*. Canada: Utah University State.

Mensah, A., & Larbi, E. (2005). *Solid waste disposal in Ghana*. Resource Centre Network for Water, Sanitation and Environmental Health.

Miezah, K., Obiri-Danso, K., Kádár, Z., Fei-Baffoe, B., & Mensah, M. Y. (2015). Municipal solid waste characterization and quantification as a measure towards effective waste management in Ghana. *Waste Management, 46*(1), 15-27.

Miller, C. (2011). *Wastage*. *Food Waste Http://wastage*. Com/Mag/Waste-Food-Waste-2/Accessed on 20th June, 2018.

Ministry of Urban Local Bodies (MULB). (2000). *Manual on municipal solid waste management*. Government of India.

MLGRD. (2004). *Sanitation Country Profile Ghana*. MLGRD, Accra-Ghana.

MLGRD. (1999). *Environmental Sanitation Policy*, Accra: MLGRD.

MLGRD. (2009). *National report for Ghana waste management*, 18th Section of United Nations Commission on Sustainable Development. www.un.org/National Reports/Ghana). Accessed on 10th October, 2018.

Molnar, H. R. (2002). Integrated pollution prevention and control. *Journal of Environmental Policy & Law*, *6*(32), 265-269.

Molambe, J.M. (1993). *Sanitation and solid waste, sanitation, environment and development, Ghana*: Conference Preprints.

Momoh, J. J., & Oladebeye, D. H. (2010). Assessment of awareness, attitude and willingness of people to participate in household solid waste recycling programme in Ado-Ekiti, Nigeria, Jakarta Indonesia. *Journal of Applied Sciences in Environmental Sanitation*, *5*(1), 93-105.

Monfared, H., & Derakhshan, H. (2005). The comparison qualitative and quantitative research. *Indian Journal of Fundamental and Applied Life Sciences*, *5*(S 2), 1111- 1117.

Monney, I. (2014). *Ghana's solid waste management problems*: The contributing factors and the way forward. http://www.ghanaweb.com.

Mosler, D. W. (2005). *Environmental Health* (3rded.). Cambridge, MA: Harvard University Press.

Mosler, H. J., & Martens, T. (2006). Designing environmental campaigns by using agent-based simulations. *Journal of Environmental Management*, *88*(4), 805–816.

Muller, M., & Schienberg, A. (1997). *Gender and urban waste management*. Paper presented at the Gender, Technology and Development Conference organised by tool/tool consultant, Amsterdam.

Nabegu, A. B. (2010). An analysis of municipal solid waste in Kano metropolis. *Nigeria Journal of Human Ecology*, *31*(2), 111-119.

Narayana, T. (2009). Municipal solid waste management in India: From waste disposal to recovery of resources? *Waste Management*, *29*(3), 1163–1166.

Neizer, A. A. (2014). *Perceptions and Attitudes influencing the management of solid waste in the Kumasi Metropolis, Ghana. Unpublished masters thesis*. Kwame Nkrumah University of Science and Technology, Kumasi.

Nikmah, Muhammad, A., Mohamad, Y., Muhamad, D., Pua, U., & Gufran D. D. (2017). Profile of knowledge management, basic sanitation and attitudes towards clean and health community in Kupang City, *International Education Studies*, *10*(3), 194-198.

Nixon, H., & Saphores, J. D. M. (2009). Information and the decision to recycle: results from a survey of US households. *Journal of Environmental Planning and Management*, *52*(2), 257–277.

Nyatsanza, T. D, & Ndebele, S. K. (2016). The usefulness of including women in household solid waste management. A case study of dzivaresekwa high density suburb; Harare. *IOSR Journal of Humanities and Social Science (IOSR-JHSS)*, *21*(3), 92-108.

Obiageli, F. E., Azubike, C. O., Chinomnso, C. N., Ngozi, F., & Queencallista, N. S. (2016). Practice, pattern and challenges of solid waste management in Onitsha Metropolis, Nigeria. *American Journal of Public Health Research*, *4*(1), 16-22.

Obirih-Opareh, N. (2002). *Solid waste collection in Accra*: The impact of decentralization and privatisation on the practice and performance of service delivery, AGIDS: Amsterddam.

Ofosu, E. (2019). *Ghana news agency, Accra*. February 21, 2019.

Ogah, J. K. (2013). *Decision making in the research process*: Companion to students and beginning researchers. Accra: Adwinsa Publication.

Ogwueleka, T. C. (2009). Municipal solid waste characteristics and management in Nigeria. *Iranian Journal of Environmental Health Science & Engineering* (IJEHSE), *6*(3), 173-180.

Okechukwu, O. I, Okechukwu, A. A., Noye-Nortey, H., & Owusu-Agyei (2012). Health perception of indiscriminate waste disposal - A Ghanaian case study. *Journal of Medicine and Medical Sciences*, *3*(3), 146-154.

Osuala, E. C. (2001). *Introduction to research methodology* (3rded). Onitsha, Africana: First Publisher Limited.

Oteng-Ababio, M., Arguello, J. E. M., & Gabbay, O. (2013). Solid waste management in African cities: Sorting the facts from the fads in Accra, Ghana. *Habitat International*, *39*, 96–104.

Oteng-Ababio, M. (2010). Private sector involvement in solid waste management in the Greater Accra Metropolitan Area in Ghana. *Waste Management & Research*, *28*(4), 322–329.

Pakpour, A. H., Zeidi, I. M., Emamjomeh, M. M., Asefzadeh, S., & Pearson, H. (2014). Household waste behaviours among a community sample in Iran: An application of the theory of planned behaviour. *Waste Management*, *34*(6), 980–986.

Pervez, A., & Kafeel, A. (2013). Impact of solid waste on health and the environment. *Special Issue of International Journal of Sustainable Development and Green Economics (*IJSDGE), *2*(1), 165-168.

Phelps, H. O., Heinke, G. W., Jonker, J. F., Ouano, E. A. R., & Vandecasteele, C. (1995). *Management of solid wastes*. Paris: UNESCO.

Pidgeon, N., Kasperson, R. E., & Slovic, P. (2003). *The social amplification of risk*. Cambridge: University Press.

Pipatti, R., & Svardal, P. (2006). Solid waste disposal. *IPCC Guidelines for National Greenhouse Gas Inventories, 5*, 1-40.

Polit, D. F., & Hungler B. P. (2004). *Nursing research*: *Principles and methods* (7th ed.). Phyladelphia: Lippincott Williams and Wilkins.

Pongr´acz, E., & Pohjola, V. J. (2004). Re-defining waste, the concept of ownership and the role of waste management. *Resources, Conservation and Recycling*, *40*(2), 141–153.

Puopiel, F., & Owusu-Ansah, J. (2014). Solid waste management in Ghana: The case of Tamale Metropolitan Area. *Journal of Environment and Earth Science, 4*(17), 2224-3216.

Pussadee, L., Yanasinee, S., Vivat, K., Anuttara, H., Tawatchai, A., & Nittaya, P. (2018). Knowledge, attitude and practice of municipal solid waste management among highland residents in Northern Thailand. *Journal of Health Research, 32*(2), 123-131.

Prabu, P. C. (2009). Impact of heavy metal contamination of Akaki River of Ethiopia on soil and metal toxicity on cultivated vegetable crops. *Journal of Environmental, Agricultural & Food Chemistry*, *8*(9), 818-827.

Quartey, S. M., & Awoyemi, M. O. (2002). *Research methodology in education*. Ghana: K “n" AB Ltd.

Ramachandra, T. V. (2011). *Management of municipal solid waste*. New Delhi: The Energy and Resources Institute Press.

Ramayah, T., Lee, J. W. C., & Lim, S. (2012). Sustaining the environment through recycling: An empirical study. *Journal of Environmental Management*, *102*, 141–147.

Rimer, B. K., & Glanz, K. (2005). *Theory at a glance*: *A guide for health promotion practice* (2nd ed.). Bethesda, MD: US Department of Health and Human Services, National Institutes of Health, National Cancer Institute. Washington DC.

Rouse, J. (2008). *Planning for sustainable municipal solid waste management: Practical action*. United Kingdom. The Schumacher Centre for Technology and Development Burton-on-Dunsmore Rugby, Warwickshire, CV239QZ.

Sakai, S., Yoshida, H., Hiratsuka, J., Vandecasteele, C., Kohlmeyer, R., Rotter, V. S., & Li, J. (2014). An international comparative study of end-of-life vehicle (ELV) recycling systems. *Journal of Material Cycles and Waste Management, 16*(1), 1–20.

Sasikumar, K., & Sanoop, G. K. (2012). *Solid waste management*. New Delhi, PHI Learning Private Limited.

Schwarz-Herion, O., Abdelnaser, O., & Hans-Peter, R. (2008). A case study on successful municipals solid waste management in industrialized countries. *Journal of Annals of Faculty of Engineering Hunehoara, VI* (3), 266-273.

Shafiul, A. A., & Mansoor, A. (2003). *Partnerships for solid waste management in developing countries*: *Linking theories to realities*. Loughborough: The institute of development engineering, water and development centre (WEDC).

Sheeran, P. (2002). Intention and behavior relations: A conceptual and empirical review. *European Review of Social Psychology*, *12*(1), 1–36.

Singh, A., & Sharma, S. (2002). Composting of a crop residue through treatment with microorganisms and subsequent vermicomposting. *Bioresource Technology*, *85*(2), 107–111.

Sisay, S., Tariku, D., Hawi, A., Nardos, T., & Tesfaye, A. (2017). Assessment of knowledge attitude and practice towards solid and liquid waste management among Addis and Kometa Kebele Community Mizan, Ethiopia. *Biomedical Journal of Science and Technical Research*, *1*(15), 1-9.

Slovin, R. (1960). Population, Sample Size and Sampling Technique.

Sniehotta, F. F., Schwarzer, R., Scholz, U., & Schüz, B. (2005). Action planning and coping planning for long-term lifestyle change: Theory and assessment. *European Journal of Social Psychology*, *35*(4), 565–576.

Srivastava, V., Ismail, S. A., Singh, P., & Singh, R. P. (2015). Urban solid waste management in the developing world with emphasis on India: Challenges and opportunities. R*eviews in Environmental Science and Bio/Technology*, *14*(2), 317–337.

Stanford, J. (2000). *Summary report on solid waste management*. Londoner's efforts contribute to improvements in the environment. Available on line at <http:// plannt.uwaterloo.ca/london. (Accessed on 2.01.2018).

Sthiannopkao, S., & Wong, M. H. (2013). Handling e-waste in developed and developing countries: Initiatives, practices, and consequences. *Science of the Total Environment*, *463*(464), 1147–1153.

Sujayita, B. (2018). 'Where goes the waste?' A knowledge, attitude, and practice study on disposal of household waste. *Open Access International Journal of Science and Engineering*, *3*(1), 25-29.

Tadesse, T. (2006) *Household behavior and solid waste management survey evidence from Mekelle*, Ethiopia.

Tain District Hospital. (2017). *Hospital end of year report*. End of Year Performance Review. Nsawkaw Hospital.

Tain District Assembly. (2018). *Tain District population*. District planning Unit Estimated Housing and Population Census. Planning Department, Nsawkaw.

Tain District Assembly. (2014). *2010 housing and population census*. GSS.

Tain District Analytical Report. (2010). *Population and Housing census*. Tain District.

Tamakloe, W. (2000). *State of Ghana's Environment–Challenges of compliance and enforcement, Accra.* Ghana Environmental Protection Agency.

Tchobanoglous, G., O'leary, P. R., & Kreith, F. (2002). *Handbook of solid waste management* landfilling (2nd ed.). New York: McGraw-Hill.

Tchobanoglous, G., Theisen, H., & Vigil, S. (1993). *Integrated solid waste: Engineering principles and management issues*. USA: McGraw-Hill Publishing Company.

Tharme, R. E. (2003). A global perspective on environmental flow assessment: Emerging trends in the development and application of environmental flow methodologies for rivers. *River Research and Applications, 19*(5-6), 397–441.

Thompson, I. A. (2010). *Domestic waste management strategies in Accra, Ghana and other urban cities in tropical developing nations*. Cleveland: Case Western Reserve University.

Troschinetz, A. M., & Mihelcic, J. R. (2009). Sustainable recycling of municipal solid waste in developing countries. *Waste Management, 29*(2), 915–923.

Tsiboe, A. I., & Marbel, E. (2004). *A look at urban waste disposal problems in Accra, Ghana*. Unpublished Masters' Thesis. Roskilde University, Denmark.

Twumasi, P. A. (2001). *Social Research in Rural Communities* (2nd ed) .Accra. Ghana University Press.

USAID. (2009). *Environmental guidelines for small-Scale activities in African* (2nd). Solid waste: generation, handling, treatment and disposal. Environmentally sound design and management capacity building for partners and progrmmes in Africa.

UNCHS/HABITAT. (1996). *An urbanizing world. Global Report on Human Settlements. London*: Oxford University Press (United Nations Centre for Human Settlements). Urban poverty and environmental conditions in informal settlements of Ajegunle, Lagos Nigeria.

United Nations Commission on Sustainable Development. (1997). *National implementation of agenda 21* (Information provided by the Government of Nigeria).

United States Environmental Protection Agency (USEPA). (212). *Guide to Septage Treatment and Disposal*. Document EP/625/R-94/002. Washington D.C.

United Nations Statistics Division. (2017). *Environment Statistics*. unstats.un.org. Retrieved 3rd March, 2018.

Van Liere, K. D., & Dunlap, R. E. (1978). Moral norms and environmental behavior: An application of Schwartz's Norm-Activation Model to Yard Burning 1. *Journal of Applied Social Psychology*, *8*(2), 174–188.

World Bank, (2018). What a waste: *A global review of solid waste management.* http://www.world bank.org/what a waste.

WHO (2012). *Preventing disease through healthy environmental*: A global assessment of the burden of disease from environmental risk.

Yoada, R. M., Chirawurah, D., & Adongo P. B. (2014). Domestic waste disposal practice and perceptions of private sector waste management in urban Accra. *BMC Public Health, 214*, 697.

Yusof, M. B. M., Othman, F., Nashim, N., & Nur, C. A. (2002). *The role of socio-economic and cultural factors in municipal solid waste generation*: A case study in Taman Berling, Johor Bahru. *J Teknologi, 37*, 55–64.

Zavodska, A. (2003). A study of residential solid waste composition and management in a selected developing country-Guyana. *Journal of Solid Waste Management and Technology, 29*(1), 1-7.

Zerbock, O. (2003). *Urban solid waste management*: *Waste reduction in developing nations.* Written for the requirements of CE, 5993. Field engineering in the developing world. Michigan Technological University.

Zhu, D., Asnani, P. U., Zurbrugg, C., Anapolsky, S., & Mani, S. K. (2008). *Improving municipal solid waste management in India*: *A sourcebook for policymakers and practitioners*. The World Bank.

Zurbrügg, C. (2003). *Urban solid waste management in low-income countries of Asia*: *How to cope with the garbage crisis*. Presented for: Scientific Committee on Problems of the Environment (SCOPE) Urban Solid Waste Management Review Session, Durban, South Africa, November, 2002.

APPENDICES

APPENDIX A: INFORMED CONSENT

UNIVERSITY OF CAPE COAST

FACULTY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF HEALTH, PHYSICAL EDUCATION AND RECREATION

QUESTIONNAIRE FOR PARTICIPANTS

Dear Respondent,

I am an M.Phil. student conducting a survey as part of my thesis on the topic: **Households waste management practices in the Tain District of Brong Ahafo Region**. You are kindly requested to read through the items and respond to them as frankly and objectively as possible. You are kindly required to answer a 28 item questionnaire lasting 10-15 minutes if you confirm your participation. Your answers would be added to other participants for analysis. Your participation is entirely voluntary and you can stop at any point in time. You would be helping to find solution to household waste management practices in Tain District if you agree to take part in the study.

If you agree to take part in the study, kindly sign in the space below;

Signature……Date……...

You may contact my supervisor Dr. Edward W. Ansah on (+233247703379) of the Department of Health, Physical Education and Recreation at the University of Cape Coast for any clarification. My contact number is 0546752778.

THANK YOU FOR YOUR TIME.

APPENDIX B: QUESTIONNAIRE

SECTION A: BACKGROUND INFORMATION

Please tick (√) the box below appropriately according to your choice

BIODATA

1. What is your age: ……..
2. Number of people in the households…….
3. What is your highest educational level?

a. None [ ]

b. Primary [ ]

c. MSLC/JSS [ ]

d. SHS/Technical []

e. Tertiary [ ]

4. What is your major occupation?

a. Farming [ ]

b. Trading[ ]

c. Public servant [ ]

e. Other……

5. Family's average monthly income?

a. Below GH¢500 [ ]

b. GH¢500-GH¢1000 [ ]

c. Above GH¢1000 [ ]

SECTION B:

Please tick (√) the box below appropriately according to your choice

6. Which of the following types of waste are generated in your household? Please rank in order of abundant. Please use 1-8, where 1 is most abundant and 8 is least abundant.

a. Plastic bag [ ]

b. Paper/cardboard [ ]

c. Packaging [ ]

d. Waste paper [ ]

e. Tin cans [ ]

f. Food scraps [ ]

g. Cloth [ ]

h. Others, Specify…….

7. Which waste management institution collects waste in your area for disposal?

a. Waste Management Department [ ]

b. Zoom Lion [ ]

c. None [ ]

d. Don't know [ ]

8. Where do you dump your waste?

a. Roadside [ ]

b. Nearby gutter [ ]

c. Skip [ ]

d. Backyard [ ]

e. Dump sites [ ]

f. Open spaces [ ]

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

a. Not at all [ ]

b. Once [ ]

c. Twice [ ]

d. Thrice [ ]

e. Daily [ ]

10. How many times is the waste collected in a month?

a. Not at all [ ]

b. Once [ ]

c. Twice [ ]

d. Thrice [ ]

e. Others…..

11. To what extend are you satisfied with the work of the waste management companies in your community?

a. Very satisfied [ ]

b. Satisfied [ ]

c. Unsatisfied [ ]

d. Very unsatisfied [ ]

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

a. Door-to-door [ ]

b. Communal [ ]

c. Other, (specify).....

13. Reuse, recycling and reducing waste generated at home is very important

a. Strongly agree [ ]

b. Agree [ ]

c. Neutral[ ]

d. Disagree [ ]

e. Strongly disagree [ ]

14. What measures can be put in place to improve the waste management situation in community?

……

The following statements may best describe your knowledge on the perceived health effects of indiscriminate waste disposal practices and management in your community. Please indicate your answer by ticking (√) one of the appropriate columns.

Agree A: (1), DisagreeD: (2).

Key: 1 is higher and 2 is lower

No.	**Health Effects of Improper Waste Disposal**	A	D
15	Throwing waste around leads to unsanitary conditions.		
16	Improper management of waste is responsible for epidemic like malaria, diarrhoea.		
17	Rodents, animals and birds scavenging waste dumps spread diseases		
18	People living near waste dumps suffer more from respiratory problems, eye diseases and water borne diseases		
19	Throwing waste around leads to clogging of drains in my community.		
20	Improper disposal of households waste can lead to contamination of food and water		
21	Improper management of waste can lead to pollution of water bodies		

Please indicate your answer by ticking (√) one of the appropriate columns. To what extend do the following influence waste disposal practices in your community.

22.	**Knowledge level on Factors influencing improper waste disposal**	Never	Sometimes	Often	Very often
23	Inadequate technical experts in the district				
24	Insufficient waste collection equipment				
25	Inadequate number of community bins				
26	Attitude of waste collection workers				
27	Rapid rate of urbanization				
28	Attitude of community members				
29	Malfunctioning of waste collection equipment				

APPENDIX C: OBSERVATION CHECKLIST

OBSERVATION CHECKLIST

/N	CONTENT	YES	NO
1.	The house area are free of visible garbage		
2.	Is there waste container in the house		
3.	The waste container in the house has a tight fitting lid		
4.	The waste disposal areas are away from water source		
5.	There is littering of the house environment.		
6.	There is waste separation done at the house		
7.	The house and surroundings are bushy		
8.	Gutters at homes are chocked		

Community

1	Community gutters are chocked with rubbish		
2	Community is bushy		
3	The number of public waste bins in the community		
4	Visible open defecation in the community		
5	Number of unauthorised dumbing site in the community		
6	Number of authorise dumbing site in the community		
7	Burning and uncontrolled dumbing are use as waste disposal practices in the community		
8	Dumbing is closer to public gathering places		