UNIVERSITY FOR DEVELOPMENT STUDIES

NATURE AND CAUSES OF SOLID WASTE CRIME AT DAMONGO IN THE NORTHERN REGION OF GHANA

ROLANDA AYI MAHAMAH

2019

UNIVERSITY FOR DEVELOPMENT STUDIES

NATURE AND CAUSES OF SOLID WASTE CRIME AT DAMONGO IN THE NORTHERN REGION OF GHANA

BY

ROLANDA AYI MAHAMAH

(UDS/MEM/0083/15)

THESIS SUBMITTED TO THE DEPARTMENT OF ENVIRONMENT AND RESOURCE STUDIES OF THE UNIVERSITY FOR DEVELOPMENT STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF PHILOSOPHY DEGREE IN ENVIRONMENT AND RESOURCE MANAGEMENT

FEBUARY, 2019

DECLARATION

I hereby declare that this thesis is my own work and that no part of this work has been used for the award of any degree in the university or any other university. Except for the material that has been given due acknowledgement.

Rolanda Ayi Mahamah …….. …….

Student Signature Date

Dr Ebenezer Owusu-Sekyere …….. …….

Supervisor Signature Date

Mr. Samuel Twumasi Amoah …….. …….

Supervisor Signature Date

ABSTRACT

The purpose of this study was to examine the nature and causes of solid waste crime at Damongo in the Northern region of Ghana. The research used mixed method approach. Among the data collection tools used included interviews, observation, questionnaire and review of official documents. A sample of 97 households and other key stakeholders concerned with and connected to solid waste management in the District were covered in the data collection. The results show that a combination of changing market forces which sometimes priced solid waste management services beyond the pockets of residents, inadequate environmental regulation and various failed policies and practices were identified as contributing to the presence of waste crime. The results show that there was irregular collection of solid waste by Zoom lion Ghana Limited. The District Assembly has no proper final disposal site. The Assembly also lacked working bye-laws on waste management, a situation which does not motivate the appropriate authority to prosecute offenders of waste crime. It is therefore recommended that there should be effective implementation of the rules and regulations guiding solid waste management as well as the establishment of an effective bye - law for Damongo by solid waste management authorities.

ACKNOWLEDGMENT

I am very grateful to Almighty God for his care and direction in the course of this study.

I am also highly indebted to my supervisors Dr. Ebenezer Owusu – Sekyere and Mr. Samuel Twumasi Amoah for making time amidst their busy schedules to guide, direct and made the necessary inputs to refine this work.

Finally I am grateful to my course mates who have also contributed to the success of this study.

DEDICATION

I dedicate this work to my mum, Madam Amabange Kontali, to my daughter Verena Ahoreda Akor and to my son Ephraim Niyofie Wunivela Akor.

.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

LIST OF ABBREVIATIONS

MSW ……Municipal Solid Waste

EPA ……..……. Environmental Protection Agency

UNEP……..United Nations Environment Programme

INTERPOL…….……..International Police Organization

GSS……..... Ghana Statistical Service

USPS……...……United States Postal Services

SEPA ……..…… Single Euro Payments Areas

UN……...United Nations

EU……European Union

EA…….……Environmental Agency

EOCD……...……Organization of Economic Cooperation Development

RIIA……..Royal Institute of International Affairs

WMDs…….……Waste Management Departments

EHSDs……..Environmental Health and Sanitation Departments

CHAPTER ONE

INTRODUCTION

1.1 Background

As the world hurtles towards its urban future, the quantity of municipal solid waste (MSW), one of the most important by-products of an urban lifestyle is growing even faster than the rate of urbanization (World Bank, 2012).

As waste generation increased for the various reasons humanity did not much anticipate the effects and so did not put in much room to deal with the waste (Poupiel, 2010). This has made the management of solid waste problematic. The effects of improper waste management could lead to consequences such as outbreak of diseases, pollution and deaths (Ejaz et al, 2010). Sustainable Solid Waste Management is a crucial problem not only for developing countries but for the developed countries as well (Wienaah, 2007). Wiennah added that the Organic component of Municipal Solid Waste may not be too much of a problem since that is biodegradable. However, the Plastic Waste component of Municipal Solid Waste is quite problematic because this is non-biodegradable and therefore can stay in the environment for a considerable length of time causing all sorts of problems.

The World Bank(2012) states that ten years ago there were 2.9 billion urban residents who generated about 0.64 kg of MSW per person per day (0.68 billion tonnes per year). It estimates further that today the quantity has increased to about 3 billion residents generating 1.2kg per person per day (1.3 billion tonnes per year) and that by 2025 this will likely increase to 4.3 billion urban residents generating about 1.42 kg/capita/day of

municipal solid waste (2.2 billion tonnes per year). Much of the increase in waste generation is estimated to come from rapidly growing cities in developing countries.

The report further indicates that low income countries are expected to generate 213 million tonnes of solid waste a day with the population rising to 676 million by 2025. Lower middle income ones are also projected to generate 956 million tonnes of solid waste per day. Its population is predicted to reach 2.08 billion. Waste generation will hit 360 million tonnes per day by 2025 in Upper Middle Income countries with expected population of 619 million. For High Income nations, waste generation a day by 2025 will reach 686 million tonnes and population at 912 million. The report adds that the challenges surrounding municipal solid waste are going to be enormous, on a scale of, if not greater than, the challenges we are currently experiencing with climate change. The world banks report indicates that a city which cannot manage its waste is rarely able to manage more complex services such as health education and transportation. Many developing and emerging countries are faced with the major challenge of improving their inadequate and unsustainable waste management.

The proper management of waste has got a lot to do with financial resource, as the (World Bank, 2012) states that city waste management forms a greater part of city authorities' budgets. The inability of city authorities to raise the needed income for proper solid waste management may cause them to manage solid waste otherwise. Deterred by the cost that has to with this proper management of waste some waste generators tend to manage it otherwise (Britain's Environmental Agency, 2013). Perhaps that is why to ensure proper waste management and compliance international, national metropolitan, municipal and districts laws are enacted.

One daunting challenge of governments and city authorities in sub-Saharan Africa – seen as the last global macro-region to experience urbanization in the twenty first century is inefficient management of solid waste (Amoah and Kosoe, 2014). Similarly waste management has become one of the biggest challenges confronting developing countries including Ghana (EPA, 2014). The EPA adds that increased population growth and rapid urbanization have resulted in increased generation of volumes of waste in Ghanaian cities. In a similar line Waste management problem has increased at an alarming rate in Nigeria in direct response to rising population growth and industrialization. This has even worsened with the adoption of the quick to use and quick to discard consumer habits which generate an endless stream of liquid and solid waste (Ajibade et al 2005).

According to the United Nations Development Program (2015), the inability of city authorities to enforce policies on safe disposal has compelled city dwellers to adopt 'dump - it – anywhere' attitude. This illegal practice in the environmental arena is also known as waste crime (Europol, 2011; Baird et al., 2014; EPA, 2014). The criminality in the waste sector involves the improper management of waste in contravention to the rules and regulations guiding solid waste management. Britain's Environmental Agency (2012), defines waste crime as the deliberate breaking of the law by people who don't manage, transport and dispose of waste correctly. In the waste chain serious crimes such as improper handling and disposal, misclassification of hazardous waste as other waste to deceive law enforcement authorities do occur. The United Nations Conference on Human Settlements (1996) reports that one – third to one – half of solid waste generated within

most cities in low and middle income countries are not collected; but however end up as illegal dumps on streets, open spaces and waste lands.

On a global scale, the Basel Convention is the major international agreement that regulates transboundary movement of hazardous and other waste. The overarching objective of the Basel Convention is to protect human health and the environment against the adverse effects of hazardous wastes. The Basel Convention defines "Wastes" as substances or materials which are disposed of, or are intended to be disposed of, or are required to be disposed of by the provisions of national law. Article 4.3 of the Basel Convention states that Parties to the convention consider that illegal traffic in hazardous wastes or other wastes is a crime. Despite the provisions of the Basel Convention on waste of which 183 member states are signatories to as at April 2015, there are still a number of waste crime activities globally, ranging from illegal trafficking to illegal processing of waste and disposal. UNEP report of 2015 indicates that there is up to 90% of electronic waste illegally traded, disposed or dumped each year.

Also the first INTERPOL operation targeting the illegal trade of electronic waste resulted in the seizure of more than 240 tonnes of electronic equipment and electrical goods and the launch of criminal investigations into some 40 companies involved in all aspects of the illicit trade (INTERPOL, 2013). UNEP's 2015 report indicates that even though the Basel Convention contains a definition of waste, there are various interpretations of the term and what exactly it covers. It adds that unclear definitions or obligations may lead to both unintentional and intentional breaches of the legal framework dealing with waste management and transboundary movement. There is also still illegal export of waste

because there is limited ban on transboundary movement of waste by the Basel convention.

Illegal trafficking of waste has an adverse effect on trade and competition putting law abiding businesses at an economic disadvantage. Illegal traffic also undermines international policy, the rule of law and enforcement efforts (UNEP, 2015). The incidence of waste crime is even more worrying because those who get themselves involved in waste crime are also involved in other crimes such as human trafficking and money laundering (Eunomia, 2014, UNEP, 2015). This can be worrying as it serves as a security threat to nations and the world at large. Also the existence of waste crime denies city authorities the needed revenue it needs to undertake its day to day running and for it to undertake development projects since there is tax evasion by waste criminals.

To help mitigate the challenges of waste crime the UNEP, 2015 recommends the need:

- To strengthen awareness, monitoring and information through a raise of further awareness of waste crime as an important threat to security, people and the environment.
- Strengthen national legislation and enforcement capacities through enforcing national legislative framework as the primary basis for effectively and efficiently combating and monitoring hazardous waste crime.

In Africa the legal framework guiding waste management is the Bamako Convention on the ban of the import into Africa and the control of trans-boundary movement and management of hazardous wastes within Africa. The objective of the Bamako Convention is to prevent the import of hazardous wastes including radioactive wastes into

African nations that are parties to the Convention. It also prohibits ocean disposal of all types of waste and obliges African country Parties to minimize their own intra-African waste trade and only conduct it with prior informed consent. The Bamako convention shares in the definition of waste by the Basel Convention. Like on the global scale the Bamako convention has not been able to stop the crime of waste in African Member states. Perpetrators of waste crime commit it in Africa, UNEP's Report on waste crime - waste Risks Gap in Meeting the Global Challenge indicates that majority of the waste trafficked is illegally dumped in Africa and that in West Africa Ghana and Nigeria receive a chunk of it. The perpetuation of waste crime in Africa puts it much at risk since it lacks the needed infrastructure skills and personnel to deal with the waste which puts its citizens and the environment at risk. According to Eunomia, (2014), when waste is illegally transported into developing countries it causes pollution that developed nations will not tolerate. The challenges faced in addressing this canker by Africa can be attributed to poor national legislations by member states. Another reason is the limited ban placed by The Basel Convention regarding the exportation of electronic waste; this creates a loop hole for criminals to operate in the waste sector. The loop hole is that once an importing country agrees to accept electronic waste then the necessary requirement is met for the exporting country to export. The problem with this is that fraudsters in the waste sector mislabel the waste items as second hand functioning equipment, household reusable materials or donated electronic equipment only to dump hazardous waste in the developing country (UNEP, 2015).

Being part of the globe, Ghana is not speared of the menace of waste crime. Waste especially electronic waste is reported to be smuggled and dumped in Ghana. For nearly

15 years, industrialized countries have been offloading their unwanted electronic waste at Agbogbloshie, now one of the world's largest e-waste sites (Morgan, 2014). According to Morgan (2014), currently, up to 80 tonns of e-waste per month, from places like the USA, UK, EU and Australia, is smuggled into Ghana and dumped at Agbogbloshie. He states that local people in Accra go to dismantle these items and come into contact with various poisonous and hazardous substances putting their health at risk. Also toxic substances from this electronic equipment cause environmental harm.

Quite apart from the illegal disposal of waste from the developed world in Ghana, there is also the problem of waste management locally. There is a legal and regulatory framework which is supposed to guide the way waste is managed to safe guard the health of people and the environment at large. This legal and regulatory framework is embedded in the 1960 criminal Code of Ghana Act 29, the Environmental Protection Act, Act 490, the Public Health Act, 2012 Act 851, the Local Government Act and the Environmental Sanitation Policy of Ghana. Despite the fact that there is a regulatory framework regarding the management of solid waste in Ghana, waste has not being properly and effectively managed. As a result of ineffective regulation of the waste sector and/or poor working relationships with councils, there is an increased risk of the dumping of illegal waste which will result in damage to the environment and the wider economy, and additional liabilities falling to public expenditure (Criminal Justice Inspection Northern Ireland, 2015).

1.2 Problem Statement

In the quarter of a century since the monumental UN Rio Conference on Environment and Development brought the issue of environmental degradation on to the international political agenda, the search for sustainable solid waste management has become a familiar saga of hope and unhappy endings, of incremental progress against an ever more urgent call for action. Like many towns in Ghana, the search for effective delivery of solid waste management services in Damongo, the capital of West Gonja District of the Northern Region of Ghana, remains a major intractable challenge facing the Assembly whose responsibility the current sanitation policy enjoins to act in that capacity. The inability of the authorities to institute proper disposal methods have compelled the residents to dispose their solid waste in a manner that violates both national and local-level regulations, a practice that have aptly been described in the solid waste management literature as constituting waste crime (Europol, 2011)

Despite the negative effects of this illegal practice such as blighting the community and health implications, the full diversity of the nature of waste crime, its causes, effects and the criminals involved is not well understood in Damongo. A deep search for literature on the full diversity of waste crime in Damongo did not return any empirical study, a situation which creates knowledge gap. It is against this background that this research was conducted. Understanding the nature and fighting waste crime has become more imperative because recent events in the environmental arena in Damongo such as the springing up of unauthorised refuse dumps and the rampant cases of malaria which the district health directorate attributes to poor waste management is enough evidence to show that waste crime is a real phenomenon that needs investigations. While waste crime

may take many forms and may include all aspects of contraventions against all types of waste laws, this research concentrates on waste crime concerning solid waste management.

1.3 Research Question

1.3.1 Main Question

What is the extent of criminality involved in solid waste management in Damongo?

1.3.2 Specific Questions

i. What is the nature of waste crime and who are the criminals involved?
ii. Why are people motivated to commit waste crime in Damongo?
iii. How is solid waste crime affecting the people of Damongo?
iv. What are the perceptions of people on solid waste crime minimization in Damongo?

1.3.3 Objective of the Study

The main aim of the research is to examine the extent of criminality involved in solid waste management in Damongo.

1.3.4 Specific objectives

i. To Identify the nature of solid waste crime and the criminals involved
ii. To investigate the motivations for committing solid waste crime
iii. To assess the effects of solid waste crime in Damongo

iv. iv. To examine the perceptions of people on how to minimize solid waste crime in Damongo

1.4 Ethical consideration

Ethically households, individuals and institutions that were contacted were assured of confidentiality and that the purpose of the information was to be used solely for academic purpose. Also departments and waste management company were officially served with letters before the information was elicited from them.

Some contacted individuals were not willing to open up and to sincerely answer questions because they thought such information was going to be used against them, probably such as them facing a possible prosecution or any other punishment to be meted out to them by the appropriate authorities. This was why it was necessary to assure respondents of confidentiality.

1.5 The scope of the study

In content the study looked at solid waste management practices at household levels and the role played by waste management departments or institutions and other relevant authorities to ensure proper solid waste management. The study was limited to solid waste management aspects which constitute crime, because the management of solid waste becomes challenge for city authorities. The study also looked at the nature of waste crime and the criminals involved in Damongo. It also investigated the motivations for committing waste crime as well as the effects and perceptions as to how to minimize

waste crime. Geographically the study is limited to Damongo, the district capital of the West Gonja District of Ghana.

1.6 Significance of the study

This study will help create awareness of individuals at the household levels and the general public of the existing legal and regulatory framework guiding solid waste management in Ghana. Also the study will inform and may serve as a awake up call to both private and public waste managers to take up their responsibilities effectively and timely to ensure that waste is properly managed so as to help deal with the menace of solid waste crime in Damongo. Again this study will inform and may awaken government, private institutions and policy makers to put the right mechanisms in place to ensure a beautiful physical environment devoid of filth. Finally, this study will add to existing literature on waste crime and add to the very limited literature on the study of waste crime in Ghana.

1.7 Limitation of the Study

Some respondents did not want to open up and give correct information to questionnaires because the study has to do with solid waste management and the crime involved in it, because they thought such information was be used against them. Other individuals were not willing to disclose the amount of income they made each month. The total number of households in the various areas could not be obtained; this is the reason why the study relied on the number of houses so as to pick a household each from a house. The unplanned nature of settlements in the town with some houses without house numbers

made it difficult in assessing houses and households that is why the serpentine movement was employed to assess houses and households.

1.8 Organization

The study is organized into five main chapters. Chapter one looked at the general introduction of the study, the problem of the study in Damongo, the significance of the study, limitations and organization of the research. Chapter two reviewed existing literature on solid waste management and the crime in solid waste management as well as the effects of solid waste crime. Chapter three deals with the profile of the study area as well as methodology that was employed in the study, this included face to face interviews, field survey and review of official documents. Chapter four analyzed findings from the study and chapter five summarized key findings of the research, conclusion and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews the literature on solid waste management and the criminality involved in parts of the solid waste management chain.

2.2 Definition of Waste

It is important to understand that the sight of waste tells it all and makes it much understanding than trying to find a definition for it. According to Awunyo – Vito et al (2014), waste is sometimes a subjective concept because items that some people thrust aside may have value to others. Waste can however be defined as an item which has been used and is no longer of use and value to the person who used it. Wastes are rubbish/refuse or materials that are not needed and are economically unusable without further processing. It may be in liquid, gas, or solid form and originate from a wide range of human operations, such as industry, commerce, transport, agriculture, medicine, and domestic activities. Waste may be classified in many different ways, such as according to its origin (e.g. domestic, industrial, commercial, clinical, construction, nuclear, agricultural) or its properties (e.g. inert, toxic, inflammable) (Ajibade, 2007). Ajibade further explained that without suitable treatment such waste becomes a source of contamination to the environment at large, leading to air pollution (e.g. acid rain or traffic pollution), water pollution, and soil pollution. Waste includes all items that people no longer have any use for, which they either intend to get rid of or have already discarded and these include: packing items, garden waste, old paints containers, vegetables, metals

etc. Interestingly according to Awake, 2002, as cited by Ajibade(2007), in nature, there is no such thing as waste, even the dead or discarded materials from one part of an ecosystem is always used to benefit other parts. Similarly GIZ(2016) reports of waste from the positive perspective, the report stated that in Europe, waste is increasingly being used to produce both materials and energy and recycling now saves more greenhouse gases than it generates. The problem of wastes in Nigeria is increasing and is compounded by a circle of poverty, population explosion, decreasing standard of living, bad governance, low level of environmental awareness and education, rapid and haphazard industrialization, and inevitable increases in waste generation (Izugbara and Umoh, 2004).

In fact Izugbara and Umoh, (2004) study further revealed the following;

- That wastes result largely from such human activities as farming, cooking, hunting, construction, and repair works, food processing, and carving, etc. as well as livestock contributing to waste generation.
- That improper waste disposal and management cause accidents, injuries, ill-health, and deaths for both humans and livestock.
- Improper waste is also associated with dirty, unhealthy, unsightly and fetid environment.
- Improperly disposed wastes were also noted to provide breeding ground for disease vectors as well as hide-outs for pests and dangerous animals. Adougo et al, (2015) opinioned that one problem people face in proper waste management and disposal is the absence of storage facilities (waste bins with tight fitted covers) in some houses

which lead to littering of refuse around the house, worsened by the absence of drainage systems in such houses.

Some wastes are biodegradable while others are not; biodegradable waste can easily get decomposed when exposed to certain environmental conditions. Non-biodegradable waste is waste that cannot be decomposed. Biodegradable waste includes any organic matter in waste which can be broken down into carbon dioxide, water, methane or simple organic molecules by micro- organisms and other living things using composting, aerobic digestion or similar processes. Biodegradable materials are composed of waste from living organisms and the actual plant, animal or other organism when its life ends (Environmental and Recycling Industry Center, 2016). This waste can serve to support life of other organisms, biodegradable materials can be changed into something useful and nourishing this process is known as degradation or decomposition.

2.2.1 Solid waste

Solid waste has attracted various definitions from various people; Moeller (2005) defined Solid waste as any garbage, refuse, sludge from waste treatment plant, water supply treatment plant, or air pollution control facility and other materials, including solid, liquid, semisolid, contained gaseous resulting from industrials, commercials, mining and agricultural operations from community activities. Ajibade (2007) Solid wastes comprise all solid waste material generated by households, institutions, commercial establishments and industries, and discharged from their premises for collection; all litter and clandestine piles of such wastes; street sweepings, drain cleanings, construction/demolition waste, dead animals and other waste materials. Solid waste is those wastes or pollutants that are

neither liquid nor gas. The major two sources of solid waste are the industries and the households. The industrial waste comes from various industries such as mining, oil and gas, agriculture and other industrial activities. The municipal solid wastes are derived from home utilities and small businesses around the homes. Of all industries, the mining industry produces the highest solid waste in the world (Miller, 1995 as cited by Ajibade, 2007)

Perhaps one of the definitions of solid waste which can be more easily understood is the one given by Tchobanoglous et al, 1993 as any material that arises from human and animal activities that are normally discarded as useless or unwanted.

2.2.2 Solid Wastes Sources and Types

Solid waste sources could arise from residential areas, commercial, industrial, open spaces, institutions and from agricultural activities Tchobanoglous et al. (1993). Types of solid waste include food waste, animal waste, rubbish, demolition and construction, hazardous waste, treatment and plant waste. According to Poupiel, (2010), Tchobanoglous et al (1993) classified types of solid waste in terms of sources and generation activities.

Table 2.1: Type of Solid Waste In Terms of Sources and Generation Activities

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

Source: Tchobanoglous et al (1993: 52 – 53) adapted from Poupiel, (2010)

The following types of waste were further elaborated by Tchobanoglous *et al* (1993) as follows;

2.2.2.1 Food waste

Food wastes are all the animal, plant or vegetable residues resulting from the handling, preparation, cooking, and eating of foods (also called garbage). The most important characteristics of these waste is that they are highly putrescible and will decompose rapidly, especially in warm weather. Often, decomposition will lead to the development of offensive odors. In many locations, the putrescible nature of these wastes will significantly influence the design and operations of solid waste collection.

2.2.2.2 Rubbish

Rubbish consists of combustible and non- combustible solid wastes of households, institutions and commercial activities. This excludes food wastes or other highly putrescible materials. Typically, combustible rubbish consists of materials such as paper, cardboard, plastics, textiles, rubber, leather, wood, furniture, and garden trimmings. Noncombustible rubbish consists of glass, tin cans, aluminum cans, ferrous and other non-ferrous metals, and dirt.

2.2.2.3 Ashes and Residues

These are materials remaining from the burning of wood, coal, coke and other combustible wastes in homes, stores, institutions, and industrial and municipal facilities for purposes of heating, cooking and disposing of combustible wastes. These are referred to as ashes and residues.

2.2.2.4 Special waste

Special waste includes street sweepings, roadside litter, and litter from municipal containers, catch-basin debris, dead animals and abandoned vehicles.

2.2.3 Solid Waste Components

Just as solid wastes arise from various sources and are of various types, solid wastes are composed of different materials. The components of the waste material will help inform what kind of management it should undergo. Before a comprehensive plan can be developed, a general knowledge of the waste composition and volume is required (Davidson 2011). This information is typically obtained by conducting waste characterization studies, or waste audits. According to Kreith, (1994) and Zerbock, (2003), solid waste is composed of combustible and noncombustible material. The combustible materials include paper, plastics, yard debris, food waste, wood, disposable diapers and other organics. Noncombustible materials also include glass, metal, bones, leather and aluminum. The combustible component of solid waste can easily be burnt and or decomposed whereas the noncombustible component cannot be easily decomposed and or burnt. In attempting to define solid waste the definition above does not include general construction and demolition (D and C) if it were added I think the definition would have been complete without D and C waste therefore this definition is incomplete.

2.3 Solid Waste Management

No single definition can be pinned to solid waste management as different writers have given different definitions and meaning to the concept, Tchobanoglous et al (1993) defines it as that discipline associated with the control of generation, storage, collection,

transfer and transport, processing and disposal of solid wastes in a manner that is in accord with the best principles of public health, economics, engineering, conservation, aesthetics and other environmental considerations that is also responsive to public attitudes.

The management of solid waste is a challenge to many nations, developing nations can be said to be the hardest hit once it comes to the management of solid waste (World Bank, 2012). A study undertaken by Baffoe - Fei et al (2014) revealed that, the following are constraints to effective solid waste management operations within Sekondi-Takoradi Metropolis; lack of finance which result in undue delays of payment leading to huge sums of money owed private waste collectors, lack of waste management personnel (understaffing), lack of appropriate technology, poor equipment and inappropriate technology to carry out waste collection activities and lack of law enforcement, non-enforcement of bye - laws to enforce waste disposal as a major contributory factor of managing waste. According to Adogu, et al (2015) almost all the respondents (96.1%) in their study have not had any formal training on waste management and 95.0% of respondents do not have waste management plan/policy provided by the local government area/council. This unfortunate situation they opined is an indication of the lack of political will and commitment towards such important statutory function and activity of the local governments, aggravated by total absence of plan for storage, collection, transportation and final disposal of waste in the area. The difficulties or challenges involved in solid waste management can result in people and institutions in charge of managing waste not to manage waste the proper way and this will lead to the

commitment of a crime per a nation or district set of regulations which do not permit the management of waste contrary to their set of regulations.

2.3.1 Processes of Solid Waste Management

2.3.2 Waste Generation

Solid waste generation is from sources such as residential commercial/municipal, open spaces, industrial, treatment plant sites, agricultural (Tchobanoglous et al, 1993).Waste generation encompasses those activities in which materials are identified as no longer being of value and are either thrown away or gathered together for disposal (Momoh and Oladebeye, 2010) as cited by poupiel (2010). According to UNEP (2009) in 2006 the total amount of municipal solid waste (MSW) generated globally reached 2.02 billion tones, representing a 7% annual increase since 2003. UNEP (2009) further estimated that between 2007 and 2011, global generation of municipal waste will rise by 37.3%, equivalent to roughly 8% increase per year

2.3.4 Storage and Collection

Tchobanoglous *et al* (1977) refers to storage as where solid waste is stored before it is collected. It could be stored in a skip or dustbin and not thrown away indiscriminately. According to them, storage is of primary importance because of the aesthetic consideration. The element of collection includes not only the gathering of solid waste, but also the hauling of waste after collection to the location where the collection vehicle is emptied (Keith, 1994). Accordingly, Kreith (1994) the most common type of residential collection services in the United States includes “curb”, “setout-setback” and “backyard carry”.

In the case of Ghana, waste collection is by door to door and communal curb. Owusu - Sekyere et al (2010). According to the USPS (2000), as cited by Poupiel (2010) in the city of Thimphu in Bhutan the collection of solid waste from households, commercial set ups was done in concrete receptacles placed at strategic points and conveyed by trucks/tractors. Accordingly, there were concrete bins and containers provided at various locations from where the waste was lifted for disposal. Individual bins/containers were also placed alongside the shops in certain areas, which were emptied directly into the trucks/tippers. This prevents people from dumping waste indiscriminately. It is important to mention that the mere presence of containers or bins for dumping waste at vantage point may not necessarily guarantee that people will dump their waste in bins. There is a need for education and sensitization to enable individuals do the right thing. There is also need for attitudinal change since containers and bins are placed at some vantage points and yet people do not dump their refuse in them. This is confirmed by (Kafando et al 2013), that waste is seen sitting on the floor even when bins are not full in the market of Burkina Faso.

2.3.5 Storage and Collection Services Prescribed by Environmental Sanitation Policy of Ghana.

The District Assembly shall require all premises to have primary storage facilities (dustbins) which shall meet the approval of the District Assembly with regards to size, material and capacity. The District Assembly shall, in consultation with each community, prescribe the minimum standard of collection service (including the sorting of refuse if applicable) taking into account household incomes, housing pattern, and the

infrastructure in the service area. The collection service shall be rendered on the basis of cost recovery.

The Policy adds that in deprived areas where ability to pay may be low, service charges may be related to the recovery of operation and maintenance costs only. In communities where house-to-house collection is not appropriate, the Assembly shall designate communal storage sites where solid waste can be discharged into a fixed or moveable container. These sites shall be formally acquired and suitably developed for the purpose. The containers should be readily accessible to those dumping wastes, including children.

2.3.6 Transport and Transfer

According to Environmental and Sanitation Policy (2010), the collection and removal of wastes from individual premises and communal storage sites shall be effected at frequencies sufficient to prevent undue accumulation and decomposition of wastes. In general, wastes shall be collected at least twice a week. To this end the District Assembly shall arrange for a transportation system with appropriate equipment and planned vehicular movement in the service areas. For sustained and cost-effective service delivery the use of intermediate transfer stations may be considered where haulage distances are uneconomical. According to Kreith (1994), transfer and transport involves two steps:

- the transfer of wastes from the smaller collection vehicle to the larger transport equipment and
- the subsequent transport of the wastes, usually over long distances to the final disposal site

2.3.7 Waste Treatment and Disposal Site Acquisition

Sites for treatment and disposal of wastes (landfills, composting facilities, waste Stabilization ponds, trickling filters, septage treatment plants, etc.) shall be located so as not to create safety and health hazards or aesthetic problems in the surrounding area (Environmental Sanitation Policy, 2010). According to Lawal, (2004) as cited by Adougu (2015), two third of solid waste generated from households and commercial center in both rural and urban Nigeria are indiscriminately dumped into streets and in drains thereby posing serious environmental health hazards. In Lagos, Nigeria, some open pits used as solid waste dumps are located near residential housing and therefore represent a threat to human health and the environment (Adogu, 2015).

2.4 Indigenous Waste Management

The human race existed long before the talk of modern waste management. This means that people lived and used commodities and for that matter generated waste. Waste generated in times past before now of course would be smaller compared to now because population was smaller and consumption patterns were also smaller. Before modern methods of solid waste management therefore people used their indigenous knowledge in managing their waste. According to Warren, (1991) indigenous knowledge is a local knowledge that is unique to a given culture or society. He adds that indigenous knowledge contrasts international knowledge system generated by universities, research institutions and private firms. And that it is the basis for local - level decisions in agriculture, health care, food preparation, education and natural resource management and a host of other activities in rural communities. Some of the indigenous waste management includes;

2.4.1 Burning

Izugbara and Umoh (2005), burning is the use of fire to destroy waste items. They added that commonly burnt waste items include rags agricultural residue and fiber sacks. Usually, waste burning is carried out under economically valued trees around the homestead. This allows the smoke from the fire to kill or drive away pests in such trees. Burning is also carried out near home gardens. Occasionally, some local, pungent leaves are added to the fire to drive away fleas, flies, mosquitoes, and dangerous animals such as snakes and scorpions.

The most popular method of waste disposal is open dumping followed by burning (Adogu et al, 2015). These methods of waste disposal they describe as inappropriate as they have consequences on the health of people. Of course one would not disagree with these writers that these methods of waste disposal are unwholesome and inappropriate considering the health hazards associated with it. However people may be practicing these methods because they do not have appropriate disposal options such as availability of appropriate dustbins and transport and disposal by waste management officials in their localities.

2.4.2 Compositing

This is an aerobic, biological process of degradation of biodegradable organic matter (Adogu et al, 2015). Composting involves burying easily degradable items in shallow pits around the homestead. Waste items generated during the processing of food and agricultural produce and animal remains are the commonly composted items. Water from domestic activities and bathrooms is occasionally channeled into these pits. When the

waste pits are full with wastes, they are covered with soil. Months later, when decomposition has taken place, the pits are dug open and the rich humus soil from them used as fertilizers in surrounding household farms and home gardens. Very often too, economic trees, such as orange, raffia palm, coconut, banana, and plantain are planted at such pits.

Anthea and Johnson (1994) recycling of waste which means taking waste materials and transforming them into raw products, results in saving natural resources, saving energy, reducing disposal costs, reducing harmful emission to air and water, saving money and creating jobs. Old iron blades, bars, and bits are also often returned to local blacksmiths who forge them into hunting daggers, bullets, spears, and arrows, garden diggers, iron-tipped pegs, hooks, traps, kitchen and carving knives, etc. among the Ngwa of South eastern Nigeria (IZUGBARA and UMOH, 2005).

2.4.4 Dig and Burry

A major waste management technique practiced among the Ngwa is burying. Commonly buried waste items are pieces of steel from broken hoes, knives, farming implements, clay pots, animal bones, etc. Occasionally, such items are dumped into pit latrines, which are covered up when they fill up. Such items ultimately decay, gradually adding to the iron, nitrogen, phosphorus, calcium, etc.; content of the soil (Izugbara and Umoh, 2004).

In the past options for waste disposal were limited and the homeowner was exclusively responsible for disposing waste. Typically, households generated small volumes of garbage and a backyard pit or personal waste site was the most common past practice of waste disposal (Zagosweski, 2011). The study further revealed that community members

had very few options for waste disposal, there was no central management and methods were limited. Public garbage dumps were non-existent and in general community residents were responsible for their own waste disposal. Primarily due to convenience and as a result of the limitations in waste disposal methodologies waste materials such as metals, iron scrap, construction materials and appliances were buried by community residents

2.4.5 Conversion

The Ngwa of Nigeria, according to (Izugbara and Umoh, 2004) practice waste conversion, especially the case with non-degradable waste items such as bottles. Such waste items are put into other uses. Bottles for instances are used to decorate graves, preserve seeds, store beads, hooks, trinkets, etc. They are also used in storing drinks, oil etc. Local farmers store and carry water to the farms in bottles. Bottles are also ground into fine sand to be used in smoothing the walls of building and fences thereby preventing climbing and crawling animals in surrounding bushes from gaining entry into houses and rooms, they added.

2.4.6 Recycling

There was a popular practice of recycling animal bones, horns and tusks into useful materials. They are carved into plates, cutleries, flutes, ivories and decorating materials (Ajibade, 2007). He further adds that metals were also recycled by blacksmiths and goldsmiths into useful tools such as knives and cutlasses, hoes and axes, jewelry (necklaces, bangles, and rings).

Similarly, Tchobanoglous et al (1993) identified the following as early practices of solid waste disposal methods

- Hog feeding
- Dumping in water
- Dumping on land, canyons and mining pits
- Ploughing into the soil
- Reduction and incineration

These indigenous and past methods of solid waste management still exist even today. Some of these solid waste practices are not very good for human health and the environment at large. According to Poupiel (2010), solid waste disposal sites in the Tamale Metropolis include skips which constitute the largest, followed by dustbins, dumpsites, backyard open spaces, nearby gutters and road side which constitute the lowest disposal method.

2.5 Technology for Solid Waste Disposal

Waste disposal issues are exacerbated by changing patterns of consumption industrial development and urbanization; this may mean that traditional systems for solid waste disposal and recycling are no longer appropriate (GIZ, 2016). The GIZ report adds that waste must no longer be deposited in residential areas and uncontrolled landfills or end up on illegal rubbish hips and in waterways.

According to Revised Environmental Sanitation Policy of Ghana, 2010 the recommended technologies for solid waste disposal are

2.5.1 Sanitary Landfill

This is internationally recognized as one of the most cost-effective methods of solid waste disposal and is recommended for use by Metropolitan and Municipal Assemblies. Sanitary land filling includes confining the waste, compacting it and covering with soil. It not only prevents burning of garbage but also helps in reclamation of land for valuable use (Centre for Environment and Development, 2003) as cited by Poupiel, (2010). The placement of solid waste in landfills is the oldest and definitely the most prevalent form of ultimate waste disposal (Zerbock, 2003:16). He further argued that landfills are nothing more than open pits, sometimes controlled dumps. According to him the difference between landfills and dumps is the level of engineering, planning, and administration involved. Open dumps are characterized by the lack of engineering measures, no leachate management, no consideration of landfill gas management, and few, if any, operational measures such as registration of users, control of the number of "tipping fronts" or compaction of waste (Zerbock, 2003). Furthermore, landfills are one form of waste management that nobody wants but everybody needs (Kreith, 1994: 2.8). According to him, there are simply no combinations of waste management techniques that do not require landfilling to make them work. Of the basic management options of solid waste, landfills are the only management technique that is both necessary and sufficient. According to Kreith (1994) some wastes are simply not recyclable, many recyclable wastes eventually reach a point where their intrinsic value is completely dissipated and they no longer can be recovered, and recycling itself produces residuals. Kreith further highlighted that the technology and operation of modern landfill can assure the protection of human health and the environment.

In contrast to what the various authors have said about sanitary landfill as the best option for solid waste management, Poupiel(2010) recognizes that landfill in itself has some disadvantages as it is costly to construct and maintain, can pollute ground water through leaching, location problem in terms of availability of land particularly in the cities. Considering the fact that landfills are expensive to construct and maintain it should not be recommended to peri urban and rural communities despite the fact that many writers praise it and see it as the best. Control dumping with cover which is less expensive to construct and maintain should be the option of district assemblies). Perhaps this is why the environmental sanitation policy of Ghana recommends open dumping with cover for district assemblies

Table 2.2: Basic Requirements for safe disposal of waste on landfills

Variable	Preferred Requirement
Neighbourhood	Landfills should not be located in the immediate proximity of occupied dwellings, waterways and water bodies; A minimum distance of at least 500 m should be provided, but should be wary that transport cost for waste increase almost linear with the distance. City development and future land use should be anticipated A need for a buffer zone (cultivated area – bush vegetation) for segregating the landfill from residential areas to prevent vector migration, absorb scattered dust driven by landfill equipment and waste collection vehicles, and reduce noise and odour nuisances of the landfill operations.
Geological and hydro geological conditions	Necessary to determine the potential risk of emissions from the landfill for the underlying soil and groundwater. Best situated in areas where subsurface layers are characterized by low hydraulic conductivity of less than 1×10^{-8} m/s. Necessary to develop groundwater monitoring wells up-and down-gradient of the landfill.
Risk of flooding, subsidence and landslides	Sites endangered by landslides, flooding and subsidence are unsuitable and such information can be gained through interviews with community leaders or city authorities.
Access control and signposting	To keep people and animals out for safety reasons To help monitor types and volumes of waste dumped at the site To provide information of the type of waste acceptable
Daily compaction and cover	To prevent wind scatter (wind-blown litter) and fly breeding. Compactions uses airspace more efficiently
Record Keeping	Record keeping of incoming waste types and quantities must be accurate for planning and reporting purposes. Weighbridge very important but in its absence, proper method for estimation must be employed
Fire must be avoided	Though difficult due to the presence of landfill gas, must be avoided to prevent the release of harmful substances in the air.

Source: EPA,2002

2.5.2 Incineration

This shall be considered as a treatment option only for health care and other hazardous or noxious wastes (example, dead animals). Only simple, easily maintained incinerators shall be used. Incineration may be carried out with or without energy recovery; however, the technology used must be consistent with sustainable operation under the prevailing conditions. Adequate control of emissions shall be provided.

According to the Centre for Environment and Development (2003: 9), as cited by Poupiel (2010) incineration is a controlled combustion process for burning combustible waste to gases and reducing it to a residue of non-combustible ingredients. Accordingly, during incineration, moisture in the solid waste gets vapourized and the combustible portion gets oxidized and vaporized. C02, water vapour, ash and non-combustible residue are the end products of incineration. Incinerators have the capacity to reduce the volume of waste drastically, up to nine fold than any other method (Kreith, 1994). According to him incineration can also recover useful energy either in the form of steam or electricity. He however recognized that the main constraints of incineration are high cost of operation, relatively high degree of sophistication needed to operate them safely and economically as well as the tendency to pollute the environment through emissions of carbon dioxide.

2.5.3 Composting

This shall be practiced at both municipal and domestic levels where possible, but large-scale capital intensive composting plant with high operation and maintenance costs shall not be employed. Composting shall be citied out using simple methods and on a decentralized basis, as near as possible to the point of waste generation. It shall only be

carried out if it results in net savings to the assembly in terms of reduced transport and landfill requirements and possible revenue (estimated with due regard to the limited market for compost).

Composting process uses microorganisms to degrade the organic content of the waste. Aerobic composting proceeds at a higher rate and converts the heterogeneous organic waste materials into homogeneous and stable humus (Centre for Environment and Development, 2003: 9). UNEP (2009) has also defined composting as a biological decomposition of biodegradable solid waste under controlled predominantly aerobic conditions to a state that is sufficiently stable for nuisance-free storage and handling and is satisfactorily matured for safe use in agriculture. UNEP (2009) adds that composting is the option that, with few exceptions, best fits within the limited resources available in developing countries. A characteristic that renders composting especially suitable is its adaptability to a broad range of situations. According to Zerbock (2003), a low-technology approach to waste reduction is composting.

2.5.4 Recycling

This shall be encouraged for all items such as plastics, bottles, paper, metals, glass etc. as inputs for production. The United States Environmental Protection Agency (USEPA), (1999) has recommended recovery for recycling as one of the most effective waste management techniques. According to USEPA, recycling turns materials that would otherwise become waste into valuable resources and, it yields environmental, financial, and social returns in natural resource conservation, energy conservation, pollution prevention, and economic expansion and competitiveness.

It is important to say that these technologies for solid waste management are also contemporary modern methods of solid waste management. This is aimed at ensuring that solid waste is at best managed in an environmentally friendly manner.

2. 6 Crime

In ordinary language, a crime is an unlawful act punishable by a state or other authority (Aquinas, 1988). Crime is a category created by law; in other words something is criminal if declared as such by the relevant and applicable law (Attenborough, 1922). Crime or criminal offence is an act harmful not only to some individual but also to a community, society or the state ("public wrong"). Such acts are forbidden and punishable by law (Aquina, 1988, Blythe, 1992). Usually to be classified as a crime, the "act of doing something criminal" must with certain exceptions be accompanied by the intention to do something criminal (Blythe, 1992).

2.7 Waste Crime

Waste crime is a component or a subset of a broader term environmental crime. Environmental crime is the breaking of environmental law by individuals or companies who carry out activities which could have an impact on the environment (Simpson and de Vries, 2014). Environmental crimes include unlicensed waste operations including transport, storage, treatment and disposal, illegal discharges to the water environment, unauthorized abstractions and illegal emissions to air (SEPA, 2013). Many countries all over the world have suffered from one form of environmental crime or the other. Environmental crime includes; five broad areas of offences against the environment as

have been recognized by bodies such as the G8, Interpol, EU, UN Environment Programme and the UN Interregional Crime and Justice Research Institute. These are:

- Illegal trade in wildlife in contravention to the 1973 Washington Convention on International Trade in Endangered Species of Fauna and Flora (CITES);
- Illegal trade in ozone-depleting substances (ODS) in contravention to the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer;
- Dumping and illegal transport of various kinds of hazardous waste in contravention to the 1989 Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and Other Wastes and their Disposal;
- Illegal, unregulated and unreported (IUU) fishing in contravention to controls imposed by various regional fisheries management organizations (RFMOs);
- Illegal logging and trade in timber when timber is harvested, transported, bought or sold in violation of national laws.

In its most literal sense, waste crime might include any activity that transgresses the laws governing the management of waste, by any organization or person (Eunomia, 2017). Waste crime creates nuisance, disamenity and health risk for the public (Eunomia, 2014). Eunomia's report adds that though the motive behind waste crime is economic, there is no doubt that waste crime causes serious environmental impacts. Waste crime affects both rural and urban communities in England and Wales (EA, 2012). A growth of the world communities from rural to urban communities has increased municipal waste

generation, and as an important component of urban life municipal waste generation has even increased faster than urbanization (World Bank, 2012).

Developed countries are known for an increased waste generation. According to the World Bank's Report, 2012 Global review of solid waste management, Organization of Economic Cooperation Development (EOCD), member countries who are classified as developed countries generate 44% of solid waste in a day. This is the highest of waste generation per day globally. The report further adds that an increase in waste generation makes it more difficult to manage solid waste, coupled with high standards regarding waste management in developed countries it becomes economically expensive to handle waste right from generation source to final disposal. Motivated by profit, some of those involved in the waste management chain break the standards and laws to deal with waste illegitimately so as to reduce the cost involved in proper waste management. The result of this is that waste is illegally trafficked and disposed or dumped in developing countries from developed countries.

It has become difficult to control illegal trafficking of waste worldwide because of the inconsistencies in regulations by exporting and recipient countries. The European Union may allow a certain percentage of some contaminants to be exported while other countries may not agree to receive any contaminant. Indonesia for instance has a zero tolerance for contaminant waste. Any shipment found to contain contaminants is sent back to the exporting countries and this can lead to dispute between countries (UNEP, 2015). According to Department of Environment Food and Rural Affairs(DEFRA) (2015), of England there are three broad categories of waste crime:

- Violation of permit conditions or other illegal acts by operators who are already part of the regulatory system
- Acts that will be illegal whether or not the perpetrator is within the regulatory system
- Acts committed by offenders outside the regulatory system.

In a similar vein according to Eunomia (2017) waste crime takes many forms generally falling into one of these six categories.

Illegal waste sites (which may operate for a long or short period of time)

Illegal burning of waste

Fly tipping

Misclassification and fraud

Serious breaches of permit conditions including the abandonment of waste and

Illegal exporting of waste

These six categories of waste crime are further summarized by Eunomia as follows.

2.7.1 Illegal Waste Sites

Sites where waste is managed without an environmental permit registered exemptions in place are illegal. Without the necessary controls to manage waste in a safe manner, they have the potential to cause damage to the environment and human health. Illegal waste sites can blight local communities through the release of foul odour, pollution of surface or ground water, noise and dust from vehicle movements or onsite operations or smoke from fires.

2.7.2 Illegal Burning of Waste

The uncontrolled burning of waste whether deliberate or accidental is one of the most visible illegal waste activities. Such burning often occurs in oxygen- poor, low temperature conditions, and emissions are not monitored or controlled. Under such circumstances, significant quantities of harmful chemicals can be released. Waste fires therefore pose a significant risk to public health and the environment

2.7.3 Fly-tipping

Fly tipping is a wide ranging offence, defined as the illegal disposal of household, industrial, commercial or other controlled waste without a waste management license (House of Commons, 2016 as cited by Eunomia, 2017). In many instances it is opportunistic, one off occurrence, with perpetrators seeking to avoid waste treatment or disposal cost. In aggregate however such activities cause significant economic, social and environmental harm.

2.7.4 Misclassification and Fraud

Proper record keeping is essential within the waste system, but there can be substantial financial rewards to falsifying paper work and records. Some criminals have sought to defraud producer responsibility schemes and claim payments for non-existing recycling. Misclassification of waste can occur at any point in the waste management chain but it mostly occurs at the point of transfer by individuals or organizations either deliberately or accidentally. Usually waste is deliberately misclassified so as to benefit the individual or the organization in question financially. For instance misclassifying hazardous waste as non - hazardous waste will cause the individual or organization less amount of money.

2.7.5 Illegal Export of Waste

Whilst some waste can be exported legally for recycling and recoveries, including a growing international trade in refuse derived fuel for energy from waste facilities it is illegal in almost all cases to export untreated waste from the UK for disposal. It's also illegal to export hazardous waste to non OECD countries. Illegal exports can be an attractive option for waste criminals, as waste disposal in less developed countries tends to be cheaper due to less stringent environmental regulations.

2.7.6 Serious Breach of Permit and Exemption Conditions

Criminal activity is not just limited to those operating outside of the regulatory framework. It can also be perpetrated by individuals or organizations through a breach of an environment permit or failure to comply with the terms of registered exemptions, sometimes with no regards to its rules. Alongside breaches of permits, it is also possible to breach conditions of waste exemption. Such breaches include managing too much waste or the wrong types of waste.

It therefore means that waste crime is sometimes committed by people who are in charge of regulations guiding waste management as well as those outside the enactment of regulation and its implementation and those who have secured permits to manage waste in a certain manner. In the case of Ghana the regulatory body includes the Environmental protection Agency and Metropolitan Municipal and District Assemblies. Individuals at household levels and institutions constitute those outside the regulatory system. Some compelling reasons could cause both regulatory bodies as well as non-regulatory individuals to commit waste crime.

2.8 Causes of Waste Crime

Of the reasons for which waste crime is committed Giada (2015) research revealed that, poor administrative controls and complex and ambiguous environmental laws are the contributory factor to waste crime in Italy. Similarly according to Simon (2008) Poor enforcement of by-laws and weak setting of by - laws are the reasons for illegal waste management practices in Kinondoni Municipality of Tanzania.

As a result of ineffective regulation of the waste sector and/or poor working relationships with councils, there is an increased risk of the dumping of illegal waste which will result in damage to the environment and the wider economy, and additional liabilities falling to public expenditure (Criminal Justice Inspection Northern Ireland, 2015). The United Nations Conference on Human Settlements (1996) reports that one – third to one – half of solid waste generated within most cities in low and middle income countries are not collected; but however end up as illegal dumps on streets, open spaces and waste lands.

Waste bins provided by city authorities in Kaya, Burkina Faso in the market are poorly used as waste is always seen sitting on the ground even when bins are not full (Kafando et al 2013). The reason for this could just be attitudinal, people not doing the right thing and thereby not managing waste properly and not because of inadequate equipment for storage. Waste crime occurs in a spectrum from the individual illegal dumping of waste (fly-tipping), through poor compliance in the waste industry, to serious organized criminality. Waste crime takes many forms, and is committed both on a large scale by organized groups and on a small scale on the spur of the moment (Eunomia 2014). Waste crime mostly takes the form of fly-tipping, illegal disposal of household, industrial,

commercial or other 'controlled' waste without a waste management licence (Priestly & Bennett 2015).

Europol (2011) found that illicit waste trafficking is often facilitated by cooperation with legitimate businesses, including those in the financial services, import/export and metal recycling sectors, and with specialists engaged in document forgery for the acquisition of permits. In their research on the topic, Solid waste management challenges for cities in developing countries, (Guerrero et al, 2012) came up with a finding that improper waste collection system due among others to lack of infrastructure or municipal inefficiencies promote people finding solutions for their waste such as domestic burning (combustible materials) and composting the putrescible fractions. When municipal leaders are interested and give priority to solid waste issues, they support strategies which include more efficient collection systems, better infrastructure and low cost recycling technologies. From the above authors the success of recycling not only depends on participation levels but on the efficiency of the equipment and infrastructure. Tadesse et al. (2008) analysis of factors that influence household waste disposal decision making results showed that the supply of waste facilities significantly affects waste disposal choice. Inadequate supply of waste containers and longer distance to these containers increase the probability of waste dumping in open areas and roadsides relative to the use of communal containers. Insufficient financial resources limiting the safe disposal of waste in well-equipped and engineered landfills and absence of legislation are mentioned by (Pokhrel and Viraraghavan, 2005).

A lot of households have not received any education on safe handling and recycling of solid waste by any local or national organization (Dangi, et al, 2013). This could therefore mean that people would be dealing with waste inappropriately because they simply do not have any knowledge on safe handling practices. An increase in the use of plastic rubber and bottle for the sale of food and water has led to an increase in littering of the environment in the African Sub - region. (Fobil and Hogarh, 2006). In a similar vein, a study conducted by Poupiel (2010) in the Tamale Metropolis showed that 57.5 % of all components of waste generated in the Metropolis were made up of plastic, the highest component of waste generated. According to the study it is an indication that a lot of polythene bags were used for packaging especially food items in the metropolis.

This the study further explains to be the reason why a lot of polythene bags were seen littered in most parts of the study areas. Puopiel's research further revealed that lack of skips and dustbins was a major problem in the study area. As Zoomlion the institution in charge of waste collection was not able to supply skips and dustbins to the areas they served. This from the study explains why 40.5% of respondents resort to dumping of waste at roadsides, open spaces, nearby gutters, backyard or burning as means to deal with their domestic waste in low income residential areas in the Tamale Metropolis. From this study as opposed to low residential areas where skips were woefully in adequate which led to indiscriminate disposal of waste in high class residential areas where a lot of households possessed and strictly used dustbins the environment was seen to look very clean and serene. In a related development, Amoah and Kosoe (2014) pointed out that households that adopt modes of disposal such as open burning, throwing in gutters usually complain that the central container(CC) sites are too far away from their houses

and in some cases they do not have at all, hence they adopt these alternative modes of disposal.

In areas were door to door waste collection was made available by waste collectors there was low patronage as exorbitant prices were charged and also because there was irregular collection by Zoomlion Ghana Limited (Puopeil, 2010, Owusu-Sekyere et al, 2015,). Massive patronage of the communal container system by majority of the residents coupled with erratic schedules of waste collection by the waste collection companies has put pressure on the limited number of skips available for waste deposition, thereby resulting in a huge number of spillages and mushrooming of illegal dumpsites often seen at most middle and low class zones where central container system is employed at no cost (Fei – Baffoe, 2014). This he said has led to serious spillages as well as the mushrooming of illegal dumpsites. From this study, it is important to note that to encourage source reduction of waste at points of generation, waste should be weighed and a fee charged according to the weight of the waste. This will reduce the quantity of waste deposited in the central containers and also provide financial strength for those who transport the waste to do their work effectively so as to clear or reduce the over spillage of waste at central container points. This could however lead to a tendency of people practicing other improper ways of disposal since such individuals will not want to commit to the charges.

In the African continent traditional environmental risks factors to human health have not been resolved. This situation can be due to inadequate or inefficient policies, weak institutional capacities and a shortage of resources, as well as a severe lack of basic public awareness in environmental health issues (First Inter Ministerial Conference on Health and Conference in Africa, 2008). Lohri et al (2013) in their study: Financial

Sustainability in Municipal Solid Waste Management – Costs and revenues in Bahir Dar, Ethiopia found out that solid waste management is not financially sustainable. Most of the institutions responsible for combating environmental crime lack the capacity to enforce environmental legislation. This is attributable to a number of factors, including an inability to detect and combat environmental crimes because of a lack of mobility and poor communication facilities, low staff morale owing to poor incentives, and little enthusiasm and support from the public. Other factors may be a lack of commitment, disinterest and awareness on the part of the police, the prosecution attorney and the judiciary (Hamid et al, 2009). Contractors take to indiscriminate tipping during the rainy season due to inaccessibility of the road to main tipping landfill in Abuja (Ayuba et al 2012).

In the same light Owusu – Sekyere et al (2015) pointed out that the lack of defined collection routes and inaccessible road networks in low income communities has additional difficulties to the existing problems of solid waste collection. Smugglers rely on a wide range of tactics, including false permits, bribes, and mislabeling of wastes as raw materials, less dangerous substances, or other products, to evade the laws (Mastny and French, 2012). According to Oteng (2012), Owusu-Sekyere et al, (2015) House to House (HH) Collection Mode which is commonly practiced in higher income and some middle income communities as well as some public institutions are charged a fee for their solid waste collection at regular intervals. Their studies however pointed out that the challenge which is faced with this system is that the fee charged is too high regarding the services that clients receive. Again their study pointed out that containers were not collected regularly as agreed upon in the performance contract.

The containers very often became the feasting grounds for domestic animals and create unsightly scenes. Residents living in the suburbs of Wa rarely patronize the house-to-house (also known as door-to-door service) solid waste collection services that Zoomlion Ghana Limited render to their customers due to financial difficulties as well as poor road access in these areas which makes the implementation of the HH service difficult Owusu-Sekyere et al, (2015). From their study (Amoah and Kosoe, 2014) pointed out that one major challenge that bedevils waste collection and transportation in Wa has been the untimely collection of the communal waste containers whenever they are full and this has serious public health implications. This they say owes to the fact that, residents living in areas where these waste containers are located are left to cope with the stench that emanate from the heaped refuse laying uncollected for a long period of time. Amoah and Kosoe further stated that the fee charged by Zoomlion Ghana Limited deters some households from patronizing this service making these households resort to the use of sub-standard waste containers (uncovered containers) for temporary storage and the disposal of their solid waste in environmentally unfriendly manner.

The problem of waste management in Sub-Saharan Africa is a function of inefficient collection, transportation and reduced availability of safe, suitable, and accessible disposal sites around urban areas (Mpofu, 2013). Waste management in cities with developing economies and economies in transition experience exhausted waste collection services, inadequately managed and uncontrolled dumpsites and the problems are worsening (United Nations Environment Program, 2013). Problems with governance also complicate the situation. Waste management, in these countries and cities, is an ongoing

challenge and many struggles due to weak institutions, chronic under-resourcing and rapid urbanization. The disposal of waste has always been an intractable problem throughout Ghana and affirms that generally, poor state of waste management is not only an engineering problem. It also has much to do with rapid urbanization, poor financial capacity, low technical capacity for planning and management and above all, lax and weak enforcement of environmental regulations which allow local authorities to flout environmental regulations without any sanctions.

A major cause of waste crime in Ghana is weak enforcement of legislations and existing regulations and rules on solid waste management (Oteng-Ababio et al. 2012). The ultimate rewards of this mirage of causes of improper waste management or waste crime are negative effects that humans and the environment at large have to suffer.

2.9 Effects of Improper Management of Solid Waste

Odor is one of the main complaints made by residents close to dump sites. This odor they state is as a result of high composition of organic waste in total waste collected and non-segregation of waste (Adu-Boahen, 2012). Open burning of waste releases smoke which is a nuisance, and can possibly cause impacts to ambient air quality, exposures to airborne contaminants and the impacts to the health of children and community members as a result of these airborne exposures (Zagozewski et al, 2011).

The illegal dumping of waste can lead to pollution of water courses and land. Waste dumped in the environment can take a long time to decompose (e.g. several weeks for paper, six months for orange peel, 10-20 years for a plastic bag, 12 years+ for a cigarette butt, 50 years+ for a metal can, 75 years+ for a disposable nappy, and hundreds of years

for plastic and glass bottles), meaning that illegally dumped waste will remain visible, and cause environmental harm, almost indefinitely if it is not removed. Waste electrical and electronic equipment contains numerous hazardous substances (EEA, 2009). During 2012-2013, the Environmental Agency for England & Wales spent around £17 million on tackling waste crime (around 7% of the Agency's total spending was on environmental protection and 20% of expenditure on waste regulation). In addition, almost £5 million was invested in the Environmental Agency illegal waste sites task force over an 18-month period (Environmental Agency, 2013). This money could have been channeled to other areas of the economy for the benefit of the masses.

Plastic bags are especially a permanent danger to natural resources and animals. Plastic is a non-biodegradable material. Poorly managed plastics pollute the soil attack vegetation; reduce infiltration of rainwater, clogged pipes and drains, discharge storm water and waste water all of which serve as a source of soil pollution to the environment (Kafando et al 2013). Accordingly, these authors add that the impact of inappropriate waste management on the environment also leads to air and water pollutions. Contaminated well water according to the hygiene standard is not treated and yet consumed by people in the town. This is a potential source of illnesses and even death. Accordingly, in the course of their research it was revealed by ONEA at Kaya the failure in achieving standards of sanitation in individual sanitation facilities is a pollution source of ground and surface water resources with the risk of pollution of the water supply network. Open air waste firing that may appear as an attractive solution for waste management because it allows reduction volumes for up to rates of 75% to 90%, contributes to a production of flying heavy metals particulates and hydrochloric acid known as very dangerous

pollutant. Air dust affect the respiratory and cardiovascular volatile organic compound ranging from odor annoyance to carcinogenic effects, hydrochloric acid is a potential irritant to skin, eyes and respiratory tract, causing cancer and cardiovascular diseases (Kafonde et tal,2013, Andaney and Oppong,2015)

2.10 Actors in the waste management chain and how the crime in waste is perpetuated

A research undertaken by Giada in 2015 pointed out that waste exits industrial premises with the correct code assigned by the waste producer, the essence is to ensure its proper and legally correct management but it is given to carriers who subsequently deliver it to unauthorized facilities or to facilities that are not allowed to treat the waste received. To conceal illegal haulage, carriers forge waste identification documents by changing the reported waste identification code or substituting the document with a false one. Thus, waste apparently corresponds to the type of haulage the destination plant could receive. Waste brokers suggest to waste producers the facilities that are willing to accept their waste and able to treat it at the lowest cost in the market. According to the researcher chemical analysis laboratories have provided substantial aid and comfort to illegal entrepreneurial activities by providing false chemical analysis certificates. False certificates were, indeed, used by carriers or recovery plants to deceive controls. Should controls be undertaken during transportation or at waste management facilities, thanks to these false certificates waste would appear suitable for the type of transportation or for the treatment facility of destination.

One driver for environmental crime may be specific regulatory or institutional failures that serve to undermine resulting control systems. Regulatory failures involve inadequate regulations that fail to implement an environmental treaty properly, contain loopholes or fail to deter (or even punish) evasion of the rules. Even when the rules themselves are adequate, institutional failures such as inadequate resources, untrained staff or cumbersome administration may prevent the effective operation of environmental controls (RIIA, 2002).

Addaney and Oppong (2015), study reveals that the major cause of poor environmental solid waste conditions can be attributed to poor attitudes of people towards cleanliness. A study conducted by Ejaz et al in 2010 on the environmental impacts of improper solid waste management in developing countries a case study of Rawalpindi City identified the following;

- Dispersed solid waste from illegal open dumps often block drains and sewers. This blockage ultimately causes flooding and unhygienic conditions, as well as supporting mosquitoes breed and infest people with malaria. Similarly, Addaney and Oppong (2015) identified environmental conditions in the Senya Awutu East municipality of Ghana as abysmal that, solid waste has clogged most of the few available drains creating stagnant water for insect breeding and floods during rainy seasons.

- Discarded polythene bags in collected solid waste generate an aesthetic nuisance and they may also cause the death of some grazing animals which eat them.

- Open dumps on the road side and heavily sized storage containers are also creating traffic blockage.
- Illegal burning of collected solid waste creates serious negative impact on serious outdoor air quality and causes illness and reduction in visibility.

In a related finding according to Addaney and Oppong (2015) littering the environment with plastics causes environmental nuisance through choking drains and reducing the aesthetic beauty of the environment. Their findings further revealed that open burning of plastic waste could result in pollution with it associate health problems due to heavy metal additives.

In many cases, the most efficient and cost effective way to manage waste is to not have to deal with it at all; therefore waste diversion and waste minimization are often a primary focus for most integrated waste management plans (Gray, 2011). It therefore means that if the focused plans are not adhered to and waste generation is increased, much less attention will be paid to the waste and this could lead to serious health and environmental hazards.

When solid waste is dumped into rivers or water streams it can alter aquatic habitats and harm native plants and animals. The high nutrient content in organic wastes can deplete the dissolved oxygen in water bodies, denying oxygen to fish and other aquatic life form. Solids can cause sedimentation and change stream flow and bottom habitats. Current waste management practices in developing countries of locating dumps in sensitive ecosystems may destroy or significantly damage these valuable natural resources and the services they provide (Beede and Bloom, 1995; EGSSAA, 2006). The major source of

water pollution in urban environments of this sub-region is the large quantity of household, industrial, institutional and hospital wastes and effluents that are discharged indiscriminately (Henry and Heinke, 2004) as cited by (Mpofu, 2013).

2.11 Theoretical Frame Work

This study was guided by the rational choice theory. In most human endeavors decision making by individuals, groups, institutions and businesses are made in a rational manner that is decisions are made based on reasons that benefit the person or entity in question. This is especially when there are potential costs and benefits attached, person's groups and businesses take decisions to maximize benefits and as much as possible minimize costs or eliminate them completely.

From the background of economic theory, the rational choice theory assumes that human actions are based on "rational" decisions that is, they are informed by the probable consequences of that action (Akers 1990). The rational choice theory of crime is of the view that people commit a crime by considering a cost benefit analysis of crime and if it happens that the benefits outweigh cost of been caught and punished they go ahead to commit the crime. As benefits accrue to the individuals who commit the crime, they willingly make their decisions and choices to commit crime devoid of any force or coercion or influence from any other party.

The theory postulates that when people are thinking about committing a crime, they consider the related costs and benefits (McCarthy 2002). By weighing what one tends to gain or lose, individuals choose to commit crime or not. In the decision making process therefore there may be benefits and costs and one certainly would dominate, what

dominates is what the individual rational criminal goes in for. So if the criminal thinks that when caught in the criminal act his or her punishment will be less than what he or she stands to gain the crime is committed. Deterministic in nature, criminal decision making process is based on free will, which could affect the successful perpetration of the planned crime, (Lanier & Henry, 2004:90).

Also deeply rooted in the tenets of classical criminology, people voluntarily and willingly choose their behaviour drive by the pleasure they tend to gain from it. Waste criminals according to Brown, Esbensen and Geis, (2008:213) is that rational decision making pertaining to crime also involves the choice of the victims determined by the type of crime, modus operandi, where and when to commit it and what to do afterwards. Waste criminals will therefore look for an opportunity to successfully dump their waste in isolated locations where people do not reside; this could be one such location where criminals will take advantage of. Another opportunity criminals could take an advantage of is the time to commit the crime, and this could be early hours of the morning or late hours of the evening or night when people are not watching. The costs or punishments such as imprisonment, payment of a fine and denial of some opportunities to individuals serve as a deterrent to some criminals and potential criminals. The absence of such punishments increase criminal activities because criminals will continue to perpetuate their criminal acts and also potential criminals will be motivated to come in.

In sub Saharan Africa however, the lack of regulations, weak enforcement of existing regulations, ambiguity of existing regulations, inadequate public education and sensitization and punishments have encouraged waste criminals to act (UNEP, 2015).

This could be due to the fact that the benefits are so huge since they tend to lose less or nothing by their unacceptable behaviours and activities.

2.12 Institutional and Legal Framework of Solid Waste Management in Ghana

Until the promulgation of the waste management policy in 1999, the sections of Ghana's Criminal Code of 1960 on public nuisance was the only legislative instrument on environmental sanitation and sought to address indiscriminate disposal of waste at public places (Oteng-Ababio, 2011). Specifically, Act 29 of the criminal code provides that whoever places or permits to be placed, any refuse, or rubbish, or any offensive or otherwise unwholesome matter, on any street, yard, enclosure, or open space, except at such places as may be set apart by the local authority or health officer for that purpose commits a punishable offence.

Currently, at the national level, many ministerial and public entities engage in a subtle competition (directly or indirectly) in executing their constitutionally mandated roles in solid waste management (SWM). Table 2.3 presents some of the ministries and their SWM functions. Though not exhaustive, the table nonetheless depicts how various ministries are assigned the responsibilities of establishing or facilitating the establishment of sectorial policies, purpose, law and norms, and guard their implementation and compliance. The experience so far indicate that these activities, though well-intentioned, are not normally coordinated as each ministry acts independently.

Table 2. 3: Ministries and their SWM Functions

Ministries	Functions and Responsibilities of SWM
MLGRD	-Responsible for the general management of domestic waste and supervise the MMDAs. -The Act gives MLGRD three responsibilities to policy and planning; legislation on SWM; and regulation, monitoring, and enforcement of SWM activities.
MEST (EPA)	-Through EPA, the guiding ministry accountable for formulating environmental laws and quality standards for the treatment, disposal as well as the design and location of sanitary landfills.
MOH	- Guiding institutions of the health sector have the regulatory authority that includes the sanitary aspects related to SWM, in which they intervene through regulatory activities and sanitary control. -They are in charge of issues pertaining to public and occupational health, hygiene and sanitary surveillance related to solid waste collection, transportation and final disposal.
MMDAs	-Responsible for providing sanitation services to the community and is responsible for financing, administering and operating SWM services. -Accountable for the operation of urban sanitation services, and here the specific function of regulating through ordinances and control of activities related to environmental sanitation, provide public sanitation service and promote environmental education programmes. -They are autonomous with capability of contracting and granting SWM services in their respective jurisdiction.

Source: MLGRD, 2008

In terms of policies, the legal framework guiding SWM is embodied in Local Government Act (1994), Act 462 and the Environmental Sanitation Policy (ESP) of 1999, which was reviewed in 2010. The environmental sanitation policy is focused on seven key areas and outlines four distinct functions for Assemblies regarding to environmental sanitation (see Table 2.4). These policies reflect the current thinking of SWM and provide a general assessment of the prevailing situation and strategies. The city authority, as legal entity, has powers conferred on it by the Local Government Act 1993 (Act 462) to promulgate by- laws to govern and regulate SWM, sanitation, cleansing and abatement of nuisance in the city. The Waste Management Department (WMD) at the various Metropolitan, Municipal, and District Assemblies (MMDAs) is responsible for waste collection and transport operations, management of disposal (landfill) sites, repair and maintenance of waste vehicles and equipment. Aside that policy, there are others which indirectly regulate SWM. For example, the National Building Regulations, 1996 (LI 1630) stipulates that a building for residential, commercial, industrial, civic or cultural use shall have a facility for refuse disposal. Other relevant legal provisions include the Town and Country Planning Ordinances, 1944 (Cap 84); Vaccination Ordinance Cap 76; Food and Drugs Law 305b (1992); and Mortuaries for sanitation and SWM.

Table 2.4: Solid Waste Aspects of Environmental Sanitation Policy (2010)

Particular areas of Funeral Facilities Act, 1998 (Act 563). All these legal frameworks have some provisions for Policy	Policy directives and decision making
Solid waste management by Integrated waste management services	-All solid wastes generated in urban areas are regularly collected and disposed of in adequately controlled landfills or by other environmentally acceptable means by Waste Management Department (WMD) -At least 20% of the solid waste collection service is done by individual Assembly and 80% provided by the private sector.
Private sector involvement in solid waste collection	-Involve the private sector in the provision of waste collection services, and supervision of the private sector by the WMD -City is to be zoned into service areas, private companies to be given monopoly in a zone with population less than 15000. -Private sector shall operate within the policies, regulations, supervisory and licensing arrangements set up by the public sector. -Full cost recovery where possible.
Environmental monitoring and public health education	-Monitoring environmental health standards and sanitary regulations -Educate the people on public, environmental, sanitation issues
Legislation by-laws enforcement and regulation	-Promulgation and enforcement of the by- laws on sanitation together with national laws. -Strictly observing and enforcing environmental health standards and sanitary regulations. -By-laws are to be enforced by the Environmental Health and Management Department of the Assembly.

Source: MLGRD, 2008

A closer look at the current policies depicts them as inadequate 'cookie-cutter plans' that appear alien to our local context. They are premised on the assumption that the historical forces and mechanisms that have driven the successful evolution of SWM in the developed countries can provide appropriate pathway to the problems confronting cities in the global South. Thus, these policies are loudly silent on the role of indigenous knowledge in SWM. Nonetheless, evidence abounds that the informal waste collector (Kaya Bola) has played and continues to play an important role in SWM, particularly in the areas of reuse and recycling (Adama, 2012). There are also evidence that since they are not officially recognised, they operate in hostile and life threatening environments and are often regarded as nuisances, embarrassments, and criminals (Nzeadibe, 2015; Okut-Okuma, 2015). We see this as a major flaw in our current arrangements for SWM that must be addressed because of the convenience, reliability, and the cost effectiveness of the operations of the informal waste collectors.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter looks at the methodology that was employed to collect data. Data was collected from both primary and secondary sources. The chapter also looks at the profile of the study area.

3.2 Profile of the Study Area

The profile of the study area for which the study considered relevant include; the location, demographic characteristics, ethnicity and culture, household characteristics as well as the economic activities undertaken by the people.

3.2.1 Background of Damongo

Damongo is the district capital of the West Gonja district as well as the seat of the overlord of Gonjaland. The district is one of the 26 administrative districts in the Northern region of Ghana which was established by PNDC law 207 on the 23rd day of December 1988. In 2004 the central Gonja was carved out of the West Gonja District with a Legislative Instrument (L.I.1775). The North Gonja District was also curved out of it in the year 2012 by (L.I.2069) (GSS, 2014).

3.2.2 Location and Size

The west Gonja District is located to the West of Tamale, the Northern regional capital of Ghana, and it lays within longitude $1^0\,5^1$ and $2^0\,58^1$ and latitude $8^0\,32^1$ and $10^0\,2^1$North. It also shares boundaries to the south with the Central Gonja District, Bole and Sawla –

Tuna – Kalba Districts to the west, Wa East District to the north - West and Northern Gonja District to the east. The District has a total land area of 4715.9skm, part of which is occupied by the Mole National Park. Geographically the West Gonja District is found within the guinea savanna and Damongo with geographical coordinates 9 9^0 5’ 0” North, $1^0$49’ 0” West.

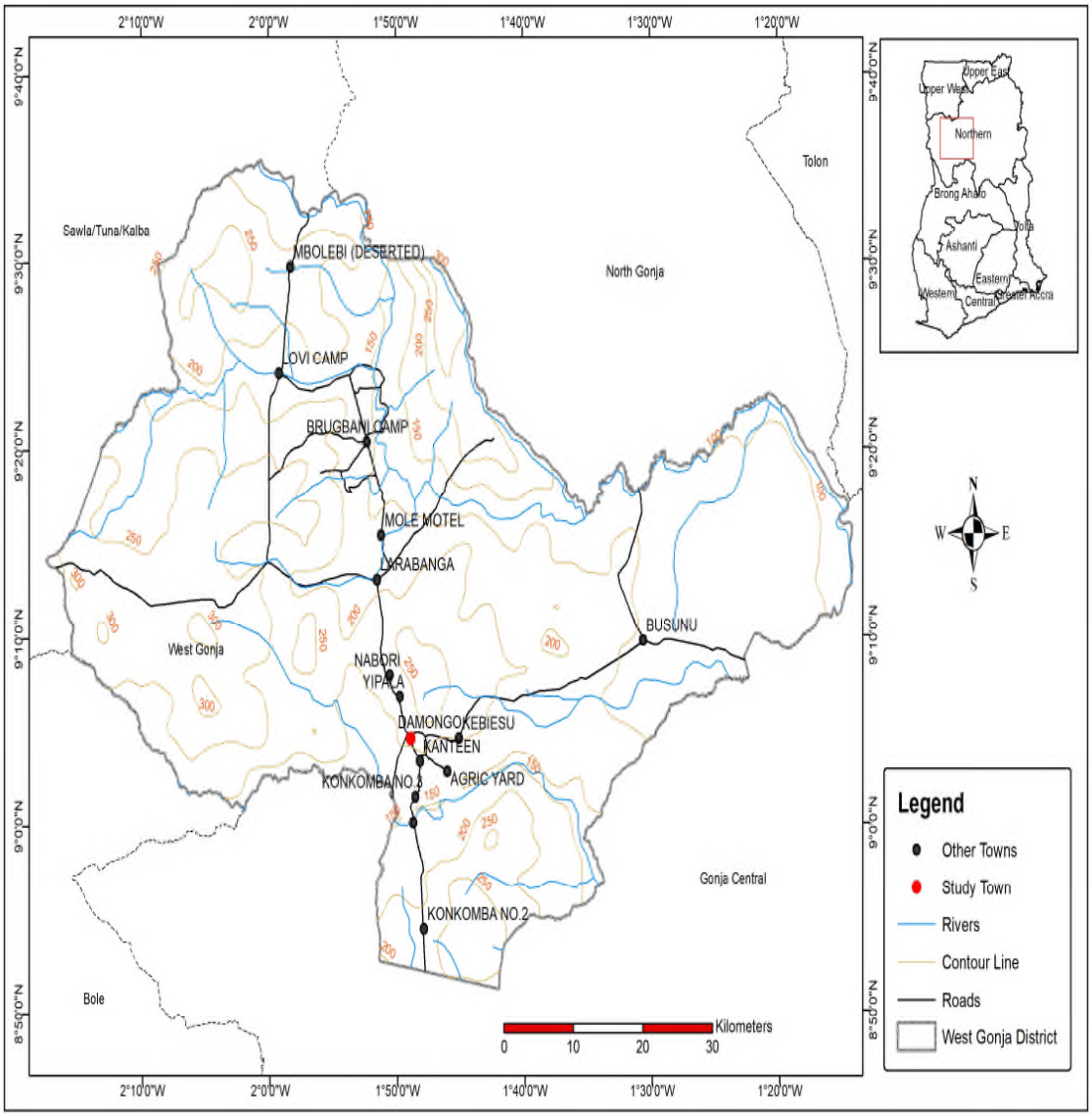

Figure 3.1: Map of West Gonja District showing the study area –Damongo

3.2.3 Population

According to the GSS, (2013) as cited by (GSS, 2014), the West Gonja District has a total Population of 41,180, representing 1.7 percent of the total population of the Northern Region. The 2010 Population and Housing Census has it that, Damongo the District Capital of West Gonja has a total population of 20,735.

3.2.4 Ethnicity

The west Gonja District is made of 22 ethnic groups. However the major groups in the order of magnitude include, the Gonja, Hanga, Kamara, Tampulma, Frafra and Dagaaba. These major ethnic groups and more are found in Damongo. Traditionally Damongo is a Gonja town and all other ethnic groups are migrant settlers.

3.2.5 Culture

There are four major religious groups in the District following the 2010 Population and Housing Census. These are Islam (41.7%), Catholic (26.3%), Pentecostal (8.0%) and Traditional Worshippers (5.4%). (GSS, 2014). The West Gonja District and for that matter Damongo celebrate some prominent festivals such as Damba and fire festival (Jintigi) as pertain in some districts of the Northern region of Ghana.

The Damba festival is celebrated to commemorate the birthday of the prophet Mohammed. While the fire festival is celebrated to commemorate the occasion on which a prominent chief's lost son was found, after touches were lit in the night in search of him. Till this day people lit grasses in the night amidst drumming and dancing to commemorate this day which usually produce a lot of waste by next day (Poupiel, 2010)

3.2.6 Economic activities

The major economic activities in Damongo include farming, agro processing and trading in food staffs. Women mostly get themselves involved in gari making and shea butter processing. The town is also dotted with hair dressing salons, tailor shops, carpentry shops and auto mechanic workshops. A weekly Saturday market in Damongo is an opportune day the residents as well as people from neighbouring communities and towns converge and sell mostly their farm produce such as yam, maize, cassava and animals and birds such as goats, sheep and fowls. They use their gains from these sales in buying mostly manufactured or processed products.

3.2.7 Housing and Sanitation

Houses are mostly constructed with mud and roofed with aluminum sheets, more recently however more and more people are constructing their buildings with concrete or cement blocks, may be this could be as a result of increased incomes and improvement in standards of living. It is however sad to say that most houses or homes lack basic sanitation services such as toilets and drains, a situation that can lead to outbreak of diseases. Most individuals in households resort to the use of the bush to attend to nature's call while bath water and other unwholesome water as a result of domestic activities just flow in compounds as a result of lack of drains. General sanitation in the Damongo town is bad as most households do not have basic sanitation services and therefore right from generation to final disposal of waste is poorly done. As households take to indiscriminate disposal method and institutions also not living up to expectation once their roles in waste management is concerned. This has become even more problematic because waste generation in the town has being on the increase.

3.3 Research Design

The survey design was employed for this study. The face to face method of questionnaire administration was used for data collection. According to Shuttleworth (2010), this is probably the most traditional method of the survey research design, it can be very accurate. As it allows one to be selective about whom to ask questions and as explanations can be given to items that are not understood by the respondent, as judgments can be made about respondents who are wasting time as well as those who are giving stupid answers. Self – administered question or face to face or one - on - one questionnaire administration involves the person administering the question and the respondent. Thayer – Hart et al (2010) defines self – administered questionnaire as a paper or web based survey that collects data without the use of telephone or in – person interviewer.

The survey design was employed because it provides some positives to aching information from a large group of people since the sample size used for this study was quite large (Sample size = 97 households), it is also easy to administer as questions are already documented only to be administered and no much probing needed to acquire information. Surveys are also good at being tailored exactly to the phenomenon one wishes to understudy. Self-administered questionnaires were administered at the household levels whiles interview guides were used to solicit information from institutions such as the EPA, Environmental Health and Sanitation Unit of the District assembly and Zomlion Ghana Limited.

The challenges in the course of the use of this design especially with the questionnaire administration were that it was very expensive considering the number of questions that were involved. It was also time consuming and tiring as such questionnaire were administered one day at a time, when tiredness set in the data collector just took a rest and continued later so as not to record wrong answers. Some people were very reluctant to give up their time perhaps because there was no incentive attached. While others were not ready to disclose certain information such as the amount of money earned at the end of the month. In such cases respondents were reassured that information was purely for academic purpose and not to be used for any other purpose, for which some were now ready to speak. For others who still did not want to disclose their information after assurances and reassurance a tactics by the data collector to leave them for the next available respondent made some of them talk.

3.4 Population/ Sample/sampling Procedure

Damongo is made up of 3275 households according to the GSS (2014) these households served as target population for the study. A designed survey questionnaire was administered to a sample size of 97 households. This was arrived at by using the Yamane 1967 formula $\mathbf{n=N/1+N\ (e)^2}$ to give a confidence level of 90% and at 0.1 margin of error. Calculation, n = 3275/1+3275 $(0.1)^2$, n = 97. 97 sample size was arrived at due to financial difficulties and the time period required for the study. Multistage sampling was used to cluster the town into various areas, the areas include: Attributo, Langbonto, Zongo, Hangaline, Alhassan Kura and Yagbon Residential Area, Frafra Settlement and Canteen. The Sample size was proportionately distributed among six areas.

After the clustering of town into areas the various areas were later classified into houses and from houses a further clustering was done to arrive at households. A total number of households were interviewed from each area based on proportions of the number of houses in each area to make up the sample size of 97. Systematic sampling was used to select houses from each of the six areas. Number of houses is used because it is in houses that households are found. However, in each house only one household was used for the study though a house could contain more than one household. This is because waste management practices by households in the same house may not be significantly different from each other. The table below illustrates the systematic procedure used.

Table 3.1: Systematic Sampling Procedure

Name of Area	**Number of houses (sample frame)**	**Total number of houses sampled**	**Sample fraction (K^{th} house)**
Attributo	491	29	17^{th}
Langbonto	119	7	17^{th}
Zongo	123	7	18^{th}
Hanga Line	220	13	16^{th}
Ward B Extention	400	24	16^{th}
Yagbon Residential Area	288	17	13^{th}

Source: Author's Construct, January, 2017

Due to the fact that most houses in the areas were not well planned with serial numbers, a serpentine movement was used to select every Kth house starting from the direction of

the first point of contact with any house in the selected area. With this approach a respondent was interviewed in each Kth house until the required number of sample for the area was obtained. Finally, accidental sampling method was employed to select the respondents for the interview. With this, every first person who is a female and is 18 years and above who was met in each selected house was contacted for response. If for a reason the person was not ready to respond, the next available person was contacted. To ensure effective communication and accurate answers to questions, since some of respondents did not understand English language a person who understood both the English and the local dialect was trained and used to administer the questionnaires.

Accidental sampling technique was also used to interview people who dump their solid waste at unapproved sites. By this sampling technique any person who came to dump refuse at the time of visit was interviewed. Basically the information that was sought was to ascertain the reason for their action, knowledge on any law regarding solid waste Management and the consequences of their action such as the law taking them on and the outbreak of diseases. Purposive sampling was also used to solicit information from Zoomlion Ghana limited (ZLG Ltd) Officials, the EPA officer as well as officials of the Environmental Health and Sanitation Department of the West Gonja District Assembly.

3.5 Sources of Data

Data sources were obtained from both primary and secondary sources. Primary source of data was gathered through; Field visits and visual inspection, Questionnaires survey and Face-to-face interviews. Secondary source of information was gathered through the review of official documents. These data gathering methods are further discussed in the subsections.

3.5.1 Field Visits and Visual Inspection

Field visits were also made to places such as approved dumpsite to see if they meet the basic requirements, unapproved dumpsites and a general observation to see the extent of garbage and litter around the town.

3.5.2. Household Survey

Simple and structured questionnaire was prepared to solicit information about sample populations' socio - demographic characteristics, their attitudes towards waste, waste management practices such as type of solid waste generated, transfer, distance covered and final disposal, what waste management services they received from ZLG Ltd, the only private waste management company in the town, waste management services from the District Assembly, their knowledge on existing laws on solid waste management in the town and how effective those laws are and the challenges that bedeviled the current waste management system.

3.5.3 Face to Face Interview

Face-to-face interviews were held with the district supervisor of ZLG Ltd and the officials at the Environmental Health and Sanitation Department of the West Gonja District Assembly. The department officials interviewed were those concerned with solid waste management at their institutions.. There was also another face to face interview with the Environmental Protection Agency (EPA) with regards to its role in solid waste management, if institutions such as the District Assembly is complying with the regulation regarding solid waste management and if there have been any action taken by the EPA such as prosecutions.

3.5.4 Review of Official Documents

Data was also collected through the review of official documents, the documents reviewed included Environmental Sanitation Policy of 2010, Public Health Act, 2012 Act 851 and Criminal Code, 1960 (Act 29). The essence of this review was to assess the effectiveness of these documents which serve to regulate waste management in Ghana.

3.6 Data analysis

Quantitatively, data was analyzed using descriptive component of Microsoft excel and data was presented using tables, charts and graphs. Data gathered were analysed with regards to the research questions and data were processed and analysed using SPSS, version 16.0 for Windows and descriptive component of Microsoft Excel. This was based on the assertion of Awanta and Asiedu-Addo (2008) that the Statistical Package for Social Science (SPSS) is by far one of the best known and widely used software for the statistical analysis of social science data. Data was presented using tables and pie charts. All of these were done after administered questionnaire was scrutinized to check for accuracy, completeness and consistency so as to identify and eliminate errors.

Qualitatively, data was analyzed into various thematic areas.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION

4.1 Introduction

This chapter concentrates on the presentation and discussion of the results that arrived from the study. Data which was collected through both primary and secondary sources have been analysed according to the various research objectives.

4.2 Socio - demographic Characteristics of Respondents

The socio-demographic characteristics of respondents considered the sex, age, educational level, occupation and income of the respondents.

Table 4.1: Sex of Respondents

Sex	Frequency	Percent
Male	9	9.3
Female	88	90.7
Total	97	100.0

Source: Field Survey, May, 2017

From Table 4.1, out of a total number of 97, 90.7% (88) were females while male respondents were 9 constituting 9.3% of the respondents. Female respondents constitute a greater number while male respondents are few because the study sought to use female respondents because they are those mostly involved in solid waste management at the

household level (Poupiel, 2010). Waste though generated by both males and females at the household level are mostly collected and disposed of by females. The males are fewer because in houses where only males were residents without any female from the ages of eighteen years and above, males were contacted for responses. This means that there are more females from the ages of eighteen years and above in houses than houses where only males are present.

Table 4.2: Age of Respondents

Age	Frequency	Percent
18-22	26	26.8
23-27	14	14.4
28-32	24	24.7
33-37	8	8.2
38-42	9	9.3
43-47	5	5.2
48-52	6	6.2
Above 52	5	5.2
Total	**97**	**100.0**

Source: Field Survey, May, 2017

From Table 4.2, the age range that was chosen to respond to the questions or contacted for the responses was from eighteen years and above. As stated earlier the people within this age group are directly involved in waste management right from generation to final disposal (sweeping, collection, transport and final disposal). Out of the total number of 97 respondents those in the age range of 18 – 22 years constitute the highest number of respondents (26.3%). People within the ages of 52 years and above constitute the least number of respondents, that is 5, representing (5.2%) of the respondents. This is an indication that there are much more young people than the aged in Damongo.

Table 4.3: Educational Level Respondents

Level of Education	Frequency	Percent
Primary	8	8.2
Middle/JHS	18	18.6
Secondary/Technical	28	28.9
Tertiary	14	14.4
No formal education	29	29.9
Total	97	100.0

Source: Field Survey, May, 2017

As seen from Table 4.3, respondents who have no formal education is made up of 29 people, this constitute the highest number of respondents that is 29.9% (29). Respondents who had only primary education constituted the smallest number of 8.2% (8) of the

respondents. The information gathered on the educational level of respondents indicates that in the study area those who have no formal education are more than those who have had any formal education no matter how low it is. Also it can be said per the findings of this study that in the study area people who have had only primary education are the least meaning that people who had only primary education without proceeding to next and subsequent stages of the academic ladder are fewer.

Table 4.4: Occupation of Respondents

Occupation	Frequency	Percent
Farming	23	23.7
Petty Trading	35	36.1
Business	19	19.6
Public servant	20	20.6
Total	97	100.0

Source: Field Survey, May, 2017

From Table 4.4, petty trading constituted the largest occupation of respondents that is 36.1% (35) with people into business constituting the smallest number of 19 people making up 19.6%

4.2.1 Income levels

Income levels of respondents in a month were classified into lower income, low income, middle income and high income. This is seen below in table 4.5

Table 4.5 Income Levels

Income level	Amount (GhȻ)
Lower income	100 -300
Low income	400 – 500
Middle	600 – 900
High income	1000 and above

Author's construct: May, 2017

Table 4.6 Level of income of Respondents in a Month

Income Level	Frequency	Percent
Lower income	40	41.2
Low income	33	34.0
Middle income	20	20.6
High income	4	4.1
Total	97	100.0

Source: Field Survey, May, 2017

The study revealed that those who are lower income earners constituted the highest of 41.2% (40) of the total percentage, followed by low income earners of 34.0% (33). While respondents who earned high incomes monthly formed the least. Only 4.1% (4) respondents making 4.1 percent of the total percentage of respondents, earned monthly income of GhȻ1000 and above and fall under high income earners.

4.3 Identifying the Nature of Waste Crime and the Criminals Involved

This section presents the results of objective one of the research which was aimed at examining the nature of waste crime and the criminals involved in the study area.

4.3.1 Nature of Waste Crime

The study showed that the nature of solid waste crime revealed itself in the manner in which solid waste was managed. Solid waste crime was committed by both residents and institutions (both public and private). The nature of solid waste crime committed by state institutions (Local government agencies) and their collaborators (development partners) was the way solid waste disposal sites were managed or through non-compliance with existing legislations and high non-collection rate. The study revealed that the town has an open dumpsite which serves as a final disposal site alongside other illegal disposal sites doted in the town that do not conform to the standard prescribed by the EPA for safe disposal of solid waste. Table 4.7 provides the basic requirements for construction and maintenance of landfill (final disposal sites) and their violations during the field study.

Table 4.7: Basic Requirements for safe disposal of waste on landfills

Variable	Preferred requirement	Nature of waste crime
Neighbourhood	Landfills should not be located in the immediate proximity of occupied dwellings, waterways and water bodies. A minimum distance of at least 500 m should be provided. A need for a buffer zone (cultivated area – bush vegetation) for segregating the landfill from residential areas.	Final disposal sites located in the immediate proximity to residential facilities. Minimum distance not observed. No buffer zones available
Geological and hydrogeological conditions	▪ Necessary to determine the potential risk of emissions from the landfill for the underlying soil and groundwater.	No available facility for the observation of geological risk
Risk of flooding, subsidence and landslides	▪ Sites endangered by landslides, flooding and subsidence are unsuitable and such information can be gained through interviews with community leaders or city authorities.	No such interviews with communities were conducted on the past flooding history of landfill site
Access control and signposting	▪ To keep people and animals out for safety reasons To help monitor types and volumes of waste dumped To provide information of the type of waste acceptable	landfill has no restricted access No observed monitoring controls All types of waste is deposited
Daily compaction and cover	To prevent wind-blown litter and fly breeding. Compactions uses airspace more efficiently	Continuous wind-blown materials and high presence of insects Not regularly compacted
Record Keeping	▪ Record keeping of incoming waste types and quantities	No records on incoming waste
Fire must be avoided	▪ Though difficult due to the presence of landfill gas, must be avoided to prevent the release of harmful substances	Site is continuously burning

Source: EPA 2002

The violation of the requirements also exposed the neighbouring houses to the ravages of the nuisance from the sites. The impact of poor solid waste management in the town was immediate – unsightly littering; foul-smelling waste-laden and choked gutters; stagnant pools of water and flooding during rains; vermin and rodents on mounds of refuse dumps and the attendant prevalence of malaria, diarrhoea and typhoid. It came as no surprise as statistics from the District Health Directorate indicate that the top three cases at the OPD in the West Gonja District Hospital in Damongo were environmentally related. Residents living in the environs of the disposal sites have on countless occasions complained of overpowering stench, mosquitoes and insects emanating from the dumpsites. This finding is similar to (Adu-Boahen, 2012) finding in Secondi Takoradi.

Plate 1: Final disposal site of the West Gonja District Assembly-Damongo

Source: Field Survey, June, 2017

The second form of waste crime committed by state institutions was their inability to regularly collect refuse bins and central containers from designated homes and public places. A participant complained bitterly about how her container had not been collected regularly as agreed upon in the performance contract:

"My container has not been lifted for the past two weeks. This is not acceptable because the contractor promised to lift the container at least once a week".

This narration is in contrast with the prescribed standards in the legal books that in hot and humid tropical climatic conditions such as the one in Ghana, solid wastes must be collected at least twice per week, as its decomposition may produce bad odor and the leachate may create unhygienic scene (UN-HABITAT, 2010). Direct observation from the field indicated that the containers were over flowing and very often became the feasting grounds for domestic animals and created unsightly scenes (Plate 2).

Plate 2: An Overflowing Waste Container

Source: Field Survey, May, 2017

The mess, the nauseating stench and the flies hovering over the heaps was a grave source of worry to residents for which they bitterly complain

The third form of institutional waste crime was the manner in which waste was being transported to the final disposal site. On route to the final disposal site waste is seen not properly covered or sometimes not covered at all and the wind blows back some of the waste materials on the road causing littering of the road and nearby communities. This illegality is called fly-tipping of waste (Read et al., 1998). The waste eventually gets back into the gutters when the wind blows or the rains come, causing the gutters to choke and block drainages as was opined by (Ejaz et al 2010). This can lead to breading of mosquitoes and other insects that can bite people and transmit diseases such as malaria. People who are infested may not be able to work or attend school and this would lead to a

decrease in productivity. This also puts a financial burden on individuals as hard earned money will be used to seek health care.

As observed by Read et al., (1998, p 55), Solid waste management has evolved from primitive origins through the development of open dumps in Ancient Rome to the sophisticated collection and disposal systems that are in use today". Today's collection requires that solid waste collection trucks are completely covered in order to avoid the spillage on roads or rain soaking the wastes. Due to the long distance between the disposal site and the collection areas in developing countries, trucks with capacities of 10-15m^3 are ideal (Read et al.,1998). Preferably, a compaction vehicle with superior capacity to reduce fly-tip-over is the acceptable practice. The study revealed that fly-tipping remained a major and widespread problem in solid waste transportation in Damongo. This happens because the buckets containing the waste are never covered as mandated by the laws guiding proper solid waste management in Ghana:

"*The solid waste containers are not handled well by the drivers. When they come to pick the container and it is full with solid waste they do not cover it, so as the vehicle speeds off, the waste materials also drop off from the bucket".* An interviewee hinted.

Apart from institutional involvement in solid waste crime, the study further revealed another form of solid waste crime involving passengers on board of commercial vehicles that is taxis and tricycles ('yellow, yellow'). While in the vehicles, the passengers throw out waste materials (such as polythene bags) unto the streets as the vehicle moves. A culprit of this had this to say

"The driver will not allow you to leave the waste in his car. I may not also want to move around town with waste on me that is why I dropped it on the street after all, Zoomlion will clean the street", she concluded.

Meanwhile, it was revealed that commercial drivers are required by law to have refuse containers on-board all commercial vehicles, a requirement both state-owned and private commercial drivers breach with impunity. In an interview with officers at the Environmental Health and Sanitation Unit, it was revealed that the Assembly lacks resources to enforce the laws regarding waste crime. When asked what was preventing the Assembly from sending personnel to the streets to apprehend waste criminals, the lack of funds and personnel syndrome was cited as the major reasons:

"We don't have enough men on the ground to check indiscriminate disposal waste so people take advantage to dump waste anywhere they want", an officer at the department of Environmental Sanitation Unit at the District Assembly said.

This situation does not only litter the street, it also poses health risk to people. It was observed that anytime it rained, these fly-tipped materials block gutters, produce bad odour and contaminate surrounding water bodies. Again, the study revealed that the most common waste crimes were committed by individuals who blatantly dumped solid waste in spaces with fatal flaws. It was observed that people intentionally disposed of all kinds of solid waste by the roadside, Gutters and open spaces (see table 4.8).

Table 4.8 Where Households Dump their Solid Waste

Disposal method	Frequency	Percentage
Road side	2	2.1
Gutter	23	23.7
Central container	5	5.2
Backyard	14	14.4
Dumpsite	19	19.6
Open spaces	24	24.7
Waste bins	4	4.1
Others	6	6.2
Total	97	100

Source: Field Survey, May, 2017

From Table 4.8, people in Damongo resort to some methods of disposing their household solid waste. Some 2.1% (2) of respondents dumped their solid waste by the roadside, while 23.7% (23) of respondents dumped their solid waste in gutters and 24.7% (24) respondents dump their solid waste in open spaces and this constitute the highest form of waste crime at the household level.

Plate 3: Dumped Solid Waste on an Open Space

Source: Field Survey, May, 2017

Some households also resort to open burning of their solid waste. ZoomLion also resort to burning at the final disposal site to reduce the quantity of it waste. This practice releases toxic substances into the atmosphere which is harmful to the environment and human health. The burning of waste whether intentionally or unintentionally can lead to serious fires that will need the attention, time and other resources of the fire service.

Plate 4: Burning of Solid Waste by a Household

Source: Field Survey, May, 2017

On this note one can conclude that the regulatory framework governing solid waste management in Damongo is not effective as the punishments prescribed by the laws are not punitive enough. Also a lot of waste crime is being committed and yet people are not punished for it. It can be concluded therefore as said earlier that criminals of solid waste crime include both private individuals as well as state institutions. Table 4.9 summarise waste criminals and the offenders involved.

Table 4.9: Nature of Waste Crime and Offenders

Waste crime	Offender
Disposal in gutters, disposal on road, disposal on open spaces	Household individuals
Erratic or irregular collection of waste containers/overflowing waste containers	Zoomlion Ghana Limited
Substandard final disposal site	District Assembly
Littering	Individuals
Burning of waste	Individuals , Zoomlion Ghana Limited

Source: Field Survey, June, 2017

4.4 Motivation for Committing Waste Crime

This section of the study covers objective two of the study which sought to investigate why people commit waste crime in the District. The study revealed that respondents' motivation to commit waste crime was mixed. For some study participants, the motivation was not by choice as indicated by the rational choice theory but predicated on condition. For instance, many of the study participants indicated that the citing of central containers far away from where residents live by state institutions and the expensive

nature of the services of ZLG ltd compelled them to select their own 'illegal' waste dumping sites. Figure 4.1 summarizes the responses from the household survey.

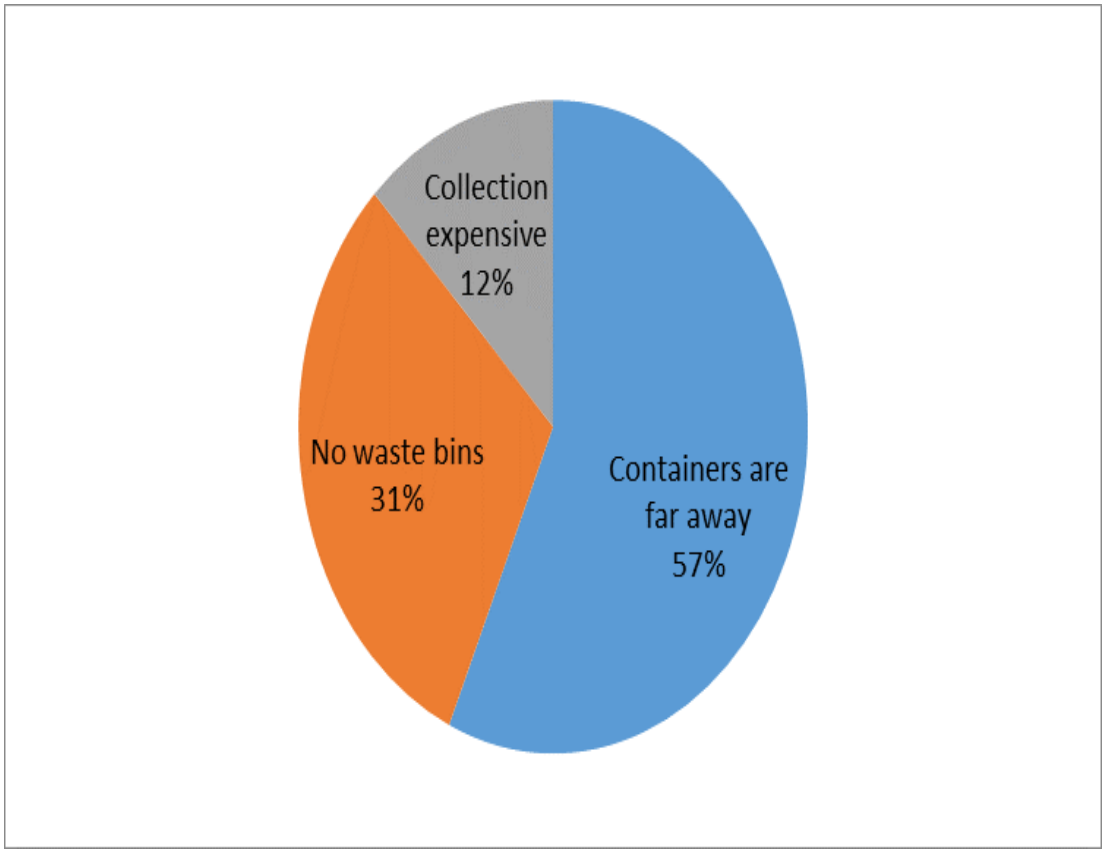

Figure 4.1: Why Households Committed Solid Waste Crime

Source: Field Survey, June, 2017

From Figure 4.1, 57% of respondents said people dispose of waste inappropriately because communal containers were far away from where people live. Also 31% of respondents alluded improper waste practices to the fact that there were no dust bins for the people to subscribe to. Indeed an interview with the ZLG Ltd supervisor, confirmed that they are usually challenged with inadequate waste bins and that coupled with the fact that some households pour hot ashes into their waste bins which damage them, when

they get hold of new waste bins they use it to replace the damaged ones instead of serving new clients.

A woman had this to say with regards to why she committed solid waste crime:

"Just around us are open spaces there are no houses, no people which is easier and convenient to throw our rubbish in this space or walk very long distance to central container sites where one cannot breath and there is no place for one to even step a foot to get close to the container and dispose of waste in the container. There is so much liter including human excreta?" Key informant discussant, May, 2017.

In-depth interviews with some participants whether they were aware that their solid waste disposal practices constitute a crime, the responses were varied (see table 4.10).

Table 4.10: Respondents Knowledge on Criminality in Solid Waste Management

Participant	Response
One woman had this to say	"I do not know it is criminal to dump waste an open space or any bush because am not aware of the law that says we should not do that".
26 year old lady said this	"I sweep my refuse into the gutter because I know when it rains the rain will flash everything to Sofo Dam"(Sofo dam is a dam in the community)
One other participant had this to say	"We have created this dump site here for our waste disposal because we have no option since it too long a distance to get to the next available central container. Even though stench and flies are now worrying us".
A mother	"I know it is not good that is why I usually let my daughter dump our waste in the gutter at down so no one will see. We do this because I cannot afford the services of ZLG ltd."

Source: Field Survey, May, 2017

Research has shown that solid waste disposal methods in many developing countries are influenced by households' socio-demographic characteristics such as age, occupation, and income among others (Owusu-Sekyere et al, 2016).To this end the research also examined the relationship between respondents' socio-demographic characteristics and method of solid waste disposal. Table 4.11 presents respondents' age and method of solid waste disposal.

Table 4.11 Age of Respondent and Method of Solid Waste Disposal

Waste Disposal Method	Age of respondent								Total
	18-22	23-27	28-32	33-37	38-42	43-47	48-52	Above 52	
Roadside	0%	1.03%	0%	0%	1.03%	0%	0%	0%	2 .06%
Gutter	7.22%	4.12%	5.15%	1.03%	2.06%	1.03%	0%	3.09%	23.71%
Communal container	1.03%	1.03%	2.06%	0%	0%	0%	0%	1.03%	5.15%
Backyard	4.12%	1.03%	3.09%	2.06%	2.06%	0%	1.03%	1.03%	14.43%
Dump sites	7.22%	1.03%	3.09%	3.09%	2.06%	1.03%	2.06%	0%	19.58%
Open spaces	7.22%	4.12%	6.19%	1.03%	1.03%	3.09%	2.06%	0%	24.74%
Waste bins	0%	0%	1.03%	0%	0%	2.06%	1.03%	0%	4.12%
Others	0%	1.03%	3.09%	0%	1.03%	0%	1.03%	0%	6.19%
Total	**26.8%**	**14.4%**	**24.7%**	**8.25%**	**9.28%**	**5.15%**	**6.19%**	**5.15%**	**100%**

Source: Field Survey, May, 2017

From Table 4.11, disposal of solid waste on the road side constitute the least of 2.06% and people within the ages of 23 – 27 years and those within the ages of 38 – 42 years are those who dump on the roadside. Dumping of solid waste on the roadside therefore constitute the least form of waste crime at the household level. Disposal of solid waste in the communal container which is one of the most preferred among the methods of disposal found in the table constitute the second least of 5.15%. All the age groups apart from those within the ages of 33 – 37 years, 38 -42 years, 43 – 47years and 48- 52 years

do not dispose of their solid waste into the communal container. One could argue that these age groups that do not dispose of their solid waste into communal container considering their ages and the fact that this whole idea of introducing communal containers for waste disposal which came with the advent of ZLG Ltd. in the year, 2006 may be new to them. These people may have had other ways of disposing of their solid waste and do not want to resort to the new way of disposing their waste in the central container. Dumping of solid waste on open spaces constitute the highest method of solid waste disposal in Damongo. Out of the total number of respondents of ninety seven, 24.74% (24) dispose of their solid waste on open spaces with those within the age group of 18 – 22 years 7.22 %(7) constituting the worst offenders. This is perhaps the case because one can find a lot of open spaces within in the Damongo town. Disposal on open spaces therefore constitute the highest form of waste crime in Damongo.

Table 4.12: Educational level of Respondent and Method of Waste Disposal

Waste Disposal Method	**Educational Level**					
	Primary	Middle/JHS	Secondary/Technical	Tertiary	No formal education	Total
Roadside	0%	2.06%	0%	0%	0%	2 06%
Gutter	4.12%	1.03%	8.25%	3.09%	7.22%	23.71%
Communal container	0%	1.03%	4.12%	0%	0%	5.15%
Backyard	0%	1.03%	4.12%	3.09%	6.19%	14.43%
Dump sites	2.06%	3.09%	4.12%	4.12%	6.19%	19.59%
Open spaces	1.03	8 8.25%	6.19%	3.09%	6.19%	24.74%
Waste bins	0%	0%	1.03%	3.09%	0%	4.12%
Others	1.03%	0%	1.03%	1.03%	3.09%	6.18%
Total	**8.25%**	**18.56%**	**28.87%**	**14.43%**	**29.90%**	**100%**

Source: Field survey, May, 2017

From table 4.12, waste disposal on the roadside is practiced by 2.06 %(2) of respondents. This is practiced by only respondents who have received Middle/JSS education. Disposal in communal container is practiced by 5.15 %(5) of the respondents and this is practiced by those who have received Middle/JSS and Secondary/Technical education. Only 1.03 % (1) of the respondents who received middle/JSS education dumps solid waste in the communal container and 4.12 %(4) who received secondary/Technical education dump

in communal container. One would have thought that given the educational level of those who have received tertiary education, they would patronize disposal in communal containers for onward disposal by ZLG Ltd. However no respondent who have received tertiary education dumps his /her solid waste in the communal container. Perhaps it could be the case that some of the respondents patronize the door to door services provided by ZLG Ltd. Once it comes to disposal of solid waste at backyard no respondent who received primary education dumps waste at the backyard while 6.19 %(6) of the respondents who received no formal education dump at the backyard. Perhaps those who have received no formal education dump more at the backyard because they are used to the traditional system of homes dumping their waste at their backyards and cleaning and burning waste materials that can be burnt.

Table 4.13 Occupation of Respondent and Method of Solid Waste Disposal

Waste Disposal Method	**Occupation of respondent**				Total
	Farming	Trading	Business	Public servant	
Roadside	0%	1.03%	1.03%	0%	2.06%
Gutter	5.15%	9.28%	3.09%	6.19%	23.71%
Communal container	1.03%	2.06%	1.03%	1.03%	5.15%
Backyard	2.06%	8.25%	1.03%	3.09%	14.43%.
Dump sites	8.25%	5.15%	3.09%	3.09%	19.59%
Open spaces	5.15%	6.19%	7.22%	6.19%	24.74%
Waste bins	0%	0%	2.06%	2.06%	4.12%
Others	1.03%	3.09%	2.06%	0%	6.19%
Total	**22.67%**	**35.05%**	**20.61%**	**21.65%**	**100%**

Source: Field Survey, May, 2017

With regards to occupation no farmer disposes of solid waste by the roadside while those from business and trading dump their solid waste by the road side. This could be the case that most businesses and trading are done along the roadside and so people within such occupations find it easier to dispose of their waste on the road or by the road side. Dumping of solid waste in the gutter is the next highest method of waste disposal that is 23.71 %(23). Traders dump more that is 9.28% of traders dump in the gutter this could be as a result of the fact that traders do their work along the road sides where gutters are mostly found. Dumping solid waste on open spaces is the highest method of waste disposal and it is practiced by some respondents in all the occupations. This is perhaps as stated earlier because a lot of open spaces are found in Damongo. Only respondents who

do business and public servants use waste bins for onward disposal by ZLG Ltd, this could be attributed to the fact that such individuals make some good incomes that enable them patronize the service.

Table 4.14: Income Level of Respondents and Methods of Solid Waste Disposal

Waste Disposal Method	**Income earned in a month**				
	Lower income	Low income	Middle income	High income	Total
Roadside	2.06%	0%	0%	0%	2.06%
Gutter	7.22%	8.25%	7.22%	1.03%	23.72%
Communal container	1.03%	4.12%	0%	0%	5.15%
Backyard	6.19%	4.12%	3.09%	1.03%	14.43%
Dump sites	10.31%	7.22%	1.03%	1.03%	19.59%
Open spaces	10.31%	7.22%	7.22%	0%	24.75%
Waste bin	0%	0%	2.06%	2.06%	4.12
Others	0%	1.03%	2.06%	3.09%	6.18%
Total	**41.24%**	**34.02%**	**20.62%**	**4.12%**	**100%**

Source: Field Survey, May, 2017

From the table lower income earners are the majority of respondents who dispose of their solid waste in the above options of waste disposal methods. Except for no disposal in waste bins, and others and only 1.03 %(1) of respondent who falls within the category of lower income dispose of solid waste in the communal container. Disposal of solid waste in gutters, roadside, backyard, open spaces and any other place that is not designated by the district assembly for that purpose constitute waste crime. One can therefore say that lower income earners commit solid waste crime more. Perhaps this is so because they are not able to afford any means of disposal method that does not constitute a crime such as patronizing the door to door services of ZLG Ltd. Again given the fact lower income earners may not have received a higher education and for that matter may not have had any knowledge on how to keep ones surrounding clean or know of existing laws that regulate waste management may just be acting contrary to the provisions of the law.

High income earners constitute the least, once it comes to disposal of solid waste with regards to the above options of methods of waste disposal except for disposal in waste bins and “others”, this could be attributed to the fact that most high income earners can afford the luxury of subscribing to the door to door services of ZLG Ltd. and would not dispose of their solid waste just anyhow. Again most high income earners are likely to be highly educated and would know the importance of keeping surroundings clean and would therefore not dump waste anyhow. They would have also known there are some regulations that guide solid waste management and therefore manage their solid waste in conformity with the rules. Again only middle income and high income earners use the

waste bins, this again can be attributed to the fact that they are financially opportune to patronize such service.

4.5. Knowledge on Waste Management Regulation

The study in an attempt to unravel possible reasons for which waste crime is committed in Damongo, sought to find out individuals' knowledge on any solid waste management regulation in Damongo (Figure 4.2) shows the responses of Yes or No.

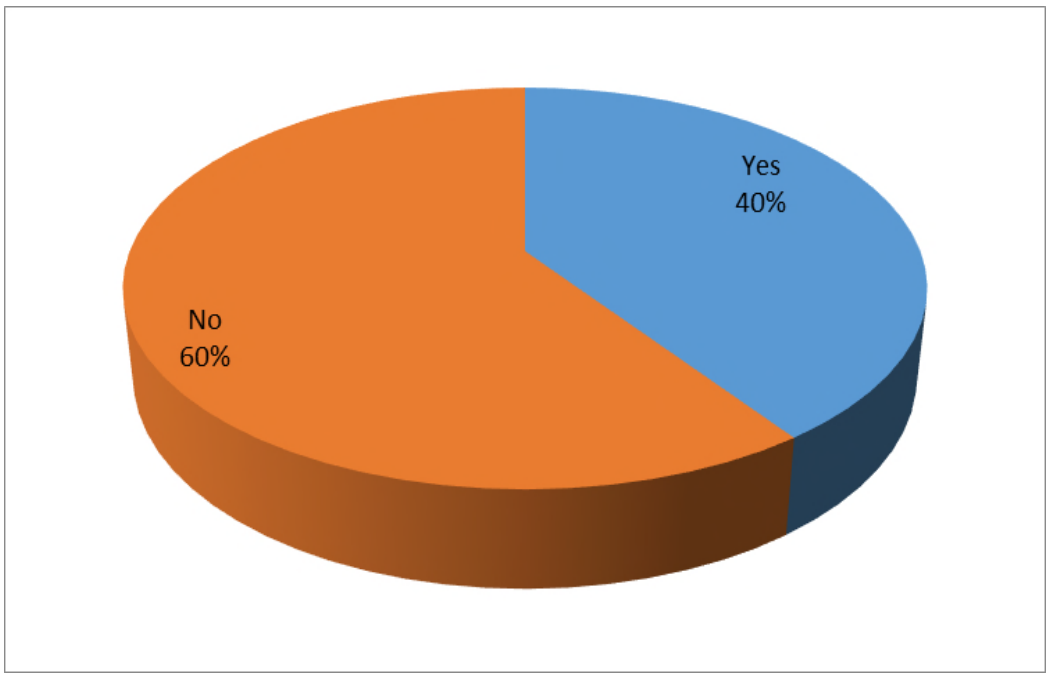

Figure 4.2: Knowledge on Waste Management Regulations

Source: Field Survey, June, 2017

It was revealed that there was no complete absence of knowledge but that there was some knowledge on regulations guiding solid waste management in the town. Though the lack of knowledge more than those with some knowledge on solid waste regulation. From figure 4.2 above 60 %(58) of respondents had no knowledge on any solid waste management regulation guiding solid waste management in the town. However 40 %(39) of respondents had some knowledge on regulations guiding solid was management.

The research further revealed that for some of the respondents who have knowledge on the presence of a regulation, the regulations did not have any influence on their waste management practices and so still did some of the things that the laws do not allow them to do. For some respondents also, the laws had an influence on the way they managed solid waste. From the ongoing discussion, it can therefore be said that for some of those who have no knowledge on any solid waste management regulation they could be committing waste crime out of ignorance even though ignorance of the law is no excuse. In other words they are committing the crime because they do not know or are not aware of any law that prohibit them from some ways of managing their waste such as indiscriminate disposal of their solid waste. It cannot also be ruled out that for some of them even if they have some knowledge they would have still managed their solid waste contrary to the rules and regulations condoned with waste management practices that contravene the provisions of the regulations. As evident by some of the 40% of respondents who said they have some knowledge and yet the regulations had no influence on their solid waste management practices. It can therefore be said that some people

commit solid waste crime not because they are no rules and regulations guiding solid waste management but because of other reasons such as attitude, weak regulations and non-enforcement of existing regulations as was pointed out by Simon (2010).

A major cause of waste crime in Damongo was weak public education on existing legislations and policies on solid waste management. The study revealed that majority of the research participants who were the generators of the solid waste were not aware of the laws and policies that guided their actions or inactions. The research further observed that some stakeholders were not informed of policy decisions and guidelines for managing solid waste.

Meanwhile, there are laws that define the responsibilities of households and individuals on environmental sanitation and the punishments for flouting them. The research revealed that the laws guiding solid waste management were inadequate or out-dated cookie-cutter plans that become even more out-dated every year. This situation allowed easy contraventions of the laws and policies. Since solid waste crime is committed when the laws regulating solid management are not followed in the management of solid waste, the study investigated the laws guiding solid waste management in the study area and how effective they have been. The study revealed that solid waste (domestic waste) management is the responsibility of the Ministry of Local Government and Rural Development (MLGRD), which supervises the decentralized Metropolitan, Municipal and District Assemblies (MMDAs) (Oteng-Ababio 2011). The MMDAs are responsible

for the collection and final disposal of solid waste through their Waste Management Departments (WMDs) and their Environmental Health and Sanitation Departments.

The study again revealed that the West Gonja District Assembly has not been involved directly in solid waste management for some time now. The Assembly therefore does no collection, and disposal of solid waste generated by its constituents. The responsibility of solid waste collection and disposal in the West Gonja District rests solely in the hands of ZLG Ltd, the District Assembly's partner service provider. As this suggests partnership is the key word so as partners both the Assembly and ZLG Ltd. will have to work together to ensure desired waste management services are delivered to the people. The finding of this research is therefore contrary to the findings of (Poupiel, 2010 and Ibrahim, 2014) that the Metropolitan Assembly of Tamale provides waste management services to its residents alongside ZLG Ltd.

The outdated sanitation bye-laws of the West Gonja District guided or regulated waste management in general but the extracts below pertains specifically to solid waste management so as to make the bye-laws much more in tune with this study. The bye laws of the Assembly are however not carved from a vacuum or anywhere but are carved out of the provisions of the national laws specifically form the 1960 criminal code, Act 29. In exercise of the powers conferred on the West Gonja District Assembly by section 79 of the Local Government Act, 1993 (Act 462) these Bye-laws were made:

- Where the Assembly has set aside a place for the disposal of refuse no person shall place, cause or permit to be placed any carrion, refuse or rubbish or any

offensive or unwholesome matter, on any street, yard, premises, enclosure or open space within the community.

- If any offender under sub-section (1) of this section has not been identified or discovered the existence of any carrion or other substance mentioned in the said section found close to any building shall be presumed to have been placed by the owner or occupier thereof. The occupier of any premises shall clear and keep free from all dirt, underbrush, under-weeds high grass, rubbish, rags, broken bottles and offensive matter (filling up holes with stones, grave, or other like materials) the streets or roads at the front, back sides, drains, gutters and channels thereon.
- No person shall cause nuisance in any public or open space. It shall not be lawful for any premises to be used for purpose which will create public nuisance.
- No person shall deposit litter, refuse or other matter which deposit of may cause nuisance or block the passage provided for a gutter or drains.
- Any person who contravenes any of these Bye-laws commits an offence and shall on summary conviction be liable to a fine of not less than three penalty units and not more than ten penalty units. For the avoidance of doubt the district assembly bye- laws penalty units refers to twelve Ghana cedis (GhȻ12). However the assembly is currently not working with this bye – laws as they are being revised or worked on to be used because the assembly sees it to have outlived its purpose.

To make matters worse Damongo which is the District capital of the West Gonja district does not have a functional magistrate court. Since 2013 there have not been magistrate in the court and criminal cases are sent to the Bole magistrate court for adjudication. This

does not motivate authorities to prosecute cases related to waste crime in the West Gonja district and for that matter Damongo. This is because travelling to Bole means there is a transport cost to bear and the one who bears the cost is the authority in charge of ensuring that offenders are punished. This coupled with other factors such as risk of travelling and other inconveniencies is enough to discourage district authorities from pursuing cases on waste crime and ensuring that offenders are punished.

The non-enforcement of waste disposal laws engenders lack of fear for the law among the public and encouraged negative waste handling practices such as littering and dumping of waste in drains and at roadsides and other unapproved places such as open spaces as revealed by this study. Such practices worsened the waste disposal situation and increased the burdensome tasks of waste collection, transportation and disposal for the town. The non-enforcement of the solid waste legislations was also due to limited resources. The resources needed to ensure that the waste sector fully complied with national/international regulations were prohibitively expensive. Inadequate resources for monitoring, enforcement and low penalties provided an environment of major opportunity for criminal actors to commit large-scale breaches of environmental and waste laws.

The study finally revealed that the District authorities were unable to adhere to the rules and regulations guiding solid waste management because of limited financial resources due to unreliable revenue sources, even though solid waste management services continue to take more than 35% of authorities' budget besides the periodic support from donor agencies (EPA 2010). Additionally, weak operational capacities of municipal

authorities; (GSS 2012); implementation of imported policies without recourse to local conditions (Ali 2010); limited community participation in strategic plan; poorly designed collection, transport and disposal systems (GSS 2012) have all conspired to heightened the illegitimate disposal of solid waste. This has led to the practice of uncontrolled and crude dumping of solid waste in open spaces which constantly block both primary and secondary drainage networks (UN-HABITAT 2010).

The lack of defined solid waste collection routes and inaccessible road networks in some communities of the town has introduced additional difficulties to the existing problems (Post et al. 2003). These communities have become the host communities for open dumps because of their inability to bargain with the city authorities for their rights. The common characteristics in these communities are choked drains and pools of stagnant water, which breeds mosquitoes and other disease causing organisms. It is therefore not uncommon to see that residents are more strongly affected by various environmental health problems such as malaria, acute respiratory infections (Cesaroni et al. 2003; Ellison-Loschmann et al. 2007)

Whether inadvertently or not, criminality is involved in solid waste management activities in Damongo, a situation that is also common across all the other cities in Ghana (Oteng-Ababio 2014; Owusu-Sekyere 2016) and that waste crime is common, exists in many forms and is committed by both individuals and institutions (both public and private) (Eunomia 2014).Waste crime is also committed along the entire solid waste management chain– from generation to the final disposal sites. It mostly takes the form of fly-tipping, illegal disposal by households, industrial, commercial or other ‘controlled’

waste without a waste management licence (Priestly & Bennett, 2015). Waste crime occurs in a spectrum from the individual illegal dumping of waste, through poor compliance in the waste industry. This includes people whose actions are due to ignorance of the law as well as those who financially cannot afford the legal means of managing their waste and even those who know the law but as a result of none or weak enforcement act contrary to it. Waste crime can be categorised by the act of doing the harm itself and/or related to a breach of conditions associated with a mandatory licence or permit, just as indicated in the Ghana's Criminal Code, 1960 (ACT 29) Sections 18 and 19.

4 .6 Effectiveness of Solid Waste Management Laws at Damongo

As already alluded to, waste management is a complex task involving numerous waste fractions, a range of technological treatment options, and many outputs that are circulated back into society (Eriksson and Bisaillon, 2011). This means that there are many diverse stakeholders involved and various aspects of its management. In order to reduce solid waste crime solid waste management laws must be effectively implemented. The following discussions concentrate on how effective waste management laws have been implemented.

Out of a total number of 97 respondents, 72.2 %(70) said they have not been punished or seen any one punished because they did not manage their waste in accordance with the rules and regulations guiding solid waste management. 27.8 %(27) respondents however responded in the affirmative that they have seen some people been punished for illegally managing their solid waste. To ascertain whether offenders were punished for waste

crime and the kind of punishment which was meted out on individuals the study required respondents to state the kinds of punishment they or others have received for committing waste crime in the study area. The table 4.15 speaks to the responses of respondents.

Table 4.15: Forms of Punishments Meted to Offenders of Solid Waste Crime

Punishment	**No. of Responses**	**Percentage**
Charged a fine	15	15.5
Clean the place	5	5.2
No punishment	67	69.1
Warning	10	10.2
Total	**97**	**100**

Source: Field Survey May, 2017

From table 4.15, 67 respondents representing 69.1% (67), said no punishment has been meted out to any offender of waste crime. Also 5.2% (5) of respondents said offenders were asked to clean the nuisance that they created. In fact the latter, 5.2% of the respondents response was actually confirmed by an officer at the Environmental Health and Sanitation Unit of the District Assembly that the extent to which they ever went with offenders was to ask them to clean the nuisance they created, failure to do so for which they were summoned to the office to explain their action. It is important to add that, if all that offenders of solid waste crime are been asked to do at best is to be asked to clean the

nuisance they created by the authorities, an act which is already their responsibility then of course this will not be deterrent enough to stop individuals from committing the offence. From the responses from the respondents and with that, which comes from the Environmental Health and Sanitation Department one can even confidently say that waste crime is not being punished in Damongo and to a large extent the West Gonja District.

4.7 Effects of Solid Waste Crime

This section covers objective three of the research which seeks to examine the effects of solid waste crime in the study area. Effects of solid waste crime could be positive or negative since to every act there are two sides of the coin. In committing waste crime perhaps the criminal tends to benefit to some extent as postulated by the rational choice theory, which underlines the theoretical aspect of this work. There is however no doubt that to a larger extent the negative effects are far greater as it affects the larger society, what this study thus did was to unearth the negative effects of solid waste crime.

Through field observation it was revealed that the Damongo township is derailed of its aesthetic beauty as a lot of plastic containers, polythene bags, empty sachet water bags were found around and lot of liter from other substances were found around, some of which choked drains as the wind blows and the rains come. (Ejaz et al, 2010, Addaney and Oppong 2015). Animals can easily get chocked and die as some feast on these plastics and rubbers which were used for food. Environmental pollution was also noticed as overflowing waste containers, and heaped dumpsites were not cleared causing a whole lot of bad odour polluting the fresh air around those areas and neighboring areas in the town and this conforms with (Adu - Boahen, 2012) findings elsewhere in Ghana.

Respondents were equally tasked to identify the effects of waste crime, the table below tells the responses they gave.

Table 4.16 Effect of waste crime

Effects	Frequency	Percent
Sickness	76	78.4
Pollution	11	11.3
Loss of aesthetic beauty of environment	6	6.2
Others	4	4.1
Total	97	100.0

Source: Field survey, June, 2017

From table 4.16, 78.4 %(76) of respondents chose sickness as the most dominant effects of solid waste crime. While 4.1% (4) chose others for being the effects of Solid waste crime. The “others” as effects of solid waste crime include; flooding, deaths and chocked gutters. It is therefore not surprising that according to the West Gonja District Health Directorate environmentally related diseases are among the top 10 diseases in the West Gonja District. In fact these environmentally related diseases; malaria and diarrhea are within the first top three diseases among the top twenty diseases in the West Gonja district for the year 2016. This situation if unchecked could lead to some deaths if patients do not seek medical care early or if they do not have the means to seek health

care. Sicknesses could also lead to low productivity as sick people use the number of man hours seeking medical care instead of working which in the long run would affect the country's overall development.

Table 4.17: OPD Morbidity Top 20 Cases in the West Gonja District, 2016

No.	Morbidity	Total
1	Malaria OPD cases – all	22614
2	Upper Respiratory Tract Infections	12073
3	Diarrhea Disease	7147
4	Rheumatism & Other	3902
5	Skin Diseases	2802
6	Eye Infection	1949
7	Acute Urinary Tract infection	1349
8	Anemia	955
9	Typhoid Fever	824
10	Vaginal Disease	663
11	Pneumonia	610
12	Hypertension	523
13	Intestinal Worms	472
14	Other Disease Of The Female Reproduction	389
15	Septicemia	387
16	Home Injuries(Home Accidents and Injuries	264
17	Acute Ear Infections	257
18	Asthma	225
19	Transport injuries (TA)	209
20	Chicken Pox	144

Source: District Health Directorate, 2016

Still in trying to find out the effects of waste crime I sought to find out if there are any socio - cultural effects of waste crime, 44.3%(43) of respondents responded in the affirmative that yes there are socio economic effects of waste crime. While 55.7 %(

54) of the respondents think that no, there are no socio - economic effects of waste crime. Of the respondents who said that there are socio - economic effects of waste crime, they gave some socio - economic effects such as if one does not manage the waste properly one is being tagged as dirty for which reason people may not want to associate with such people or want to eat their food. To be tagged or associated with dirt means that such individuals may feel isolated and this can lead to loss of self-confidence and depression with it attendant consequences such as one contemplating suicide and even committing it.

4.8 Perception of Stakeholders on How to Minimize Waste Crime

This section covers objective four of the research which seeks to examine the perception of some study participants on how to minimize or stop waste crime from being committed. Admittedly, the research reckons with the fact that most solid waste crimes could not be avoided, yet there are things people could do to minimize or stop it. In that perspective, the research identified some strategies which are geared towards reducing waste crime in Damongo in particular and Ghana in general from the perspective of study participants. Study participants did agree instituting punitive measures such as imprisonment, payment of fines, clearance of nuisance by solid waste criminals could help minimise solid waste crime in Damongo as well as public education.

Table 4.18: Respondents' Perspectives on Reducing Solid Waste Crime

Perception	Frequency	Percentage
Imprisonment	15	15.5
Payment of Fines	30	30.9
Public Education	35	36.1
Clearance of nuisance by culprits	17	17.5
Total	97	100

Source: Field Survey, May, 2017

The common theme from the study participants therefore suggests that raising the awareness of residents on solid waste management activities that may constitute waste crime through public education by the state institutions concerned and other environmental NGOs can be a starting point. This stems from the fact that majority of the study participants admitted that the current public education on proper solid waste management practices have been woefully inadequate and do not reach the intended beneficiaries, a situation that may have elevated solid waste crime to unacceptable levels. Again, the responses suggest that the current mode of information dissemination through the use of the television and radio on proper sanitation practices exact almost zero responses. The study respondents were however quick to add that if awareness campaign was properly implemented, the information could successfully reach the wider public and this could lead to a re-orientation of the many stakeholders towards proper solid waste management.

In the long run, the study proposes the adoption of the crime script concept as an approach to complementing the efforts aimed at preventing or fighting solid waste crime. In its application, crime script details the components regarding the series of decision points that an individual offender passes in the process of crime commission (Tompson and Chainey, 2011). The significance of crime scripting as a crime analysis technique is believed to lie in its potential to assist designers of situational prevention measures. It can provide a way of eliciting offender's subjective account of crime commission and provide a framework for constructing more comprehensive and objective accounts of crime-commission synthesized from offender account and other source of information (Cornish, 1994; Borrion 2013).

The crime script concept can be applied as an objective assessment and understanding of waste crime. The crime script approach breaks up the process into six acts (creation/generation; on-site storage; collection; transfer and transport; treatment and final disposal) with each act sub categorized into scenes where the illegal activity might take place. Baird et al. (2014), intimate that each scene or stage has a preparation, pre-activity, activity and post activity stage, with the principal offender being the lead actor in the scene. Crime script analysis can enable waste managers to unearth the relationship between the illegal activity and the structures that helped the crime to exist (Tompson and Chainey, 2011). Waste managers therefore have the responsibility to identify all the factors that make it profitable and easy for offenders to commit illegal waste activity. As postulated by the rational choice theory, offenders weigh the related costs and rewards associated with committing waste crime. If the

offender realises that the rewards are more lucrative and the chances of being apprehended are low, they commit the illegal waste activity.

Tompson and Chainey (2011), further state that after identifying the conditions that facilitate waste crime, waste managers need to make sense of the information collated by interpreting the content of the script. This according to Boba (2005), can be achieved by asking and finding answers to questions of 'who', 'what', 'where', 'when', 'why' and 'how' the illegal activity occurred. After this, the waste manager then identifies how to deal with the problem by exploring the specifics of the crime (Tompson and Chainey, 2011). Though the crime script approach may suffer from information fragmentation (Leclerc, 2013; Guilmour, 2014) and may not be able to give a clear distinction between the offender, a victim or any person capable of intervening during the crime scene, it still offers a means of drawing out the necessary details required to help understand and tackle the waste crime problem.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1. Introduction

Indiscriminate disposal of solid waste, irregular collection of solid waste, inadequate knowledge on regulations guiding waste management, inadequate education on waste management, non-existence of a working bye – law, effect of solid waste crime as well as the perceptions as to how solid waste crime can be minimized or eliminated are the key findings of this study undertaken in Damongo. The main objective of the study was to examine the extent of criminality involved in solid waste management in Damongo. Find below the key findings.

5.2 SUMMARY OF FINDINGS

After analyses of the data gathered from both primary and secondary sources, the following key findings came up and are discussed below:

5.2.1 Nature and Cause of Waste Crime in the Study Area

The study revealed that solid waste crime is committed at both the institutional level as well as at the individual level. The nature of waste crime included improper acts by waste management institution Zoomlion Ghana limited and the West Gonja District assembly as well as those of individual households. The nature of the crime committed by the waste management institution included irregular collection of solid waste especial solid waste dumped in the central containers as most of these containers placed at vantage points were seen overflowing, uncovered solid waste collection

vehicles on the move to the final disposal site which led to littering of neighboring communities where the vehicle pass through to dispose of the waste.

Again individual households took to improper disposal methods and these methods of course constitute solid waste crime. Such methods of disposal include dumping of solid waste on roadside, in gutters, open spaces and others such as open burning of household waste. 24.7 % (24) of respondents disposed their solid waste on open spaces which is the highest form of waste crime committed in the town at the household level, closely followed by dumping in gutters, constituting 23.7% (23) of the crime at the household level. Waste disposal on the roadside constituted the least of crime committed of 2.1% (2). The disposal of waste in communal container which is one of the most accepted means for onwards disposal by ZLG Ltd constituted the lowest method of disposal that is 5.2 %(5) after roadside. Disposal in communal or central container is one of the most preferred choice for which waste is to be disposed of by individuals among all of the above choices because in the container it is supposed to be disposed of in a much better way by the waste management company. This will pose less health and environmental risk than the other methods.

It was revealed that the rules and regulations that guide solid waste management in Damongo are not effective in fighting waste crime. As some of the prescribed punishments seems to outlive their purpose and needs revision. Also due to fact that officers who are supposed to prosecute offenders are not prosecuting anyone and the menace of waste crime appears to now be the norm in the town of Damongo. It has been discovered by this study that the West Gonja District Assembly does not have

any working bye- law that regulates solid waste management in the district and for that matter no bye - law regulates solid waste management in Damongo. It was revealed that since the bye - law is currently been amended and worked on to be gazzeted for use the district currently has no working bye – law.

Also the assembly for a couple of years now has never prosecuted any one for committing waste crime. At best the highest they got to, was to summon a criminal for refusing to clear a nuisance after he or she refuses to abide by an abatement notice. It was further discovered that since the district currently has no functional magistrate court for some time now, it is not even motivating to attempt prosecuting criminals based on national laws such as the 1960 Criminal Code Act, 29 and the Public Health Act, (Act 851). Since one in an attempt to do so will have to travel to Bole in the Bole district or Tamale both in the northern region. Besides proceeds from that will not come to the district but go into national coffers.

5.2.2 Motivation for Committing Solid Waste Crime

From the research it was found that more than half of the respondents had no knowledge of the existence of waste management regulation. To be specific 60 %(58) of the respondents had no knowledge on solid waste management. However 40% (39) had some knowledge on solid waste management regulations. Of the 40% who have some knowledge on solid waste management, the knowledge on regulation does not have any influence on some of them with regards to their waste management practices. In other words for some of these households who have the knowledge on the waste management regulations still managed their waste in contradiction to the regulations even though the regulations frown on that. Of the greater majority who do not have

any knowledge on solid waste management and of part of the 40% who have knowledge on solid waste regulation but of which the regulation had no influence on their waste management practices means that over 60 %(58) could be managing waste inappropriately which constitute waste crime. Also in an attempt to find out if anyone have been punished for committing waste crime, 69.1% (67) of respondents said no one has ever been punished for committing waste crime. This was confirmed by an officer at the Environmental Health and Sanitation Unit of waste management department of the district assembly that no one has ever been punished for committing waste crime.

12%(12) of the respondents said collection of waste by the service provider was expensive, 31%(30) said there were no waste bins to put solid waste for onwards collection by ZLG limited, the private service provider, while 57% (55) indicated that central containers where far away from residents. These contributed to people committing waste crime.

With regards to Knowledge on solid waste management 38.1% (37) of respondents had some education on solid waste management, while 61.9%(60) of respondents have never had any education on solid waste management.. However even some of the comparatively few people who have had some education on solid waste management do not still manage their waste properly. As they took to crude or indiscriminate solid waste disposal methods such as dumping in gutters, on the road side, open spaces among others, all of which constitute solid waste crime.

5.2.3 Effects of Solid Waste Crime

From observation it has been revealed that the Damongo town has been derailed of its aesthetic beauty as plastic containers and polythene bags are seen littered and flying around at the slightest wind. Again gutters and drains have been chocked or blocked worsening the situation especially when it rains. As a result of uncollected refuse containers and heaps of refuse at unauthorized dumpsites, there is stench emanating from such areas causing air pollution and denying residents and others who pass by such areas the opportunity to fresh air.

5.2.4 Perception on how Solid Waste Crime can be Minimized or Eliminated

In order to help reduce or do away with the canker of solid waste crime in Damongo, study participants are of the view that to be able to minimize or eliminate solid waste crime then solid waste criminals must to not be speared and must be punished like other criminals. Participants are therefore of the view that solid waste criminals should be charged fines, imprisoned, made to clear they nuisance the created as well as the need for public education on how to properly manage solid waste.

5.3 Conclusion

This study has established that indeed solid waste crime does exist in Damongo and this of course is not the best and will have dire consequences on the environment and health of humans as well as other living organisms that depend on the environment if necessary steps are not taken to ensure this current situation is curbed or reduced. Households take to crude solid waste practices such as dumping solid waste in gutters open spaces and on the road side and burning of their solid waste.

Admittedly these households have their reasons for which they resort to these unwholesome practices among which include; the fact that central containers are far away from their houses, unavailability of waste bins though some households express interest in them and some expressed concerns that the waste bins services are expensive to subscribe to. None the less, these concerns should not be the reasons for which solid waste crime should be condoned and allowed to be perpetuated in the town.

Irregular collection of solid waste by the sole private service provider ZLG Limited is evident in the overflowing of central containers through field survey. This is unhealthy to residents and the environment at large and unacceptable amidst their numerous challenges. Existing national laws on waste management are not being adhered to and the appropriate authorities seem not to bother. To make matters worse on regulations or legal framework, the West Gonja District Assembly does not have any working bye – law that regulates waste management in the district at the moment. The non-involvement of the district assembly in solid waste management in the district for

some time now does not help. More so when ZLG Limited is bedeviled with some challenges which do not make it work effectively.

The poor state of the final disposal site is environmental and life threatening since it is just a mere shallow pit for which they dump waste. To further worsen they case one finds medical waste with injects and other instruments containing human fluids such as blood all dumped at this place.

To ensure that proper solid waste management practices are adhered to so as to minimize or at best eliminate waste crime in the Damongo town and the district at large, waste crime must be seen as serious just like other crimes such as murder and theft among others are being seen and given the necessary attention. The necessary attention should include: public education on what constitute proper waste management practices as well as what constitute waste crime. What follows then should be meting appropriate punishment to people who are culprits of waste crime to deter others from walking similar routes.

5.4 Recommendations

Based on the results of the research, the following recommendations are being suggested:

i. There should be effective implementation of the rules and regulations guiding solid waste management as well as the establishment of an effective bye - law for Damongo by solid waste management authorities. To help the local authority (District Assembly) fight solid waste crime, there is a need for the assembly to have its own working bye-law. Even though there are national regulations such as the 1960 criminal code Act 29, the National Health Act (Act 851), to help combat offenses related to waste management.

ii. There should be community sensitization on regulations on waste management education as sensitization is a key to getting well-meaning people act in line with a particular issue. Sensitizing people on the existence of these rules and regulations will help them act in line with the regulations if not for anything at all but for the fear that breaking the law may lead to their punishment.

iii. From the study some respondents alluded to the fact that crude dumping methods are practiced because it is expensive to use waste bins while others say they are not adequate bins and yet for others central containers are far away from where people live. And as such

they are not willing to walk long distances to dump their solid waste. It is therefore recommended that adequate waste bins be provided and supplied to interested people. Also central containers should be located close to most residents of the various areas, as well as regular collection so as to encourage people patronizes central containers.

iv. To help minimize solid waste crime, appropriate punishment should be meted to solid waste criminals. To make solid waste crime unattractive to criminals, waste criminals should be given the appropriate punishment to serve as deterrent to others who would want to commit the crime.

REFERENCES

Adati, K. A, Manaf, L.A, Abdullah H. S and Wan Nur A. S. (2013) Current Status of Municipal Solid Waste Management Practice in FCT Abuja Journal of Environmental and Earth Sciences 5(6): 295-304, 2013

Addaney, M. and Oppong R. A. (2015). Critical issues of municipal solid waste management. JENRM, Vol. 2, No. 1, 30 -36, 2015

Adu - Boahen A. (2012) Assessing the Operations and Management of the Kojorom Final Waste Disposal Site by the Sekondi Takoradi Metropolitan. Thesis

Agbogbloshie: On the trail of Ghana's illegal e-waste (Part 2)(2014)/habitat – destruction/Earth Touch News .http://www.earthtouch news.com/all articles/2014/april/02//agbogbloshie-on-the-trailof-ghhanas-illigal- e-waste (part - 2)/

Ajibade L.T, Sanusi O.F and Awoeyo A.O,(2005). Quality evaluation of packaged-water for Human Consumption in Ilorin, Kwara State, Proc. Nat Conf, (Fac Business Social Sci, University of Ilorin), 4 th- 7 th April, 2005.

Ajibade, LT. 2007 Indigenous Knowledge System of waste management in Nigeria. Indian Journal of Traditional Knowledge Vol. 6(4)

Akers, L. R. (1990). Rational Choice, Deterrence, and Social Learning Theory in Criminology: The Path Not Taken, 81 J. Crim. L. &Criminology 653 (1990-1991)

Amoah, T. S and Kosoe, A. E,(2014).Solid Waste Management in Urban Areas of Ghana:Issues and Experiences from Wa.Journal of Environment Pollution and Human Health, 2014, Vol. 2, No. 5, 110-117

Aquinas, T.(1988). On Law, Morality and Politics. 2nd Edition. Indianapolis: Hackett Publishing Co. ISBN 0-87220-663-7

Attenborough, F. L.(1992). The Laws of the Earliest English Kings. Cambridge University Press. ISBN1-58477-583-1

Awanta, E. K and Asiedu – Addo, S. K (2008). Essential Statistical Research for Universities, Colleges and Research Institutions. Accra Salt and Light Publishers.

Bafoe – Fei, B., Nyankson, A. E. and Gorkeh – Miah, J. (2014). Municipal solid waste management in sekondiTakoradi Metropolis. Journal of waste management. Volume 2014 (2014)

Beede, D. N., & David E. B. (1995). The Economics of Municipal Solid Waste. Research Observer 10, (2): pp 113- 150.

Priestley, S. and Bennett, O. (2015) Fly-tipping - the illegal dumping of waste. Briefing Paper Number 05672, 15 September

Blythe, J.M.(1992). Ideal Government and the Mixed and the Mixed Constitution in the Middle Ages. Princeton University Press. ISBN 0-691-03167-3

Boba, R. (2005). Crime Analysis and Crime Mapping. Thousand Oaks, CA: Sage Publications Inc.

Borrion, H. (2013) *Quality Assurance in Crime ScriptingCrime Science*,2(6)

Britain's Environmental Agency (2013). Cracking Down on waste Crime. Waste Crime Report 2012 – 2013

Clarke, R. V., and Cornish, D. B.(1985). The reasoning criminal: Rational choice perspectives on offending. New York: Springer-Verlag.

Cornish, D. (1994). The procedural analysis of offending and its relevance for situational prevention, In Clarke RV (ed.) *Crime Prevention Studies*, Vol. 3. Monsey, NY: Criminal Justice Press, pp. 151-196.

Criminal Justice Inspection Northern Ireland (2015). A Review of Northern Ireland Environmental Agency's Crime Unit

Dangi, M. B. ,Urynowicz M. A. and Belbase, S.(2013) Characterization, Generation, and Management of Household Solid Waste in Tulsipur, Nepal. Journal of habitat International 40 (2013) 65 – 72

Davidson Gray (2011). Waste management Practices: Literature Review

DEFRA (2015). Part I: A consultation on Proposals to Enhance Enforcement Powers at Regulated Facilities. Part II: A call for Evidence on other Measures to Tackle Waste Crime and Entrenched poor Performance in the Waste Management Industry

EEA,(England Environmental Agency) (2009). Diverting Waste from Landfill - Effectiveness of waste-management policies in the European Union landfill effectiveness- of-waste management-policies-in-the-european-union/ p4445 EEA

EGSSAA (2006) Solid Waste Part II Chapter 15: "Environmental Guidelines for Small Scale Activities in Africa". Available at www.encapafrica.org.

Ejaz, N., Akhtar, N., Nisar H., Naaeem, A. U.(2010) Environmental Impacts of Improper Solid Waste Management in Developing Countries: a Case Study of Rawalpindi City. Transactions on the Ecology and the Environment, Volume 142

Enete, I. (2010). Potential Impacts of Climate Change on Solid Waste Management in Nigeria. Journal of Sustainable Development in Africa, 12, 101-103.

Environment Agency (2013) Cracking down on waste crime: Waste crime report20122013,https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/288604/LIT_8776_956402.pdf, p8

Environmental and Recycling Industry Center(2016). Biodegradable and Non-Biodegradable Materials. http//www.spreycycling.com/biodegradable/nonbiodegradable materials

EPA (Environmental Protection Agency) (2002) Ghana landfill guidelines. Accra, Ghana

EPA (Environmental Protection Agency) (2002) Ghana landfill guidelines. Accra.

EPA (Environmental Protection Agency) (2010) Revised Environmental Sanitation Policy, Accra, Ghana

EPA (2014). The Challenges Of Waste Management In Ghana; EPA's Perspective. http: www.todaygh.com/challenges- waste- management- Ghana- perspective/ Retrieved 14/06/2017.

EU Organized Crime Threat Assessment. Europol Police Office. Europol, The Hague.https://www.europol.europa.eu/sites/default/files/publications/octa_2011.pdf (accessed 27.12.2013).

Eunomia (2014) Waste Crime, Tackling Britain's Dirty Secret. Online:http://www.esauk.org/esa_reports/ESAET_Waste_Crime_Tackling_Britains Dirty_Secret_LIVE.pdf. Accessed 12/02/2016.

Eunomia (2017). Rethinking Waste Crime. Environmental Services Association. 154 Buckingham Palace Road, London SW1W 9 TR.

First Inter Ministerial Conference on Health and Conference in Africa (2008).

Giada, D. G.(2015).Treating the Cause, not the Symptoms: Exploring the Possible Relationship Between Environmental Administrative Law and Waste Crime in Italy. The European Review of Organized Crime.

Gilmour, N. (2014). Understanding Money Laundering –A Crime Script Approach. The European Review of Organised Crime 1(2), pp.35-56

GIZ(2016). Concepts for Sustainable Waste Management. https//www.giz/en/worldwide/15

GSS (2014). 2010 Population and Housing Census; west Gonja District Analytical Report retrieved 5/7/2016

Guerrero, L. A.,Maas, G. and Hogland, W. (2012) Solid waste management challenges for cities in developing countries. Journal of waste management 33 (2013) 220 – 232

Hamid, H. A. ,Mwiturubani, A. D. and Osiro, D. (2009) Nature and extent of Environmental Crime in Sudan. © 2010, Institute for Security Studies

INTERPOL (2013). INTERPOL Operation Targets Illegal Trade of E-waste in Europe, Africa. Online. 25/02/2016. Available from: http://www.interpol.int/en/News-and media/News/2013/N20130225/

Izugbara O. C. and Umoh J.O (2004). Indigenous Waste Management Practices among the Ngwa of Southeastern Nigeria: Some Lessons and Policy Implications. The Environmentalist, 24, 87–92, 2004

Kreith, F. (1994). Handbook of Solid Waste Management. MacGraw Hill, USA.

Lanier, M., & Henry, S. (2004). Essential Criminology. 2nd edition. United States of America: Westview Publishers. Lanier, M., & Henry, S. (2010). Essential Criminology. 3rd edition. United States of America: West view Publishers.

Leclerc, B. (2013). New developments in script analysis for situational crime prevention: Moving beyond offender scripts. In B. Leclerc & R. Wortley (eds.), Cognition and crime: Offender decision-making and script analyses. Crime Science Series. London: Routledge.

Lohri, C. R., Camenzind E. J., Zurbrügg C. (2013) Financial sustainability in municipal solid waste management–Costs and revenues in Bahir Dar, Ethiopia. Waste management 34 (2014) 542 – 552

Lutya, M.T. and Lanier, M. (2012). An Integrated Theoretical Framework to Describe Human Trafficking of Young Women and Girls for Involuntary Prostitution, Public Health - Social and Behavioral Health. ISBN:978-953-51-0620-3InTech,Availablefrom: http://www.intechopen.com/books/public-health-social-and-behavioral-health/an-intergrated-theoreticalframework-to-describe-human-trafficking-of-young-women-and-girls-for-invo

Mastny, L. and French, L. (2002) Crimes of (a) Global Nature (2002) WORLD WATCH magazine © 2002 Worldwatch Institute Working for a Sustainable Future

McCarthy, B. (2002). New Economics of Sociological Criminology. Annual Review of Sociology, 28,pp.417–442

Miller G.T Jr.,(1995) Environmental Science: Working with Earth, (Wadsworth Publications, California), 1995.

Moeller, D. W. (2005). Environmental Health (3rd ed.). Cambridge, MA: Harvard University Press.

Mpofu, P.Z.(2013). Urbanization and urban environmental challenges in Sub-Saharan Africa Journal of Agricultural and Environmental Management Vol. 2(6)

Oteng-Ababio, M. MelaraArguello J. E. and Gabbay O. (2012) Solid waste management in African cities: Sorting the facts from the fads in Accra, Ghana. Habitat International.

Owusu – Sekyere, E. ,Bagah, D.A, Quansha J. Y. D. (2015). The Urban Solid Waste Management Conundrum in Ghana: Will It Ever End?(2015) World Environment 2015, 5(2): 52-62DOI: 10.5923/j.env.20150502.02

Pokhrel, D., Viraraghavan, T., (2005). Municipal solid waste management in Nepal: practices and challenges. Journal of Waste Management 25, 555– 562.

RIIA (2002). International Environmental Crime: The Nature and Control of Environmental Black Markets. 10 St Jamesís Square, London SW1Y 4LE, UK www.riia.org/sustainabledevelopment

Royal Institute of international Affairs (2002). International Environmental Crime. The Nature and control of Environmental Black Markets. 10 St James's Square, London SW1Y 4LE, UK

RWM (2016). Tackling the Dirty Secretes of Waste Crime retrieved on March ,1, 2016 from http.//www.rwmexhibition.com./content/tackling- the –dirty – secrets of-waste-crime SEPA (2013) SEPA Enforcement Report 2012 2013. Online: http://www.sepa.org.uk/about_us/publications/enforcement_reports.aspx. Accessed 12/20/2016

Simon,A.M (2008.) Analysis Of Activities Of Community Based Organizations Involved in Solid Waste Management, Investigating Modernized Mixtures Approach. The case of Kinondoni Municipality, Dar es Salaam, Tanzania. Thesis is submitted to the Wageningen University and Research

Simpson, K. and Frans P. de Vries,(2014) An Economic Assessment of Waste Crime Enforcement in Scotland. Stirling Management School Division of Economics. University of Stirling.

Tadesse, T., Ruijs, A., Hagos, F., (2008). Household waste disposal in Mekelle city. Northern Ethiopia Journal of Waste Management 28, 2003–2012.

Tchobanoglous, G., Theisen, H. and Vigil, S. (1993). Integrated solid Waste: Engineering principle and management Issues. McGraw – hill publishing Company USA.

Tompson, L.and Chainey, S. (2011). Profiling illegal waste activity: using crime scripts as a data collection and analytical strategy. *European Journal on Criminal Policy and Research* 17,pp.179–201.

Traditional and current environmental risks to human health. IMCHE/1/CP1 19.

UNCHS (1996). An Urbanizing World Global Reports on Human Settlements, Oxford University Press. Oxford

UNEP (2015). Waste Crime – Waste Risks. Gaps in meeting the Global Waste Challenge. UNEP (2013). (PDF). ISBN 978-92-807-3333-4.

Warren, D. M. (1991). The Role of indigenous knowledge in facilitating the Agricultural Extension process. A paper Presented at the International workshop on Agricultural knowledge system and the Role of Extension (1991). Bad Boll, Germany.

Wienaah, M. M. (2007) Sustainable Plastic Waste Management, Accra Ghana. Master Thesis ISSN 1651-064XLWR –EX-07-10

Zagozewski, R.,Judd-Henrey,I. Nilson, S. ,and Bharadwaj .L (2011).Perspectives on Past and Present Waste Disposal Practices: A Community-Based Participatory Research Project in Three Saskatchewan First Nations Communities. Environmental Health Insights. 2011; 5: 9–20.

Appendices

Appendix i

AUNIVERSITY FOR DEVELOPMENT STUDIES

FACULTY OF INTEGRATED DEVELOPMENT STUDIES

DEPARMENT OF ENVIRONMENT AND RESOURCE STUDIES.

THIS RESEARCH IS SOLELY FOR ACADEMIC PURPOSE AND ANSWERS GIVEN WILL BE TREATED AS CONFIDENTIAL.

THANK YOU.

Location of House: .....

Date of Interview:.....

SECTION A

Background Information

Q. 1 Sex of respondent

Male

Female

Q2.How old are you?

18- 22 ☐

23 – 27 ☐

28 – 32 ☐

33 – 37 ☐

38 – 42 ☐

43- 47 ☐

48 – 52 ☐

52+ ☐

Q3.What is your highest level of education?

Primary ☐

Middle/J.S.S/J.H.S ☐

Secondary/Technical ☐

Vocational ☐

Training College ☐

Tertiary ☐

Q4.What is your major Occupation?

Farming ☐

Petty Trading ☐

Business ☐

Public servant ☐

Other, specify.....

Q5. Approximately, how much do you earn in a month? GHs……

Q6. What is your religious affiliation?

Christian ☐

Muslim ☐

Traditionalist ☐

Other, specify…….

Q7. What is your household size?.....

SECTION B

Please tick *ONLY THE BOX* of the response given/state briefly for 'other' answer.

Place of Disposal of Household Waste

Q8. Where do you dump your waste?

Roadside ☐

Nearby gutter ☐

Communal container ☐

Backyard ☐

Dump sites ☐

Open spaces

Other, specify: .....

Q9. If waste is dumped in a communal container, do you pay as you throw?

Yes ☐

No ☐

Q10. If yes, on average how much are you charged?

20pesewas 30pesew 50pesewas 60pesewas Other, specify.....

Q11. Have you ever dumped your refuse at unapproved sites (anywhere else) because you did not have money to pay?

Yes No

Q12. If waste is dumped in a communal container how long does it take to get there?

5-10mins. 11-15mins. 16-20mins 21-25mins.

More than 25mins.

Q13. If you travel more than 10mins to dispose off the waste, does it inconvenience you?

Yes ☐

No ☐

Q14. If yes, what do you do with the waste?

I/ dump them in nearest available space nearest gutter Burn them

Barry them other, specify.....

SECTION B

Waste Collection by Waste management Institutions

Q15. Which of the following types of waste do you generate in your home? **(if need be thick more than one answer).**

Food wastes ☐

Rubbish ☐

Ashes ☐

Other, specify: .....

Q16. Which waste management institution collects waste in your area for disposal?

District Assembly

ZoomLion

None

Others, specify ……..

Q17. How many times is the waste collected in a week**?**

Once Twice Thrice Four times throughout Not at all

Q18. What is the mode of collection of waste in your area?

Door-to-door Communal Curb Other, (specify):.....

Q19. If any of the modes, how many times a week**?**

Once Twice Thrice Four times throughout Not at all

Q20. Are you charged for the collection?

Yes No

Q21. If yes how much? Indicate the amount in GH¢.....

Q22. Are you in position to pay? Yes No

Q23. If no, why?

I am not working I don't see the need my income is very small

Other reason (Specify): .....

Q24. How can solid waste disposal be better managed in your area?

Contributing to buy waste containers paying for the collection and disposal of waste Stop dumping waste any how

Others (specify).....

Q25. Are you able to do any of these?

Yes No

Q26. If yes, mention those that you are able to carry out.

Contributing to buy waste containers Paying for the disposal and collection of waste

Stop dumping waste any how Other specify.:.....

Section D

Household Knowledge on Solid Waste Management Regulation

Q27. Are you aware of any law that regulates solid waste management in Damongo?

Yes No

Q28. If yes does the existence of the regulation help you manage waste properly?

Q29. Have you or anyone been punished for not managing solid waste in accordance with the law?

Yes No

30. If yes when was the last time you or someone was punished? ……

31. What was the form of punishment?

Charged a fine Imprisoned Both Other, specify ……..

Section E

Implications of Improper Waste Management

Q32. If you do not manage your solid waste properly what will happen **(you can thick more than one option)**

Sickness

Pollution

Loss of aesthetic beauty of the environment

Other specify

Q33. According to your religion are the any consequences of improper waste management?

Yes

No

Q34. If yes what are the implications……..

Q35. Is there any socio – cultural implications of improper solid waste?

Yes

No

Q36. If yes what are they……

SECTION F

Reasons for Inappropriate Methods of Solid waste Disposal

37. Why do you think people dump their solid waste inappropriately?

Central containers are far away from residents ……..

Inadequate waste bins …….

Waste bins are expensive ……..

SECTION G

Perception on how to Minimize or Eliminate Solid Waste Crime

38. What do you think can be done to minimize or eliminate solid waste crime?

Appendix ii

UNIVERSITY FOR DEVELOPMENT STUDIES

FACULTY OF INTEGRATED DEVELOPMENT STUDIES

DEPARMENT OF ENVIRONMENT AND RESOURCE STUDIES.

THIS RESEARCH IS SOLELY FOR ACADEMIC PURPOSE AND ANSWERS GIVEN WILL BE TREATED AS CONFIDENTIAL.

Thank you

Interview guide for Waste management Department of District Assembly

Position of Respondent: .....

Date of Response: .....

SECTION A

Solid waste Management Regulation

Q1. Do you have any bye -law that regulates waste management in Damongo?

Q2. What is the law?

Q3. Is the regulation contributing to sustainable waste management in Damongo?

Q4. Have you prosecuted anybody for improper management of solid waste before?

Q5. If yes how many times and when was the last time?

Q6. On which regulation was the victim punished? Local byelaw or national law?

SECTION B Both District Assembly and Zoomlion

Waste collection and disposal

Q1.What is the quantity of waste generated in a day in tonnes? (In figures): .....

Q2.What is the quantity of waste generated per capita in a day in tonnes? (In figures):..... Q3. What are the common types of waste generated in the area? (List them) 1..... 2..... 3..... 4..... 5.....

Q4. Do you separate the waste before disposal? (Either into plastic, wood, metals, glass, food waste among others) Yes No

Q5. If yes, indicate the reasons. ……

Q6. What are the major components of waste generated in the area? (Indicate their percentages in the various areas?

Major Component Percentage Generated Plastic Glass Wood Metals Food Waste Other:

Q7. What is the mode of collection and the number of times waste is collected per week in the following listed sections in Damongo?

Name of section Mode of collection Number of times per week (in

Name of Area	Mode of Collection	Frequency per Week
A – Attributo		
B – Langbonto		
C.-Zongo		
D- Hangaline		
Ward B Extension		
YRA Yagbon Residential Area		

Q8. What is the cost of collection per week in GH¢?.....

Q9.Where do you dispose off the waste collected from the various sections? (Final disposal site).....

Q10. What is the distance covered to final disposal site in kilometers? .....

Q11. Is the distance a problem? Yes No

Q12. If yes, indicate the problem(s)

.....

.....

Q13. How do these problems affect the frequency of waste disposal at the site?

.....

.....

Q14.What methods do you use in managing the solid waste generated in the area? (If more than one indicate them) Composting Recycling Incineration ISWM (Reduce, Reuse and Recycle/landfill/incinerate) None Other, (specify):.....

Q15. Why do you choose to use any of the method(s) for managing solid waste above? (Indicate the reasons in the spaces provided below).

.....

.....

SECTION C

Availability of Resources for Managing waste

Q16. Do you have adequate professionals in managing solid waste?

Q17. Do you have all the necessary equipment for solid waste management? Yes No

Q 18. if no list how many are available and what is required

Q19.what challenges do you encounter in managing solid waste

.....

.....

Q19. How can these challenges be addressed

.....

.....

……

Appendix iii

UNIVERSITY FOR DEVELOPMENT STUDIES

FACULTY OF INTEGRATED DEVELOPMENT STUDIES

DEPARMENT OF ENVIRONMENT AND RESOURCE STUDIES.

THIS RESEARCH IS SOLELY FOR ACADEMIC PURPOSE AND ANSWERS GIVEN WILL BE TREATED AS CONFIDENTIAL.

THANK YOU.

INTERVIEW GUIDE FOR EPA OFFICE

Position of Respondent: .....

Date of Response: .....

SECTION A

Q 1. What role does EPA play in solid waste management in Damongo?

Q 2. Does the EPA monitor the District Assemblies solid waste management practices in Damongo?.....

Q 3. Does the Damongo township have any sanitary landfill? Yes No

Q4. If No does it have any final disposal site that meet the requirement for final waste disposal?.....

Q5. Is the District assembly performing up to standards with regards to solid waste management in Damongo? Yes No

Q6. If No what measures have you put in place to ensure they perform according to the standards?.....

Q7. Have you ever prosecuted the District Assembly with regards to sub standard performance?

Q8. What challenges does the EPA encounter in trying to ensure assembly perform up to expectation with regards to solid waste Management?.....

Q9. In your opinion what can be done to ensure assembly performs very well in solid waste management in Damongo? ……..