UNIVERSITY FOR DEVELOPMENT STUDIES

SOLID WASTE DISPOSAL AND ITS EFFECTS ON HEALTH OF PEOPLE OF BUIPE IN THE CENTRAL GONJA DISTRICT OF GHANA

ROGER ASIATEBA ADUOK

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BY

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DISSERTATION SUBMITTED TO THE DEPARTMENT OF COMMUNITY DEVELOPMENT, FACULTY OF PLANNING AND LAND MANAGEMENT, UNIVERSITY FOR DEVELOPMENT STUDIES IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF A MASTER OF ART DEGREE IN ENVIRONMENTAL SECURITY AND LIVELIHOOD CHANGE

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DECLARATION

I hereby declare that with the exception of references to the work of others, which has been duly acknowledged, this work is the result of my own research and that it has neither in part nor whole been presented elsewhere for other degrees.

ROGER ASIATEBA ADUOK Date 01-02-13

(SUPERVISEE)

Supervisor's Declaration

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

MR. JOSEPH A. AWUNI Date: 1/02/2013

(SUPERVISOR)

ABSTRACT

Solid waste which includes; food peels, plastics, papers and scraps of metal from both domestic and industrial sources as well as human and animal excreta, remains a problem in most cities and towns in Ghana . As much as 88.3% of households dispose off their solid waste at their convenience, which could be in a stream or an open gutter and on some undeveloped plot of land, all of which have serious environmental and health consequences. (The Sanitation Division of Central Gonja District Assembly 2010). Despite numerous initiatives by the local government ministry in conjunction with the metropolitan, municipal and district assemblies, the management of solid waste continue to exert much pressure on the meager resources of these local authorities. The recent tax increase on sachet and mineral water is to raise additional revenue for proper disposal of solid waste in the country. This study examined the health and other implications of solid waste disposal in Buipe capital of the Central Gonja District. To achieve the research objectives, various quantitative and qualitative methods were employed for data collection and analysis. These included Focus Group Discussions, In-depth Interviews, Questionnaires and Observations. Sixty households randomly sampled from five communities of the Buipe Township formed the study sample. Some staff of the District assembly, District Environmental Health Team, District Disease Control Unit, Zoom Lion Ghana Ltd, and UNICEF was also interviewed. The main findings are that: Solid waste is mostly generated in the household through domestic food consumption, and commercial activities. Inadequate sanitary facilities have created severe environmental and sanitation problems such as indiscriminate dumping of waste along the roads, surroundings of residential dwellings and gutters. These poses serious environmental problem and health risk to the residents of the community especially to the mothers and their children. Inadequate waste disposal facilities and the low level of environmental health awareness need to be addressed urgently.

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DEDICATION

To my Mother Martha Ayarik; An extraordinarily exceptional woman Who has given me strength, fortitude, love; and been my life wire

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ABBREVIATIONS

CGDA	Central Gonja District Assembly
DFID	Department for International Development
EU	European Union
EPA	Environmental Protection Agency
EQI	Environmental Quality International
GLSS	Ghana Living Standards Statistics
GIM	Ghana innovation marketplace
MMDA	Metropolitan Municipal and District Assemblies
MLGRD	Ministry of Local Government and Rural Development
MMDAs	Metropolitan, Municipal and District Assemblies
MSW	Municipal Solid Waste
NESPOCC	National Environmental Sanitation Policy Coordinating

	Council
NGO	Non-Governmental Organization
OECD	Organization for Economic Co-operation and Development
PHC	Population Housing Census
RCC	Regional Coordinating Council
RPS	Rapid Household Survey
TMA	Tamale Metropolitan Assembly
UNSD	United Nations Statistics Division
UESP	Urban Environmental Sanitation Project
UESP	Urban environmental sanitation project

1.0 INTRODUCTION

1.1Background to the Study

The issue of solid waste disposal, which is a major problem confronting the world basically emanates from urbanization, industrialization and population growth and continues to remain as a threat to the environment. The major federal statute in United States of America on solid waste, Act (RCRA)1976 at section 1004 (27) defines waste as "any garbage or refuse from a waste treatment plant and discarded materials including solid and liquid materials resulting from industrial, commercial mining and agricultural operations and from community activity".

Solid waste is any material which comes from domestic, commercial, and industrial sources arising from human activities which has no value to people who possess it and is discarded as useless. In the early days, waste disposal did not pose difficulty as habitations were sparse and land was plentiful. Waste disposal became problematic with the rise of towns and cities where large numbers of people started to congregate in relatively small areas in pursuit of livelihoods (Shafiul and Mansoor, 2003). While the population densities in urbanised areas and per capita waste generation increased, the available land for waste disposal decreased proportionately. Solid waste management thus emerged as an essential, specialised sector for keeping cities healthy and liveable.

In Ghana, the disposal of solid waste remains a major concern of the government and other stakeholders of the nation since dirt is eating up the beauty of our cities and communities. Ghana with over 22 million people generates 3.0 million tones of solid waste annually (Anthony 2000).Rapid urbanization hitting the cities at the current rate estimated at 4% per annum coupled with the lack of proper land use planning, hinder effective sanitation and waste management practices.(Anthony and Eugene, 2000)

In the Northern Region of Ghana, most households dispose of their solid waste elsewhere at their convenience (65.5%) or at public dumpsite (21.9%). Only few households have the means of burning or burying their solid waste presumably around or having it collected for disposal. The regional pattern is repeated in each of the districts.(The Sanitation Division of Central Gonja District Assembly 2010).Buipe Township consists of three-hundred and sixty eight (658) premises with five (5) KVIP. There are three (3) approved and seven (7)

unapproved sanitary sites. The solid waste generated in the community includes; plastics, papers and scraps of metal which comes from both domestic and industrial sources as well as human and animal excreta (faeces). As much as 88.3% of households dispose of their solid waste at their convenience, which could be in a stream or an open gutter and on some undeveloped plot of land, all of which have serious environmental and health consequences. (The Sanitation Division of Central Gonja District Assembly 2010 annual report).

The current demolition of an authorise building of structures in Ghana is geared toward improving sanitation in the cities and the country at large. The recent tax increase on sachet water and mineral water is to raise additional revenue for proper disposal of solid waste in the country. Ghana has signed a contract with Zoom lion Ghana Limited a sanitation organization to collect waste in the country. However, despite their efforts, much is still left to be desired.

1.2 Problem Statement

Despite the present concerns of individuals and the government about waste management in Ghana, Buipe community in the Central Gonja District, is still faced with serious solid waste management problems. From observation, domestic and municipal solid wastes are commonly found in Buipe. Domestic waste comes from activities such as cooking and from human excreta. Municipal wastes are the trash from commercial establishments, small industries, and households. These include tins, plastic products, and polythene bags. These form the greater part of the waste observed on the streets, in gutters, and the back of houses in Buipe.

Containers for storing solid wastes in homes include old buckets, baskets, plastic containers, boxes, sacks, and even polythene bags, which in most cases have no lids. Hence, the wastes are even spread around before they get to the sanitary sites. Solid waste, when treated well, can be turned into a resource, but the greater part of wastes generated in Buipe seem not to undergo any treatment before their final disposal. They are left in piles for weeks to create unsanitary scenes that smell bad and, worst of all, create diseases. Solid wastes generated in Buipe are most often disposed of in open dumps, gutters, and at the back of houses probably due to the inadequate solid waste management equipment or the long distances to the sanitary sites. People also leave their wastes in piles for days before they finally get to the sanitary sites for disposal.

The above problems make it clear that the District Assembly is unable to cope with the problem. On the bases of the above problems, the study has the following research questions and objectives:

1.3 Research Questions

The study seeks to address the following questions;

1.4 Main Research Question

What are the effects of indiscriminate solid waste disposal on the people of Buipe in the Central Gonja District?

1.4.1Specific Research Questions

- What are the sources of solid waste in the Buipe township of Central Gonja?
- What are the various techniques of solid waste disposal in Buipe?
- Are there health effects attributable to the various techniques of solid waste disposal in the Buipe Township?

1.5 Main objective

To examine the effects of indiscriminate solid waste disposal on the environment and on health of the people in Buipe.

1.5.1Specific objectives

- To identify the sources of solid waste in the Buipe township.
- To examine the various techniques of solid waste disposal in Buipe.
- To identify the health effects attributable to the various techniques of solid waste disposal in the Buipe Township.

1.6 Significance of the Study

The study would serve as a baseline data and also developed a comprehensive account of waste management in the Buipe community, which would be used to inform policy and decision making by stakeholders. It would further inform the people on how improper disposal of waste affects human health and the environment in general. The study would also add up to existing literature which will form the basis for future studies in related areas.

1.7 Organization of the Study

The study has been organized into five chapters;

Chapter one comprised the background, problem statement, objectives of the study, justification of the study, methodology, scope of the study and limitations. Chapter two consisted of the profile of the community while chapter three covered the review of the relevant literature to the study. Chapter four constituted the analysis and the presentation of the result and finally, chapter five outlined the findings, conclusion and recommendation.

1.8 Limitation of the Study

The process of getting this work completed has not been without difficulties and challenges. However, for want of space and time, all the challenges encountered cannot be mentioned here.

A few but most difficult challenges encountered include; huge financial cost that had to be incurred during the data gathering process and printing of works. The writer had to spend many weeks in the field gathering data alone without involving field assistants because the cost of engaging them was too high. This led to the limiting of the number of questions and the details of probing that otherwise could have been done if field assistants were engaged. To maintain the quality of work output, very salient questions were asked.

Also, it was very difficult getting participants for the focus group discussions because most of them were on their farms as this is the farming season. This was overcome with several call-backs. A similar challenge was encountered in trying to get respondents for the interviews as most of them had very busy official schedules. This led to many postponements of appointments and even when the opportunity came, the interview sessions had to be reduced to very limited time and thereby putting enormous pressure on the researcher. To overcome this and maintain the quality of work output, more emphasis was placed on the use of tape recorders to record responses with minimum writing of feedback from respondents.

Determination, hard work and sacrifice however, led to the successful completion of this work. With the aforementioned discussion of the background and objectives of the study, the next chapter contains a review of relevant literature.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter basically reviews the relevant literature to the study. The review covers such areas as the conceptual aspect related to the research topic. Some of which include waste disposal and management techniques, waste management, access to sanitation facilities, causes and effect of indiscriminate solid waste disposal on households.

2.2 Conceptual Definition

2.2.1 Waste

Waste is more easily recognised than defined. Something can become waste when it is no longer useful to the owner or it is used and fails to fulfil its purpose (Gourlay, 1992). Solid waste according to Miller (1988) is any useless, unwanted, or discarded material that is not liquid or gas. A great mixture of substances including fine dust, cinder, metal, glass, paper and cardboard, textiles, putrescible vegetable materials and plastic characterise solid waste (Simmens, 1981).Throughout the western world, there are no longer enough convenient holes in the grounds into which to tip unwanted matter (Gourlay, 1992). The third world, having refused to become the "dustbin" of the western world, also lacks appropriate storage facilities, treatment technologies, and good methods of disposal for its waste.

According to Basel Convention,(2001) waste is defined as "Substances or objects which are disposed off or are intended to be disposed off or are required to be disposed off by the provisions of the international law''. According to the United Nations Statistics Division (UNSD), "Waste are materials that are not prime products (that is products produced for the market) for which the generator has no further use in terms of his/her own purposes of production, transformation or consumption and of which he/she wants to dispose off. Waste may be generated during the extraction of raw material, the processing of raw materials into intermediate and final products, the consumption of final prophets and other human activities. The European Union (EU) defines waste as an object the holder discards, intends to discard or is required to discard. Once a substance or object has become waste, it will remain waste

until it has been fully recovered and no longer poses a potential threat to the environment or human health. For the purpose of this work, waste would be defined as any substance or object which the producer or the person in possession of it, discards or intends or is required to discard but with exception of anything excluded from the scope of the Waste Directive (Ghana's Waste Management Licensing Regulations 1994).

2.2.2 Solid Waste

The term solid waste has been defined differently by various authors. Solid waste is any material that arises from human and animal activities that are normally discarded as useless or unwanted (Tchobanoglous et al 1993). According to Zerbock (2003), solid waste includes non-hazardous industrial, commercial and domestic waste including:

- Household organic trash
- Street sweepings
- Institutional garbage and
- Construction wastes.

The Ghana Innovation Market Place (2009) popularly known as 'GIM` defines solid waste as neither waste water discharges nor atmospheric emissions, arising from domestic, commercial, industrial, and institutional activities in an urban area. Operationally, it can therefore be said that, solid waste is any material which comes from domestic, commercial, and industrial sources arising from human activities which has no value to people who possess it and is discarded as useless. Having analysed what solid waste is; the next section examines the sources and types of solid waste.

Solid Waste is useless or unwanted material discarded as a result of human or animal activity. Most commonly it is solids, semisolids or liquids in containers thrown out of houses, commercial or industrial premises. (Environmental Assessment Report, Stockholm, 1993)

Solid waste is broadly defined as including non-hazardous industrial, commercial and domestic refuse including household organic trash, street sweepings, hospital and institutional garbage, and construction wastes; generally sludge and human waste are regarded as a liquid waste problem outside the scope. Solid waste is also refers to any waste in a solid form. Solid waste means any garbage, refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility and other discarded materials including solid,

liquid, semi-solid, or contained gaseous material, resulting from industrial, commercial, mining and agricultural operations, and from community activities. (Atomic Energy Act of 1954)

2.3 Sources and Types of Solid Waste

Tchobanoglous et al (1993), classified types of solid waste in relation to the sources and generation facilities, activities, or locations associated with each type which is presented in table 2.1 below.

Table 2.1 Typical Facilities, Activities, and Locations associated with various Source of Solid Waste.

Source	Typical Location	Types of Solid Waste
Residential	Single-family and multifamily dwellings, low-medium, and high-rise apartments.	Food wastes, rubbish, ashes, special wastes
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 wastes, special wastes, occasionally hazardous wastes
Industrial	Construction, fabrication, light and heavy manufacturing, refineries, chemical plants, lumbering, mining, demolition	Food wastes, rubbish, ashes, demolition and construction wastes, special wastes, occasionally hazardous wastes.
Open areas	Streets, alleys, parks, vacant plots, playgrounds, beaches, highway and recreational areas.	Special wastes, rubbish
Treatment plant sites	Water, wastes water, and industrial treatment processes.	Treatment plant wastes, principally composed of residual sludge
Agricultural	Field and row crops, orchards, vineyards, dairies, feedlots and farms.	Spoiled food wastes, agricultural wastes, rubbish, hazardous wastes

Tchobanoglous et al (1993), classified types of solid waste in relation to the sources Tchobanoglous et al (1993) has further explained the types of solid waste which include food waste, rubbish, ashes and residues and special 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 odours. In many locations, the putrescible nature of these wastes will significantly influence the design and operations of solid waste collection.

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. Non-combustible rubbish consists of glass, tin cans, aluminium cans, ferrous and other non-ferrous metals, and dirt.

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

The Centre for Environment and Development (2003) has also classified types of solid waste based on origin (food waste, rubbish, ashes and residues, demolition and construction, agriculture waste), based on characteristics (biodegradable and non-biodegradable), based on the risk potential (hazardous waste). The Centre also enumerated sources of solid waste as residential, waste from shops, commercials establishment, hotels/restaurants/eating stalls, slaughter houses and others. This has confirmed the sources and types of solid waste outlined by Tchobanoglous *et al* (1993). Based on the types of solid waste enumerated by Tchobanoglous *et al* (1993) and the Centre for Environment and Development (2003), it can be said that types of solid waste include the following. Food waste, rubbish, ashes and

residues, demolition and construction, and agriculture waste. The sources of solid waste also include domestic, commercial and industrial.

Solid waste consists of many different materials. Some can burn, some cannot. Some can be recycled, some cannot. Therefore, a detailed understanding of the composition of solid waste will indicate the management methods that will be used. Solid waste is composed of combustibles and non-combustible materials. The combustible materials include paper, plastics, yard debris, food waste, wood, textiles, disposable diapers, and other organics. Non-combustibles also include glass, metal, bones, leather and aluminium (Denison and Ruston 1990; Kreith 1994 and Zerbock 2003).

Solid Waste is the term used to describe non-liquid waste materials arising from domestic, trade, commercial, agricultural, industrial activities and from public services. Waste management is a global environmental issue which concerns about a very significant problem in today's world (ERSI, 2001).But, according to Ibrahim (2002) solid wastes are categorized into three (3) type's base on the composition. These are: Biodegradable mainly composed of garbage trash; semi-biodegradable, this consists of rubbish; and non-biodegradable that comprises scraps and other carcasses.

Aibor and Olorunda (2006) generalized solid wastes into Domestic and Estate solid wastes. The domestic solid wastes are those generated directly from households. These include garbage, rubbish, ashes, house sweepings, other domestic bulky wastes, etc. While the estate solid wastes are those generated in larger quantities and are mostly from industrial establishments, hospital wastes, municipal wastes, agricultural wastes, site demolition and construction activities, etc.

Solid waste composition varies from one area to another according to income level, population, density and predominant activities (residential, commercial, industrial, etc.). Changes in solid waste composition occur seasonally as a result of seasonal changes in food consumption. Changes in lifestyle and increasing dependence on processed food and associated plastic packaging continuously alter the solid waste composition (Environmental Quality International, 2005).

Waste creation by mankind is inevitable as far as the manipulation of the environment continues. The worry by environmentalists is the quantity and toxic level posed by the wastes produced. Waste has always been created by mankind since the prehistoric

times(Udoessien,1998).

Municipal solid waste in Nigeria are composed mainly of paper, food scraps, vegetable matter, plastics, metals, textiles, rubber, and glass (Uba, 2008; Amusan, 2005 and Cointreau, 1982)

Household solid waste is one of the most difficult sources of solid waste to manage because of its diverse range of composite materials

- A substantial portion is made up of garbage, a term for the waste matter that arises from the preparation, and consumption of food and consists of waste food, vegetable peelings and other organic matter
- . Other components of household solid waste include plastics, paper, glass, textiles, cellophane, metals and some hazardous waste from household products such as paint, garden pesticides, pharmaceuticals, fluorescent tubes, personal care products, batteries containing heavy metals and discarded wood treated with dangerous substances[3] such as anti-fungal and anti-termite chemicals.

2. 3.1 Solid Waste disposal

Waste disposal refers to getting rid of trash or garbage. (Wikipedia, April 22, 2011) For the purpose of this work solid waste disposal refers to the collection and disposal of solid waste (rubbish) generated by members of the household. Six methods of disposal are specified. The methods are categorized as "collected" where the solid waste is either collected by authorized or self –appointed collectors; "Burnt by household" implies that the household burns the rubbish "Buried by household" inside the dwelling unit. Disposal at ''public dump" refers to the situation where the household disposes off solid waste at a locally designated place. When the household disposes off solid waste indiscriminately in the bush, along streets at abandoned or uncompleted building sites or river bouts, the method is termed "Dumped Elsewhere

According to Anomanyo (2004), waste disposal from households in AMA took different forms; He further added that since the formal systems of solid waste disposal could not cope with the ever-increasing volume of solid waste being generated in Accra, the public itself employs various means of waste disposal. Waste was thus disposed off indiscriminately especially in watercourses and drainage channels and also through burning.

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

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

Some of these unwholesome practices of solid waste identified during the early disposal practices still exist in cities, towns and villages today. Indiscriminate dumping on opened land and dumping in gutters particularly are clearly evident in towns and cities, while dumping in water especially people living in coastal towns is common place.

Burning of dumps is also common in peri-urban and rural communities in Ghana and in many other less developed countries. A study carried out in Ado-Akiti in Nigeria by Momoh and Oladebeye (2010) showed that, the methods of solid waste disposal include dumping of waste in gutters, drains, by roadside, unauthorized dumping sites and stream channels during raining season and burning of wastes on unapproved dumping sites during the dry season. This has gone to confirm that the practices of solid waste disposal in the 1950s still exist today and study area is not an exception. On the other hand, Momoh and Oladebeye's (2010), assessment of waste situation in Ado-Akiti in Nigeria is questionable as they did not further explain what brought about the indiscriminate dumping.

Benneh et al. (1993) observed that residential domestic waste forms the bulk of all sources of solid waste produced in urban areas. These household wastes are known to have high densities with high moisture content and the organic component of solid wastes, which properly accounts for about 70% to 90%, while tins, cans and paper are probably responsible for about 5% to 10% of the total waste produced. They further argued that because the capacity to handle all of the household waste generated is still weak, about 83% of the population dump refuse in either authorised or unauthorised sites in their neighbourhood which creates unsanitary conditions. They also argued that insufficient communal facilities can lead to open defecation along beaches, drains, and open spaces and the tendency for faecal materials to become intermixed with household refuse.

This view expressed by Benneh et al. (1993) is relevant to the study because Buipe Township is becoming densely populated and low-income community. The community is also not served with adequate sanitary facilities. These inadequacies lead to indiscriminate disposal of refuse into drains, gutters, and waterways, and to open defecation in these areas. Benneh et al. proposed the involvement of local groups in solid waste management side by side the operations of governmental agencies.

According to Stirrup (1965), the method of refuse disposal must be related to the nature of the community served, its financial capacity, the type of materials arsing, climatic conditions, the desirability of utilising materials in certain instances compared with the imperative need to utilise them in order to assist in the provision of vital raw materials. The effectiveness of the selected system will be determined in relation to the immediate disposal requirements and the need to cater to the conditions likely to arise from planned future developments in the

2.3.2 Solid Waste Management

Solid waste management is a polite term for garbage management. As long as humans have been living in settled communities solid waste or garbage has been an issue, and modern societies generate far more solid waste than early humans ever did. Therefore solid waste management is a system for handling all of this garbage; municipal waste collection is a solid waste management, as are recycling programs, dumps, and incinerators (Anku, 2000)

To the great benefit of archaeology, early solid waste management consisted of digging pits and throwing garbage into them (Annul, 2002). Waste management remained a major development issue mainly as a result of lack of understanding of the basic dynamic characteristics of waste generation, and appreciation of the origin of sanitation (Noye Nortey, 2007).

The notion of waste management has come to mean different things to different stakeholders with different environmental, economic and societal considerations given greater or lesser prominence. For example, for some it can simply mean the sustainable management of leachate and landfill gas is returned to the environment in environmentally accepted fashion (Bruce, 1998).

For others, such as Tammemagi (1999), it means protecting health and the environment; minimizing the burden of future generations has been critique for not fully addressing the

economic requirement of sustainability (Chung and Ho, 2003). Still others argue that interpretation of sustainable waste management systems should be expanded to include participation for all stakeholders (Petts, 2000; OECD, 2002), and in particular between localities (Furedy, 1990).

The Rio Declaration on sustainable development (UNCED, 1992) defined sustainable waste management as the application of the integrated life cycle management concept in waste management. This was later elaborated by the United Nations (2005) as: "Environmentally sound waste management must go beyond the mere safe disposal or recovery of wastes that are generated and seek to address the root cause of the problem by attempting to change unsustainable patterns of production and consumption"

In effect, the Declaration suggests an approach to waste management that incorporates environmental, social and economic perspective into environmental policy, planning and practice. However, it is only recently that waste management policies, plans and programmes have begun to consider all of these different stands of sustainability. As Nilson-Djerf and McDonald (2000) argue for a waste management system to be sustainable, it needs to be environmentally effective, economically affordable and socially acceptable. The most common method of waste disposal in most developing countries is some form of land filling (WHO, 1973).

The current environmental sanitation status of Ghana leaves much to be desired. Less than 40% of urban residents are served by a solid waste collection service, less than 30% have acceptable household toilet facility (Boadi et al., 2004), and only about 10% of solid wastes generated are properly disposed (Menah et al.,2005), with Rural dwellers less well served (Boadi et al.,2004). Landfills in Ghana are primarily open dumps without leachate or gas recovery systems, several are located at ecological or hydro logically sensitive areas, and are generally operated below the recommended standards of sanitary practice. Open refuse dumps are most commonly located at the perimeter of major urban centres in open lots, wetland areas, or next to surface water sources.

Emerging literature on solid waste management suggest that involvement of professional collector teams, resident committee workers, private institutions can prove effective in solid waste management rather than involving only public institutions. Some literature argues that involvement of resident community and individuals brings about understanding of garbage

management which has been a major source of failure (Olley and Olbina, 1999; Coker and Sikiru,1999;Osucha, 1999).

If people know or are informed about the nature of improvement in environmental quality, that is, solid waste, the envisaged welfare improvement elicits people's .(Hartwick et al 1998).

Households consider solid waste services as normal economic good that can alter household welfare. But this presupposes the need to understand the existence of a problem and appreciate the risks they pose before households can make a trade off decision with regard to Willingness to pay (Atlaf et al 1996).

Public cleaning of streets and open area is critically important in areas where waste is indiscriminately dumped along roadsides and those inefficient collection techniques may exacerbate this problem (Ohnesorgen 1993). Use of uncovered trucks spills some of their loads back onto streets and roads thereby complicating the garbage collection Waste collection in developing countries maintained that in such countries the cost per metric ton of cleaning waste off the streets is estimated to be between two and three times the cost of collection. He therefore recommended that covered trucks or other more costly collection equipment that reduce spillage would probably be more efficient (Cointreau-Levine 1994).

The rural folks expect the municipal cleaning and collection service hence their Willingness to Pay is not only low but also negative at times. However, in a study on Willingness To Pay for community based solid management and its sustainability in Bangladesh, Salequzzaman and co-authors (2000) maintain that where a community perceives that new facilities provide a service higher than the existing management they are more willing to pay higher contribution. This, according to them, is particularly the case, if the users are not satisfied with the current service they are receiving. However, this argument has one major setback because it assumes households have perfect information about the envisaged alternative sanitation methods for them to be compelled to make higher payments. However, this does not apply to our rural folks, who may not understand the environmental implication leave alone alternative sanitation.

The environment is considered to be normal with income elasticity of 0.13 using the contingent valuation of the environmental impact of Solid Waste Management in San Pedro Cholula-Mexico (Viniegra et al, 2001). They also found a negative association between age

and the Willingness to pay for quality change of the environment citing the lack of generation altruism among households.

While investigating management of solid waste in Addis Ababa, (Beyene, 1999) found that environmental health does not depend on rising public awareness and on the creation of mechanism of controlling generation of waste at the source. Also, sharing of responsibilities between the public, institutions, private sector, non- governmental organizations and the government. The above argument is internally consistent with Snel (1999) who argued that if responsibilities are shared social stigma on waste disposal could be mitigated.

In developing countries, the least costly options of waste dumping in public spaces or burning it openly –are often the most popular (Bartone and Bertntein, 1993). They argue that although inexpensive in terms of out-of-pocket costs and environment effects to those that dump or burn waste, these acts may impose large costs on society. Aesthetic, environmental and health problems may result, especially in densely populated urban areas

2.4 Waste Disposal and Management Techniques

The National Environmental Sanitation Policy Coordinating Council (NESPOCC) has been put in place since January 2000 to expedite the implementation of National Sanitation policy. The national laws specifically the criminal code (Act 29) 1960 and revised bye-laws of all Metropolitan Municipal and District Assemblies (MMDAs) have enough laws to support the Environmental sanitation service delivery and enforce the compliance of sanitation rules. All Metropolitan Municipal District Assemblies (MMDA's) have developed waste management and environmental health plans to help solve the numerous sanitation problems.(AMA 1995, Five Year Medium Development Plan, 1996-2000).

General waste management in Ghana is the responsibility of the Ministry of Local Government and Rural Development which supervises the decentralized metropolitan, Municipal and District Assemblies (MMDA's) However regulatory authority is vested in the Environmental Protection Agency under the auspices of Ministry of Environment Science and Technology (Accra Metropolitan Assembly 1995, Five Year Medium Term Development plan (1996-2000).

The (Environmental Sanitation Project, ESP1995) indicates the waste collection ratio in five main cities is below the desirable level: Accra 67 Percent, Kumasi 45 percent, Tema 57

percent, Sekondi- Takoradi 42 percent and Tamale 13 percent. Marry F. B (1999) stated that, "dry refuse should be put in dustbins and the dustbin should have a heavy well fitting lid. According to GLSS 3 (1995) dumping either at official collection point or at unofficial sites is the predominant mode of garbage disposal in the country as a whole. However, how solid waste reaches the landfill site leaves much to be desired, as according to (Johan 1995) two third of waste generated in residential areas Ghana does not reach the landfill.

Several waste management projects and other related programmes have been implemented and some still being implemented in the country, for example, the government of Ghana with the support of World Bank implemented different phases of Urban Development Projects. That is Urban I, II, III) in 1990s, and the Urban Environmental Sanitation Project (UESP) 1996-2000 in Accra, Kumasi, Tamale, Takoradi and Tema including construction of sanitary infrastructure such as night soil treatment plant and private toilets. DFID also supported the Accra Waste management project designed to address waste water night soil treatment option in the city. The installed capacity of the plant was 11,010kg per day equivalent to 222,020kg COD (biological organic load) per day (Accra Metropolitan Assembly 1995, Five Year Medium Term Development plan (1996-2000)

According to Anku S (2000), for most industrialized nations today, solid waste management is a multibillion dollar business which is also crucial to survival. Garbage collection agencies remove tons of garbage yearly and sort it for recycling or ultimate disposal. Most cities require citizens to pay for waste collection, while rural areas have dumps and recycling facilities for citizens to bring their garbage to. The end goal is a reduction of the amount of garbage clogging the streets and polluting the environment, whether that garbage is disposed of or recycled into something useful.

2.4.1 Access to Sanitation Facilities

Under the Urban Environment Sanitation Programs (UESP) that is urban IV, the heads and the other officers of Metropolitan Municipal and District Assemblies (MMDA's) had training in waste management in the Netherlands and Denmark. The duration ranged from two (2) weeks to three (3) months. Under the Accra Waste Project, DFID assisted the country with septic containers and constructed access roads and culvert at the proposed Kwabenya sanitary land fill. (AMA 1995, Five Year Medium Term Development Plan 1996-2000).

The majority of solid waste is collected into bins ranging in size from household trash cans to industrial dumpsters which are filled by individuals or companies. Solid waste collection trucks roam the streets on regular schedules to collect these bins. Garbage is also collected by streets weeping agencies, volunteer cleanup organizations, and through consumers who bring their waste directly to the solid waste management company. Once solid waste is collected, it is routed to a recycling facility that can handle toxic waste, composting centre, or disposed off. Many solid waste management companies maintain large dumps for this purpose, while others incinerate their garbage, using the energy generated by the incinerator to run a recycling plant or feed power back into the electrical grid. (Anku, 2000).

Having the water closet (W.C) in house is not common; given the low availability of piped water in houses .Access to flush toilet and its hygienic use is strongly influenced by the continuous supply of piped water into the facility. The proportion of households with flush toilet in house is below 3.0 percent in the northern region, and varies from 1.3 percent in Buipe Township to 3.7 percent in the whole Central Gonja District (Central Gonja district Assembly Waste Management Department).

About a tenth (9.1%) of households in the northern region uses a toilet facility in another house. This practice is most common in Tamale (23.5%) and least in Damango (0.5%) and Salaga (0.6%). The practice of using toilet facility in another house is likely to put pressure on these facilities since they are already inadequate for the households within the dwelling units. Pressure on available toilet facilities in the house is even greater when account is taken of the fact that these toilet facilities, in most cases, have to be shared with other households in the same house. About a tenth (10.1%) of households in the region use public toilet facilities.(15.1%) of households using a public facility, with the lowest (0.5%) in Buipe.(Central Gonja District Assembly, Waste Management Department 2009).

There are households which have no toilet facilities of any kind available for the use. The household members use the bush or the field or small receptacles that are disposed off indiscriminately in drains, open gutters or in the bush. The picture with regard to toilet facilities is far from satisfactory. Whereas for the country, 20.2 percent have access to no specific facility by contrast, 69.1 percent of households in the region have no facility. The lowest proportion of households with no toilet facilities is 63.8 percent in Tamale while the highest is 82.8 percent in Buipe. (Tamale Metropolitan Assembly, Waste Management Department, 2009).

The above situation of limited access to solid waste manageent and toilet facilities appears applicable to Buipe. In spite of the relentless efforts made by the WMA to manage the solid waste generated by the inhabitants it is quite worrying to realize that the people still dispose of their waste any where they deem convenient. And these certain have implications for the environment.

According to Anku, (2000). There are many methods of refuse disposal techniques which are teamed up under: - four main groups namely; burial method, burning method, recycling method, controlled tipping method.

Burial Method: Under this method, refuse is literarily buried, unwanted materials like broken bottles, potsherds or sanitary landfill composting is also associated with burying. This method has impact seriously on the health of man himself. For instance, nobody would like to have refuse-burial site within his vicinity because of the harmful effect they generate. After the burial of organic matter, there may be leachate that often pollutes the aquifers, wells and boreholes.

2. 5 Problems of Waste Management

In Ghana, Boadi and Kuitunen (2004) pointed out some of the problems affecting solid waste management. These include: weak institutional capacity and lack of resources; both human and capital. They also indicated that, home collection of waste is limited to high and, some middle income areas while the poor are left to contend with the problem on their own. This leads to indiscriminate disposal of waste in surface drains, canals and streams, creating unsanitary and unsightly environments in many parts of the city. Furthermore, MLGRD (2004) summarises the challenges of solid waste management in Ghana as follows: poor planning for waste management programmes; inadequate equipment and operational funds to support waste management activities; inadequate sites and facilities for waste management operations; inadequate skills and capacity of waste management staff; and negative attitudes of the general public towards the environment in general.

It can therefore be said that the main challenges facing solid waste management in developing countries and for that matter Ghana include: inadequate funds to support waste management, inadequate equipment to support waste storage, collection and disposal, low

collection coverage and irregular collection services, crude open dumping and burning without air and water pollution control.

2. 6 Effects of Indiscriminate Solid Waste Disposal on Households

The rapid and powerful force of urbanization and its accompanying effects of population growth, industrialization and commercialization in the city of Accra, waste generated has increased tremendously, while permanent ways of disposing off keep eluding the authorities concerned. For instance, the city generated 541 tons of waste per day in 1996 and 838 tons of waste per day in 1999. This has increased to1, 200 per day as at February,2000.(Accra Metropolitan Assembly Waste Management Department).

A significant number of urban poor in Bangladesh rely on the collection of secondary materials for their primary source of income. The waste pickers (scavengers) sort through waste at site, usually open dumps, and sell anything that can be recycled to agents of industries. The waste pickers have no special protection for sorting through wastes and are in danger of becoming seriously injured or sick. Though large scale recycling occurs for both medical and non-medical wastes, waste pickers are in constant danger of becoming contaminated and injured (Akter et al., 1999).

According to Benneh et al (1993), a high incidence of non-storage and storage of waste in open containers increases the risk of attracting diseases causing pest and infestation. Given the widespread inadequacies in waste management, it is not surprising that waste accumulation is a problem to neighbourhoods.

In 1992, the UN conference on Environment and Development referred to as the Earth Summit in Rio de Janeiro gave a clear message to the world ''without better environment stewardship, development would be undermined and without accelerated development in poor countries, environmental policies will fail'' (UN1992 as seen in Acquah 1997 p .2). Solid waste is probably the most visible form of pollution. People throw billions of tones of solid materials each year (World Bank volume 2 1997).

Waste attracts scavenging, animals and bats. As it ferments it gives off foul odours flavours fly feeding and contaminates both water and air. Piles of refuse or landfill during its decomposition process generates several gases, the most important among which are methane

(CH4) nitrogen (N2) and occasionally hydrogen sulphide (H2S) if burnt, carbon di-oxide (Co_2) is released. CH4 and CO2 are greenhouse gases and have potential greenhouse effects. The soil underlying these wastes is typically contaminated by pathogenic micro-carbons. These wastes also cause public nuisance by clogging sewers and open drains encroaching on roadways diminishing landscape aesthetics and giving off unpleasant odours and dust (World Bank 1991).

According Akter et al. (1999) a variety of methods were used by the medical facilities to dispose off waste. These include; burning, burial, selling, dumping, reuse and removal by municipal bins. There are several modes of waste transport. Waste was primarily carried by buckets as mentioned by some respondents (44.38%) and plastic bowl (23.89%). The medical waste was disposed in several places: Corporation's dustbin: pits near hospitals (dig a hole); open field/ road way/by the road side Canal water/ river/ lakes/ ditch; Own net house/ closed house/ own closed dustbin. Notably, most wastes were disposed off in Municipal dustbins (59%) without any treatment or separation (Akter et. al, 1999).

Accumulated refuse creates hazards as well as being offensive in aesthetic sense. It also creates the opportunity for mosquitoes to breed in tins, cans and discarded receptacles that are filled with rain water or shelters in insect's larvae and pupa until maturity. Ashes and street dust are easily lifted by wind and when they blow about, may irritate eyes, nose and throat" Gordon M. Farr (1956).In rural areas and small towns, there are often no vehicles for collection of waste, hence uncontrolled dumping occurs within the built up areas with all its attendant health hazards and negative environmental impact (Menah et al., 2005).

The resultant poor sanitation has serious health impacts as more than half of reported diseases are related to poor environmental sanitation (WHO, 2000). It is widely noted that the contribution and benefits of the environment to other determinants of health are not well understood by policy makers and planners. This is reflected in the low level of resources allocated for the maintenance of an enabling environment to support life and health (WHO, 2002). Waste, when not properly managed will directly or indirectly negatively affect the environment and health. The diseases that burden communities' particularly those from deprived rural and urban communities in Africa are mainly due to environmental conditions that can be avoided. In Africa, water-related diseases such as malaria, schistosomiasis and river blindness are some of the causes of high morbidity which impact negatively on the economy and the health sector. Infectious diseases linked to poor environmental conditions

kill one out of every five children in Africa, with diarrhoea and acute respiratory infections being the two major killers WHO, 1998). Other water and sanitation related diseases include guinea worm, trachoma, cholera, hepatitis A, bilharzias, typhoid, malaria, polio, hookworm, and tapeworm (Boadi et al., 2005).

Waste when indiscriminately dumped and allowed to accumulated will not only favour the spread of diseases, but also look unsightly and produces a lot of stench. It can harbour and encourage the breeding of rodents and disease causing organisms, causes pollution of both land and water, and lowers the image of the community. Certain factor such inadequate sanitary facilities, behavioural pattern of community members, socio-economic power of the community, political negligence etc, have been found to contribute to uncontrolled waste disposal.

The major influences on morbidity and mortality are social and environmental factors. Social advances in general living conditions, such as improved sanitation and nutrition, have been responsible for most of the reduction in mortality achieved during the last century. The contribution of medicine to reduced mortality has been minor, when compared with the major impacts of improved environmental conditions. (Naidoo J & Wills J, 2000) Despite continuous attempts to improve sanitation, 40 % of the world's population is still without basic sanitation. Poor waste disposal practices are responsible for a significant proportion of the world's infectious disease burden. (WHO, 2006-05-17) if a society is going to work; it ultimately requires that its people's health is good. The infrastructure and the environment are important determinants for health and are often the focus of public health work.

Due to the strong link between low socioeconomic standard and poor health, poor countries have to get access to the basic conditions needed for healthier population- pure water, organised waste management and working sewer system etc, to be able to avoid epidemics (Werkö L, 2003).

There are five basic conditions to consider in the preventive work to minimize the disease burden:

- Good housing (ventilation, light, construction and environment).
- Clean and safe drinkable water.
- Good control of pests like mosquitoes flies and rats.
- Good control of wastes like sewage and garbage.

- Good food (a balanced and nutritious diet). Interview with former HPD, 2006

All these things are linked together; if the waste management is improved it will have an effect on all the other conditions:

- A good environment – due to reduce in littering.
- Drinkable water – as it is often polluted due to a poor waste management.
- Control of pests – as they thrive in garbage.
- Good food – as the food will not be infected by flies to the same extent (Harpham and Tanner 1995). Examples of diseases and health problems caused by poor sanitation are cholera epidemics, outbreaks of bubonic and pneumonic plague, diarrhoea, typhoid, typhus and dysentery.

Infestation by disease-ridden carriers such as insects and vermin is another problem e.g. the water that collects in urban detritus, such as polythene bags, nurture mosquitoes, which spread malaria, yellow fever and dengue fever. Rats thrive on the mountains of waste and are principal carriers of bubonic and pneumonic plague (Khan , 1997).

Accidents due to poorly disposed wastes, like surgical needles, glass materials etc. is also a health hazard. Improper disposal of solid waste has serious results for the environment and human health. Problems can spread over a wide area. For example disposal of wastes into nallahs, canals and rivers can pollute the water supply along the whole length of the watercourse. Infections and diseases can spread from dump sites into the general population.(Draft Environmental Assessment Report, Stockholm,1993) Skin and eye infections are common; dust in the air at dumpsites can cause breathing problems in children and adults; Flies breed on uncovered piles of rotting garbage and spread diseases like diarrhoea, dysentery, typhoid, hepatitis, and cholera. Mosquitoes transmit many types of diseases like malaria and yellow fever; dogs, cats and rats living around refuse carry a variety of diseases including plague and flea born fever and intestinal, parasitic and skin diseases are found in workers engaged in collecting refuse.

The most serious problem is groundwater contamination. As water filters through any material, chemicals in the material may dissolve in the water, a process called leaching. The resulting mixture is called leachate. As water percolates through sold waste, it makes a leachate that consists of decomposing organic matter combined with iron, mercury, lead, zinc, and other metals from rusting cans, discarded batteries and appliances. It may also contain paints, pesticides, cleaning fluids, newspaper inks, and other chemicals.

Contaminated water can have a serious impact on all living creatures, including humans, in an ecosystem.

When waste is burnt heavy metals like lead, toxic gases and smoke spreads over residential areas. The wind also carries waste, dust and gases caused by decomposition. Putrefaction of waste in sunlight during daytime results in bad smells and reduced visibility.

2.7 Solid Waste Management in Ghana

Over the years, solid waste disposal in Ghana has become a major challenge to MMDAs. As a result of urbanisation and increasing densities, Metropolitan Assemblies find it difficult to deal with the large quantities of solid waste generated. This is due to the fact that, people resort to indiscriminate dumping as the only means to managing their domestic solid waste thus resulting in littering and heaping of waste. This section of the review analyses solid waste management processes in Ghana with AMA and KMA as a case. These include collection and disposal as well as waste management regulation and policy in Ghana. The next sub-section discusses solid generation in AMA and KMA.

2. 7 1 Solid Waste Generation

According to Mensah and Larbi (2005) based on an estimated population of 22 million and an average daily waste generation per capita of 0.45 kg, Ghana generates annually about 3.0 million tonnes of solid waste. Boateng and Nkrumah (2006) have further added that, solid 22 waste generated daily in Accra was between 1500-1800 tonnes. According to Anomanyo (2004) about 1800 tonnes of municipal solid wastes were generated per day in the Accra Metropolis and the average waste generated per capita per day was estimated at 0.5 tonnes. He attributed this to the rate of population growth in the Metropolis which stood at 3.5 per cent. Waste from domestic sources include, food waste, garden waste, sweepings, ash, packaging materials, textiles and electric and electronic waste with organic waste being the major component. This constituted about 65 per cent. According to him, the high proportion of food and plant waste was due to the fact that Ghana's economy largely depended on agricultural products for export and domestic consumption. But the waste rate of AMA was about 2000 tonnes a day with per capita waste generation of 0.45kg (AMA, 2009). Also, according to KMA (2009), the current domestic waste generation in Kumasi rate was approximately between 1000-1500 tonnes a day. This was based on the projected population of 1,610,867. According to Ketibuah et al (2010), in Kumasi the bulk of household waste is

found to be organic waste which includes food waste and pustrecible waste with an average of 55 per cent. Having discussed the quantities and composition of waste generated in the two Metropolises, this leads the discussion on solid waste collection in the next sub-section.

2. 7 2 Solid Waste Collection

According to Tsiboe and Marbel (2004), there are basically three methods of household waste collection in Accra:

- Waste Management Department (WMD) curbside collection by trucks directly outside each house. According to them, this collection method was provided weekly in the high-income residential areas like Roman Ridge, Airport and Cantonment by compactor trucks.
- WMD collected from communal containers to which people must bring their own waste. These were restricted to low-income areas like Niima and amounted to some 200 communal containers. Households that could not afford the house to house collection service took their waste to any of these 200 communal containers and from which the WMD collected the waste and disposed of it at the landfill site (Stephens et al 1994: 25) cited in Tsiboe and Marbell (2004) and
- Door-to-door collection services in middle-income areas like Labadi.

According to Anomanyo (2004), for the purpose of effective waste collection, the city was demarcated into waste collection districts where a company was contracted by AMA to collect waste in one district or two. Fifteen (15) waste collection companies were contracted. These include: Liberty Waste Service Company, Vicma Waste Construction, Ako Waste Management Limited, Gee Waste Limited and Daben Cleansing Construction Services Limited. The main types of vehicles used by AMA were compaction and skip trucks. The wastes were taken by road directly to the disposal sites. There were no waste transfer stations.

According to him, solid waste collection in the city was carried out both on franchise and contract basis. On the franchise basis, a house-to-house collection was done in high income areas and the contractors charged the households some fees with weekly collection frequency. These areas were well-planned residential areas with access roads described as first and second class areas and include areas as Airport residential area and Cantonments. Each household had plastic containers with covers. These contractors then paid a tipping fee to the AMA for the use of its dump site. The user fees charged form about 20 per cent of

general service to the beneficiaries whose wastes were collected. On contract bases, waste contractors were paid by AMA to perform both block and communal container collection. Block collection occurred in middle-income residential areas including Dansoman, Adabraka, Kaneshie and other parts of Accra. Approximately 75 per cent of the waste generated was collected in these areas. Central communal skip collection occurred in low income high population density and deprived residential areas such as James Town, Nima and other parts of Accra where houses were not well planned with poor or even no access roads (third class areas). Market places were also covered under this arrangement. Residents deposited their waste in such communal containers and the frequency of collection was at least once daily. Waste generators here did not pay user charges. He added that despite the strategies put in place for the collection of waste in Accra, maximum waste collection was not achieved. Between 65 and 75 per cent of waste was collected per day.

According to KMA (2006), there are two modes of waste collection in the Kumasi Metropolis. These are house-to-house and communal collection. According to Metropolitan Assembly, Aryetey Brother Company Limited (ABC), Waste Group Ghana Limited (WGG), Sak-M Company Limited (SAK-Mo Meskworld Limited (ML) and Kumasi Waste Management Limited (KWML) were contracted for solid waste collection. About 33 per cent of the population enjoys this service but payment for the service was irregular. It is on franchise basis for a monthly fee of GH¢1 to GH¢3 per house. Additionally, the communal collection was awarded to Kumasi Waste Management Limited (KWML), Waste Group Ghana Limited (WGG), Meskword (ML) and Aryetey Brother Company Limited (ABC). The total quantities collected were weighed at the disposal site and payment was based on a rate of GH¢ 9 per tonne.

From the above assessment, it can be deduced that there are basically, two main modes of waste collection in AMA and KMA. These are door-to-door or house-to-house collection and communal collection which are carried out in the high class and low class residential areas respectively. Unlike the door-to- door collection which attracts some fee from households, the communal collection is carried out at no cost to the households in AMA. In the case of KMA waste collection is charged per house. However, the door-to-door collection may not favour the poor or low income areas and therefore there is the likelihood of poor waste collection services in these areas. Additionally, attention on collecting solid waste in these areas will be less. So there is the tendency for residents to dump waste any how because of poor collection service.

However, to use income as measure to stratify residential areas in a city like Accra may be misleading. This is because those living in the supposedly low income residential areas may be well to do than those residing in the high income areas as indicated by Stephen et al (1994) and accepted by Tsiboe and Marbell (2004). This means that Tsiboe and Marbell did not critically examine the text before accepting it. Instead, the class of buildings, willingness and ability of the people to pay for the collection service should have been considered.

2. 8 Solid waste Status in Buipe.

Buipe is the capital of central Gonja with a population estimated to be 19,962 people. The town is riddled with numerous problems associated with solid waste management. Waste management is the sole responsibility of the central Gonja district Assembly through the Sanitation health Department. Waste management constitutes garbage collection and disposal from households, market areas, industries, and city centre. Efforts to manage garbage in the city are continuously overwhelmed and frustrated with the ever-increasing population of city residents and levels of economic activity. As result ineptitudeness and low service coverage characterize the District Assembly. Often times the service are not on schedule and only provides them in crucial areas such as market places, residential areas, as well as politically sensitive areas (JICA 1998). However, in the mid 2007, the District Assembly collected only over 30% of the waste generated in the district.

The solid waste services in the district are mainly divided into subsystems- primary and secondary systems. The District Assembly mainly concentrates on the latter, that is, the secondary system where it only engages in transportation and disposal of solid waste to the final dumping site – an open space in the outskirts of the town (Buipe). The primary system, which is normally at source- households, industries and institutions, are often neglected despite the District Assembly levying property and utilities. The Assembly has placed limited garbage pits and containers that are emptied approximately once a week. Eventually heaps of garbage piles up around the residential areas.

Dumping of refuse in open space in Buipe Bridge

CHAPTER THREE

3. 0 RESEARCH METHODOLOGY

3.1Research Approach

The main method of data collection was basically qualitative in nature and to achieve the purpose of the study, the following methods have been employed; interviewing, focus group discussion and review of secondary literature. According to Strauss and Corbin (1990), qualitative research is a type of research whose findings are neither arrived at by means of statistical procedures nor quantitative means.

According to Nachmias and Nachmias (1996:28), qualitative approaches facilitates our understanding of behaviour through knowing the persons involved and their rituals, beliefs, values, and emotions. Qualitative approach is necessary in this study because it allows the researcher to typically investigate solid waste management and its health effects on the people of Central Gonja district. Again, McMillan and Schumacher (1993), state that qualitative research presents facts in a narrative form with words and also concerned with understanding social phenomenon from the perspective of the participants.

Furthermore, the researcher had first hand information from the people involved including sanitary health inspectors, disease control officers, chiefs, assembly men, and teachers on their knowledge regarding solid waste management and its health effects in the district. The role they can play to improve solid waste management in the district. The use of multi-method strategies in gathering data is very necessary in qualitative research. For the purpose of this study, the methods employed in gathering data were; interactive methods and non-interactive methods.

A combination of these two approaches presents to the researcher an advantage of systematically observing, interviewing, and recording processes as they take place naturally. The appropriateness of these activities to the researcher emerges from the point as explained by Miles and Huberman (1994) that they are carried out in close proximity to the local setting for a sustained period of time.

3.2 Interviews

In the perspective of (Maykut and Morehouse 1994; 80), an interview refers to a discourse shaped and organized through the asking of questions and the supply of answers, through which the interviewer and the interviewee are able to talk about the study focus; and this brings out thoughts and perceptions. On the other hand, (Gillham 2000; 1) describes interview as a conversation that usually goes on between two people, the interviewer asks questions and seeks response from the interviewee.

Interviews can be conducted face-to-face, through the telephone, or other means, but according to Gillham (2000: 62), the overwhelming strength of face-to-face interview is its possibility of making the communication 'rich'. Interviews, according to Bogdan and Biklen (1992:96) are used to gather descriptive data in the subject's own words. Through this, the researcher is able to develop insights on how subjects interpret some piece of the world.

3.2.1 Semi-Structured Interviews

This method was chosen for a number of good reasons. According to Borg and Gall (1989; 452), semi-structured interview facilitates a more thorough understanding of the respondents' opinion and the reasons behind such opinions than what could be achieved if mailed questionnaire is used. Also, this method was good because it made it possible for the expression of opinions by the interviewees. Again Robson (1993;231) states that, when using semi-structured method, the interviewer has the advantage of being able to modify the order of questions based upon the context of the conversation, change the wording of the question, give explanations and can avoid particular questions that appear inappropriate with a particular interviewee.

Semi-structured interview was chosen by the researcher because it was able to provide in-depth, objective information that account for the lack of improved solid waste disposal. Though semi-structured interview was used, the interview guide was used to keep the interviewer and interviewee on focus

3.3 Focus Group Discussions

Focus group research can best be described as a loosely constructed discussion with a group of people brought together for the purpose of the study, guided by the research and addressed as a group. This approach was used to promote brainstorming and debate among the participants on key issues affecting poor solid waste management in the district. Again focus group discussions promoted the sharing and learning of new ideas among participants. The researcher was part of the group discussion and moderating the process as well to keep the discussion on track. A total of 5 focus groups made of 10 people each were engaged in the study (these are the health inspectors, health workers, assemblymen, and teachers of the five (5) selected communities.

3.4 Sampling

Under qualitative designs for example where unstructured or participant observation is employed, the subjects are often chosen by means of purpose or theoretical sampling (Sarandakos, 2005:224).

The researcher acknowledges that the problem under study may be prevailing in other districts in the Northern Region; however the study was limited to Buipe community of the Central Gonja District of the Northern Region because there is poor solid waste management couple with the health effects in the district (annual disease control report, 2008). Sampling was used for the study because the district has a large population size of 84,338 inhabitants (2000 population and housing census), therefore a focus on a small distinct group of participants (health inspectors, health workers, assembly men, and residents), will enable the researcher to get an in-depth understanding of the problem of lack of poor solid waste management in the district. Purposive sampling was considered the main sampling technique used in the study. It was also the expectation of the researcher that the selected participants will be information-rich, because they were knowledgeable in terms of the phenomenon being studied.

3.4.1 Purposive Sampling

The researcher selected and interviewed community stakeholders in sanitation such as health inspectors, health workers, assembly men, and residents Responses and contributions of these people can form a good basis for carrying out analysis and stating findings of study in the

district. There has been consensus by Gillham (2000); McMillan and Schumacher (1993:378); and Patton (1990:169) that purposive sampling involves selecting people with in-depth knowledge of the problem being studied, while keeping the number of interviews to a minimum for adequate representation. The people that will be selected for this study should have good ideas regarding the problem being studied. (McMillan and Schumacher, 1993; 378).

3.5 Sample Size

Sample size refers to the subset of the population drawn for the survey. Among the factors that influenced the choice of the sample size were the size of the population, cost of study, and the time frame of the study.

The Buipe Township has a total number of 917 households located in 5 communities sixty (60) households (twelve (12) households from each community) were sampled for the study; this number is to promote effective study taken into consideration the time and resource constrains. In each community 12 households were randomly selected from each community. The reason here is to ensure that all communities are proportionately represented since these communities posses almost equal number of households and for that matter all communities are given equal resources for their operations.

Again, it help in improving the quality of the study through blending communities that have previous knowledge on solid waste disposal techniques and communities that may not have such previous knowledge. Sixty (60) respondents were sampled purposively, 12 respondents each from the 5 communities and one respondent per a household and questionnaires administered on broad areas bordering on issues pertaining to household solid waste disposal practices.

The district also has a number of institutions or bodies serving as key stakeholders on solid waste management. These institutions include District Assembly, District Waste Management Department. District Disease Control Unit, Zoom lion and NGOs such as, World Vision (an international NGO), UNICEF, and others, all working to promote quality Sanitation delivery in the district

A total of five (5) people, made up of one representative each from District Assembly, District Waste Management, District Disease Control, the education desk officer of UNICEF, and the coordinator of zoom lion were selected and interviewed on issues relating to school community relations. Also five (5) focus group discussions made up of one (1) focus group from each community were organized as part of the data gathering process. (These memberships included community chiefs and assembly members of the school-communities)

3.6 The Study Communities

Tables - contain communities that were selected for the study.

Table 2: sub communities and number of households

Name of Sub community	Number of Households	Number of households Selected
Buipe Yipala	187	12
Wuranto	154	12
Old Buipe	169	12
Buipe Bridge	243	12
Burasea	123	12
TOTAL	917	60

Source: Extracted from CGDA Profile, 2010

3.7. Sex and Age Distribution of Respondents

To ensure that the study is gender sensitive there was a mixed sex participation in the interviews and the focus group discussions. Also 40 of the 60 respondents were females.

The sample size is geared towards women because they mostly dispose solid waste at the household level.

3.8 Management of Field Data / Data Analysis

Both descriptive and inferential tools and techniques were used to present and analyze the results. During the field work, data obtained from interviews, and focus group discussions were tape-recorded, and notes were also taken and after each field visit, reports were written based on the field notes and all the audio recordings were also transcribed in the exact words of the respondents. These were then classified into themes under solid waste disposal

practices and synthesized using descriptive narratives to reflect the collective views of stakeholders.

Data analysis was done by thoroughly examining the field notes of what was observed and the responses of every participant that was interviewed. In line with Maykut and Morehouse (1994: 135), the following data analysis steps were adopted for the study;

- Recording the interview conducted, making a reflection of the process, and carrying out further observations and writing notes, comments, as well as memos.
- Transcribing what has been recorded in the exact words. This was done immediately after the interviews of the day. All additional comments were placed in brackets.
- Reading through the data that has been transcribed and stating clearly in writing, the meaning of the transcribed data.
- Coding the data and identifying the code meanings in line with research question. The coding process involved reviewing transcripts and field notes, identifying themes that seem to be of potential theoretical significance within the social world of the school-communities being studied, as put by Bryman (2008:542), dividing the research into chunks or units and allocating the units to the themes.

For the quantitative data, the Statistical Package for Social Sciences (SPSS) was used as the main tool. Data from the questionnaires were codified by assigning numbers to answers before feeding them into the computer (spreadsheet) for SPSS analysis. The data was then presented using frequencies, percentages, charts and graphs for inferences to be drawn from the descriptive values.

3.9 Profile of the Study Area

The Central Gonja District is located at the South Western part of Tamale in the Northern Region of Ghana. It lies on Longitude 1°5 and 2°58' West and Latitude 8°32' and 10°2' North. It was carved out other West Gonja Districts in 2004. It is therefore one of the newly created Districts. Central Gonja District shares boundaries in the South with Kintampo North District of the Brong -Ahafo Region, West Gonja District in the West, and Tamale Metro in the North, East Gonja District in the East. The District stretches along the main Kumasi Tamale trunk road from Buipe through Yapei to Sankpala and then to Tamale (DHMT Central Gonja 2010).Unfortunately Buipe have serious solid waste management problems due the rapid population growth the community.

3.10 Physical Environment.

Currently, Buipe faces all the serious problems confronting all rapidly growing areas. Sanitation generally in the area is very poor. There are visible unsightly scenes of heaps of rubbish in containers, which are ever flowing. Livestock are often found feeding on some of the rubbish on or along the streets and other open places.

The area has a very poor drainage system. Drains, which are very essential in residential areas, are lacking in the area. The very well constructed ones along roads are in a deplorable state with most of them caving in. These drains are dirty and filled with rubbish, and some are running through compounds of houses.

Basically, there is a minimal provision of amenities such as adequate refuse dumping grounds, toilet facilities, and playing fields as well as recreational centres for the area. There is evidence of uncontrolled development. This and the lack of basic infrastructure have made the community substandard. In terms of residential stress, it is one of the worst affected areas in the northern region of Ghana. The houses are invariably of the closed compound courtyard type. On the whole, the general environment is quiet dismal, and it especially faces very severe problem of solid waste management.

3.11 Economic Background.

The main economic activity of the people is agriculture involving crop production and livestock farming. The land is extremely fertile for agriculture and farming is normally intensive. Some of the crops cultivated are maize, sorghum, millet, groundnut, cowpea, soya beans, yam, rice, as well as cassava.

Other economic activities undertaken in the district are small- scale agro-based industries such as Shea butter processing, rice milling, groundnut oil extraction and gari processing. Shea-butter processing is a major commercial activity for the women apart from retailing.

Fishing and livestock's are considered as supplementary activities to crop farming. Large scale fishing is carried on at Yapei and Buipe on the white and Black Volta lakes. The major animals produced or reared including cattle, sheep, goats, fowls, guinea fowls etc. the animals and birds are practically reared in every home, but large scale ranching in non-existence in the district

Very often, it is the income generated by the trading women that is used to support the income of their husbands and for that matter the up-keep of the family. Most of the women traders are able to earn more than their husbands who work as low-level peasant farmers and fishermen, and in most cases the financial support from the women in the family is higher than that of the men. Income levels in Buipe are generally low as majority of the residents have low formal educational backgrounds.

3.12 Ethnicity and Cultural Values

The Gonjas who are the indigenous population constitute about 80 per cent of the total population in district. Apart from district centre where there is ethnic diversity almost all people in the surrounding villages are Gonjas. Before the advent of both Christianity and Islam religions, the Gonjas as were mostly traditionalists. Their culture was deeply enshrined in their customs and beliefs. The result of this is still manifested in the numerous traditional festivals still practised. These practices are no longer pronounced in district centre as a result of the ethnic diversity and the influence of both Islam and Christianity.

On the religious front, the people in the community are mostly muslims since this was the first religion exposed to them by Arabs from the north. It is therefore not surprising that almost 90 per cent of ethnic Gonjas are muslims. On the other hand, Christianity arrived later from the south and hence mostly practised by non-Gonja ethnic groups. Until recently, festivals were largely enshrined in the customs of the Gonjas. However, this is changing as a result of the practice of Islam. Festivals are not much celebrated especially in the community as compared to the villages. The most important festivals are discussed below.

3.12.1 The Fire Festival:

This is to commemorate the occasion when the beloved son of a powerful chief got missing and the chief ordered his subjects to search for the boy. Torches were consequently lit in the night and the child was found. This marks the beginning of the fire festival as practiced today. On this day, a lot of grasses are lit in the night by people from all walks of life; children, women and men alike on almost all the streets and even in the metropolitan centre. By the break of day a lot of rubbish is produced and usually on all the main roads in the community. In short, a lot of waste is produced during this festival.

3.12.2 The Damba Festival:

This is to commemorate the birthday of the holy Prophet of Islam, Muhammed. Damba is celebrated after the fire festival. With this festival, a lot of solid waste is produced, especially plastic waste through the sale of food items.

3.13 Health

The health situation of majority of the people in the District capital can be described as generally poor. This is due mainly to the prevalence of diseases. That apart, the following factors contribute to the bad state of health of the people: Poor nutrition and poor housing conditions, Problem of environmental sanitation, inadequate health services and facilities. The health services provided in the district including medical care, antenatal and child welfare services. Other services are immunization, post-natal services, family planning services and guinea worm eradication programme and health education on prevalent health issues.

Table 3. Top ten diseases in the district

No	Disease	Number Of Reported Cases At OPD
1	Malaria	1765
2	Skin Diseases	543
3	Pneumonia	421
4	Diarrhoea	359
5	Typhoid	106
6	Malnutrition	91
7	Anaemia	48
8	Intestinal	33
9	UTRI	8
10	Guinea Worm	2

Sources District Health Management Team 2010 report

Top ten diseases in the district are Malaria, skin diseases, pneumonia, diarrhoea, typhoid, malnutrition, anaemia, intestinal worm's accidents, UTRI and guinea worm. HIV/AIDS cases are also on the increase in the district.

Family planning services in the district is provided by ministry of health institutions and some organizations in the district. Family planning services provided in the health institutions include health education on the need for family planning, methods available and also provision of needed services.

3.14 Household Characteristics

The fertility rate is about8 children per women is considered high in the district compared with the national average of 4 to 5 children per women in normal reproductive life. The average household size is about 8 which are also larger than the national average of 5 per household. As a result of polygamy and accommodation problems, some households have separate cooking and feeding arrangements. It is estimated that about 60% of the super structure of housing in the district are constructed with mud bricks and over 20% of these buildings are roofed with corrugated iron sheets. The rest are roofed with thatch. Currently, less than 5% of the settlements are connected to the national electricity grid. It is also estimated that over 95% of the population in the district rely on fuel wood energy for both domestic and commercial functions.

The poor housing situation is typically a direct reflection of the low-income levels of the people. The low-income levels are as a result of unemployment and low productivity

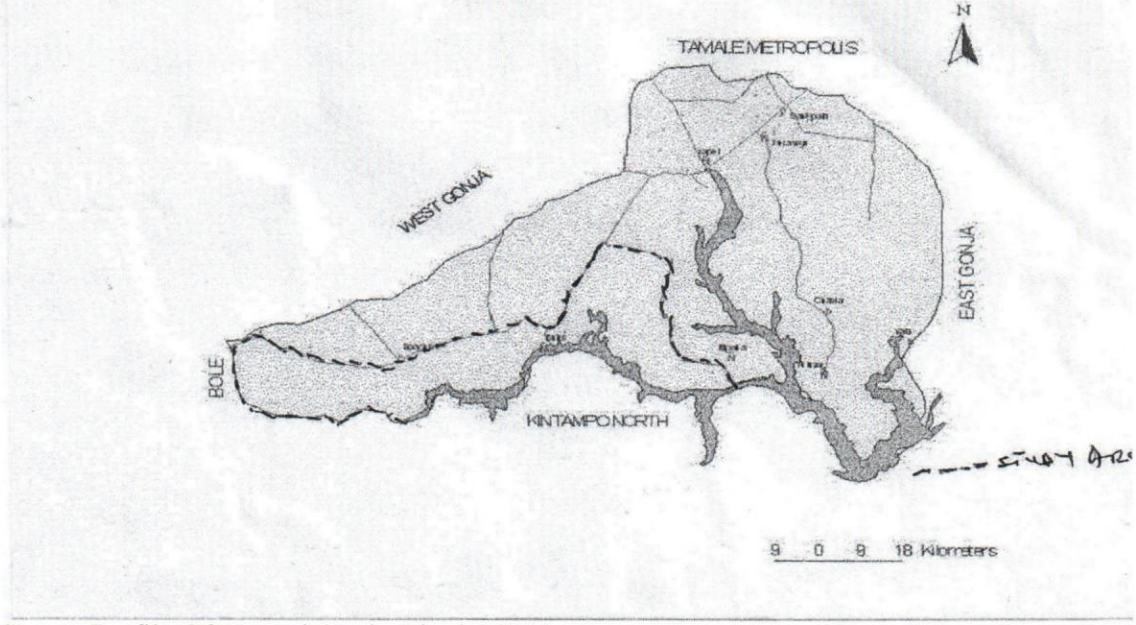
3.15 Environmental sanitation

The main environmental health and sanitation issues of the district could be grouped under the following headings; Poor environment sanitation due to indiscriminate liquid (defecation)and solid waste disposal, Inadequate food hygiene, Water sanitation Poor housing. and

Most of the communities and towns do not have refuse disposal facilities. There is uncontrolled dumping of house-hold refuse around and public places. During the dry season, strong winds normally blow these refuse around and in the rainy season the refuse is carried by water into rivers, dams and other sources of water supply, mosquitoes breeding are encouraged under this condition. Another environmental issue of great importance is that of excreta disposal, contamination of food, water and soil with human and animals waste poses a great health problem or hazard. Many communities do not have toilets of any kind and people practice indiscriminate defecation at any place of their choice.

Improper food hygiene is yet another major environmental issue in the district. The district currently cannot boast of a single slaughter house. Market places such as Buipe market and Mpaha are not provided with toilets. Accumulation of refuse in towns and other places lead to contamination of food items on sale at such places which sometime leads to food poisoning. Food vendors and chop-bar operators have not undergone any medical examination of any kind thus exposing those who rely on wayside prepared food too the risk of contracting.

Majority of the people rely no dug-out wells, rivers and dams for their water supply. Most of these sources of water are not constructed to sanitary standards. For instance, during the rainy season, storm water and run-offs from the surroundings diseases of the well and dams wash dirt into them thereby contaminating the water. These sources of water are not zoned; hence both animals and human beings drink from them. This obvious health hazards with regard to spread of water related diseases. None of the communities in the district can boast of pipe borne water, but there are a number of bore-holes that are being constructed by the government and some District Health Management Team 2010 report District Health Management Team 2010 report Non-government organizations. Some of these bore-holes unfortunately have dried up.Figure: 1 Map of Central Gonja Showing the Study area.



Source:Profile Of Central Gonja District 2010

CHAPTER FOUR

4.0 RESULTS DISCUSSION

4.1 SOCIO DEMOGRAPHIC CHARACTERISTICS

The socio demographic characteristics of respondents such as sex, age, level of education and occupation has a relationship with solid waste disposal and management. "Socio demographic characteristic of respondents are considered important because they contribute in one way or the other in shaping the behaviour of respondents in adopting an innovation". Dickson (1992).

Table 4.1 Sex Distribution of respondents

Sex Distribution	Frequency	Percentage
Female	40	67.0
Male	20	33.0
Total	60	100

Source: field survey March 2012

The above table indicates that out of the sixty (60) respondents interviewed, thirty three (33%) percent of the respondents were males and sixty-seven (67) percent of the respondents were females. The data gathered skewed towards women because they mostly do solid waste management at the household level.

From the observation, women were the majority which implies that waste management at the household level will not be a problematic, because women traditionally manage solid waste at the household level.

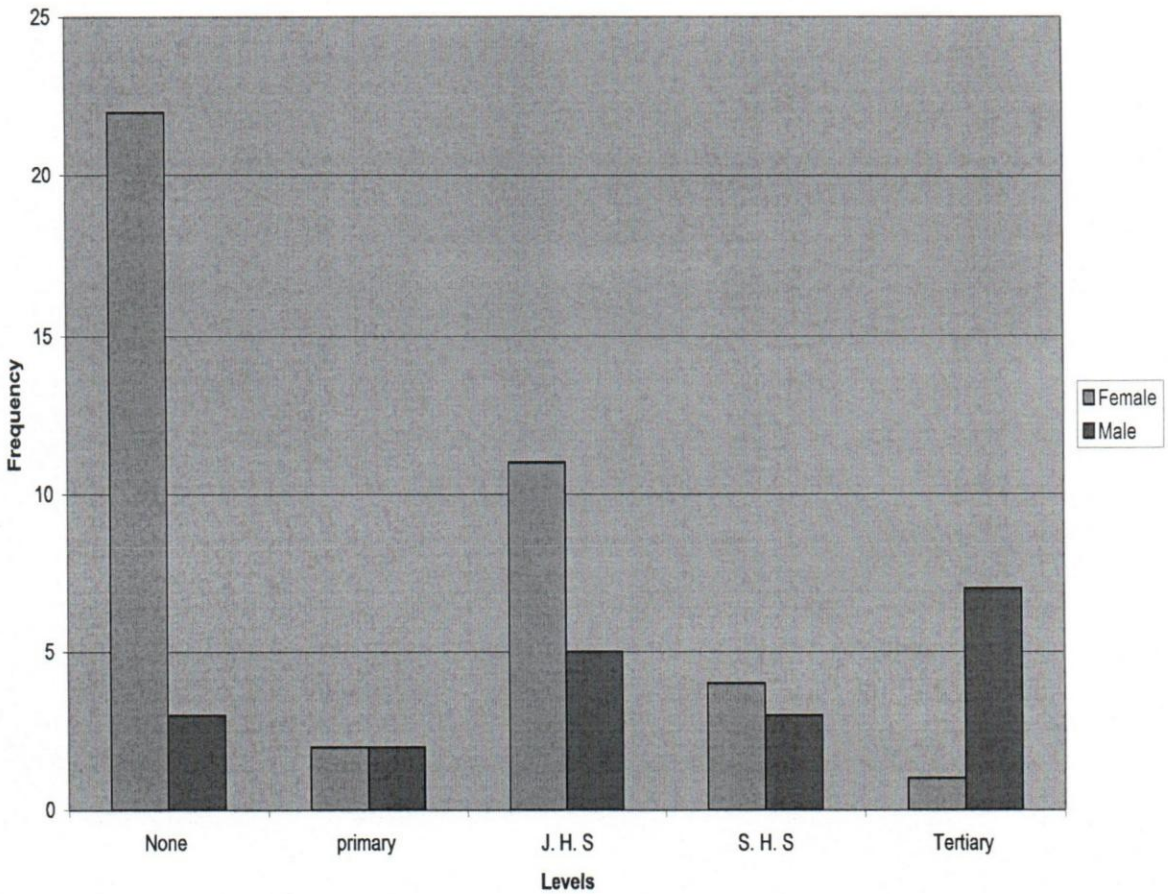


FIG 4.1 Educational Statuses of Respondents

Source: field survey March, 2012

From this analysis, the problem of solid waste management and people's attitude and perceptions in the study area can be linked to the levels of formal education. Improved teaching and learning of issues on sanitation in all levels of education could help improve the general sanitation in the communities.

This supports the suggestion of Agbola (1993) that perceptions and attitudes are learned response sets and can therefore be modified or changed through education. Hence, continuous public education of the people of Buipe may help improve the sanitation in the Area. Education of households on cleaning their surroundings was discussed. The causes of many nations' environmental problems could be found by the way the imbedded behavioural patterns and acquired values are superimposed on the environment. The imbedded

behavioural patterns are cultural in origin, derived from the socialising processes in families and communities (Agbola, 1993: 24).

The study showed that as high as about 74% of the respondents do not educate their households on the need to clean the surroundings while about 26% do. The implications of having more people who do not care to educate their household on making their surroundings clean could mean that the society will translate it into acceptable behaviour in relation to solid management, and especially the children will not develop the right perceptions and attitudes for sanitation at an early stage in life. This is likely to impact negatively on how the next generation would handle sanitation in general and solid waste in particular. Behavioural patterns as suggested by Agbola (1993) are derived from the socialisation process in the families and communities.

The perpetual creation of the awareness on the need for household heads and well informed members to educate their household on basic issues on sanitation may help curb the problem. Linked to the interest of the households, educating other members is the lesson that should be taught. The study revealed a high level of illiteracy in Buipe especially among females as indicated by figure 4.1 above which constitutes the sixty (60) households interviewed. Majority of the females did not have access to formal education. As it has been acclaimed, formal education 'holds the key to development. This phenomenon of high illiteracy among the community members would impede their understanding of government policies on waste management such as landfill levies, deposit refund system and pay by the bag system.

Table 4.2 Occupational Distribution of Respondents

Occupation	Frequency	Percentage
Farmer	12	20.0
Trader	15	25.0
Students	14	23.0
Seamstress	5	8.0
Hairdresser	2	3.0
Teacher	1	2.0
Food vendors	2	3.0
Businessman	1	2.0
Wielder	1	2.0
Health worker	1	2.0
Retired	2	3.0
Assembly man	1	2.0
Weaving	1	2.0
Shop keeper	2	3.0
Total	60	100

Source: field survey March, 2012

Occupation has high tendency of influencing the level and volumes of waste generation and its proper disposal. Occupations like trade and farming were observed, occupational distribution is an essential factor because it helps to determine the level of income of the people as against the background that funds must be raised to support the waste management efforts. For example funds may be needed to support waste management equipment. From my observation the people in the community did not pay any amount when they disposed of their refuse at the refuse dump site to generate high volumes of waste. High income occupation leads to increase expenditure thereby creating more waste. However, this high income can also enable sanitation department, companies and individuals of the household level to choose proper waste disposal method since they can pay for such waste collection services.

From my observation the people were traders, selling day and night in a small market within the community. It was also seen that proper waste disposal services were not available in the community. However, I observed that the door- to- door waste collection services had just

begun in some areas such as Buipe Bridge , District Assembly quarters etc in the township by Zoom lion Ghana Limited at a fee of GH¢ 7.00 per month. This service should and if extended to Buipe township will help reduce the waste problem at district. The table indicates that out of the sixty respondents interviewed 20% were farmers,25% were traders,20% were students,8%were seamstresses, hairdressers, food vendors, retired public servants and shop keepers were 3% each respectively, and teachers, businessmen, wielders, health workers, Assembly man, and a weaver were 2% each respectively. Farmers, traders and students were the majority of interviewed because there more accessible.

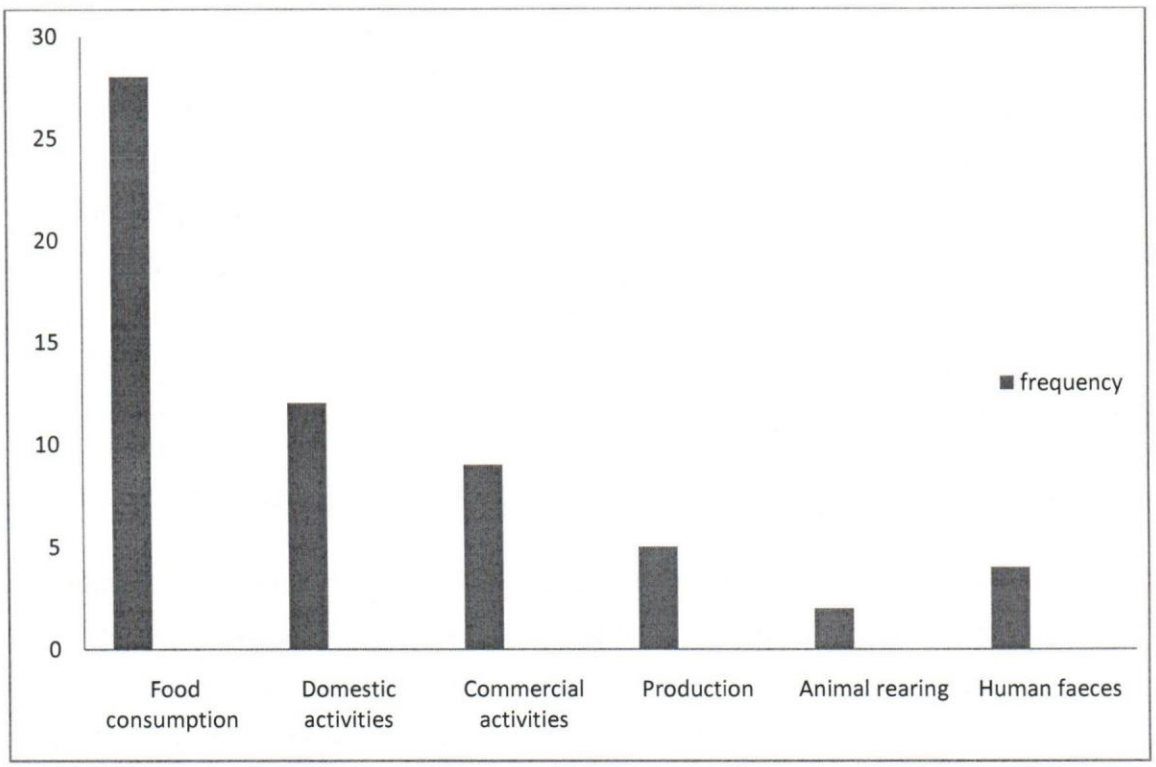


FIG. 4 .2 Source of Solid Waste Generation

Source: field survey March, 2012

Based on the questionnaires administered consumption of food products generated more solid waste relative to other activities which included, domestic activities, commercial, production and animal rearing. As Aibor and Olorunda (2006) categorised solid wastes into Domestic and Estate solid wastes. The domestic solid wastes are those generated directly from households. These include rubbish, ashes, house sweepings and other domestic bulky wastes, etc. While the estate solid wastes are those generated in larger quantities and are mostly from industrial establishments, hospital wastes, municipal wastes, agricultural wastes,

4.2 Effects of Solid Waste Disposal

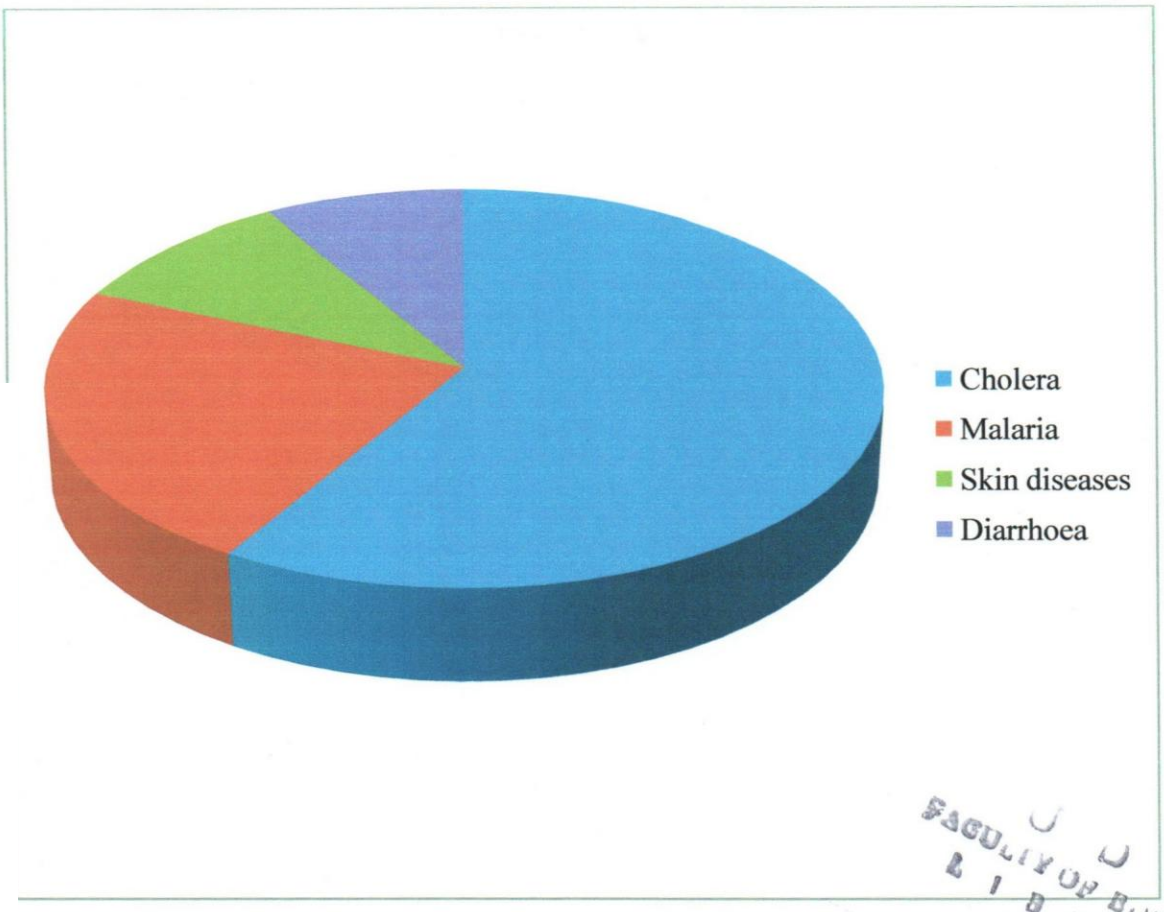


FIG 4.3 Perceived Diseases Associated with Solid Waste Disposal

Source: field survey March, 2012

The perceived diseases mentioned by respondents in the community included cholera with the highest percentage of sixty-two (62) followed by Malaria, skin diseases and diarrhoea with seventeen (17), twelve (12) percent and ten (10) percent respectively. These were the major diseases that affected the inhabitants of Buipe as mentioned by the respondents. However, they also indicated that the refuse container at the dumping site had not been lifted for a long time which produces bad odours, causing health hazards and a breeding ground for mosquitoes.

The assembly had only one vehicle serving the whole district. However the pressure on this vehicle often made it to break down resulting delays in emptying the containers in various communities in the district. The vehicle found it difficult to access the sanitary sites in Buipe Township whenever it rained. Based on the study, the respondents reported that the container at the dumping site had not been emptied for a long time which made them to dump their

refuse at a dug out pit near the cotton company in Bulpe and other places of their convenience. From observation, it was realized that it was impossible for the container to be there for such a long time, as there would have been signs of decomposition, unbearable stench and rusting of the container which the community members could not have withstood for all that while. It confirmed, Benneh et al (1993), studies that a high incidence of non-storage and storage of waste in open containers increases the risk of attracting diseases causing pest and infestation. Given the widespread inadequacies in waste management, it is not surprising that waste accumulation is a problem to neighbourhoods.

Table 4.4 Types of refuse containers

Type	Frequency	Percentage
Polythene	6	10.0
Box	4	7.0
Buckets	30	50.0
Dustbin	20	33.0
Total	60	100

Source: field survey March, 2012

With the exception of the dustbins, none of the containers had covers (personal observation). A substantial percentage of the garbage is put into polythene bags before kept in the storage containers. These waste handling methods are a likely contributory factor for poor sanitation in the area, because much of the refuse is littered about before reaching the sanitary sites. Generally, it was realised that a greater percentage of the respondents relied on old Buckets than other storage methods. This might be because it was cheaper and perhaps could store more waste but lack of any covers have serious health implications.

Most of the refuse is kept close to kitchens and rooms, which may cause diseases like cholera and typhoid fever. The District Assembly subsidising the prices of standard dustbins and offering education to residents on the need to store refuse in dustbins could help change this situation for the better. However, those who kept their refuse in polythene also had some implications on the environment as the polythene was often thrown with the rubbish which is non degradable.

Table 4.5 **Refuse Disposers**

Categories of Refuse Disposers	Frequency	Percentage
Male Children	2	3.0
Female Children	29	48.0
Adult Male	1	2.0
Adult Female	12	20.0
Anyone in the Family	16	27.0
Total	60	100

Source: field survey March, 2012

The table 4.5 portrays five categories of people who disposed of refuse in the household. Out of sixty (60) respondents interviewed, forty-eight 48 percent of the categories were femalechildren, three percent were male children, two (2) percent were male adult, twenty (20) percent were female adult and twenty-seven (27) percent was anyone in the family. However, the female children who cannot dispose refuse properly constituted the majority who disposed of waste at the household level. The inability of these children to properly dispose of solid waste has made a condition at the disposal site an eyesore and to spread solid waste in the community. This was partly due to the fact that the refuse collection facilities at the authorized dumping sites were too high for most children. Based on this, they ended up dumping the refuse on the ground and turning the disposal sites into heaps of garbage.

Table 4.6 Techniques of solid waste Disposal

Disposal Sites	Frequency	Percentages
Refuse dump	21	35.0
Bury	6	10.0
Burn	10	17.0
In surroundings	23	38.0
Total	60	100

Source: field survey March, 2012

According to GLSS 3 (1995) dumping either at official collection point or at unofficial sites is the predominant mode of garbage disposal in the country as a whole. The disposal of household solid waste is one of the functional elements in the management of waste. Figure 4.6 below illustrates the methods of disposal sites of solid waste by respondents in the Buipe community. From figure 4.6 above, the least methods of solid waste disposal was the burning and burial (27 per cent). This method was used in the whole community. These areas include: Buipe Yipala, Wurantu, Old Buipe, Buipe Bridge and Burasea. This is followed by storing waste in Refuse dump (35 per cent) mostly in the high class residential areas and some middle class residential areas in the community. These areas were: Volta river residential areas and the district assembly residential areas. The rest of respondents (38 per cent) resorted to dumping waste in either the roadside, dump, open spaces, nearby gutter or backyard. These methods of waste disposal also happened in the low class residential areas as mentioned above. This resulted in littering and heaping of waste thereby making the environment filthy. Therefore, the possibility of outbreak of cholera and other environmental related diseases is high if such practice continues.

Also, burning and uncontrolled open dump site presents a possible risk to public health and the environment. During burning and decomposition, methane and other gases are released into the environment. With this it is possible that many people will suffer from both respiratory and cardio-vascular diseases such as heart cancer.

Table 4.7 Frequency of Refuse Disposal

Number of Days	Frequency	Percentages
Daily	16	27.0
Every 3days	6	10.0
Weekly	34	57.0
Monthly	4	7.0
Total	60	100

Source: field survey March, 2012

From figure 4.7 above, 57 per cent of respondents indicated that, they dispose solid waste weekly and in some instances once a day as indicated by 27 per cent of the respondents. In

some monthly. Twice daily should have been the required number of times solid waste should be disposed of.

From the table above, it indicated that majority of the inhabitants do keep their refuse for more than a day without proper fitting lid which poses a possible health hazard to the people in the households. This is why Marry F. Bradley (1999) stated that dry refuse should be put in dustbins and the dustbins should have well fitting lids.

From observation, it was realized that the distance from the houses to the disposal site is far making it difficult for the disposers to dispose their refuse daily. Besides the poor attitude of the people towards proper waste disposal and management was another factor. Therefore they should be educated toward proper waste disposal and community management.

Table 4.8: Reasons for Individuals to Help Clean their Own Surroundings

Response	Frequency	Percentage
The residents are mostly affected by the bad	20	33.3
odour resulting from dirty surroundings	36	60.0
Dirty surroundings causes diseases	4	6.7
It will save the the assembly some money	0	0.0
others	60	100
total		

Source: Field Survey march 2012

Besides the above reasons given by the respondents that individuals should take responsibility for the cleanliness of their surroundings, there are others reasons. These reasons include the impressions of visitors to the area, destruction of the area's scenic beauty, and the choking of drainage channels that will lead to flooding and environmental pollutions.

The responses suggest the lower level of the respondents' knowledge concerning sanitation issues. More seminars and talk shows on sanitation could be organised by the government or organisations as a remedy. It was realised that there was some kind of relationship between the respondents' level of education and their perceptions about cleaning their own surroundings. A higher percent of those with relatively higher education thought it was appropriate for individuals to clean their own surroundings. This confirms the findings of

Pacey (1990) that formal education for women in particular is a prerequisite for change in sanitation behaviour.

4.4 Improper Solid Waste Disposal on the Health of the People

Dumping of refuse in open space in Buipe

From figure 4.4 above, plastic waste constitutes major portion of the waste dumped in the gutter and this can easily be blown by wind back to where it came from. This will further aggravate littering in the area. The dumping of waste in open spaces can easily cause flooding when it continues. This is because when the stream is choked with waste; it will block water from flowing thereby causing the over flowing of the stream banks. This can easily affect nearby houses in the area. Additionally, this may also cause malaria through stagnated water and possibly pollute a nearby water body that takes its source from this stream.

The above analyses show that waste disposal in low class residential areas was similar to those identified-in Ado-Akiti in Nigeria by Momoh and Oladebeye (2010) where waste was similarly dumped in gutters, drains, roadside and unauthorised dump sites. However, the

indiscriminate dumping of waste was shaped by lack of skips in the low class residential areas. Moreso, the indiscriminate dumping could be attributed to the negative attitudes of the people towards waste disposal. This is because the waste dumped in the gutter could have been safely dumped in an organised dumpsites for collection by ZoomLion. This discussion leads to the analyses of time spent by residents in the low class residential areas to dispose of waste in skips.

4.5 Communal Cleaning Exercise in Buipe Township

Effective communal cleaning exercises can enhance proper sanitation, improvement of health status and promote better communication among participants. From the study, eighty-two (82%) percent of the respondents out of sixty (60) households undertake communal cleaning exercises every month in the community. While eighteen (18%) percent of the respondents confirmed that they undertook communal cleaning exercises every week. From observation, the eighty-two (82%) percent was a significant figure, which should have reflected in the cleanliness in the community. However, the community was still lagging behind with regard to proper waste disposal since the environment is still littered with all kinds of solid waste

4.6 The Role of stakeholders in Ensuring Proper Waste Management in Buipe

The Waste Management Department of the District Assembly and the EPA had no regulations on waste management, but there were guidelines. For instance the Li (1652). (Mahamadu 2012 personal communication)

The guidelines are for the establishment of waste sites and are to ensure that the disposal sites are not close to water bodies which could lead to contamination of the water bodies. The EPA had only one approved waste disposal site in Buipe Township; however, in other areas they could have waste disposal sites without guidelines from EPA. EPA as an implementing Agency collaborates with the Waste Management Department at the Central Gonja District Assembly to give advice on waste management.

Also, when waste is disposed beyond the guidelines, they get in touch with the Waste Management Department or draw their attention for appropriate action to be taken. It is their role to ensure that waste is disposed of properly. They educate and resolve complains with regard to waste management.

CHAPTER FIVE

5.0 SUMMARY OF MAJOR FINDINGS

5.1 Introduction

This chapter highlights the major findings of the study on the causes and effects of indiscriminate solid waste disposal on households in Buipe in the Central Gonja district, followed by NTRA conclusion as well as some suggested recommendations based on the findings.

5.2 Major Findings

The study revealed that waste was mostly generated in the household through consumption, domestic activities, production, and commercial activities.

The findings also indicated that households indiscriminately disposed of solid waste which mostly comprised left over solid food, water sachets, polythene; rice husks, mango seeds, both human and animal faeces, yam peelings etc.

Moreover, the study revealed that the majority of the people resorted to the use of bucket and a few others using polythene and boxes for the collection of refuse at the household level. This was as a result of inadequate dustbins in the community. According to the people, the buckets were without covers which served as breeding place for houseflies and mosquitoes.

In addition the study research portrayed that refuse disposal at the household level was often done by female children who could not handle refuse properly. This was partly due to the fact that refuse collection facilities at the authorized dumping sites were too high for most children. Based on this, they ended up dumping the refuse on the ground and turning the disposal sites into heaps of garbage.

In addition, the refuse collection container provided by the Assembly at the refuse dumping site had not been emptied for a long time; this made the inhabitants to dispose of their refuse in dug out pits causing floods.

Furthermore, the study revealed that refuse at the household level was often kept for some number of days by some of the households before disposing it of.

Again, it was discovered that the Central Gonja District Assembly had only one refuse collection multi lift truck and did not visit the dumping sites regularly to get the refuse in the container cleared. This happened mostly in the raining season and also when the truck broke down. It was also discovered that EPA has no regulations on waste management, but there were guidelines and example was the Li (1652).

The study also revealed several possible health impacts on the inhabitants of Buipe. These included cholera, malaria, diarrhoea, skin diseases among others.

Finally, the research findings showed that some efforts were made by the community in communal cleaning up exercises on weekly and monthly basis. However, the weekly and monthly clean up exercises did not reflected in the manner of waste disposal in the community. Observation revealed that the community was still lagging behind with regard to proper waste disposal since the environment was still littered with all kinds of solid waste.

5.3 Conclusions

The causes and effects of indiscriminate solid waste disposal have serious environmental implications on households in Buipe Township in the Central Gonja District Assembly. The rapid urbanization and population growth, inadequate of budget for waste management, inappropriate technologies, and limited knowledge on solid waste management as well as lack of regulations on waste management have also led to the indiscriminate dumping of waste by the community along the roads, surroundings and gutters. This poses serious environmental problem and health risk to the residents of Buipe

Solid waste disposal is a very big task and the sooner a comprehensive plan is drawn and implemented, the better it will be for the District as toxic waste and radioactive waste will soon rear its ugly head to compound the problem.

5.4 Recommendations

Based on the findings of the study, the following recommendations are made.

- The public should be educated by the Assembly on solid waste and its related issues. Basically, hygiene practices should be taught especially in schools to educate people on proper ways of handling solid waste and keeping the surrounding clean.
- Stricter enforcement of byelaws should be ensured by the Assembly where administrative penalties for minor violations should be taken with urgency.

- .Refuse disposal at the household level should not be left to female children but should be the sole responsible of anyone in the family.
- There should be an increase in the number of multi lifted trucks by the Assembly to enable the trucks visit the dumping sites regularly to prevent the refuse from being blown over by wind, thereby littering the environment.
- There should be a considerable and separate budgetary allocation to waste management Department to enable it adopt appropriate technology, on solid waste management and procure adequate facilities for waste management.
- The community should adopt a self-help approach to solve the problem. Much can be achieved when the various communities mobilise themselves and organise periodic clean up exercises and by contributing financially to support the exercise, the residents can also act as watch dogs and make sure that they themselves adhere to proper waste disposal practices.
- The chiefs and other opinion leaders must be given additional roles to play in ensuring environmental cleanliness. This can be done by authorising the chiefs in each area or community to take up the additional job of ensuring clean environmental practices with the youth playing an important role
- It is hoped that these recommendations, when considered for action by the government, local authorities, and the people themselves would help address the solid waste management problems and its related issues in Buipe

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APENDDIX1

THIS QUESTIONNAIRE IS DESIGNED TO OBTAIN INFORMATION ON THE TOPIC: IMPROPER SOLID WASTE DISPOSAL AND ITS HEALTH EFFECTS ON THE PEOPLE OF BUIPE IN THE CENTRAL GONJA DISTRICT OF THE NORTHERN REGION.IN PARTIAL FULFILMENT OF REQUIREMENT FOR THE AWARDING M A IN(ESLC).PLEASE BE ASSURED THAT INFORMATION SO OBTAINED WILL BE USED STRICTLY FOR ACADEMIC PURPOSES AND WITH UTMOST CONFIDENTIALITY

PERSONAL CHARACTERISTICS.

QUESTIONNAIRE TO THE INDIVIDUAL

I am a post graduate student of UDS conducting research into causes and effects of improper solid waste disposal in Buipe. l will be very grateful if you could devote a bit of your time to respond to the questions that l have. It is part of my academic programme and the responses you give will be held confidential and used only for academic purposes.

Basic Information

Name of interviewee: _____

Sex: (i) Male ☐ (ii) Female ☐

Age: 21 -30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐ 61+ ☐

Marital Status: (i) Single ☐ (ii) Married ☐ (iii) Divorced ☐ (iv) Widowed ☐ (v) others ☐

a. Religion: (i) Christianity ☐ (ii) Islam ☐ (iii) Traditional (iv) Others, specify .....

Level of Education: (i) Primary ☐ (ii) JHS ☐ (iii) SHS ☐ (iv) Tertiary ☐ (v) None ☐

Occupation .....

Questions that seek to answer objective one (sources of waste generation)

How is solid waste generated in this household?

_____

_____

_____

_____

_____

_____

_____

_____

What type of solid waste is being generated (list them)?_____

_____

_____

_____

_____

Questions that seek to answer objective two (techniques of waste disposal)

.10. Where do you dispose- off the solid waste collected (i) Refuse dump sites ☐ (ii) Bury ☐ (iii) Burn ☐ (iv) dumped in surroundings /places of convenience to them /gutters? Collect by zoom lion Etc. if other specify

_____

_____

_____

How often do you dispose off your solid waste (I) daily (ii) weekly (iii) monthly (iv) do not know

11. Who disposes off refuse in this household? (i) Male children ☐ (ii) female children ☐ (iii) male adults ☐ (iv) female adults

15. Why do you dispose off waste in that manner

_____

_____

_____

_____

_____?

16. Do you think is the appropriate way of disposing off waste?

(i) If yes why_____

(ii) If no why?_____

18. Whose responsibility to ensure proper solid waste disposal in the community?

(i) Government ☐ (ii) Individual ☐ (iii) Shared responsibility ☐

19. How do you keep your household waste (i) In polythene ☐ (ii) Dustbins (iii) Others, Specify.....

D .Questions that seek to address the effects waste disposal (objective three)

20. Doyou know the effects of improper waste disposal on your health? (i) Yes ☐ (ii) no ☐

21.In your opinion, what are some of the adverse effects of improper solid waste disposal onyourhealth_____

_____

_____

_____

_____

_____

22. Are there any ailments attributable to improper solid waste disposal? Yes or No

23. if yes mention some of the ailments attributable to insanitary conditions_____

_____

_____

_____

_____

_____

APENDIX 2

b. QUESTIONNAIRE FOR HEALTH WORKERS, ASSEMBLY PERSONS,

HEALTH INPECTORS, TEACHERS

(i) Questions on objective one

1. What type of waste is mostly generated in the community?

2. Which part of the community is refuse generated the most?

3. What is the quantity of waste generated daily in the community?

(ii) Questions on objective two

4. How many sites do you have for refuse disposal in the district?

5. How large is/are your refuse disposal sites?

6. What is the distance of the dumping site (s) from each other in the district?

7. How often is waste collected in the area?

8. How and where do you dispose off the waste collected?

9. What are some of the equipment you use in the collection of waste?

10. How many workers are engaged in the collection of solid waste in the community?

11. How much do you spend in the management of solid waste in the district and Buipe to be specific? Averagely in a month?

12. Are there any agencies apart from waste management department involved in waste collection in Buipe (a) Yes ☐ (b) No ☐

If no why? .....

13. If yes, which are these agencies?

14. Do you encounter any challenges in the management of solid waste in the district and particularly in Buipe? (a) Yes ☐ (b) No ☐

If yes, what are they?_____

15. What do you think can be done to address these challenges?

16. Who is responsible for the maintenance of the refuse dumping site in the community? District Assembly ☐ Community ☐ Both ☐

(iii) Question on objective three

17. What do you think are some of the negative effects of indiscriminate solid waste disposal in the community?

18. In your opinion, what are some of the adverse effects of improper solid waste disposal on your health.....

19. Are there any ailments attributable to improper solid waste disposal? Yes or No

20. If yes, mention some of the ailments that are attributable to improper solid waste disposal?

APENDIX3 a. QUESTIONNAIRE FOR ENVIRONMENTAL HEALTH DEPARTMENT

1. Are there any regulations governing waste management in Ghana?
2. Are the regulations effective enough?
3. If the regulations are not effective enough, what in your opinion needs to be done to strengthen the regulations or make sure the people adhere to them?
4. What role do you play in solid waste management in Central Gonja District as a whole?
5. To what extent do you ensure environmental protection with regards to solid waste management in the district?
6. Are there any possible methods that can be employed in your own opinion to ensure environmental safety in the district specifically?
7. What in your opinion needs to be done to curb the indiscriminate waste disposal in the district?
8. there any other information you may want to add to what has already been discussed

APENDIX 4 PICTURES OF DUMPING OF REFUSE IN OPEN PLACES IN BUIPE

Dumping of refuse in a open space in Buipe.

Dumping of refuse in a open space in Buipe.

Dumping of refuse in an open space in Buipe