UNIVERSITY OF CAPE COAST

WASTE MANAGEMENT PRACTICES IN SUNYANI MUNICIPALITY, BRONG AHAFO REGION – GHANA

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BY

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DECLARATION

Candidate’s declaration

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

Candidates signature:……. Date:…….....

Name: Kwame Afriyie Aforo

Supervisor's declaration

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

Supervisor’s signature:…… Date:…… ……

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ABSTRACT

The study sought to survey waste management practices in Sunyani municipality. Some of the specific objectives of the study were to: assess the nature of waste generated in the Municipality, the pattern of waste disposal in the Municipality, assess the waste disposal practices used in the study area and establish the willingness of the polluter pay system. Two broad types of data, the secondary and primary data were used in the study. Interviews and personal observations were also used to collect some of the data. Among the findings were that: Waste management practices differ in urban, peri-urban and rural areas of Sunyani Municipality. Burning of refuse or solid waste is rare in the Municipality; 43.3% of households did not have toilet facilities in their homes; 78.7% of the household disposed of liquid waste anywhere, 15% in nearby gutter while 5.9% dispose off liquid waste in a soak away pit. Some of the recommendations made in the study were that waste management should involve the use of the Integrated Waste Management approach, where combination of the management measures is used. The authorities should ensure that the ban of pan latrine is enforced, there should be more collaboration between the EPA, Municipal Assembly and the Private waste management company to deal with waste in the Municipality. It could be concluded that waste was not being managed efficiently since the various comprehensive approaches were not applied but rather waste was being displaced.

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This dream would not have been realized without the help of my affable supervisor Professor A. B. Abane, his constant correction and encouragement made it possible, and my dear mother Florence O. Ansah

DEDICATION

To my lovely wife Harriet Afriyie Aforo, my son Afriyie Aforo Jnr. and my daughter Maame Abena Addobea Aforo.

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LIST OF ACRONYMS

EPA	-	Environmental Protection Agency
ESP	-	Environmental Sanitation Policy
IWM	-	Integrated Waste Management
KVIP	-	Kumasi Ventilated Improved Pit
MLG and RD	-	Ministry of Local Government and Rural Development
MMDAs	-	Municipal, Metropolitan and District Assemblies
MSW	-	Municipal Solid Waste
NEAP	-	National Environmental Action Plan
NEP	-	National Environmental Policy
WC	-	Water Closet
WHO	-	World Health Organisation
WTP	-	Willingness-To-Pay

CHAPTER ONE

INTRODUCTION

Background of the study

Waste refers to the material that is put aside or thrown away because they are of no significant use to the owner again. In other words, waste is any material that is unfit for use and is discarded because it has served its original purpose. Waste may be of different forms such as liquid, solid and gaseous forms. Liquid waste is sometimes referred to as sewage and comprises water that has been used for washing, flushing or in manufacturing processes. Solid waste on the other hand, are materials resulting mainly from human and animal activities that are useless, unwanted or hazardous. It is generated by domestic, commercial, industrial, healthcare, agricultural and mineral extraction activities and accumulates in streets and public places. The word ‘garbage’, ‘trash’, ‘refuse’ and ‘rubbish’ are used to refer to solid waste. Gaseous forms of waste primarily could be attributed to burning fossil fuel – natural gas, coal and oil to power industries and motor vehicles (Cunningham, 1997).

The Organisation for Economic Co-operation, Development and Environment (1999) reports that a person living in an industrialized nation may produce as much as 695kg of solid waste. This figure includes a wide variety of items, often a mix of potentially reusable or recyclable items such as newspapers

and cans and largely non-recyclable material such as broken or worn out device and plastic packaging materials. Due to dwindling space for landfills, many cities have adopted a wide variety of recycling programmes in which people separate the valuable components of the refuse before the remainder is taken to the local dump site.

The solid waste problem facing the world today has its root cause in the economic boom that followed World War II (Smith & Euger, 2000).This is where the marketing experts tried to use new strategies to get consumers to buy more for a high profit. The developed world also devised strategies to deal with the waste problem. However, it appears in most low income and medium income countries, very little progress has been made in upgrading waste disposal operations. Open dump, where the waste is unloaded in piles, make very uneconomical use of the available space, allow free access to waste pickers, animals and flies and often produce unpleasant and hazardous smoke from slow burning (Rushbrook & Pugh, 1999).

Waste management is the collection, transport, processing, recycling or disposal of waste materials. The term usually relates to materials produced by human activity and it is generally undertaken to reduce their effect on health, the environment or aesthetics. Waste management is also carried out to recover resources from it.

Ghana, like many other nations of the world, has endorsed the sustainable concept of economic development that integrates environmental considerations. In 199,1 Ghana adopted the National Environmental Action Plan (NEAP-91) and

National Environmental Policy which provide the broad policy framework for the implementation of the action plan. The environmental policy aims at ensuring a sound management resource of the environment in such a manner as to avoid over exploitation and damage to the environment. Among other things, the policy seeks to:

- Ensure environmentally sound use of all the country's natural resources for sustainable development;
- Establish and implement appropriate standards and guidelines for acceptable level of health and environmental protection;
- Asses the potential impact of all major projects on the environment in order to integrate mitigative measures with planning policy (NEP, 1991).

Statement of the problem

Modern methods of liquid and solid waste disposal are not practiced by a majority of households in the region. The pit latrine and public toilet are the commonest facilities in the Brong Ahafo region and liquid waste is mostly thrown onto the street or anywhere outside the house. According to the Ghana Statistical Service (2000), only 12.8% of household used water closet, 32.4% used pit latrine, 7.8% had access to KVIP, and those who used pan or bucket was 1.2%. This Study further showed that all districts in the region have less than 10% of their household disposing liquid waste into the gutters with the exception of Sunyani, where 17% of households dispose liquid waste through the proper

sewage system. The bulk (92.9%) of solid waste generated in the region are either disposed of in a public dump or burnt.

The high proportion of persons disposing of liquid waste in gutters in Sunyani, typifies an increasing but unacceptable phenomenon, in virtually all urban towns and cities in the country as a whole. Open drains and gutters instead of serving their intended purposes as storm drains, have virtually become receptacles for all types of waste. These in turn accumulate stagnant water and serve as breeding grounds for mosquitoes and other household vectors.

Aside causing environmental degradation, the waste that finds its way into rivers and water bodies pollutes these resources and hence decrease their utilization; It appears that there is either a sheer lack of a framework to implement proper waste management practices or there has not been a demonstrable commitment to effective management of waste in the developing countries (Edoho & Dibie, 1996).

Disposing of solid waste anywhere, other than the public refuse dump, burning or burying it can create hazardous and insanitary environmental conditions. In the light of this there is the need to study the waste management practices in the Sunyani Municipality with a view to identifying critically the problematic areas and make recommendation for the way forward

The following are research questions for the study:

- Is there any relationship between the income level and amount of waste generated?

- Is there any relationship between educational level and the pattern of waste disposal practices?
- Is there any relationship between area of residence and method of waste disposal practices?
- Is there any relationship between location of resident and amount of waste generated?
- Is there any relationship between location of resident and waste disposal methods?
- How realistic is the ability to pay a determinant of the type of waste management option?

Objectives of the study

The general objective of the study is to assess the waste management practices in the Sunyani Municipality of the Brong Ahafo Region.

The specific objectives of the study are to

- Assess the volume of waste generated in the Municipality
- Study the pattern of waste disposal in the Municipality
- Assess the waste disposal practices used in the study area
- Establish the willingness of the polluter pay system
- Analyze the various alternative ways that waste can be managed

Hypothesis

The study is guided by this hypothesis.

- There is no significant relationship between income levels of residents and their willingness to pay for improved waste management services

Significance of the study

The write up would provide information on waste management practices in Sunyani Municipality. It will lay bare the realities on the ground so that authorities and decision makers in development can adopt proper intervention to improve sanitation in the Municipality. The study would also serve as a reference point for the Municipality and other organisations concerned with waste management.

Organisation of the study

The study is divided into five chapters. Following this introductory chapter is the second which covers the literature review where issues discussed include methods of waste management, funding of waste management, policies on environmental sanitation in Ghana, and the conceptual framework adopted for the study. Chapter Three describes the methodology used in the study. The fourth chapter deals with the result and discussion of the study, while the fifth and final chapters cover the summary, conclusions and recommendations of the study.

CHAPTER TWO

REVIEW OF RELATED LITERETURE

Solid waste

Solid waste is defined by Khan and Ahsan (2003) as a material that is cheaper to throw away than to store or use. It is considered as unwanted material to be dumped out of the site. Solid wastes are simply solid materials at a wrong place which can be segregated, transformed, recycled and reused with great financial and environmental benefit. In developing countries, it is common to find large heap of garbage festering all over the city. The problems get further complicated due to large population and obsolete techniques employed for waste management. Guourlay (1992) observes that in larger cities, collection and disposal of solid waste is a municipal responsibility but the actual business of disposal is often contracted to private firms.

Sources and types of solid waste

Solid wastes are generated from various sources like institutions, industries, construction and demolition activities, municipal services, agricultural activities, treatment plants and special category sources (Khan & Ahsan, 2003). Residential and commercial waste include all organic and inorganic refuse from residential areas and the organic component of these wastes consist mainly of

material such as remnants of food, paper, cardboard, textile, plastic, rubber and leather. The inorganic component consists of items such as glass bottles, tin, cans, aluminiums and other metals, batteries, oil and paints; Commercial wastes are rich in paper, cardboard, plastics, glass, wood and other packaging materials.

Institutional wastes include waste from schools, colleges, government and private institutions and prisons. This category of waste is similar to residential and commercial waste but may also contain hazardous wastes like chemicals from laboratories. The proportions of paper, cardboard and packaging material is generally much higher in this type of waste.

Industrial wastes are generated from various processes in small and large scale industries, these are likely to be heterogeneous in nature and are industry specific. Both hazardous and non-hazardous components are found in industrial waste. Construction and demolition waste are generated from construction, repairing, demolition and renovation of buildings and other structures. These include, bricks, plaster, stone, concrete, dirt, wood, plumbing and electrical parts. Most of the construction and demolition wastes are inert (Khan & Ahsan, 2003).

Municipal service waste are the type of waste produced by operations and maintenance of municipal facilities including street sweeping, roadside litter, tree trimmings, yard waste from public parks and playground. On the other hand, agricultural waste is generated from activities such as planting and harvesting of trees, animal farms and poultry farms (Cunninghan, 1997).

Waste having special characteristic like those from the hospitals, slaughter houses, fly ash from thermal power station, radioactive waste are kinds of waste requiring special treatment and disposal technique.

Municipal Solid Waste (MSW)

These include waste from residential, commercial and institutional areas, Municipal solid waste is normally assumed to include all the waste generated by a community except industrial waste but the term municipal solid waste is some times used interchangeably with solid waste.

The volume of MSW generated varies with the lifestyle of the people, it has been estimated that each American generate waste about 4000 times his body weight; each west European 1000 times; each citizen of developing countries about 150 times; the United States of America alone generates more than 200 million tons of waste a year, an amount enough to fill a convoy of a garbage truck stretching eight times around the globe. By all accounts, the management of MSW will be a major challenge for years to come in developing countries.

Impact of composition of municipal solid waste on the environment

The composition of MSW describes the distribution of each component of waste by its percent weight of the total. The information is required for the selection of suitable treatment and disposal methods, the precise composition depends upon the locality, season of the year, standard of living, land use etc. Seasonal variations are often large in municipal solid waste, many fruits and

vegetable waste are seasonal. Composition of MSW also differs from locality to locality, people in a particular locality have similar backgrounds in terms of income, taste and expenditure. Waste from high income group locality is usually heavy in paper and packaging while in low income group areas, the predominant constituent is usually food waste (Khan & Ahsan, 2003). Composition of waste from commercial areas depends upon the nature of activities. Around offices and institutions, usually paper and packaging are major components while close to vegetable and food markets, food wastes are predominant. Similarly, waste near dairy farms will be high in animal feed and manure while in the waste from slaughter houses, blood and animal parts will be commonly found. Unless properly managed, solid waste has the potential of serious impact on the environment. It can lead to surface groundwater contamination, land pollution and air quality deterioration (Khan & Ahsan, 2003); Dust and litter scattered by wind are responsible for deterioration of air quality in the vicinity of disposal sites.

Insanitary methods of disposal of waste also produce odour and affect the aesthetics of the area, decomposition of waste also releases noxious gases posing high risk to human health. According to Khan & Ahsan (2003), alarm, large number of disease vectors and water borne diseases spread due to poor collection and disposal practices of solid waste.

Integrated solid waste management

The cardinal principle in waste management is the 3Rs: reduction, reuse and recycling. An integrated solid waste management system is based on this

principle; it requires comprehensive approach for each stage of solid waste management, generation, collection, processing and final disposal. The important components of such a system are: waste minimization, material recovery and recycling, waste transformation, volume reduction before disposal, waste disposal and database management (George et al, 2001).

Waste minimization material recovery and recycling

Waste should be ideally minimized at the source of its generation, minimizing the amount of material used in the manufacture of produce, increasing the useful life of the product and reducing the amount of material used for packaging and marketing of consumer goods, material balance studies and environmental audits of industries can effectively help in the formulation of strategies for reducing waste generation. Waste reduction can also be achieved in households and commercial units through increase in public awareness of improved buying pattern and through reuse of product.

High generation of waste tells us how source reduction as waste management method is important. Gourlay (1992) argued that by focusing on the production process itself, examining where waste are generated, and exploring how they can be reduced, even simple measures, such as separating waste so that they can be reused more easily, using different raw materials or replacing non-biodegradable products with biodegradable ones can help achieve large waste reduction results. He also claimed that the greater part of present waste arises not because the producer does not want it, but he/she fails to use it or at least use it in

such quantities that waste is inevitable. This argument places emphasis on recycling and conversion of waste as important solid waste management practices.

Waste transformation and volume reduction

This is the physical, chemical or biological conversion of waste for any beneficial purpose. A number of processes such as composting, anaerobic digestion, pyrolysis, gasification and pelletization are employed for this purpose, Several by-products of these processes in the form of manure and energy can be recovered. Selection of the suitable technique depends upon the objective of the waste transformation as well as the composition of waste.

Volume reduction of waste is carried out before its final disposal. It includes size reduction through shredding, size separation through screening and volume reduction through compaction. Volume reduction of waste reduces land area required for its landfill disposal (George et al, 2001).

Waste disposal and database management

Availability of precise and reliable data is of utmost importance in the planning and design of any environmental management system; the data should not only be available in records but should be instantaneously accessible to planners and engineers (Khan & Ahsan, 2003). Database should be an integral part of the solid waste management system. Precise, relevant and reliable data are necessary for selection of various treatment and disposal techniques. They also

help in developing indigenous techniques suitable for a particular type of waste composition. The database include composition of waste, physical, chemical and biological properties of waste and information regarding equipment, staff and facilities available for collection, transportation and disposal of waste

Open dump

Often, the way people dispose off waste is to simply drop it at some open place. Unregulated dumps are still the predominant method of waste disposal in most developing countries (Cunningham & Cunningham, 2004). The third world mega cities have enormous garbage problems, for example Mexico City, the largest city in the world generates some 10,000 tons of trash each day. The most notorious is the ‘smoky mountain’ because of its constant smoldering fire.

Most developed countries forbid open dumping at least in metropolitan areas but illegal dumping is still a problem. The problem of illegal dumping is likely to become worse as acceptable site for waste disposal become more and more scarce and cost of legal dumping escalates (Cunningham & Cunningham 2004). According to Asamoah (1998), lack of adequate sanitary facilities results in indiscriminate dumping of refuse and defecation at places not designated for such purpose.

Landfill

Sanitary landfill is the cheapest satisfactory means of disposal of waste, but only if suitable land is within economic range of the source of the wastes.

Collection and transportation account for 75% of the total cost of solid waste management worldwide (Jones, 1995). In a modern landfill, refuse is spread in thin layers, each of which is compacted by a bulldozer before the next is spread. When about 3 m (about 10 ft) of refuse has been laid down, it is covered by a thin layer of clean earth, which is also compacted. Pollution of surface and groundwater is minimized by lining and contouring the fill, compacting and planting the cover, selecting proper soil, diverting upland drainage and placing wastes in sites not subject to flooding or high groundwater levels. Gases are generated in landfills through anaerobic decomposition of organic solid waste. If a significant amount of methane is present, it may be explosive; however, proper venting eliminates this problem.

Landfills are mostly built away from rivers, lakes, flood plains and aquifer recharge zones. Landfills are not only convenient but also relatively inexpensive waste disposal options in most places (Cunningham & Cunningham, 2004). Suitable places for waste disposal are becoming scarce in most areas, as other uses compete for open space and citizens have become more concerned and vocal about health hazards as well as aesthetic. It is thus difficult to find a neighborhood or community willing to accept a new land fill.

Edmunson (1981) in his study on refuse management in Kumasi pointed out that most site used for refuse dump are chosen without taking into consideration the distance to be covered by residents. He recommended that sanitary sites should be cited close to waste generators.

Incineration and resource recovery

In incinerators of conventional design, refuse is burned on moving grates in refractory-lined chambers; combustible gases and the solids they carry are burned in secondary chambers. Combustion is 85 to 90 percent complete for the combustible materials. In addition to heat, by products of incineration includes the normal primary products of combustion that includes carbon dioxide and water as well as oxides of sulfur and nitrogen and other gaseous pollutants. Non-gaseous products include fly ash and unburned solid residue. Emissions of fly ash and other particles are often controlled by wet scrubbers, electrostatic precipitators, and bag filters.

This method is often termed ‘burning’ more so the name commonly used for this technology is energy recovery or waste-to-energy because the heat derived from incinerated refuse is a useful resource for heating and generating electricity.

Municipal incinerators are specially designed plants capable of burning thousands of tons of wastes per day. In some plants, refuse is sorted as it comes in to remove unburnable or recyclable materials before combustion. This is called refuse derived fuel because the enriched burnable fraction has a higher energy content than the raw trash.

Another approach called mass burn is to dump everything smaller than sofas and refrigerators into a giant furnace and burn as much as possible. This technique avoids the expensive and unpleasant job of sorting through garbage for

non burnable materials, but it often causes problem with a pollution and corrosion of burner gates and chimneys.

A number of companies burn in-plant wastes in conventional incinerators to produce steam. A few municipalities produce steam in incinerators in which the walls of the combustion chamber are lined with boiler tubes; the water circulated through the tubes absorbs heat generated in the combustion chamber and produces steam.

Stirrup (1965) also claimed that the major advantage of incineration are complete destruction of combustible and organic matter, reduction of bulk, the ability to operate under hygienic conditions free from interference by the type of weather conditions that would affect disposal by tipping and the possibility of using residual heat from furnaces.

The efficiency of incinerators is measured in terms of unburnt organic matter or the product of improper combustion escaping through flue gas and the bottom ash. Important parameter in the design of an incinerator systems are waste combustibility, temperature, turbulence and residence time required for combustion (Khan & Ahsan, 2003).

Some problems associated with the operation of incinerators include excessive stock emissions; smoke leakage through changing doors, excessive auxiliary fuel consumption and incomplete burning of waste. These problems can be minimized by a systemic operational approach and proper maintenance of incinerators (Khan & Ahsan, 2003).

Composting

Pressed for landfill space, many cities have banned yard waste from municipal garbage. Rather than bury this valuable organic material, they are turned into a useful product through composting: biological degradation or breakdown of organic matter under aerobic (oxygen-rich) conditions. The organic compost resulting from this process make nutrient rich soil amendment that aid water retention, slow soil erosion and improve crop yield.

Composting operations of solid wastes include preparing refuse and degrading organic matter by aerobic micro-organisms. Refuse is pre-sorted to remove materials that might have salvage value or cannot be composted and is ground up to improve the efficiency of the decomposition process. The refuse is placed in long piles on the ground or deposited in mechanical systems, where it is degraded biologically to humus with a total nitrogen, phosphorus, and potassium content of 1- 3%, depending on the material being composted. After about three weeks, the product is ready for curing, blending with additives, bagging, and marketing.

According to Stirrup (1965), pulverization and grinding are means of reducing the volume of waste or they are used to prepare refuse for final disposal processes. He further stressed that in some instances a threefold problem could be overcome by the use of composting.

Recycling

The term recycling has two meanings in common usage, sometimes we say we are recycling when we really are reusing something, such as refillable beverage containers. In terms of solid waste management however, recycling is the reprocessing of discarded material in to new useful product (Cunningham & Cunningham, 2004).

The practice of recycling solid waste is an ancient one. Metal implements were melted down and recast in prehistoric times. Today, recyclable materials are recovered from municipal refuse by a number of methods including shredding, magnetic separation of metals, air classification that separates light and heavy fractions, screening, and washing. Another method of recovery is the wet pulping process where incoming refuse is mixed with water and ground into slurry in the wet pulper, which resembles a large kitchen disposal unit. Large pieces of metal and other non-pulpable materials are pulled out by a magnetic device before the slurry from the pulper is loaded into a centrifuge called a liquid cyclone. Here the heavier non-combustible, such as glass, metals, and ceramics, are separated out and sent on to a glass- and metal-recovery system. Other lighter materials go to a paper-fiber-recovery system the final residue is either incinerated or is used as landfill.

Increasingly, municipalities and private refuse-collection organisations require those who generate solid waste to keep bottles, cans, newspapers, cardboard, and other recyclable items separate from other waste. Special trucks

pick up these waste and cart it to transfer stations or directly to recycling facilities, thus lessening the load at incinerators and landfills.

Recycling is usually a better alternative to either open dumping or burning waste. It saves money, energy, raw material and land space, while reducing pollution. Recycling also encourages individual awareness and responsibility for refuse produced. It drastically reduces pressure on landfill and incinerators. Despite the encouraging gains in recycling major challenges exist, wild fluctuation in commodity prices make it still harder to develop a market for recycled materials, contamination is also a major obstacle.

An alternative approach to waste management in Ghana

There are various elements in the effort to keep the country clean, there could be regulatory framework that guides the implementation of the bye laws on waste management by the various Municipal, Metropolitan and District Assemblies (MMDAs). For people know that the responsibilities are that of the citizenry, keeping cost down in effort to clear the country of the enormous amount of waste; the gross application of large sums money that Ministry of Health says are used in malaria prevention programs; the use of human resources from prisons in Ghana to help fight against waste and filth, the design of a systemic, cautious and sustainable cost effective waste management programme to use the prison service could help.

In the bid to fashion out a new approach to be revolutionary and probably out of the accepted normal scheme of doing things, this will involve the

amendment of the Ghana prisons custodial rule and also the government financial regulations to enable the used of some resources from the Ghana Prison Service and Ministry of Finance and Economic Planning. Based on this proposal, it is envisaged that government should be able to authorize the use of prisons to engage in a very regular and massive cleaning exercise continuously (Braimah, 2009). This would involve government collaborating with the management of Ghana Prison Service to find out how far the regulation of the Service can be amended to allow for the use of prison labour especially in the night to desilt the drains and clean the streets side drains all over the country.

Braimah (2009) asserted that the use of prison labour arises from the fact that in a small way this will help decongest the already crowded prisons, poor feeding and lack of other facilities arising from limited budgetary allocation by government. Monies that would accrue from the use of this labour should go a long way to ease some of the problems facing the Prison Service. The proposal being made was to use about thousand (1000) prisoners each day in two shifts in each regional capital under appropriate security cover to remove waste and filth that have choked the drains all over the country. During the day, the workforce could be engaged in clearing of weeds along the drains and other similar areas.

The rationale is that while the exercise is on, the presence of security personnel would deter would be litterers and that could become a habit after the exercise is over. The exercise would involve unit committee members and civil society. Individuals would be held responsible for littering, land lords and owners of properties would be made responsible for keeping their properties and

immediate environment clean. Many countries like Singapore and China used prison labour for social improvement without infringing on the right of the prisoners (Braimah, 2009).

Ahmed in a Daily Graphic September 4 article on the mosquito Act of 1911 said that the circumstances that led to the establishment of the sanitary inspectors popularly known as “Saman sama” enumerated the check list by which the sanitary inspectors could use to carried out their function. He further stated that laws which govern sanitary inspectors are still in the statute and with a daunting challenge facing the country in waste management and subsequent effect (www.ghanaweb.com).

Toilet – a very essential part of every home

The 2000 Population and Housing Census revealed that 31.4% of household in Ghana used public latrine as compared to 8.5% using water closet; 22% used pit latrine , 6.9% used KVIP , 4% used bucket or pan latrine and 6.9% used other peoples houses. The Environmental Sanitation Policy states that at least 90% of the population should have access to acceptable domestic toilet, while the remaining 10% should have access to hygienic public toilets.

As far back as 1891, there was legislation for the construction of water closet in houses by the British under the London householders’ chat. There were nuisances which could be dealt with summarily under the Public Health (London) Act 189. Across Africa, about 62% of the people do not have access to an improved toilet (WHO/UNICEF, 2008). Though having clean accessible toilet is

also central to the human right and personal dignity of every woman, man and child, 2.6 billion people, half the developing world, lack simple “improved” latrine. WHO/UNICEF estimates that 1.2 billion people world wide gained access to improved sanitation only between 1990 and 2004, while about 980million children had no toilet at home. If the current trends continue, there will still be 2.4 billion people without basic sanitation by 2015.

Most rural homes in Ghana and urban slum areas truly lack toilet facility and where there is community toilet the people do not use it because of the fees charged for maintaining them. From July 2008, the Supreme Court ruled that the use of pan latrine was banned and ordered the Assemblies to phase out its use completely by 2010. However, as at the time of this survey pan latrines are still in use.

Environment and sanitation policy of Ghana

Policies governing the environment and sanitation in the Ghana are numerous. The keys policies include the National Environmental Policy (N.E.P), the National Environmental Action Plan (NEAP) and the Environmental Sanitation Policy (ESP). The National Environmental Policy state that the Environmental Protection Agency in Ghana should be guided by the preventive approach, with the recognition that socio-economic development must be undertaken in such a way as to avoid the creation of environmental problems (EPA, 1996/97).

The purpose for these policies was to develop and maintain a clean, safe and pleasant physical environment in all human settlements, to promote the social, economic and physical well being of all sections of the population (Ministry of Local Government and Rural Development, 1999). The body that is charged to supervise the implementation of these policies is the EPA. The problems of sanitation are mainly due to lack of a comprehensive policy which will assign responsibilities to various actors within the environment, weak, outdated and poorly enforced environmental sanitation legislations and inadequate allocation of resources for environmental sanitation service.

These shortcomings have necessitated the designated of the Environmental Sanitation Strategy Day which is to be observed every year by all citizens. The strategy involves the promotion of research to review sanitation technologies and the adoption of cost recovery principles in the planning and management of environmental and sanitation services (MLG & RD 1999). The target is that the strategy would help achieve the following by 2020:

- Solid waste generated in urban areas will be regularly collected and disposed of in adequate controlled landfill or by environmentally accepted means;
- Excreta will be disposed of either in hygienic on site disposal system or by hygienic collection, treatment and off- site disposal system;
- All pan latrines will be phased out by the year 2010;

- At least 90% of the population should have access to acceptable domestic toilet and the remaining 10% should have access to hygienic public toilets; and
- Hygienic public toilet would be provided for the transient population in all areas of intense public activities.

Achieving policy target

The roles of citizens include cleaning their immediate environment, ensuring that the environment is not polluted, disposing of all forms of waste the individual generates either in the immediate environment of public areas by the use of a specific toilet facility or solid waste containers and participating in all communal practices geared towards the cleansing of the environment.

The role of the community is to ensure a good sanitation by undertaking community educational programmes that will create an awareness of the environmental sanitation issues to maintain a clean, safe and pleasant physical environment. The communities could organize community clean-up exercises at least once every two months under the supervision of the unit committee, urban/town or area council and sanction all who fail to take part in the community clean-up exercise or those who commit or omit acts contrary to community sanitation norms. The community could develop appropriate sanitation infrastructure like domestic or public toilet and waste disposal points.

Functions of the Municipal Assembly

With reference to environmental sanitation the functions of Municipal Assemblies include waste management, public health management, environmental monitoring and planning and public relation. Waste management department or Environmental Sanitation Division within the health department of the Assembly carries out the waste management function and the services that these bodies provide may be direct or indirect through private contractors or franchises. Whatever the case is the Assembly should provide at least 20% of the service directly (MLG & RD, 1999).

Toilet facilities in Brong Ahafo Region

Information on toilet facilities is considered important for housing as well as public health policy. Toilet facilities available for both public and private use are mostly WC, KVIP, pit or bucket. In Sunyani,12.8% of the resident use water closet, 33.0% use pit latrines, 10.4% use KVIP and 2.2% use bucket/pan (Ghana Statistical Service, 2000).

Waste disposal in Brong Ahafo

In Brong Ahafo, all districts have less than 10% of their households disposing liquid waste into the gutter, with the exception of Sunyani, where 17% of households dispose of liquid through this medium. It is also in Sunyani that 2.7% households dispose off liquid waste through a proper sewerage system; all

the other districts have less than 2.0 % of their households using the sewerage system to dispose of liquid waste (Ghana Statistical Service, 2000).

The bulk (92.9%) of the solid waste generated in the region are either disposed off in public dump (70.3%) or are dumped anywhere. Burning of solid waste (3.4%) is rather rare in the region, exceeding 5.0% in Sunyani.

The high proportion of persons disposing of liquid waste in gutters in Sunyani, typifies an increasing but unacceptable phenomenon, in virtually all urban towns and cities in the country as a whole. This is very pertinent in Ghana where waste management services are largely inefficient and ineffective. It is estimated that about 83% of the population dump their refuse in either authorized or unauthorized sites in their neighbourhood and due to weak capacity to handle solid waste, unsanitary conditions are created (Benneh, Songsore, Nabila, Amuzu, Tutua & Yaugyuorn, 1993).

Although these weaknesses have been attributed to lack of logistics and proper financial management, peoples attitude towards waste management should not be ignored (Nze, 1979). Nze further noted that this came as a result of inadequate and deficient infrastructures, inadequate structures for environmental administration and sometimes human factors. The management of household refuse is tied to perception and socio-cultural practices which result in modes of appropriation of space for private or public facility (Navez-Bounchaire, 1993).

Abrokwah (1998) observed that ignorance, negligence, lack of law to punish sanitary offenders and low level of technology in waste management are

major causes of waste management problems in places such as Kumasi; this might not be far from what may be happening in Sunyani.

Private waste management company

Zoomlion Ghana limited is a waste management company on the environmental landscape of Ghana. It was incorporated in January 2006 and commenced operation in May 2006, and it is in association with Zoomlion China, manufacturer of waste management vehicles and equipments with over 50 years experience in the waste management sector in China, Their core value is to provide services which prevent environmental pollution and safeguard public health.

The vision of this private waste management company is to develop and grow as a leading fully integrated private waste management company in Ghana by 2015. This company have introduce the utilization of simple but modern technologies and methods of waste management at affordable rates

Conceptual framework

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

as Integrated Waste Management (IWM) and Willingness-To-Pay Approach (WTP).

The Integrated Waste Management approach concerns the volume of waste that is generated. It is a balance between the costs of reducing waste sources and the benefits of making such reduction. It also deals with the analysis of the cost and benefit of the various disposal options in order to adopt environmentally correct and analytically sound policies. Cost in this approach offers a coherent structure for waste management. The approach, as noted, considers how much waste should be produced at source and also involves making judgments on balancing of cost and benefits of the various management options like recycling, reuse, landfill and incineration

The Willingness To Pay approach deals with the amount of money people are ready to pay to enhance the management of waste. It constitutes the cost of generating the waste and measures the cost and benefits of various management options together with the cost and benefit of each management option on human wellbeing or welfare.

It should be noted that the willingness to pay implies ability to pay because one cannot express a willingness to pay for anything, the income of the people involved should be an important factor; This means that where the income of the people are relatively low their ability to pay will be low and as such they will have a lower willingness to pay than when they have high income levels. The process of finding out willingness to pay may either be direct or indirect. For the purpose of this study, the direct method of finding out willingness to pay is used,

the direct method of finding out the willingness to pay for environmental quality is called Contingent Valuation Method. This method suggests that if the willingness of people to pay is to be known, then they should be asked. This will help to find out how people will react when they are placed in a contingent situation. The need to ask people of their reactions arises when there is no real market for what the people being asked to pay for.

In finding out the willingness to pay from people, the following steps were recommended by Field (1997). The identification and description of environmental quality characteristic to be evaluated in this case, "better'' waste management practices. The next is the identification of respondents to be approached followed by the design and application of a survey questionnaire through personal or mail interviews and the analysis of results and aggregation of individual responses.

Field (1997) noted again that questionnaire should have clear statement of exactly what people are being asked to evaluate. Again the questionnaire should be able to describe the respondents' economic status such as income, wealth and age.

Three major ways can be used to find out how much respondents are willing to pay and, these include asking people to provide the exact amount they are willing to pay without probing or prompting them, bidding which involves engaging the respondent in price quotation and printing a response card with prize tags. With the use of this bidding the interviewer will quote a price and the respondent may also quote a lower price, as a way of reaching an acceptable

price, the interviewer will reduce the price quoted and also ask the respondent to increase his or her price, this will continue until they all reach a compromise. The problem with this principle is that, because environmental amenities like clean environment are often regarded as public goods, there is the tendency for people to under-estimate their preference when expressed in monetary units especially when they think that their answers may be used to established payment scheme. However, the type of questions to be used can avoid the threat of this possibility.

CHAPTER THREE

METHODOLOGY

Study area

The Brong Ahafo Region, formerly a part of the Ashanti Region, was created in April 1959. It covers a land area of 39,557 square kilometers and shares boundaries with the Northern Region to the north, Ashanti and Western Region to the south, Volta Region to the east, the Eastern Region to the southeast and La Cote d'Ivoire to the west. The Sunyani Municipality is part of Brong Ahafo and it shares boundaries to the east with Techiman and Tano districts, to the west by Berekum and Dormaa districts, to the north and south with Wenchi and Asutifi South district respectively. The region has tropical climate, with high temperatures averaging 23.9 º C (75 º F) and a double maxima rainfall pattern. Rainfall ranges from an average of 1000mm in the northern parts to 1400mm in the southern parts.

Type and source of data

The study was carried out using both secondary and primary data; the primary data involved data from respondents. The population included residents from Sunyani Municipality aged eighteen and above. The secondary data source includes books relevant to the study. The environmental sanitation policy of

Ghana by Ministry of Local Government and Rural Development and 2000 Population and Housing Census of Ghana by the Statistical Service were also used. Data was also collected from a private waste management company which deals with waste management in the municipality, which was sampled purposively. Information from EPA was also considered for secondary source of data.

Sampling procedure and sampling

The municipality was divided into three zones namely urban, peri-urban and rural communities and samples were taken from all these zones using simple random sampling. Three urban, three peri-urban and three rural communities were selected randomly. The respondents were chosen based on stratified random sampling and the number of respondents from a particular area depended on the size of the population of the area. Forty-five (45) respondents each were interviewed in three urban communities, thirty (30) each from three peri-urban and ten(10) each from three rural communities representing the sample frame for each stratum, these were merged into one making a sample size of 255.

Purposive sampling was done where the head of a private waste management company (Zoomlion Limited) in the Municipality was interviewed to compliment the information gathered.

Data collection instrument

The following instruments were used in the data collection. Questionnaires were used to collect data from the respondents. The questionnaires had both close and open ended questions. The researcher and four assistants administered the questionnaire after the research assistants were trained by the researcher. The questions also involved issues on personal information, knowledge, attitude and practice towards waste disposal, Perceptions on waste management, current waste management practice, beliefs about sanitation, rules and regulations concerning waste, willingness to pay, perception of the correlation between waste and disease incidence were also sourced from respondents.

The researcher also used observation, especially by visiting waste dump sites and waste treatment sites.

Data analysis

The questionnaire and interview schedules were collated and were edited to ensure consistency and were then coded for analysis. The Statistical Product and Service Solutions (SPSS, Version 16.0) was used to analyse the data. Tables, frequency distribution, measures of central tendency and dispersion were used to analyse the data. Test of significance of 0.05 alpha level.

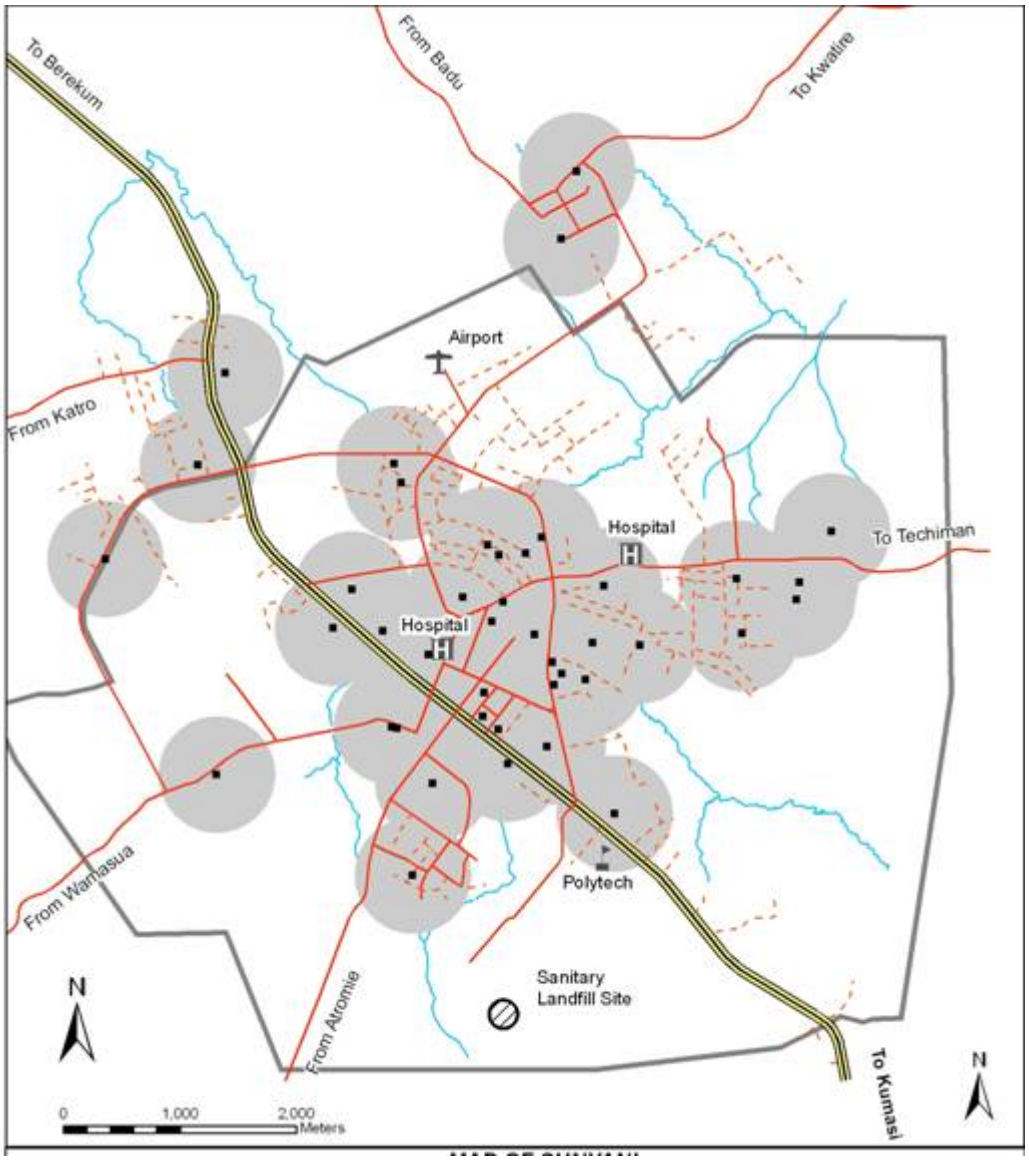

Figure 1: Map of the study area showing refuse collection points

Source: Zero waste project, 2010

CHAPTER FOUR

RESULTS AND DISCUSSION

Issues in the study area

The views of respondents on the challenges in the study area were summarized to bring to light various problematic waste management issues that were of top priority.

Table 1: Most pressing issues in the study area

Pressing issue	Urban		Peri- murban		Rural		Total	
	Freq.	%	Freq.	%	Freq.	%	Freq	%
Electricity related problem	14	10.4	7	12.5	7	23.3	32	12.6
Refuse related problems	23	17.0	16	18.2	1	3.3	40	15.8
Water related issues	15	11.1	44	50	10	33.3	69	27.3
Feacal disposal problems	51	37.8	0	0	0	0	51	20.2
Poor drainage	3	2.2	0	0	0	0	3	1.2
Security issues	17	12.6	9	10.2	4	13.3	30	11.9
Inaccessible roads	2	1.5	0	0	0	0	2	0.8
Roaming farm animals	14	10.4	7	12.5	7	23.3	32	12.6
Lack of health facility	0	0	0	0	1	3.3	1	0.4
Total	139	100.0	83	100.0	23	100.0	228	100.0

Source: Field survey, 2008

Out of the 255 respondents, feacal disposal problems forms 27.3%, followed by poor drainage of 20.2% and 15.8% refuse related problems, whilst among the urban communities the main challenge is poor drainage (37.8%), the peri-urban and the rural communities saw feacal disposal problem as prime, forming 50.0% and 33.3% respectively.

Characteristics of respondents

This section present the characteristics of the people sampled. This was done by analysing the sex, age, occupation, educational background and marital status, the purpose of this was to put the study in context.

Age of respondents

Age of respondents were necessary in the study because waste generation and management could not be linked with a particular age group. Different age groups participate in waste management practices in the Sunyani Municipality. Besides, the age of respondent was important in this study because it was to make sure that children were not included in the study and the study would have adequate and relevant information was collected on waste management. It was also useful to determine the age group so that educational programmes carried out by the Municipality and civil society organisation could be targeted to help with strategic plans to manage waste in the Municipality.

Of the 255 sampled respondents, 33.5%, 24.4% and 15.7% were within the age range of 21-30, 31-40 and 41-50 respectively. A total of 92.9% were in the economically active age of 20-60 years as presented in Table 2. Those less than twenty were given consideration because in some households they are the ones directly involved with disposal of waste.

Table 2: Age and location of residents

Age Group	Urban		Peri- urban		Rural		Total	
	Freq	%	Freq.	%	Freq.	%	Freq.	%
Less than 20	15	11.1	7	7.9	4	13.3	26	10.2
21-30	44	32.6	31	34.8	0	33.3	85	33.5
31-40	30	22.2	27	30.3	5	16.7	62	24.4
41-50	23	17.0	14	15.7	3	10.0	40	15.7
51-60	13	9.6	6	6.7	4	13.3	23	9.1
61-70	9	6.7	4	4.5	2	6.7	15	5.9
Above 70	1	0.7	0	0.0	2	6.7	3	1.2
Total	135	100.0	89	100.0	30	100.0	254	100.0

Source: Field survey, 2008

Educational level of respondents

The educational background of respondents was also taken into consideration during the study; this is because it could be a factor influencing respondent perception of wastes management. Education could be a powerful tool to determine knowledge levels, skills and attitude. Though a little over two fifths of the population in the whole region aged six and older have never been to school, a higher proportion of the regional population has attained primary (22.3%) and middle/JHS (23.3%) education, (Population and Housing Census 2000). The study revealed that 10.2% of the respondents had no formal education, but generally 88.8% had some kind of education from primary to tertiary levels as shown in Table 3. It could also be seen that educational attainment differed with location, with the urban communities having lower illiteracy rates.

Table 3: Educational level and location of respondent

Education level	Urban		Peri-murban		Rural		Total	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Lack formal education	10	7.4	9	10.0	7	24.1	26	10.2
Primary	6	4.4	5	5.6	3	10.3	14	5.5
Middle school	28	20.7	20	22.2	5	17.2	53	20.9
JHS	35	25.9	27	30.0	7	24.1	69	27.2
SHS	32	23.7	17	18.9	6	20.7	55	21.7
Tertiary	24	17.8	12	13.3	1	3.4	37	14.6
Total	135	100.0	90	100.0	29	100.0	354	100.0

Source: Field survey, 2008

Occupation and profession

Agriculture and related work (45.9%) was the major occupation in the region but the study revealed that of all the 255 people interviewed, 16.5% were unemployed, 53.7% were self employed, 17.6% were students while public/ civil servant formed 12.2%. According to Table 4, the majority who indicated that they were self employed were basically farmers and hence the type of waste that they may generate may be organic and biodegradable, this is confirm by Figure 2.

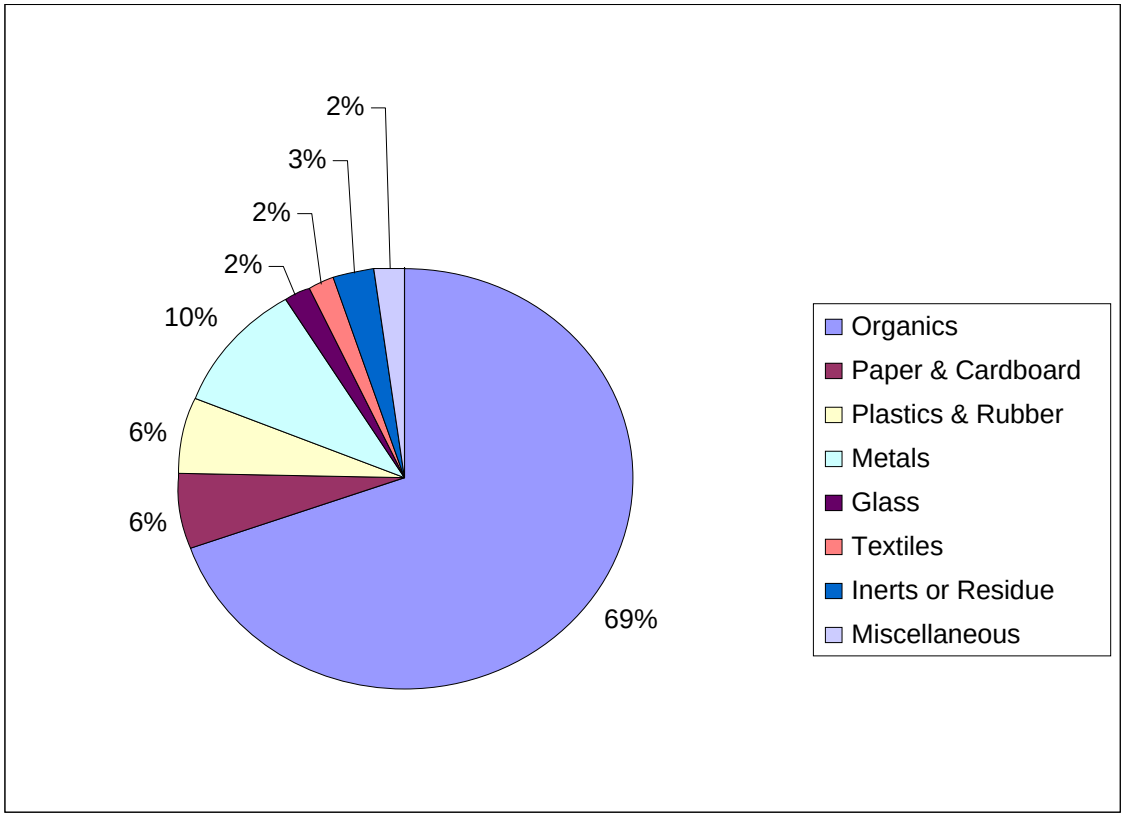

Figure 2: Waste composition in Sunyani Municipality

Source: Zero waste project, 2007

Table 4: Profession of and location of respondent

Occupation/Profession	Urban		Peri- urban		Rural		Total	
	Freq.	%	Freq	%	Freq	%	Freq.	%
Unemployed	28	20.7	13	14.4	1	3.3	42	16.5
Student	25	18.5	14	15.6	6	20.0	45	17.6
Artisan/Self employed	63	46.7	51	56.7	23	76.7	137	53.7
Public/Civil Servant	19	14.1	12	13.3	0	0.0	31	12.2
Total	135	100.0	90	100.0	30	100.0	255	100.0

Source: Field survey, 2008

Refuse disposal pattern in Sunyani

According to the report of the Population and Housing Census (2000), the bulk (92.9%) of solid waste generated in the region are either disposed off in public dump (70.3%) or are dumped anywhere. The study however revealed that dumping indiscriminately (15.7%), paying for refuse collection (8.2%), transfer station (69.4%), burying (3.9) and burning (2.7%) were the way resident dispose of their waste as shown in Table 5. The scenes as shown in plates 1 to 3 shows various ways that waste is collected and disposed in Sunyani Municipality.

Refuse disposal methods in Sunyani in pictures

Plate 1 to 3 show how residents dispose of their waste, typical scenes of how residents dispose of their waste in the market places. Most gutters were

chocked with refuse and this pose health risk to the inhabitants as shown in plate 5.

Plate 1: Typical transfer station in Sunyani

Source: Field survey, 2008

Plate 2: Sunyani District Assembly transferring refuse to the land fill site

Source: Field survey, 2008

Plate 3: Private waste management company collecting waste

Source: Field survey, 2008

Plate 4: Indiscriminate dumping at a market place in Sunyani

Source: Field survey, 2008

Plate 5: A Typical scene at urban community in Sunyani (chocked gutter)

Source: Field survey, 2008

Table 5: Refuse disposal pattern in Sunyani Municipality

Disposal patter n	Location of respondent			Total
	Urban	Peri-urban	Rural	
Dumping indiscriminately	5	17	18	40
	3.7%	18.9%	60.0%	15.7%
Pay for refuse collection	18	2	1	21
	13.3%	2.2%	3.3%	8.2%
Transfer station	107	67	3	177
	79.3%	74.4%	10.0%	69.4%
Bury them (“land fill”)	3	2	5	10
	2.2%	2.2%	16.7%	3.9%
Burning	2	2	3	7
	1.5%	2.2%	10.0%	2.7%
Total	135	90	30	255

Source: Field survey, 2008

Perception on waste management in Sunyani Municipality

The table 6 shows that waste appears to be a menace in the urban areas than the rural areas, higher percentages (65.4%) of respondent in the urban area compared to 44% and 0% for peri urban and rural communities respectively, This confirms what Gwebu (2004) observed that the combined effect of population dynamics and economic development are having a noticeable imprint on the environment in the form of increased waste generation. According to Wellins (1984), waste management practices differ for more and less developed nations, for urban and rural areas, and for residential, industrial, and commercial producers.

Table 6: Perception on waste management by respondent

Perceptions	Urban		Peri- murban		rural		Total	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Extremely serious	10	7.3	7	8.8	0	0	17	7.5
Quite serious	50	37.1	15	17.6	1	3.3	66	29.4
Slightly serious	28	21.0	15	17.6	1	3.3	44	19.6
Not serious at all	43	32.3	29	32.4	1	3.3	73	32.5
Don't know	3	2.4	21	23.5	0	0.0	24	10.7
Total	134	100.0	87	100.0	3	100.0	224	100.0

Source: Field survey, 2008

Solid waste generation in Sunyani Municipality

During the survey it emerged that about 79.2% of the respondents in the urban part of Sunyani disposed of their waste at transfer stations while a few others (13.3%) patronize the Zoomlion free dustbin project, Rural settlers (60.0%) disposed of their waste indiscriminately during the study, probably due to the absence of refuse collection points or the fact that the waste generated were basically organic and thus biodegradable as confirmed in Figure 2.

Though the percentage of people who burn their waste was 6.4 as per the 2000 Population and Housing Census in the region, this study revealed that 2.7% in the Municipality burn their garbage (Table 7).

Table 7: Methods of waste disposal in Sunyani Municipality

Location of responders	Indiscriminate dumping	Pay for refuse collection	Transfer station	Burry them	Burning	Total
Urban	5(3.7%)	18(13.3%)	107(60.4%)	3(2.2%)	2(1.4%)	135(52.9)
Peri-urban	17(18.8)	2(2.2%)	67(74.4%)	2(2.2%)	2(2.2%)	90(35.3)
Rural	18(60%)	1(3.3%)	3(10%)	5(16.6%)	3(10%)	30(11.8)
Total	40(15.6%)	21(8.2%)	177(69.4%)	10(3.9%)	7(2.7%)	255(100.0)

Source: Field survey, 2008

Toilet facilities used in the Sunyani Municipality

Information on toilet facilities is also considered important for public health policy. Pit latrine inside the dwelling and public toilets, which could be water closet (12.8%), KVIP (7.8%), pit (32.4%) or bucket (1.2%) are the

frequently used toilet facility in the municipality as indicated in publications of the 2000 Population and Census by Ghana Statistical Service. The study showed that 43.3% did not have any toilet facility in their homes and therefore patronized either public toilet facility or the nearby bushes or field; Among those who had toilet facility in their homes, 58.9% used water closet, 38.3% used KVIP, 2.0% used pan latrine though it has been banned, and 0.6% used pit latrine; The water closet users were high among the those that were in the urban and in the peri-urban communities; The pan and the pit latrine were prevalent in the rural communities of the Municipality (Table 9); This could be due to the unavailability of running water in the households; the discovery was the high number of the respondent(44.7%) in the urban did not have toilet facilities in their homes, explain the chocked gutters with black polythene bags filled with human excreta.

Table 8: Availability of toilet facility in the Sunyani Municipality

		Toilet facility in your house		Total
		Yes	No	
location of respondent	Urban	74(55.3%)	60(44.7%)	134(52.7)
	Peri-urban	50(55.6%)	40(44.4%)	90(35.4)
	Rural	20(66.7%)	10(33.3%)	30(11.9)
Total		144(56.7)	110(43.3%)	254(100.0)

Source: Field survey, 2008

Table 9: Type of toilet facility used in the Sunyani Municipality

Location of respondent	Type of toilet facility used in the house				Total
	KVIP	Pan latrine	Water closet	Pit latrine	
Urban	6	1	66	0	73
Peri-urban	35	0	17	0	52
Rural	15	2	3	1	21
Total	56(38.3%)	3(2.0%)	86(58.9%)	1(0.6%)	146(100.0%)

Source: Field survey, 2008

Liquid waste disposal

Households in almost all the Municipality dispose of liquid waste on the street or outside the house. Previous studies show that 17.0% of households in Sunyani dispose liquid waste in to gutters and only 2.0% of households use proper sewerage system to dispose off their waste, however this study shows that 78.7% of the households disposed of their liquid waste anywhere,15% in nearby gutter and only 5.9 % soak away pit (Table 10). The high proportion of persons disposing of liquid waste in gutters and anywhere in Sunyani typifies the increasing but unacceptable phenomenon observed virtually in all urban towns and cities in the country as a whole. Open drains and gutters normally border roads constructed in these urban places. Instead of serving their intended purposes as storm drains, they have virtually become receptacles for all types of waste

including solid and liquid waste. These in turn accumulate stagnant water and serve as breeding grounds for mosquitoes and other household pest.

Table 10: Liquid waste disposal pattern

Location of respondent	Nearby gutter	Soak away pit	Any where	Total
Urban	37(27.6%)	13(9.7%)	84(62.2%)	134
Peri-urban	2(2.2%)	2(2.2%)	86(95.6%)	90
Rural	0(0%)	0(0%)	30(100%)	30
Total	39(15%)	15(5.9%)	200(78.7%)	254

Source: Field survey, 2008

Strategies to augment the waste management practice

Though there are a lot of ways to improve the waste management systems in different parts of the world, in the current situation that Sunyani Municipality finds itself, full privatization, partial privatization (as stated in Environmental Sanitation Policy), reduction in charges of operations and efficiency on the part of service providers were found to be more accustomed, according to Table 12, 47.0% advocate for full privatization of waste management services though private enterprises could own maximum of 80% as it has been enshrined in the Environmental Sanitation Policy. The proposal to fully privatise may be due to lack of awareness on the part of respondents or probably the private company in the municipality is doing well.

Though there was a picture painted during the study (Table 11) that the community was not satisfied with waste management service, the efficiency in this service was not their main concern.

Table 11: Level of satisfaction of waste management services

Level of satisfaction	Urban		Peri- urban		Rural		Total	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Yes	56	41.5	33	36.7	3	10.0	92	36.1
No	79	58.5	57	57.5	27	90.0	163	63.9
Total	135	100.0	90	100.0	30	100.0	255	100.0

Source: Field survey, 2008

Table 12: Strategies for improving waste management services

Strategy	Urban		Peri- urban		Rural		Total	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Full privatetization	71	52.6	35	39.3	2	33.3	108	47.0
Partial privatization	11	8.1	38	42.7	4	66.7	53	23.5
Reduction in cost of services	43	31.9	11	12.4	0	0.0	54	23.5
Increase rate of services	10	7.4	5	5.6	0	0.0	15	6.5
Total	135	100.0	89	100	6	100.0	230	100.0

Source: Field survey, 2008

Hypothesis testing

On general perception that income category would determine respondents willingness to pay for improved waste management practice, chi square test was performed in order to find out if there is any significant relationship between income levels and respondents willingness to pay. The hypothesis state that;

H_0: There is no significant relationship between income levels and respondents' willingness to pay.

$H_{1:}$ There is significant relationship between income levels and respondents' willingness to pay.

Table 13: Willingness to pay and income levels of respondents

Responses	Below minimum wage		Above minimum wage		Total	
	Freq.	%	Freq.	%	Freq.	%
YES	59	72.0	75	85.2	134	78.8
NO	23	28.0	13	14.8	36	21.2
Total	82	100.0	88	100.0	170	100.0

Source: Field survey, 2008

Decision rules

If phi (observed) value 3.232 exceeds 0.05 alpha level reject the H_0 in favour of H_1 otherwise do not reject the $H_{0.}$

With the test of significant using the Pearson Chi-square test statistic, it is stated that there is no significant relationship between income levels and respondents willingness to pay. Using an alpha level of 0.05, Pearson Chi-square calculated 3.232 is more than the alpha, refer to the appendix B, this means that we reject that there is no significance relationship exist between income levels and willingness, thus we accept the $H_{1.}$

Expectation of the people in the municipality

Owing to urbanization, population growth and rapid development, it is generally expected that the waste generated in the municipality would increase, notwithstanding this the study shows that the majority (56.7%) of the people expect waste situation to be overwhelming (Table 14).

Table 14: Expectations of respondent for the next 10 years

Respondent	Urban		Peri-murban		Rural		Total	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
More serious	80	59.3	46	51.7	18	60	144	56.7
The same	19	14.8	12	13.5	6	20	37	15
Less serious	27	20.7	14	15.7	4	13.7	45	18.1
Don't know	6	5.2	16	19.1	2	6.7	24	10.2
Total	132	100.0	88	100.0	30	100.0	250	100.0

Source: Field survey, 2008

That is, more serious for the next ten years, this is a threat to the target set in Environmental Sanitation Policy in 2020. Others (15%) also think that the situation as it looks is would not be going to be better.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The study sought to examine the waste management practice in the Sunyani Municipality. Specifically to examine by the nature of waste generated in the area, the management measures used to handle such waste and to identify the alternative waste management measures, the pattern of waste disposal in the Municipality and establish the willingness of residents to embrace the polluter-pay- system.

Respondents involved in the study were grouped into three, namely respondents from rural, peri-urban and urban areas in the Municipality. The purpose of these grouping was to find out how the population characteristics (urban, peri-urban and rural) of these respective respondent influences their opinions.

The analysis of the data done in the previous chapters opened up the following:

- Among the challenges in the study area, feacal disposal problems, poor drainage and refuse related problems were paramount
- Waste appeared to be a menace in the urban areas,

- Waste management practices differ for urban, peri-urban and rural areas of Sunyani Municipality. The urban part of Sunyani disposed of their waste at transfer station and few others (13.9%) of the people interviewed patronized the free waste bin programme.
- Burning of refuse or solid waste was rare in the Municipality
- 43.3% of people interviewed did not have toilet facilities in their homes and thus patronized either public toilet or nearby bush or field,
- The study showed that 78.7% of the respondents disposed off liquid waste anywhere, 15% in a nearby gutter while 5.9% dispose of liquid waste in a soak away pit.
- The study rejected the null hypothesis that there was no significant relationship between income level and respondents willingness to pay at 0.05 alpha levels
- The waste management practice in the Municipality was not in line with the best standard of practice that is Integrated Waste Management Practice as recommended by Ministry of Local Government and Rural Development (1999) of Ghana. There was no use of the mixed strategy which includes alternative like inceneration, recycling, re-use, composting, using waste to generate energy, waste prevention and minimization and landfilling.

Conclusions

The cardinal principles in waste management, 3Rs (reduction, reuse and recycling) was not identified during the study, An integrated solid waste management system based on this principle which requires comprehensive approach for each stage of solid waste management, generation, collection, processing before final disposal was also not being practiced in Sunyani Municipality. The important components of waste management such as waste minimization, material recovery and recycling, waste transformation, volume reduction before disposal and database management were not in existence, rather 43.3% of people interviewed did not have toilet facilities in their homes and thus patronized either public toilet or nearby bush or field, 78.7% of the respondents disposed off liquid waste anywhere, 15% in a nearby gutter while 5.9% dispose of liquid waste in a soak away pit. Waste was not being managed but rather displaced (have its location changed).

Recommendations

The findings of the study led to the following recommendations

- Waste management should involve the use of the Integrated Waste Management approach, where combination of the management measures is used, that is the Municipality should not stick to one particular methods of waste disposal but use a mix of the alternative method as discussed earlier in order to ensure the best standard practice.

- Communal labour should be encouraged at all levels of the society to promote public cleanliness
- A lot of collection points should be created and the distribution should be closer to the users. This may ensure maximum patronage.
- Sewerage should be treated before it is disposed of onto its final place of disposal
- Refuse collection should be extended to some of the peri-urban and rural communities of the municipality in order to improve refuse collection.
- The authorities should ensure that the ban on pan latrine is enforced, since some respondents were still using pan latrines in their homes
- There should be more collaboration between the EPA, Municipal Assembly and the private waste management company (Zoomlion Co. Ltd) to deal with waste in the Municipality.

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APPENDICES

APPENDIX A

QUESTIONNAIRE

Section A: General Issues

1. What are the three most pressing issues facing your community according to order of prioriry?

(i)……...

(ii)……..

(iii)…….

2. What are you doing as a community to address the issue?

……

……

3. What are you doing as a person to address the issue?

……

……

4. What do you think should be done to solve these problems?

……

……

Section B: Personal information

Please indicate your responses by circling the appropriate number.

5. Sex (i) Male (ii) Female

6. Age……years

7. Highest Education attained

Primary Middle School JHS SHS Tertiary; Polytechnic

TTC

NTC

POST GR

Others(Specify)…….

8. How many years have you lived in your present community?

(i) Less than one year (ii) 1-4 years

(iii) 5-9 years (iv) 10-14 years

(v) 15-19 years (vi) 20 years or more

(vii) Don't Know /No option

9. What is your monthly income? Gh ¢ ……..

10. What is your current marital status?

(i) Married (ii) Divorced (iii) Single (iv) Widowed (v)Co-habitation

11. Highest Education attained by your spouse attained?

Primary Middle School JHS SHS Tertiary; Polytechnic

TTC

NTC

POST

Others(Specify)……..…

12. What is your occupation/profession?

(i) Student (ii) Public Servant (iii) Artisan/Self Employment (iv) Unemployed

(v) Others (specify)……

13. Level of education of your Mother…….

Mothers Occupation…….

14. Level of education of your Father…….

Fathers Occupation…….

Section C: Knowledge, attitude and practice

15. Are satisfied with the current waste management practice in Sunyani Municipality?

(i) Yes (i) No

16. If yes how do you perceive the management of the waste problem in your community?

(i) Extremely serious (ii) Quite serious

(iii) Slightly serious (iv) Not at all serious

(v) Don't Know /No option.

17. If your answer to question 11 is option (i) or (ii) above, what do you think might be the contributing factor?.....

……

18. To what extent have you personally given the waste disposal problem in your community a thought?

(i) Very high degree (ii) Fairly high degree

(iii) Only somewhat (iv) Not at all.

19. How do you expect the waste disposal to be in your community to be over the next ten years?

(i) More serious (ii) The same

(iii) Less serious (iv) Don't Know /No option

20. Listed in the table below are the various waste management options. We would like to find out your attitude towards each option. Please indicate by circling the number on the scale corresponding to your feeling.

Options	VUF	UF	N	F	VF
Open burning	1	2	3	4	5
Land filing	1	2	3	4	5
Composting	1	2	3	4	5
Pay as you dump (crude)	1	2	3	4	5
Indiscriminate dumping	1	2	3	4	5

Key: VUF =Very unfavourable UF =Unfavourable

N = Norrmal F= Favourable VF= Very Favourable

21. How do you dispose off refuse collected in your household?

(i) By dumping indiscriminately (ii) By paying for waste (refuse) collection

(iii) Transfer station (iv) Others (specify)……..

22. If you pay for waste (refuse) collection, are you satisfied with the services provided?

(i) Yes (ii) No

23. If No give reasons…….……..

……

24. What is the value of waste generated daily in your household?

(i) ¼ (34) bucket (ii) ½ (34) bucket (iii) ¾ (34) bucket (iv) 1 (34) bucket

25. How often is the household refuse container emptied?

(i) Once a day (ii) Twice a day (iii) Once a week (iv) When full.

26. Are you prepared to pay more for improved service? (i) Yes (ii) No.

27. If you dispose off refuse indiscriminately, what account for this?

(i) Inability to pay for fee charged.

(ii) Absence of Transfer Station in the area.

28. If there is no transfer station in your area how do you dispose off your refuses collected in the bucket?

(i) Dig a hole (ii) I take it to where there is a transfer station

(iii) Dump it anywhere I find a space (iv) I dump it in the gutter in front or near our house

29. Do you have toilet facility in your house? (i) Yes (ii) No (if No skip)

30. If yes, indicate which of the following you have?

(i) KVIP (ii) Bucket (Pan latrine) (iii) Water closet

31. If the toilet type in your house is Pan Latrine, how often is it emptied?

(i) Once a week (ii) Twice a week (iii) When full

32. How much do you pay for each emptying? GH¢…….

33. Who empties it?

(i) The assembly staff (ii) Private contractors (iii) Members of the household.

34. If the pan latrine is emptied by the Assembly staff or private contractor, are you satisfied with their service? (i) Yes (ii) No

35. If you don't have a toilet in your house which of the following practices do you engage in?

(i) Patronize public latrines (ii) Open defecation

(iii) Use the chamber pot which is latter emptied (iv) Use black polythene bag.

36. If open defecation, indicate where.

(i) Nearby bush (ii) Refuse dump site (iii) Drains /gutters

37. If you patronize public toilet, how much do you pay?

GH¢……

38. Do you willingly pay the amount at the public toilet? (i) Yes

(ii) No

39. Are you satisfied with the service provided in the public toile? (i) Yes

(ii) No

SECTION D Community Information

Please tick one response for each statement in the table below:

40. We need some information on methods of garbage disposal in your community.

Garbage Disposal method	Current method being used	Method that you would recommend
Open burning	1	1
Incineration	2	2
Composting	3	3
Recycling	4	4
Pay as you dump programme	5	5
Indiscriminate dumping	6	6

41.

Excretal Disposal method	Current method being used	Method that you would recommend
Free range defecation	1	1
Public pit toilet	2	2
Public KVIP	3	3
Public water closet	4	4
Household bucket toilet	5	5
Household water closet	6	6

42. How do you assess current methods?

Comment on waste disposal methods	Garbage disposal methods	Excretal disposal methods
Good	1	1
Safe and economical	2	2
Reduces contamination and protect community	3	3
Not environmentally friendly	4	4
Bad	5	5

43. Which of the following would you choose as a strategy for the improvement in the provision of waste management services?

(i) Full privatization of the waste management functions of the Municipality

(ii) Partial privatization

(iii) Reduction in cost of municipal's waste collection services

(vi) Increase rate of service to improve collection

Section D: (Belief about Sanitation)

44. Read the following series of statements about garbage disposal. As you read each, circle one number corresponding to a statement which indicates how much you agree or disagree with the statement.

Item	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
Children's faeces not harmful	1	2	3	4	5
Do not sweep room at night as you would throw away your wealth	1	2	3	4	5
African germs are not harmful	1	2	3	4	5
Cholera, malaria diarrhea are caused by improper waste disposal	1	2	3	4	5

45. Some information is needed on incidence of selected diseases in your household for this year. Please circle one response for each statement.

46. Incidence of Diseases

Item	Option	Malaria	Diarrhea	Typhoid fever	Cholera
No of members	None	1	1	1	1
Not affected	One	2	2	2	2
	Two	3	3	3	3
	Three or more	4	4	4	4
No of times	Zero	1	1	1	1
	One	2	2	2	2
	Twice	3	3	3	3
	Three times	4	4	4	4
	More than 3 time	5	5	5	5

47. How do you assess the correlation between insanitary condition and incidence of disease. (Please circle one response for each statement.

Correlation between insanitary condition and incidence of diseases	Malaria	Diarrhea	Cholera
Highly correlated	1	1	1
Fairly correlated	2	2	2
Not correlated	3	3	3

Section E

48 Do you know of any rules or regulations concerning waste disposal?

(i) Yes (ii) No

49. If Yes, mention one……..

……

50. Are those regulation enforced? (i) Yes (ii) No

51. If Yes, who enforces them?.....

52. What sanctions are prescribed for any breach of these regulations?.....

……

53. What other issues about waste disposal practice would you like to mention or discuss?

……

……

54. What do you think should be done to improve the waste disposal practice on campus?

……

…….

Thank you for cooperating with us on this issue. The information obtained would be shared with you.

APPENDIX B

HYPOTHESIS TESTING

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.232(b)	1	.072		
Continuity Correction(a)	2.593	1	.107		
Likelihood Ratio	3.269	1	.071		
Fisher's Exact Test				.091	.053
Linear-by-Linear Association	3.213	1	.073		
N of Valid Cases	170				

Source: Field survey, 2008

		Value	Approx. Sig.
Nominal by Nominal	Phi	-.138	.072
	Cramer's V	.138	.072
N of Valid Cases		170	