KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

COLLEGE OF ART AND SOCIAL SCIENCES

KNUST SCHOOL OF BUSINESS

DEPARTMENT OF INFORMATION SYSTEMS AND DECISION SCIENECE

ECONOMIC VALUATION OF IMPROVED SOLID WASTE MANAGEMENT IN EFFUTU MUNICIPALITY

BY

HAYFORD ALFRED (BSc)

B.Sc (Hons) FOREST RESOURCES TECHNOLOGY

A THESIS SUBMITTED TO THE DEPARTMENT OF INFORMATION SYSTEMS AND DECISION SCIENCE, KNUST SCHOOL OF BUSINESS, IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF A MASTER OF BUSINESS ADMINISTRATION (MBA) DEGREE IN INTERNATIONAL MANAGEMENT OF RESOURCES AND ENVIRONMENT.

JULY, 2013

DECLARATION

I hereby declare that this thesis is my own work towards the MBA and that, to the best of my knowledge, it contains no material previously published by another person or material which has been accepted for the award of any other degree by the university or any other university, except where due acknowledgment has been made in the context.

Signature…… Date……..

HAYFORD ALFRED

(STUDENT)

CERTIFIED BY;

Signature …… Date……..

DR. A.A ADJAOTTOR

(SUPERVISOR)

CERTIFIED BY;

Signature …… Date……..

MR.JONATHAN ANNAN

(HEAD OF DEPARTMENT)

ACKNOWLEDGEMENT

We usually see only the things we are looking for- so much so that we sometimes see them where they are not.

-Eric Hoffer, *The Passionate State of Mind (1993)*

First I would like to thank the Almighty God for seeing me through this course. Indeed wherever He leads you, no wants shall turn you back. I will forever be grateful to Him.

Working with Dr. A.AAdjaottor of the Materials Engineering Department, KNUST has been a delightful experience. His insightful contributions and close supervision of this material cannot be overemphasized.

At a point in time, I was amazed and encouraged by the willingness of my respondents to talk frankly to the issues. I would want to extent my gratitude to them all for helping me finish my work.

I would also like to acknowledge Mr and Mrs Joshua Dampson, Kumasi and Mrs Agnes Mbroh, Winneba, for helping me complete this work successfully. Their support has been gratifying and energizing.

It is impossible to fully acknowledge the contributions of Mr and Mrs Alexander AsumAhinsan, Tarkwa and the entire Celtis Prestige and Safety Solutions Team. I will forever remain indebted to you. God richly bless you.

My list would never be complete without thanking some very important personalities in my life. I owe a large debt of gratitude to my Granny, Mrs Faustina Elsie Akyempong and my parent Mr and Mrs Doughan for their unfailing love and

support.How am I supposed to thank you enough? Finally, I would thank Marilyn Yankson for her fresh and unsuspected loveliness. Thank you for standing by me.

ABSTRACT

The study investigates the economic valuation of improved Solid Waste Management (SWM) in Effutu Municipal assembly.The households in the municipality were categorized into threegroups as underdeveloped, developed and new sites using the quality of housing in the absence of any other formal way of stratification. A dichotomous choice contingent valuation technique was used to elicit households' willingness to pay (WTP), using the survey format of contingent valuation method (CVM).This research focused on 50 households in each stratification summing up to 150 to determine the factors that motivate the households to pay for the improved solid waste management.The logit linear regression model was used to obtain the Willingness to pay of the households.Out of the 150 administered questionnaires, only 11 households representing 7.3% of the total sample size indicated their unwillingness to pay for an improved solid waste management. 92.7% of the respondent households were willing to pay various amounts to improve the services of waste collection and disposal in the Effutu Municipality.The minimum WTP amount per month was GH₵ 1.00 while the maximum was GH₵ 15.00. The anticipated amount to be collected for improved SWM per month for the municipality was GH¢ 49,178.15. The annual mean total WTP would be GH¢ 590,137.80 for the Municipal.The factors which influenced WTP significantly were gender ($p=0.003$), in which females were 69.10% more willing to pay than males (30.90%), Family size ($p=0.004$), Marital status ($p<0.001$), Monthly households income ($p<0.001$), Responsibility of SWM ($p<0.001$). However, Age of household head ($p=0.975$), level of education ($p=0.511$) and Time spent in the area ($p=0.581$) did not affect the WTP for improved SWM significantly.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

1.0 Introduction

1.1 Background of the Study

Rapid increase in volume and types of solid and hazardous waste as a result of continuous economic growth, urbanization and industrialization, is becoming a burgeoning problem for national and local governments to ensure effective and sustainable management of waste. It is estimated that in 2006 the total amount of municipal solid waste (MSW) generated globally reached 2.02 billion tonnes, representing a 7% annual increase since 2003 (Global Waste Management Market Report 2007).

Based on incomplete reports from its participants, The Basel Convention estimated that about 318 million tonnes in 2000 and 338 million tonnes in 2001 of hazardous and other waste were generated. Healthcare waste is classified as a sub-category of hazardous wastes in many countries. As per WHO estimations, the total health-care waste per person per year in most low income countries, is anywhere from 0.5 kg to 3 kg. There is no estimate about global industrial wastes generation. The US EPA estimates that, American industrial facilities generate and dispose of approximately 7.6 billion tonnes of non-hazardous industrial solid waste each year. The EU estimated that its 25 member states produce 700 million tonnes of agricultural waste annually. Waste Electrical and Electronic Equipment (WEEE) or E-waste is also one of the fastest growing waste streams and it equals to 1% of total solid waste on an average in developing countries.

Although considerable efforts are being made by many Governments and other entities in tackling waste-related problems, there are still major gaps to be filled in this area. The World

The World Bank estimates that in developing countries, it is common for municipalities to spend 20-50 percent of their available budget on solid waste management (open dumping with open burning is the norm), even though 30-60 percent of all the urban solid wastes remain uncollected and less than 50 percent of the population is served. In low-income countries, collection alone drains up to 80-90 percent of municipal solid waste management budget. In mid-income countries, collection costs 50-80 percent of total budget. In high-income countries, collection only accounts for less than 10 percent of the budget, which allows large funds to be allocated to waste treatment facilities. Upfront community participation in these advanced countries reduces the collection cost and facilitates waste recycling and recovery (World Bank, 2010).

In Africa, Municipal Solid Waste Management constitutes one of the most crucial health and environmental problems facing governments of African cities (Achankeng, 2003). This is because, even though these cities are using 20-50% of their budget in solid waste management, only 20-80% of the waste is collected. The uncollected or illegally dumped wastes constitute a disaster for human health and environmental degradation (Achankeng, 2003).The amounts of waste generated also vary within countries, according to the income group from which it originates. The high and middle income groups in many countries have adopted Westernised consumption patterns. The richer the citizens, the more waste is generated, as the case of Accra-Ghana. Highincome groups generate 0.6kg/capita/day, middle income groups, 0.4 kg/capita/day and low-income groups 0.3 kg/capita/day (Lardinois et al., 1995).

Municipal solid waste disposal practices in Ghana in the past have not been environmentally friendly (EPA, 2002). The recent edition of the United Nations' Human Development Report (2007) for Ghana indicated that both solid and liquid waste disposal have been a source of concern as they contribute to a great deal of unsanitary conditions in cities in Ghana. Nationally, about 58 percent of households dispose of their refuse at public dump sites. About a quarter of households dispose of their solid waste elsewhere into valleys, pits, bushes, streams or river side's, open gutters or on undeveloped plots of land. About 8 percent burn, 4 percent bury, while only about 5 percent of households have their solid waste collected in an organized way (United Nations' Human Development Report 2007).

1.2 Statement of the Problem

The annual cost of global solid waste management is projected to rise from the current $205 billion to $375 billion, according to a new, far-reaching World Bank report on the state of municipal solid waste around the world. Most cost is believed to increase severely in low income countries by 2025. Released on June 6, 2012, the report titled "What a Waste: A Global Review of Solid Waste Management", said a sharp rise in the amount of garbage generated will come from urban residents between now and 2025.

The report estimates that the amount of municipal solid waste (MSW) will rise from the current 1.3 billion tonnes per year to 2.2 billion tonnes per year by 2025, with much of the increase coming in rapidly growing cities in developing countries. The World Bank believes that there is a looming crisis in MSW treatment as living standards rise and urban populations grow. Giving projections, the report indicated that with the population rising to 676 million by 2025, Low Income countries are expected to generate 213 million tonnes of solid waste a day. Lower Middle Income

ones are also projected to generate 956 million tonnes of solid waste per day. Its population is predicted to reach 2.08 billion. Waste generation will hit 360 million tonnes per day by 2025 in Upper Middle Income countries with expected population of 619 million. For High Income nations, waste generation a day by 2025 will reach 686 million tones and population at 912 million.

The Effutu Municipal Assembly over the years has invested much effort in managing the solid waste. Waste containers are sited at strategic places to collect all the waste that is generated in the municipality. Zoomlion Company workers have also done tremendous job in keeping the municipality clean by de-silting choked gutters, cleaning the Main Lorry Park, sweeping the streets and also embarking on household collection of wastes. Despites all these efforts, there seems to be an upsurge of indiscriminate disposal of waste especially around the beaches and improper management of the final disposal site of the solid wastes. This is increasing the Municipal's cost of managing waste. There could also be an outbreak of communicable diseases if this menace goes unchecked. It is strongly recommended that private entrepreneurs can play a very tremendous role on managing the waste of the municipality. These proposals can be achieved if the households make some financial commitment to enable the sustainability of the project. These reasons have necessitated the researcher to conduct an economic assessment in managing the municipal's waste.

1.3 Objectives of the Study

The general objective of this study is to find out the best method of waste collection and proper management to keep the municipal safe from dirt and other diseases. This economic analysis of proper solid waste management will go a long way to inform

both the municipal and the private sector to make decision based on empirical findings.

The specific objectives of the study are:

- To elicit Households' Willingness to pay for an improved Solid Waste Management
- To assess the determinants of the Households' Willingness to pay for an improved Solid Waste Management

1.4 Research Questions

The research questions set to guide the study were as follows:

- How much are the households willing to pay for an improved SWM?
- What factors determine their motivation to pay for the amount of money they are willing to pay?

1.5 Justification of the Study

According Palczynski R. J (2002), no single solution has been identified that completely answers the question of what to do with solid waste. Every community or region has its own unique profile regarding solid waste. The attitudes of people in different regions of each country vary regarding waste management practice. The diversity of communities and their waste is one reason why no single approach to waste management has been accepted as "the best" method. Since there is no preferred method, every community must create its own "best approach" to dealing with its waste.

Until the late 1980s, solid waste management policies and programs in most African cities were formulated and implemented by government agencies without significant

public participation. There were many problems in the overall management schemes for solid waste policies. The most often encountered problem was decentralized responsibility for various activities of waste management.

Many cities have adopted a management system whereby waste collection is administered under the department of health; disposal is handled by the works' or mechanical engineering department; and the fleet was centrally maintained for all city vehicles by the works or mechanical engineering department. It has resulted in placing waste collection at the bottom of the organization tier structure. In some cases there are supervisors assigned to administer the activities of the workers, but there are seldom planners, managers, and field foremen included in the organizational framework. The waste management personnel are so low in the scheme of the municipal hierarchy that they do not influence funds allocation for regular replacement and maintenance of equipment. Another aspect of this arrangement of responsibilities is that the department performing the collection (i.e., by street sweeping) is often not responsible for the transfer and disposal. These problems still prevail in some less developed African countries.

Therefore the study will seek to profile the attitude of the households in the Effutu Municipality to examine their motivation to pay for an improved solid waste management and also find out how much they are willing to pay. This will go a long way to help the Municipal assembly to make an informed decision as to organising proper household collection of waste at a fee. Private sector organisations can also benefit from the findings since it will help them look at the investment opportunities in managing the municipality’s solid waste.

1.6 Scope of the Study

The scope of this research was the Effutu Municipal Assembly in the Central Region of Ghana. The focus is much on the households in the municipality and their willingness to pay for an improved solid waste management.

1.7 Limitation of the Study

The study is limited to solid waste management in Effutu municipality thus other types of waste such as liquid, industrial, health care and radioactive waste and their management will not be investigated in this study. This is a deliberate effort on the researcher's part to make the study manageable given the time and resources available to complete the study.

1.8 Organization of the Study

The study has been presented in five chapters. The chapter one deals with the whole conduct of the study. The chapter looks at the Background of the study, statement of the problem, Objectives of the study, Research questions, Justification of the study, scope the study, limitation of the study and organization of the study. The chapter two of this study deals with relevant literature review.Chapter Three looked at research working definitions and hypothesis, research design, population and sampling procedure, and the method of analysis of the data. Chapter Four deal with analysis of the data and discussions. Chapter Five finally focused on the summary of the findings, conclusion and recommendations for government, stakeholder, municipality and private investors.

CHAPTER TWO

LITERATURE REVIEW

2.0 Waste Definition

A quick look at definitions of waste in media and printed documents reveals that waste is considered an unwanted good that is no longer useful or desirable. In the German Waste Act of August 1993, waste is defined as "a portable object that has been abandoned by the owner" and also as an "orderly disposal garbage" (Bilitewski et al 1994, p. 21). The Framework Directive on Waste in the United Kingdom states that waste is a substance and/or object that is discarded by its owners. This statement is followed by 16 waste categories that are currently in force (Porteous, 2000). The Mexican view on waste, expressed in the General Waste Amendment of October 2003, refers to a material or product that owners or holders discard, which can be found in a solid or semisolid state, as well as liquid or gas in a container or thrown away and can be revalued, treated or disposed of according to specific regulations (Congreso General de los EstadosUnidosMexicanos, 2003).

Waste is classified in categories such as municipal solid waste (MSW), agricultural and animal refuse, industrial residues, extraction and mining waste, construction and demolition debris and sewage sludge among others. In this thesis the focus will be given to MSW. The distinction that is made from MSW to other types of waste is in its origin. MSW emerges from households, commerce and trade, small businesses, office buildings and institutions (schools, hospitals, government buildings).

MSW is defined by the United Nations as "household waste and similar waste". This includes bulky waste, which includes voluminous unwanted items such as old furniture found in households; green waste such as garden waste (i.e. leaves, grass,

tree branches); street sweeping products and market cleaning materials (United Nations Statistic Division, 2007).

2.1 Overview of Solid Waste Management

The overall goal of urban solid waste management is to collect, treat and dispose of solid wastes generated by all urban population groups in an environmentally and socially satisfactory manner using the most economical means available. Local governments are usually authorized to have responsibility for providing solid waste management services, and most local government laws give them exclusive ownership over waste once it has been placed outside a home or establishment for collection. As cities grow economically, business activity and consumption patterns drive up solid waste quantities. At the same time, increased traffic congestion adversely affects the productivity of the solid waste fleet. Productivity loss is exacerbated by longer hauls required of the fleet, as open lands for disposal are further and further away from urban centres. The challenge is to rationalize worker and vehicle performance, while expanding services to a growing urban population (World Bank 2011).

2.2 Waste Management

Solid waste management is described by Tchobanoglous et al. (1993) as "the control of generation, storage, collection, transfer and transport, processing, and disposal of solid wastes in manner that is in accord with the best principles of public health, economics, engineering, conservation, aesthetics and other environmental considerations, and that is also responsive to public attitudes".

According to Bilitewski et al.(1994) waste management incorporates "the collection, transport, storage, treatment, recovery and disposal of waste". Both definitions concur

with Mexican scholars who view waste management as the body of actions related to waste characterization and classification, waste selection, storage and transportation, as well as its transfer, treatment and final disposal (Mora Reyes, 2004).

2.3 Integrated Solid Waste Management

Integrated Solid Waste Management (ISWM) according to USEPA, (2002) is a comprehensive waste prevention, recycling, composting, and disposal program. An effective ISWM system considers how to prevent, recycle, and manage solid waste in ways that most effectively protect human health and the environment. ISWM involves evaluating local needs and conditions, and then selecting and combining the most appropriate waste management activities for those conditions. The major ISWM activities are waste prevention, recycling and composting, and combustion and disposal in properly designed, constructed, and managed. Each of these activities requires careful planning, financing, collection, and transport.

2.3.1 Waste Prevention

Waste prevention—often called source reduction—means reducing waste by not producing it. Examples of waste prevention would include purchasing durable, long-lasting goods and seeking products and packaging that are as free of toxic substances as possible. It can be as simple as switching from disposable to reusable products, or as complex as redesigning a product to use fewer raw materials or to last longer. Because waste prevention actually avoids waste generation, it is the preferred waste management activity. Overall, waste prevention conserves resources, protects the environment, and prevents the formation of greenhouse gases. (USEPA, 2002)

2.3.2 Waste Generation

The term encloses the activities where waste is produced. Every day people identify a number of materials as no longer valuable and throw them away or gather them for its posterior disposal. Waste generation says Tchobanoglous et al.(1993) is not easily controllable as it is an activity involving an array of factors and different groups of actors. According to Bilitewski, (1994)the waste generation arena includes direct and indirect actors. Those who are directly implicated in waste generation are households and service sectors, retail, and product manufacturing and industry. Indirect players are made up of local government and regulatory agencies, responsible for the overall environmental strategies necessary when it comes to waste generation.

2.3.3 Waste storage at the source

Solid waste management systems encompass activities handling waste in places where it is generated. For instance, separating and storing waste in households has been proven to be economically beneficial for further recycling processes. More homeowners nowadays realize the importance of separating newspapers, cardboard and glass from their waste and to divert them from landfills. Appropriate storage at the source of generation not only reduces costs in the overall waste management system but also responds to public health concerns andaesthetic considerations. This is suggested by Tchobanoglous(1993, p. 12) which refers to “unsightly makeshift containers” and “open ground storage” as both “undesirable” in residential areas.

2.3.4 Waste collection

Waste collection plays an important role in waste management processes. It is also a wide and complex subject. It involves diverse elements such as collection systems,

special equipment, personnel requirements and the layout of collection routes as well as loading and unloading activities. It starts from the moment when filled waste containers or garbage bags are loaded onto waste trucks. Waste collection represents almost 50% of the total cost of waste disposal say Tchobanoglous et al. (1993). Management arrangements include municipal services to franchised private companies and informal groups in developing countries.

There are several methods that can be employed for waste collection.The most commonamong them are:

- ***Simple emptying method***where standardized containers are mechanically emptied into a collection vehicle and then returned at the source.

- ***Exchange method***where containers are replaced by others. This technique is often used to handle high vo*lume waste such as construction debris and waste in industrial areas.*

- ***Curb-side collection***is very common. It involves picking up garbage bags placed on the sidewalks or other specific locations. The collection is generally manually handled.

- ***Special collection or non-systematic collection***involves picking up bulky waste and other voluminous items. This service is generally provided upon request.

In general the most appropriate waste collection method is the one which best serves the need of a community and takes into account factors of efficiency, health and environmental requirements, physical demand and zoning parameters. The methods previously mentioned carry both advantages and disadvantages. Weingaertner(2003)

indicates for instance, that the simple emptying method which requires special vehicles, standardized waste containers and road access can be viewed as a drawback in developing communities, whereas curbside and informal collection, have been both proven to alleviate poverty, despite their high physical demand on personnel.

2.3.5 Waste transfer and transportation

Transfer stations are employed to load the waste collected from smaller waste trucks to higher capacity vehicles. This process is used as a transition step before the further transport of MSW to remote areas for its final disposal. Separation and recovering of recycle goods may occur prior totransfer and final transportation. This process often includes the separation of bulky waste, shredding, metal selection among other processes. Tchobanoglous(1993) stresses that generally the decision to use transfer stations is based on economics as transfer operations become a necessity when haul distances to final disposal sites are no longer economically feasible. Bilitewski (1994) on the other hand suggests that transportation costs, location analysis and the assessment of the type of waste to be handled are the main concerns for planning a transfer station.

2.3.6 Final disposal

Waste final disposal take many forms. There are biological, thermal treatment treatments as well as landfilling. This last technic has been a traditional way of discarding waste in developing countries however there is a tendency to look into other alternatives such as composting.

2.3.6.1 Biological waste treatment

2.3.6.1.1 Composting

Composting is the controlled aerobic decomposition of organic matter by the action of micro-organisms and small invertebrates. There are a number of composting techniques being used today. These include: in-vessel composting, windrow composting, vermicomposting and static pile composting. The process is controlled by making the environmental conditions optimum for the waste decomposers to thrive. The rate of compost formation is controlled by the composition and constituents of the materials i.e. their Carbon/Nitrogen (C/N) ratio, the temperature, the moisture content and the amount of air.

The C/N ratio is very important for the process to be efficient. The micro-organisms require carbon as an energy source and nitrogen for the synthesis of some proteins. If the correct C/N ratio is not achieved, then application of the compost with either a high or low C/N ratio can have adverse effects on both the soil and the plants. A high C/N ratio can be corrected by dehydrated mud and a low ratio corrected by adding cellulose.

Moisture content greatly influences the composting process. The microbes need the moisture to perform their metabolic functions. If the waste becomes too dry the composting is not favoured. If however there is too much moisture then it is possible that it may displace the air in the compost heap depriving the organisms of oxygen and drowning them. A high temperature is desirable for the elimination of pathogenic organisms. However, if temperatures are too high, above 75°C then the organisms necessary to complete the composting process are destroyed. Optimum temperatures

for the process are in the range of 50-60°C with the ideal being 60°C (Sewerage and Solid Waste Project Unit. 2000)

Aeration is very important and the quantity of air needs to be properly controlled when composting. If there is insufficient oxygen the aerobes will begin to die and will be replaced by anaerobes. The anaerobes are undesirable since they will slow the process, produce odours and also produce the highly flammable methane gas. Air can be incorporated by churning the compost (Sewerage and Solid Waste Project Unit. 2000).

2.3.6.1.2Anaerobic Digestion

Anaerobic digestion like composting uses biological processes to decompose organic waste. However, where composting can use a variety of microbes and must have air, anaerobic digestion uses bacteria and an oxygen free environment to decompose the waste. Aerobic respiration, typical of composting, results in the formation of carbon dioxide and water. While the anaerobic respiration results in the formation of carbon dioxide and methane. In addition to generating the humus which is used as a soil enhancer, anaerobic digestion is also used as a method of producing biogas which can be used to generate electricity. Optimal conditions for the process requires nutrients such as nitrogen, phosphorous and potassium, it requires that the pH be maintained around 7 and the alkalinity be appropriate to buffer pH changes.Temperature should also be controlled (Sewerage and Solid Waste Project Unit. 2000).

2.3.6.2 Recycling

Recycling makes use of materials that otherwise would become waste by turning them into valuable resources. Recycling helps reduce greenhouse gas emissions, in part, by diverting waste from landfills.

In some countries, a great deal of recycling occurs before the waste reaches the landfill. Scrap dealers buy directly from households and businesses, waste pickers or scavengers collect materials from waste bins, and waste collectors separate materials that can be sold as they load their trucks. Governments can build on these practices by providing support to organize and improve recycling efforts. (USEPA, 2002)

2.3.6.3 Thermal treatment

This refers to processes that involve the use of heat to treat waste. Listed below are descriptions of some commonly utilized thermal treatment processes.

2.3.6.3.1 Incineration

Incineration is the most common thermal treatment process. This is the combustion of waste in the presence of oxygen. After incineration, the wastes are converted to carbon dioxide, water vapour and ash. This method may be used as a means of recovering energy to be used in heating or the supply of electricity. In addition to supplying energy incineration technologies have the advantage of reducing the volume of the waste, rendering it harmless, reducing transportation costs and reducing the production of the greenhouse gas methane (Sewerage and Solid Waste Project Unit. 2000)

2.3.6.3.2 Pyrolysis and Gasification

Pyrolysis and gasification are similar processes. They both decompose organic waste by exposing it to high temperatures and low amounts of oxygen. Gasification uses a low oxygen environment while pyrolysis allows no oxygen. These techniques use heat and an oxygen starved environment to convert biomass into other forms. A mixture of

combustible and non-combustible gases as well as pyroligenous liquid is produced by these processes. All of these products have a high heat value and can be utilised.

Gasification is advantageous since it allows for the incineration of waste with energy recovery and without the air pollution that is characteristic of other incineration methods (Sewerage and Solid Waste Project Unit. 2000).

2.3.6.3.3 Open burning

Open burning is the burning of unwanted materials in a manner that causes smoke and other emissions to be released directly into the air without passing through a chimney or stack. This includes the burning of outdoor piles, burning in a burn barrel and the use of incinerators which have no pollution control devices and as such release the gaseous by-products directly into the atmosphere. Open burning has been practiced by a number of urban centres because it reduces the volume of refuse received at the dump and therefore extends the life of their dumpsite. Garbage may be burnt because of the ease and convenience of the method or because of the cheapness of the method. In countries where house holders are required to pay for garbage disposal, burning of waste in the backyard allows the householder to avoid paying the costs associated with collecting, hauling and dumping the waste (Sewerage and Solid Waste Project Unit. 2000).

Open burning has many negative effects on both human health and the environment. This uncontrolled burning of garbage releases many pollutants into the atmosphere. These include dioxins, particulate matter, polycyclic aromatic compounds, volatile organic compounds, carbon monoxide, hexachlorobenzene and ash. All of these chemicals pose serious risks to human health. The dioxins are capable of producing a multitude of health problems; they can have adverse effects on reproduction,

development, disrupt the hormonal systems or even cause cancer. The polycyclic aromatic compounds and the hexachlorobenzene are considered to be carcinogenic. The particulate matter can be harmful to persons with respiratory problems such as asthma or bronchitis and carbon monoxide can cause neurological symptoms (Sewerage and Solid Waste Project Unit. 2000).

The harmful effects of open burning are also felt by the environment. This process releases acidic gases such as the halo-hydrides; it also may release the oxides of nitrogen and carbon. Nitrogen oxides contribute to acid rain, ozone depletion, smog and global warming. In addition to being a greenhouse gas carbon monoxide reacts with sunlight to produce ozone which can be harmful. The particulate matter creates smoke and haze which contribute to air pollution (Sewerage and Solid Waste Project Unit. 2000).

2.3.6.4 Land filling

Uncontrolled dumping of waste can contaminate groundwater and soil, attract disease carrying rats and insects, and even cause fires. Properly designed, constructed, and managed landfills provide a safe alternative to uncontrolled dumping. For example, to protect groundwater from the liquid that collects in landfills (leachate), a properly designed landfill has an earthen or synthetic liner. As waste decomposes, it emits methane, a greenhouse gas that can also cause fires. To prevent fires, a properly designed landfill should have a way to vent, burn, or collect methane. Landfill operators can also recover this methane—thereby reducing emissions—and generate electricity from the captured gas (USEPA, 2002).

2.4 Challenges of Solid Waste Management

Waste generation increases with population expansion and economic development. Improperly managed solid waste poses a risk to human health and the environment. Uncontrolled dumping and improper waste handling cause a variety of problems, including contaminating water, attracting insects and rodents, and increasing flooding due to blocked drainage canals or gullies. In addition, it may result in safety hazards from fires or explosions. Improper waste management also increases greenhouse gas (GHG) emissions, which contribute to climate change. Planning for and implementing a comprehensive program for waste collection, transport, and disposal—along with activities to prevent or recycle waste—can eliminate these problems.

2.4.1 Developing a Plan for Integrated Solid Waste Management

Planning is the first step in designing or improving a waste management system. Waste management planners should, for example, take into consideration institutional, social, financial, economic, technical, and environmental factors. These factors vary from place to place. Based on these factors, each community has the challenge of selecting the combination of waste management activities that best suits its needs. Because integrated solid waste management involves both short- and long-term choices, it is critical to set achievable goals.

Government plays an important role in developing and enforcing waste management standards, providing funding, and managing day-to-day operations of solid waste management activities. Each level of government may have responsibility in ISWM plan: national governments typically set standards for solid waste management; the state, provincial, or regional governments may help monitor and enforce these standards; and local governments often play the primary role of managing solid waste

activities on a daily basis. All levels may also provide funding for solid waste management activities. Two primary costs must be considered in any waste management system: initial capital costs (to purchase equipment or construct new facilities) and ongoing operations and maintenance costs. These costs can be funded in a number of ways including private equity, government loans, local taxes, or users' fees.

2.5 Solid Waste Systems – Cash Flow Needs

According to Cointreau Sandra, (2005) Solid waste management is a daily task that is never done. Every day brings new waste to collect, streets to sweep, waste loads to haul and safely dispose. As local economies develop, per capita waste generation increases in proportion to increased consumer activity and related packaging. Tourism and other foreign business transactions may cause waste generation to increase faster than local consumption growth.

Solid waste budgetary requirements in municipalities of developing countries are substantial. They commonly range from 20-50% of total municipal recurrent expenditures. With the rise in contracting for private sector service delivery, the recurrent cost goes up, because capital investment by the private sector is reimbursed through their contract payments.

When services are provided by government workers, solid waste budgets may be significantly obligated to labour salaries and benefits. Fuel costs and consumables, such as tires, also have precedence. Beyond these priority commitments, the solid waste budgets may not be sufficiently ample to buy spare parts to make repairs, replace collection bins, or purchase soil to cover waste in the landfill. In such situations, solid waste workers may not be able to perform their job for lack of

operable vehicles and/or consumables. Without spare parts, a portion of the fleet may be set aside to be cannibalized for spare parts. These circumstances then lead to a spiral downward and willingness to pay for service diminishes as residents experience service irregularities (Cointreau Sandra, 2005).

Good solid waste service occurs only where reliable, regularized and adequate cash flow is available. With adequate cash flow for recurrent expenditures, it is possible to arrange for private sector involvement that would provide investment in new equipment and facilities, and thus enable capital costs to be translated to recurrent debt service payments. Similarly, adequate cash flow enables municipalities to borrow from local commercial or national development banks. Without adequate recurrent revenues, only transfers, grants and borrowing on concessional terms are likely to be available (Cointreau Sandra, 2005).

2.5.1 Solid Waste Governance – Who is Responsible?

Municipalities own the solid waste that is put on their public streets, have full control over who they allow as their agents to handle that waste, and are expected to provide waste management services from the source to the final disposal. This service is highly visible and it influences the perception of city functionality held by all residents and visitors. The many surveys conducted by the World Bank have routinely demonstrated that it is important to municipal residents and they are willing to pay for service that is conducted in a cost-effective manner. Follow-up surveys show willingness to pay increases after services have been improved (Cointreau Sandra, 2005).

Inadequately collected and improperly managed solid waste generates significant local externalities that affect, for example, local traffic, aesthetics, flooding, disease,

odours, air particulate levels, and water quality. There are few potential regional and global externalities, but these are quite controllable, at a cost, through pollution control systems. The primary regional and global impacts needing special controls are: regional air emissions from improperly controlled incineration (i.e., dioxins, furans and volatilized heavy metals in stack gases), and global greenhouse gases from improperly controlled waste disposal (i.e., methane gas from sanitary landfills that do not have gas flaring or recovery systems). Because solid waste systems have few externalities beyond local boundaries, it is appropriate for local people to manage their wastes within their local capacity, including financial capacity (Cointreau Sandra, 2005).

2.5.2 Sources of Funds to cover Capital Expenditures – Options

Cointreau Sandra, (2005) asserted thatmost municipalities are restricted from having renewal funds to replace capital assets. They also are restricted from saving monies today to cover the capital costs of tomorrow. Allowing this flexibility should be a part of putting municipal finances on a sound footing. Borrowing for long-lived assets is typically a good solution because this approach allocates the costs to those who benefit from the assets in the future as well as today.

Finance to cover capital costs may be obtained from the following potential sources:

- Intergovernmental transfers from central government, including earmarked and matching grants (sometimes supported by external assistance);
- loans from specialized institutions or funds (sometimes supported by external assistance);
- direct municipal borrowings from local development banks, communal funds, and commercial banks;

- renewal funds from local solid waste user fees, including tipping fees, and special environmental/disposal taxes;
- bond-issues for facilities that are potentially revenue generating, such as landfill gas recovery and compost facilities; and
- Private sector investment as part of a concession, private subscription or service contract.

Municipalities may offer private sector investors a range of financial incentives that could be viewed as hidden subsidies. These include:

- use of government land and/or facilities,
- tax exemption,
- customs duties exemption,
- accelerated depreciation periods for taxation,
- staffing support from government roles,
- facility in obtaining permits,
- improved regulatory enforcement to assure compliance with new systems,
- assured source segregation to obtain quality wastes for resource recovery purposes,
- revenue sharing of by-product sales revenues,
- special utility pricing,
- limited liability (as in the long-term post-closure liability of sanitary landfills)
- Development rights to completed and/or reclaimed disposal sites, in partnership with government.

2.5.3 Solid Waste Service – A Public or Private Good?

Solid waste management is a public good. In part, this determination reflects the fact that uncollected and illegally discharged solid wastes adversely affect the general public, not only the individuals that are not participating in the proper management of their wastes. Also, everyone benefits from the actions of various individuals to properly manage their wastes. When user charges and tipping fees are not acceptable to various households, establishments, and private haulers, they may resort to illegal dumping of their wastes (Cointreau Sandra, 2005).

This supports the public good argument, as no one should be excluded from service or it would affect the service benefit to all. While a valid argument for many types of waste (such as demolition rubble), it is possible that a significant portion of illegal discharges of most solid waste types may be identifiable from mailing envelopes or other items with names and addresses found in the waste. This is a tool for enforcement that is unique to some solid waste categories, as opposed to the impossible task of trying to identify where an illegally dumped load of pumped seepage might have originated (Cointreau Sandra, 2005).

Although solid waste management is a public good, there are limitations to the ability to act as a free rider and people are willing to pay for the service, so promoting cost recovery to the extent possible and affordable is good policy. Willingness to pay is greatly enhanced when local residents perceive accountability and transparency in the management of the fees charged for solid waste management services, thus collecting money in a segregated account for the sole use of the solid waste sector is a useful tool for financial management. Ideally, there should be one entity with full solid waste responsibility to enable accountable and transparent services. When the solid

waste activities are disaggregated (e.g., collection equipment maintained by a central workshop, fleets managed by an engineering department, field supervision conducted by health inspectors, and collection workers operating under a solid waste manager) accountability is virtually impossible(Cointreau Sandra, 2005).

From the perspective of encouraging private sector participation in the solid waste sector, evidence of self-sustaining revenues at the local government level may affect the private sector's willingness to invest in solid waste infrastructure and enter into long-term service agreements. In a few cases, central government payment guarantees have enabled city-wide contracting for all solid waste services (as in Senegal, where MIGA also provided a non-commercial risk guarantee)(Cointreau Sandra, 2005).

2.5.4 Solid Waste Revenue Generation – Payment by Fee or Tax?

There are few cities in developing countries that attempt to achieve full cost recovery for collection, recycling, transfer, treatment and disposal systems. Activities such as street sweeping, cleaning of public areas (e.g., public markets), servicing public institutions and barracks, and removal of clandestine waste piles easily comprise 20-40% of the total waste collection effort.

People in developing countries typically are willing and able to pay for the solid waste collection service that they receive directly at their door and within their immediate neighbourhood. Few appreciate the rationale to contribute to city-wide street cleaning, clean-up of parks and other public areas, emptying communal collection bins, promoting recycling activities, providing secondary collection beyond their neighbourhoods, transferring waste long distance, treatment or sanitary landfill. When residents directly pay a private operator to collect waste from their home or

establishment, it is particularly difficult to convince them that a second fee is justified to government for services provided beyond the primary collection service (Cointreau Sandra, 2005).

Ideally, it would be efficient and effective to fully cover all solid waste costs through solid waste tariffs included within the property tax, designating on the tax bill the solid waste portion to be set aside for the solid waste sector. However, in most developing countries, given the inadequate property cadastral and appraisal systems, poor tax collection efficiency, and the large number of illegal settlements, recovering some payment from all residents through property tax is typically not feasible.

2.5.5 Solid Waste Fees – Cross Subsidies among Service Recipients

Solid waste collection commonly costs more for service to the poor than the wealthy, and costs vary with settlement patterns, road conditions, and traffic levels. The poor have small quantities of waste in containers that are less easy to gather and load than those found in wealthy neighbourhoods. Access for collection vehicles is better in wealthy neighbourhoods. It costs much less to collect waste in a large container from a big hotel or commercial establishment, on a per tonne basis, than it costs to collect waste in baskets and cartons in front of slum dwellings(Cointreau Sandra, 2005).

A practical and reasonable solution to this problem from a public finance perspective is to cross subsidize different consumers across a benefit area, and link charges broadly to capacity to pay, for equity reasons. As long as the service is well-managed, the cross –subsidies needed should not be so significant as to disaffect more affluent users.

Solid waste treatment and disposal could also cost more for the waste of the poor than the wealthy. The waste from the poor has a lot of water, ash and sand in it, and

seldom has very much combustible or recyclable material that could generate resource recovery revenues. Charges for various treatment and disposal facilities should be based on city-wide costs for environmentally safe waste management and proportioned fairly by ability to pay. To minimize transport emissions and energy consumption, comparable tipping fees at the various unloading facilities are essential(Cointreau Sandra, 2005).

To avoid the administrative costs of separate collection of yet another charge or tax uniquely for solid waste, an effective expedient collection involves tying a solid waste surcharge to utility bills, such as electricity or water. This solution works well when utility services cover most households and charges are linked to consumption.

Fees that reflect affordability (and related consumption that leads to waste) are relatively easy to develop and preferable to customer-specific cost of service fees. For households, this typically means setting the tariff based on one of the following:

Size of property, category of neighbourhood (by income) and related property tax, Water consumption and billings, and Electricity consumption and billings

In order to discourage excessive waste generation, waste generators that regularly produce large quantities are typically charged by the size of their containers. The cut-off for a large generator is any establishment with containers that can hold, for example, over 1 cubic meter of waste per day.

As countries develop and solid waste systems become more regulated, it becomes possible to increase quantity-based charges. This may be done, for example, by selling specially coloured or labelled plastic bags for a price that would enable cost recovery and then collecting only waste that is in these specially marked plastic bags. At this time, few low and middle income countries have the monitoring and

enforcement system that would enable this system to be put in place without significant potential for illegal dumping(Cointreau Sandra, 2005).

2.5.6 The financial dilemma and private sector participation

Developing countries spend around $46billion annually on MSW management, but it is estimated that they should spend another $40 billion to cover the service delivery gap. Considering the projected increase in MSW generation, their financing needs could surpass $150 billion annually by 2025(Hoornweg, D. and Bhada-Tata, P., 2012). MSW is often an important budget item for municipalities, and can comprise as much as half of the municipal budget in many low-income countries. Considering the actual gap between MSW costs and the funding of these, and the forthcoming growth of the waste sector, local authorities must enhance their service efficiency and access other sources of funding if they wish to lower the burden on their finances.

As with many public services, the private sector can provide many benefits. First, it allows for part of the financial costs of MSW to be transferred out of the municipal budget, either for investment, operation, or both. Private sector participation may be a way of assisting the public sector to address the huge financial shortfall. Second, always seeking to reduce financial losses and improve service effectiveness, the private sector is more likely to provide a high-quality service at a lower price, whereas due to a lack of incentive, the public sector often fails to achieve this (Kessides, I.N. 2004).

2.5.7 New Business Opportunities

The natural resources market faced huge price increases in the early 2000s up to the financial crisis in 2008, raising awareness of the limited availability of fossil energy, mineral resources, and agriculture and forest products, and questioning the model of

our consumer society. One solution to limiting the human impact on the planet could take the form of using waste as a valuable resource, either as a form of energy production or for reuse and recycling with access to the global market of secondary materials such as scrap metal, paper, or cellulose fibre or local markets such as compost. The world produces four billion tonnes of all types of waste per year, but only a quarter is currently diverted from disposal (Le Courtois Alexandra, 2013).

Most recently, the international market again exhibited recycling material price increases, which may this time prove the potential of the sector in a very consumerist world (Kelly, T., Matos, G. 2011). In developing countries, the recycling sector is very different in many respects compared with developed countries. With very little experience of public incentive, the sector benefits from very cheap labour, driving its local-market- based profitability (Chalmin andGaillochet,2009).

As an example of the potential of the sector, composting is a promising recycling chain in developing countries, considering the very high organic content (around 50-80%, mostly food waste) and high moisture levels of MSW, as well as its associated finance-enhancing possibilities: revenues from the sale of compost, cost reductions from avoided transportation of waste if composting is operated within the community, and from avoided disposal costs (including the price of land) (Hoornweg, D., Bhada-Tata, P., 2012). Moreover, composting has also positive social impacts, by creating jobs.

2.6 Contingent Valuation Method (CVM) as a tool for Assessing Willingness toPay (WTP)

The Contingent Valuation Method (CVM) is an economic, non-market based valuation method especially used to infer individual's preferences for public goods,

notably environmental quality. For this same reason, CVM is known in the literature by exploring the use of questionnaires and asking consumers directly, i.e. respondents, for their maximum willingness to pay (WTP) for specified improvements in the environmental quality, including protection of marine biodiversity. In short, CVM circumvents the absence of markets for public goods by presenting consumers with a survey market in which they have the opportunity to buy the good in question – protection of marine biodiversity. Because the elicited WTP values are contingent upon the market described to the respondents, this approach came to be called the contingent valuation method (Nunes, P.A.L.D. et al 2007).

Today, the CVM is one of the most used techniques for valuation of environmental benefits, widely used by academic institutions as well as by governmental agencies as a crucial tool in cost-benefit analysis and damage cost assessment. This is partly due to the advantages of CVM compared to other valuation methods. First, the CVM method gives immediately a monetary assessment of respondents' preferences. Second, the CVM method is the only valuation technique that is capable of shedding light on the monetary valuation of the non-use values, i.e., the benefit value component of the environmental commodity that is not directly associated with its direct use or consumption. Third, CVM brings with it the advantage that environmental quality changes may be valued even if they have not yet occurred (ex antevaluation). This implies that the CVM can be a useful advisory tool for policy decision-making. Furthermore, the constructed nature of the CVM method permits to value environmental changes even if they have not yet occurred. Therefore, CVM offers a greater potential scope and flexibility than the revealed preference methods since it is possible to specify different states of nature (policy scenarios) that may

even lie outside the current institutional arrangements or levels of provision (Nunes, P.A.L.D. et al 2007).

It was first used by Davis to estimate the benefits of outdoor recreation in a Maine (USA) backwoods area (Davis R.K., 1963). Subsequently, the CVM was extensively developed throughout the 1970s and 1980s and finally received a major endorsement when the US National Oceanic and Atmospheric Administration (NOAA) proposed the first federal government guidelines for the use of the method in environmental policy analysis in 1993 (Arrow K.Jet al 1993). The high-frequency use of the CVM and its subsequent federal authorization helped to make the CVM a broadly accepted method of environmental valuation. Since then, the CVM has been widely used to measure the value of types of environmental goods and the improvement of their status. The method has been used to evaluate goods such as air quality, water quality, ecosystem services, biodiversity, and wildlife and has even been applied in the fields of waste and resource management (Afroz R., et al. 2010).

Description of Study Area

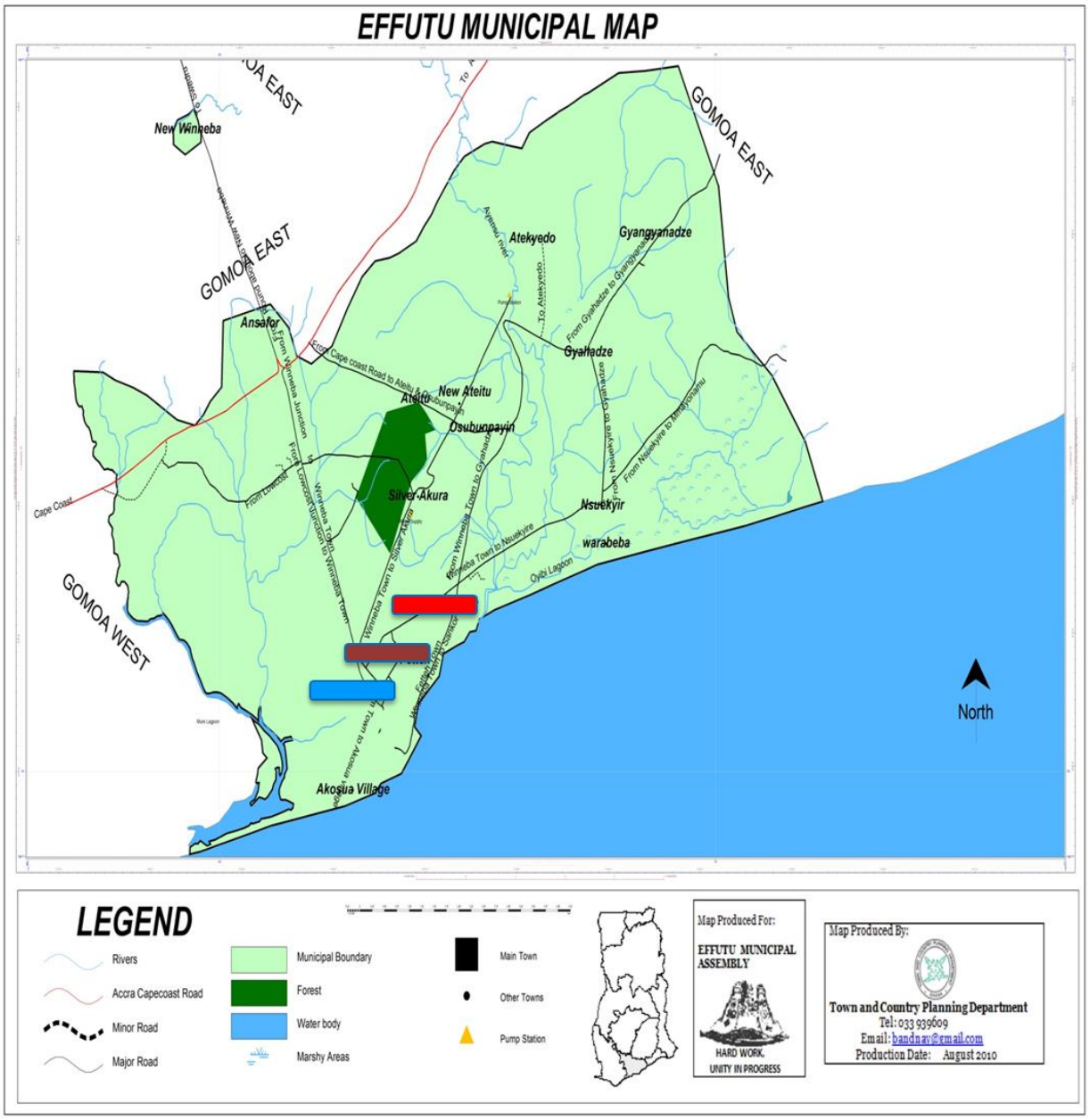

Figure 1.0 Map of Effutu Municipal
Source: From the Effutu Municipal Assembly

The research was conducted in Effutu Municipal Assembly in the central region of Ghana. The municipality is inhabited mainly by the Effutus who are among the Guan speaking group of the country. The vegetation is that of the coastal savannah grassland. The soils are largely clayey with high salinity. The annual rainfall ranges from 400mm – 500mm with a mean temperature range of 22°C - 28°C. The

municipality consists of protruding granite rocks and isolated hills surrounding the metropolis. Coordinates: The Effutu Municipal is situated on latitudes 5°20′N and longitudes 0°37′W.

It is bordered to the north by Agona Municipal the north-east by the West Akim Municipal, to the south by the Gulf of Guinea, to the east Gomoa District and Ga West Municipality, and on the west by the Gomoa District. The Municipal covers an area of 417.3 square kilometers (163 sq miles). In 2000, the Municipality had a population of 46,854 which is made up of 21,346 males and 25,508 females representing 46% and 54% for males and females respectively. According to the 2010 Population and Housing Census, the estimated number of inhabitants in the municipality is about 68,597, with 32,795 being males and 35,802 being females with an average family size of 4.4.

Before 1988, the district was part of the Gomoa-Awutu-Effutu Senya District Council. The AwutuEffutuSenya District Assembly was carved out of the District Council with the establishment PNDC Law 207 of 1988, which re-demarcated the country into 10 districts from 65 District, was established in 1988 by LI 1376. Administratively, the Municipal Assembly, which was established in 2007 by L.I 1860, has one Constituency, seventeen (17) Electoral areas, twenty-six (26) Unit Committees, and forty-three (43) polling stations. Winneba is a town renowned for its several specialised major institutions of learning. These include the University of Education, Winneba (UEW), the National Sports College, Nurses Training College and the Regional Police Training School.

Winneba which is the district capital is about 66 km west of Accra, Ghana's capital, on the Accra – Takoradi road. Medium sized and traditionally known as Simpa,

Winneba is the principal town of the Effutu State founded around 1530 AD. According to history, the name Winneba originated from sailors who plied along the Atlantic Coast and who were often aided along the bay by a favourable wind. From their constant use of the words "windy bay" the name Winneba was coined.

The indigenous dialect of Winneba is Effutu but Fante is also widely spoken. As a coastal town the principal occupation of the people is fishing. In the colonial days, Winneba was the second seat of administration in the Central Province of the Gold Coast, as Ghana was then called. It was also salubrious weather the colonial government made it a convalescent place for its European civil servants.

During the early post-independence days Winneba was particularly famous for the ideological institute which was established by Osagyefo Dr Kwame Nkrumah and which became the "Mecca" for freedom fighters from all over Africa.

Winneba has a proud history, culture and fascinating environment. A former commercial hub the town's historic warehouses and other colonial architecture projecting against the long clean, white, breezy beaches provide a serene and congenial atmosphere for all manner of businesses.

The EgyeiManko Hill, near Mankoadze, is the most prominent hill and serves as hunting grounds for the deer during Aboakyire (Deer Hunting) festival. Two major rivers, Ayensu and Gyahadze, drain the Municipality and enter the sea at Warabeba and Opram respectively: The Omanyi and Ntafrofam streams also traverse the lowland plains stretching from north-eastern part near the round-about through Klimovic Hospital and Zion Girls High School and enter the sea through the Muni Lagoon.

From a survey of 88 households in October 2002, the average annual income for the district was ¢6,944,091 as against the expenditure of ¢12, 46018. Given the average household size of 8, the average monthly income per capital was ¢72,334.30 compared to the average monthly expenditure per capital of ¢129,798.10. Only 27% of the households generate their own income. Thus 73% of the households depended solely on the income of the household's heads. The major sources of household income were crop farming (44.8%), business/trading (29.1%), salary (11.4%) and food processing (10.3%).

In the area of tourism, the district abounds in nature tourist attractions. This includes a large stretch of coconut fringed sandy beaches with the potential for the development of beach resorts. The Muni Lagoon, with its seasonal array of migratory birds, offers nice sight-seeing. There is also an estuary of the river Ayensu near Winneba. The municipality also has a unique Aboakyire Festival which is celebrated every first week in May. The festival involve the catching of a live deer in the bush with the bare hands which attracts thousands of well-wishers from far and near.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

The study was conducted with the household heads as the main focus. The basic research design used in this study was a cross-sectional descriptive survey where data collection occurred at a single point in time for each household head (Fraenkel&Wallen, 2006). The main aim is to elicit their willingness to pay for an improved Solid waste management and also to find out the motivating factors.

3.1 Research Working Definitions and Hypothesis

Household: A household consists of a person or a group of persons who live together in the same house or compound, share the same house-keeping arrangements and are catered for as one unit. (GSS, 2012)

Head of household: The household usually recognizes one person as the head. The head of household is generally the person, male or female, who has economic and social responsibility for the household (GSS, 2012).

Like any other environmental and public goods, the willingness to pay amount and whether households are willing to pay or not for an improved solid waste management is expected to be affected by various factors. Some of these factors with their expected signs are defined as follows as used in similar project by (AmigaAklilu, 2002).

X1 (Sex of Respondents)-this is a dummy variable taking 1 if the respondent is male; 0 otherwise. This study expects*a priori*that female respondents will be more willing to

pay than men, since traditionally it is the role of women to clean the house and dispose the waste.

X2 (Age of Respondents)-this refers to the age of the respondent and it is expected*a priori* to affect willingness to pay negatively. This is because old people may consider waste collection, as government's responsibility and could be less willing to pay for it. While the younger generation might be more familiar with cost sharing like for education, health, etc. and could be more willing to pay(AmigaAklilu, 2002).

X3 (Education of Respondent)-This variable is taken to capture the number of years the respondent spent informal school system. Education is expected to have positive and significant effect on waste management. Thus, the longer period the individual spent in formal school system, the more likely that he/she would be willing to pay more for improved waste management.

X4 (Marital Status of Respondent)-whether the respondent is currently single or not is expected to influence the value the individual gives for the proposed change. MSR is dummy variable taking 1 if the respondent is married; 0 otherwise, and it is expected a priori to have a positive sign. This is due to the fact that married people are likely to be more responsible to keep the environment clean than single ones because married respondents are likely to have larger family size and hence face higher risks than those not married.

X5 (Monthly Income of the Household) - this variable refers to the monthly money income of the household in terms of Ghana cedis. It includes the income of the head and all other members of the household from all sources. There is a general agreement in environmental economics literature on the positive relationship between income and demand for improvement in environmental quality. Therefore, it is expected a

priori that income will affect willingness to pay and its amount positively and significantly.

X6 (Number of Children in the Household)-this refers to the number of children below 15 years of age. This variable is expecteda priori to have a positive effect on willingness to pay. This is due to the fact that the more children in the household, the more willingness to maintain a clean environment in the future in which children will grow with lesser risk due to cleaner environment.

X7(Responsibility of Solid Waste Management)-this variable is taken as proxy to examine the attitude of the respondent towards cost sharing in solid waste management. RSWM is a dummy variable taking 1 if the respondent believes households have responsibility to the improvement of solid waste management (including cost sharing) with the government; 0 otherwise, i.e., if the respondent feels it is entirely government's responsibility. This study expects positive attitude towards cost sharing to influence willingness to pay in the positive direction.

X8(Time Spent in the Area)-this refers to the number of years the household has been living there. This is expected a priori to influence willingness to pay in the positive direction, since the longer the year the household has been there, the more they would understand the problem of solid waste management of that area, and the more they are expected to pay.

Table 1: Description of explanatory variables used in the model.

Variable	Description	Unit of measure
Sex	X1 (Sex of Respondents)	Binary = 1 if male, 0 = otherwise
Age	X2 (Age of Respondents)	Years
Education	X3(Education of Respondent)	Years
Marital Status	X4 (Marital Status of Respondent	D = 1 if married 0 = otherwise
Monthly Income	X5 (Monthly Income of the Household	Ghana Cedis (GH₵)
Number of Children	X6 (Number of Children in the Household)-	Number individuals
Responsibility of Solid Waste Management	X7 (Responsibility of Solid Waste Management	Binary 1 = if they think EMA is responsible, 0 = otherwise
Time Spent in the Area	X8 (Time Spent in the Area	Years

3.2 The Sample Size and Techniques

The study used primary data. The data were collected with the use of structured questionnaires.

A two stage sampling technique was used to select households used for the study. The first stage involves stratifying the entire study area into three locations (Underdeveloped area, Developed Area and New Sites). The areas covered within the underdeveloped areas started from Sankor passing Royal beach through Roman

School down to Fete through Lancaster to Sir Charles Beach. The developed areas start from the Police training school through South Campus to North Campus. The new site covers Klimovic Hospital through Low cost to Winneba Junction.

The second stage involved selecting the sample size out of the stratified arrangement. In determining the sample size, the formula n=N/ (1+N (α) 2) (Coffie F.M 2010) was used where n is the sample size, N is the Population size and α is the confident level at 95 percent. Winneba has a population of 68,597 according to 2010 Population and Housing Census. Fifty households were randomly selected from each of the stratified segment. In all 150 households were selected for the study.

3.3 Method of Data Collection

Primary data for the study was gathered using detailed structured questionnaire, interview and direct observation.

3.4 Method of Data Analysis

Descriptive statistics such as frequency distribution tables, mean and standard deviation were used to analyse the socioeconomic characteristics of the respondents. The logit model was used to determine the mean willingness to pay for improved solid waste management by households.

The Theoretical and Analytical Framework

Logistic regression, also called a logit model, is used to model dichotomous outcome variables. The logistic regression model describes the relationship between a dichotomous response variable Y, coded to take the values 1 or 0 for `yes' and `no', respectively, and k explanatory variables X1, X2…….Xk. The explanatory variables can be quantitative or indicator variables referring to the levels of categorical variables. Since Yis a binary variable, it has a Bernoulli distribution with parameter p

= P(Y = 1), that is, Pis the probability of success for given values X1, X2…….Xk of the explanatory variables. For a Bernoulli variable, the mean is given by

$$E[Y] = P(Y = 1) = p$$

The logistic regression model is defined as follows. Suppose that Y1,…..,Yn are independent Bernoulli variables, and let Pi denote the mean value of Yi, that is, pi = E[Yi] = P(Yi = 1) = p. Themean value Pican be expressed in terms of the explanatory variables Xi, 1, X2,……, Xi,k as

$$p_i = \frac{1}{1 + \exp\left(-\beta_0 - \sum_{j=1}^{k} \beta_j x_{i,j}\right)}.$$

In the logit model the log odds of the outcome is modelled as a linear combination of the predictor variables.The explanatory variables can be quantitative or indicator variables referring to the levels of categorical variables. The respondents were asked the bid amounts to state whether they are willing or not willing to pay by responding "yes" or "no". The responses were treated as a binary variable taking the value of 0 or 1. Then logistic regression function package was used to estimate the parameters of the function. The non-linear binary Logitmodel takes the following form

$$\mathbf{WTP_i = \alpha + \beta Bid + \beta_1 X1 + \beta_2 X2 + \beta_3 X3 + \beta_4 X4 + \beta_5 X5 + \beta_6 X6 + \beta_7 X7 + \beta_8 X8 + \varepsilon}$$

Where WTP = the dependent variable or response obtained from respondents in the form of "yes" or "no" answer; WTP=1 if the respondent answers yes and 0 otherwise, ε= random disturbance term; "α" is the constant term and "β" is the bid coefficient; X1 = (Sex of Respondents), X2 = (Age of Respondents), X3 = (Education of Respondent), X4 = (Marital Status of Respondent), X5 = (Monthly Income of the

Household), X6 =(Number of Children in the Household), X7 = (Responsibility of Solid Waste Management), X8 = (Time Spent in the Area)

Mean willingness to pay for improved Solid waste management by households was calculated using the formula derived and given as:

$$\text{MeanWTP}=1*\text{In}\frac{(1+esp\beta 0)}{(\beta 1)}$$

Where ß$_0$ and ß$_1$ are absolute coefficient estimates from the logistic regression and the Mean WTP is the mean for the improved Solid waste management by households.

The pseudo-R square and the chi-square were used to measure the goodness of fit of the model and the significance of the model used.

Coefficient of determination (**R^2**) is statistical method that explains how much of the variability of a factor can be caused or explained by its relationship to another factor.it is used in trend analysis. It is computed as a value between 0 (0 percent) and 1 (100 percent). The higher the value, the better the fit. Coefficient of determination is symbolized by r^2 because it is square of the coefficient of correlation symbolized by r. The coefficient of determination is an important tool in determining the degree of linear-correlation of variables ('goodness of fit') in regression analysis.

The chi-square test is a statistical test that can be used to determine whether observed frequencies are significantly different from expected frequencies. Chi-square tests enable us to compare observed and expected frequencies objectively, since it is not always possible to tell just by looking at them whether they are "different enough" to be considered statistically significant. Statistical significance in this case implies that the differences are not due to chance alone, but instead may be indicative of other processes at work.

CHAPTER FOUR
ANALYSIS AND DISCUSSION OF RESULTS

4.0 Waste Disposal methods and Benefactors of Municipal Assembly Solid Waste Management

The table 4.1 below depicts the preferences of how the various households dispose of their waste in relation to the services the municipal assembly renders as far as household waste collection is concerned.

Table 4.1Preference of Waste Disposal methods over the Benefactors of Municipal Assembly SWM

			Waste Disposal Methods					
			Private collectors Take It	Take it to the nearby storage receptacle	Dig a hole around the house and bury/burn it	Dump it at the Beach	Throw it on an open space or on the street	Total
Benefactor of Municipal Assembly's SWM Services	Yes	Frequency	5	3	2	0	5	15
		%	33.3%	20.0%	13.3%	.0%	33.3%	100.0 %
	No	Frequency	3	62	37	32	1	135
		%	2.3%	46.6%	27.8%	22.6%	.8%	100.0 %
Total		**Frequency**	**8**	**65**	**39**	**32**	**6**	**150**
		%	**5.3%**	**43.3%**	**26.0%**	**21.3%**	**4.0%**	**100.0 %**

Source: Author's Survey, 2013

A total of 15 respondents representing 10% of the total number of respondents who have previously enjoyed household collection of solid waste from the Municipal Assembly have now resorted to other disposal methods due to the frequency of

collection. According to table 4.1, 33.3% of those who have benefitted from the Municipal Assembly's SWM services, have now secured the services of private waste collectors and others also dispose of in open spaces. This can be attributed to the fact that, the municipal assembly less frequently collect their waste and because they cannot wait forever for the Assembly, hence their reason to go with this method of disposal. About 20% of the households who are no more enjoying any services from the municipal assembly have also resorted using the various nearby waste collection containers provided by the Municipal Assembly. Also 13.3% of respondents have also dug holes in their backyard to dispose of their waste.

Almost 47% of the households who do not enjoy any household collection from the municipal dispose of their waste at the various containers provided by the assembly at vantage points. A substantial amount of 27.8% of the respondents who have never enjoyed any household waste collection have dug holes in their respective houses to dump their waste in and burn them subsequently when it gets full. Most of these households who are practising this disposal methods have enough spaces at their backyards and think it is easier and less stressful in managing the waste through that method.Disturbingly enough, 22.6% of the respondents dumb their solid waste at the beach. Most of these respondents claim they have practiced this all their life time and when there is a high tidal waves at night, the sea will carry all the waste away. They feel it is a best way of disposing of solid waste. Enough waste containers should be provided in these areas to serve as an alternative.

4.1 Dumping and littering of waste in the Effutu Municipality

Even though there is a physical presence of Zoomlion Company Ltd on the ground which sees to the daily management of solid waste in the municipality, according to figure 4.1, 72% of the respondent households perceive that, the extent of littering and

illegal piles of waste in the municipality is very and somewhat serious and needs immediate attention.

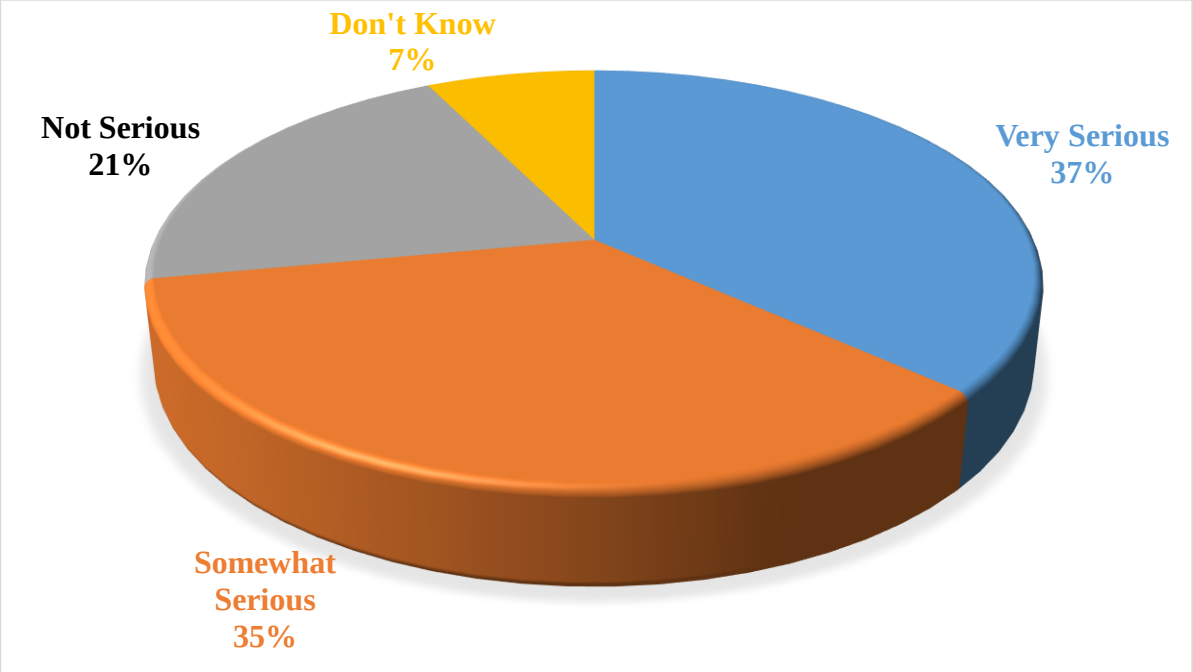

Figure 4.1 Extent of littering and illegal piles of waste
Source: Author's Survey, 2013

In contrast, about 21% of the households also think that the situation of littering and illegal piles of waste is not serious and does not need any immediate attention. Also those of the households who are indifferent about the waste situation in the municipal represent about 7% of the respondents.

Table 4.2 Satisfaction of Solid Waste Management services over the frequency of collection

			Satisfaction of Solid Waste Management Services				
			Very Satisfied	Reasonably Satisfied	Not Satisfied at all	Don't Know	Total
Frequency of Waste Collection	Daily	Frequency	1	1	0	0	2
		%	50.0%	50.0%	.0%	.0%	100.0%
	Three times a week	Frequency	9	3	12	0	24
		%	37.5%	12.5%	50.0%	.0%	100.0%
	Once a Week	Frequency	0	0	7	0	7
		%	.0%	.0%	100.0%	.0%	100.0%
	Less Frequently	Frequency	10	15	62	21	108
		%	9.3%	13.9%	57.4%	19.4%	100.0%
	Don't know	Frequency	0	3	5	1	9
		%	.0%	33.3%	55.6%	11.1%	100.0%
Total			**20**	**22**	**86**	**22**	**150**
			13.3%	**14.7%**	**57.3%**	**14.7%**	**100.0%**

Source: Author's Survey, 2013

From table 4.2, it can be deduced that about 57.4% of the households who think the municipal assembly collect the waste less frequently are never satisfied at all with their services. They demand better services from the assembly to keep the municipal clean. Only 13.9% of the respondents who perceive that the municipal less frequently collect the waste are reasonably satisfied. All the respondents who think that the municipal collect the waste once a week are not satisfied. About half of the respondents who perceive that the waste is collected every three days are also not satisfied at all with the kind of services that is being rendered.

Availability of Waste Receptacle in Households

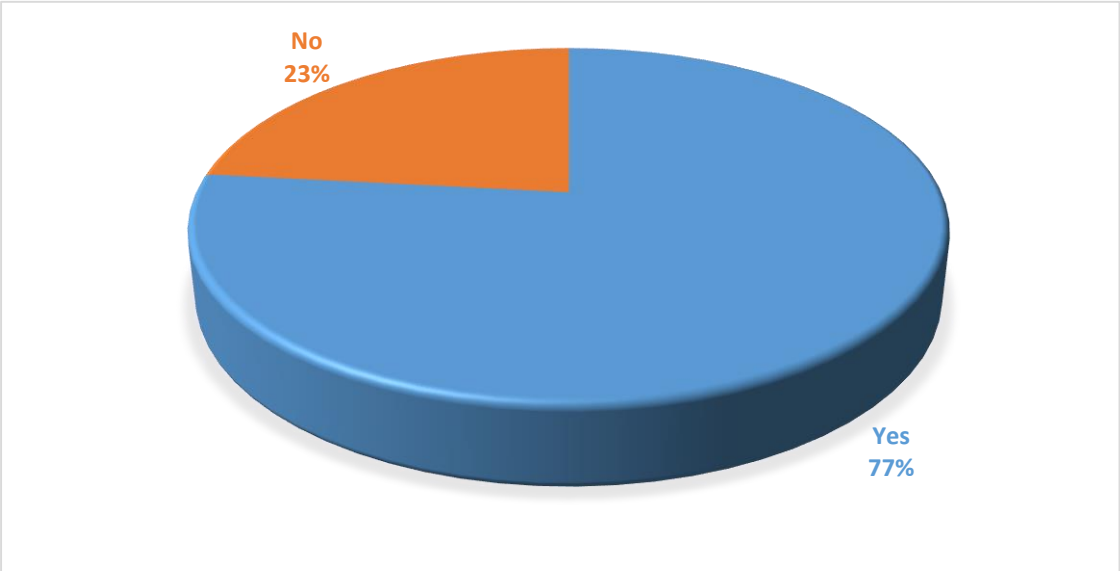

Figure 4.2 Availability of Waste Receptacle in the House
Source: Author's Survey, 2013

On the availability of waste receptacle in households, 77% of the respondents have waste receptacle of all kinds in their households and 23% of the households do not have any waste receptacle in their households. The 23% are those who have dug holes in their houses and therefore see no need to have receptacles since all the waste generated are directly dumped in the holes at their backyards. Those who keep waste receptacles take them to nearby containers, dumb them at the beach or in open spaces.

4.2 Multivariate Analysis Results

4.2.1 Socioeconomic Characteristics and Willingness to Pay Reponses

Table 4.3 describes the socioeconomic characteristics of the households and their related willingness to pay response. Out of the 150 administered questionnaires, only 11 households representing 7.3% of the total sample size indicated their unwillingness to pay for an improved solid waste management. About 92.7% of the respondent

households were willing to pay various amounts to improve the services of waste collection and disposal in the Effutu Municipality.

From the table, the household heads whose age were between the ranges of 20-40 years who were willing to pay some amount for an improved SWM represented a substantial figure of 56.80% as against 26.60% for those in the 41-60 age group and 16.50% for those above 60 years. It could clearly be seen from the statistics that most people would be less willing to pay as their age increases owing to the fact that all aged people feel that it is the responsibility of the government to manage the municipality's waste. This is similar to the work of Ojok J. et al, (2012), who asserted that,the middle age group in the age range of 21 to 60 were found to be more willing to pay for improved MSWM than older ones above 60.

Table 4.3 showed that married people who were willing to contribute some monies for improved SWM represented 77% whiles the singles (divorced, separated, widowed, not married before) represented 23%. The reason for this huge percentage for married people is the reason of the fact that married are seen to be more responsible in terms of waste management than single individuals.

Family size was also considered to influence households' willingness to pay for an improved solid waste management. According to table 4.3, family sizes less than 2 who were willing to contribute some amount to improved solid waste management represented 5%, whiles family size in the range of 3-6 had 66.2% and more than 6 family sizes had 28.8%. It could be deduced from these statistics that larger family sizes were more willing to pay for an improved services since they naturally produce

larger volumes of solid waste. This is in consistent with similar work by Roy and Deb (2013).

Level of education was also hypothesized to influence households' willingness to pay for an improved solid waste management. From table 4.3, those who had no formal education and were willing to pay for an improved SWM represented 21.6%. Household heads who has had some form of education (Basic, Secondary, Professional Certificate and Tertiary) represented
78.4%. As the number of years people spend in school increases, it could be seen from the table that, they come to the understanding that municipal solid waste management is a shared responsibility therefore they have to contribute something for the sustainability of the project. This argument is also supported by research findings by Roy and Deb (2013).

Time spent in a vicinity could greatly influence people's willingness to pay for improved solid waste management as those who had stayed for less than a year represent only 16% of the yes responses. It could be seen from the table that those who have stayed between 2-5 years represent about 50% of the total respondents. The number increases as those who have spent between 6-10 years represent 35% and increases further to 38% for those who have stayed more than 10 years.

Table 4.3 Socioeconomic Characteristics and Willingness to Pay Reponses

		No	Yes
Gender	Female	6	96
		54.50%	69.10%
	Male	5	43
		45.50%	30.90%
Age of Household Head	20-40	5	79
		45.50%	56.80%
	41-60	4	37
		36.40%	26.60%
	Above 60 Years	2	23
		18.20%	16.50%
Marital Status	Single	5	32
		45.50%	23.00%
	Married	6	107
		54.50%	77.00%
Family Size	Less than 2	4	7
		36.40%	5.00%
	3-6	6	92
		54.50%	66.20%
	More than 6	1	40
		9.10%	28.80%
Level of Education	No Formal Education	2	30
		18.2%	21.6%
	Basic	2	24
		18.2%	17.3%
	Secondary	3	33
		27.3%	23.7%
	Professional Certificate	3	29
		27.3%	20.9%
	Tertiary	1	23
		9.1%	16.5%

Monthly Household Income	Less than 500	6	37
		54.50%	26.60%
	510-1000	4	53
		36.40%	38.10%
	1001-2000	1	35
		9.10%	25.20%
	Above 2000	0	14
		0.00%	10.10%
Time Spent in the Area	Less than a Year	1	16
		9.10%	11.50%
	2-5 Years	5	50
		45.50%	36.00%
	6-10 Years	3	35
		27.30%	25.20%
	More than 10 Years	2	38
		18.20%	27.30%

Source: Author's Survey, 2013

4.2.2 Willingness to Pay for Improved SWM

The histogram in figure4.3 shows that 35 households representing 25.2% of the respondents were willing to pay GH₵ 1.00, while 29 households representing 20.9% of the respondents were also willing to pay GH₵ 2.00 and 24 households representing 17.3% were also willing to pay GH₵ 3.00 per month for an improved solid waste management in Effutu Municipal Assembly. About 17 households representing 12.2% of the respondents were willing to pay GH₵ 4.00 whiles 12 households representing 8.6% wanted to contribute GH₵ 5.00. As the price increases, the number of respondent decreases, fulfilling the normal demand theory where less of goods and services would be demanded when price increases, ceteris paribus.

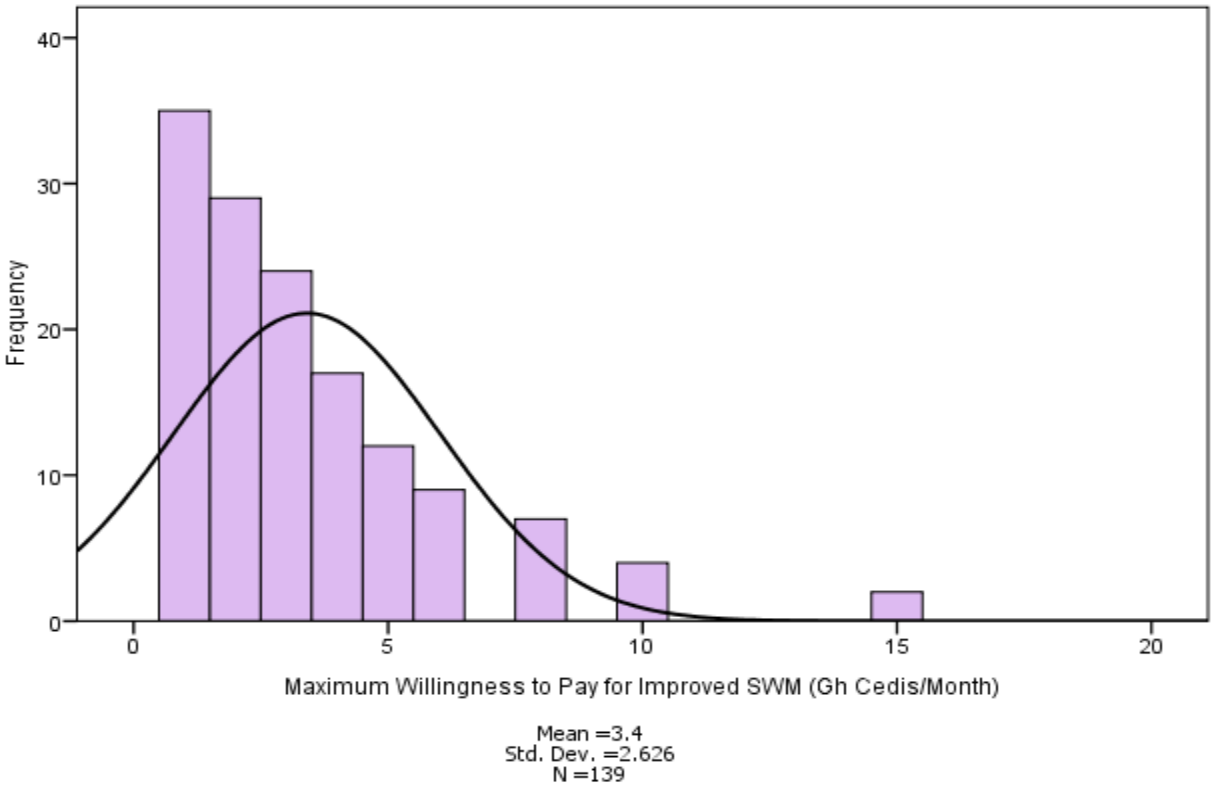

Figure 4.3 Distribution of Willingness to Pay for Improved SWM
Source: Author's Survey, 2013

4.2.3 Determinants of Willingness to pay

The regression results shows the factors influencing willingness to pay for improved solid waste management in the Effutu Municipality. The results from the table 4.4 showsthat, respondents' Age (p=0.975), Level of Education (p=0.511) and Time Spent in the Area (p=0.581) do not significantly influence the willingness to pay for improved waste disposal.The results gave coefficient of determination, R^2, of about 0.377. The validity of the regression model in estimating willingness to pay for improved solid waste management is consistent with related studies (AltafM. A. et al, 1996). The R^2 value for theregression model is considered acceptable, because Mitchell and Carson (1989) andO"Garra (2009) mentioned that regressions on Contingent Valuation data usually yield R^2 values between 10% and 40%.

The gender of respondents (p=0.003) showed positive and significant relationship with willingness to pay for improved SWM. This result supports the appropriate expectation that female respondents have a higher likelihood of willing to pay for improved waste management services as compared to their male counterparts. This is particularly so because in Ghana women are mainly responsible for waste management at the household level (Dadson Awunyo-Vitor et al, 2013).

Table 4.4 Multivariate Analysis results for WTP function

Variable	Coefficient	Standard Error	p-Values
(Constant)	0.32	0.115	0.006
Gender of Respondents	-0.128	0.042	0.003
Age of Household Head	0.001	0.026	0.975
Marital Status of Respondent	0.165	0.039	0.000
Family Size	0.095	0.033	0.004
Level of Education	-0.009	0.013	0.511
Monthly Household Income	0.077	0.02	0.000
Time Spent in the Area	-0.011	0.019	0.581
Responsibility of SWM	0.122	0.021	0.000

R^2= .377 F-statistic = 10.676

Source: Author's Survey, 2013

The household size (p=0.004) significantly affected WTP for improved SWM services. This was due to the fact that the more number of people in the household,

the more the waste generated, hence disposal becomes a problem. Households are thus more willing to pay in order to keep a clean environment.

The marital status of household respondents ($p<0.001$) affected the WTP for improved SWM services significantly. This was due to the fact that married people were more responsible to keep the environment clean compared to single ones because married respondents had larger family size and hence faced higher risks of hygiene associated diseases than those not married.

Respondents' household income variable ($p<0.001$) is positive and significant at 5% level of significance indicating that improved solid waste management is a normal good since its demand increases with income. This is because as the household income increases people would be able to afford the fees that are charged for solid waste management. The marginal effect revealed that an additional income would increase the likelihood of person's willingness to pay for improved waste management services by about 7.7%.

Finally, the responsibility of SWM ($p<0.001$) showed positive sign as expected and was statistically significant. This can be explained as the households in the Effutu Municipal are of the opinion that solid waste management is a collective responsibility, therefore they would not mind to share the cost of the management.

4.2.4 Demand for Improved Solid Waste Management Service

Based on the 2010 Population and Housing Census, the estimated number of inhabitants in the municipality is about 68,597 with an average family size of 4.4 per household. On the aggregation, we have around 15,590 households in Effutu

Municipal. Hence, the Monthly WTP was calculated the monthly WTP for the municipal by multiplying the mean by the total number of households. This gave an anticipated amount to be collected for improved SWM of **GH¢ 49,178.15**for the Effutu Municipal per month. The annual mean total WTP would be **GH¢ 590,137.80** for the Municipal according to table 4.5

Table 4.5 Estimated Demand for Improved Solid Waste Management Service

WTP Interval (GH ₵/Month)	**Frequency**	**Percent**	**Total No. of Households**	**Total WTP (GH₵)**
1	35	25.2	3638.98	3638.98
2	29	20.9	3015.15	6030.30
3	24	17.3	2495.30	7485.89
4	17	12.2	1767.50	7070.01
5	12	8.6	1247.65	6238.24
6	9	6.5	935.74	5614.42
8	7	5.0	727.80	5822.36
10	4	2.9	415.88	4158.83
15	2	1.4	207.94	3119.12
Total	**139**	**100**	**14451.93**	**49,178.15**

Source: Author's Survey, 2013

4.2.5 Demand Curve for Improved Solid Waste Management

With reference to figure 4.3 as the monthly payment increases, the number of households willing to pay that amount declines. This can be observed from the values which continuously decline as the amount of money increases. This relationship can

be more easily observed by deriving a demand curve for the improved solid waste management.

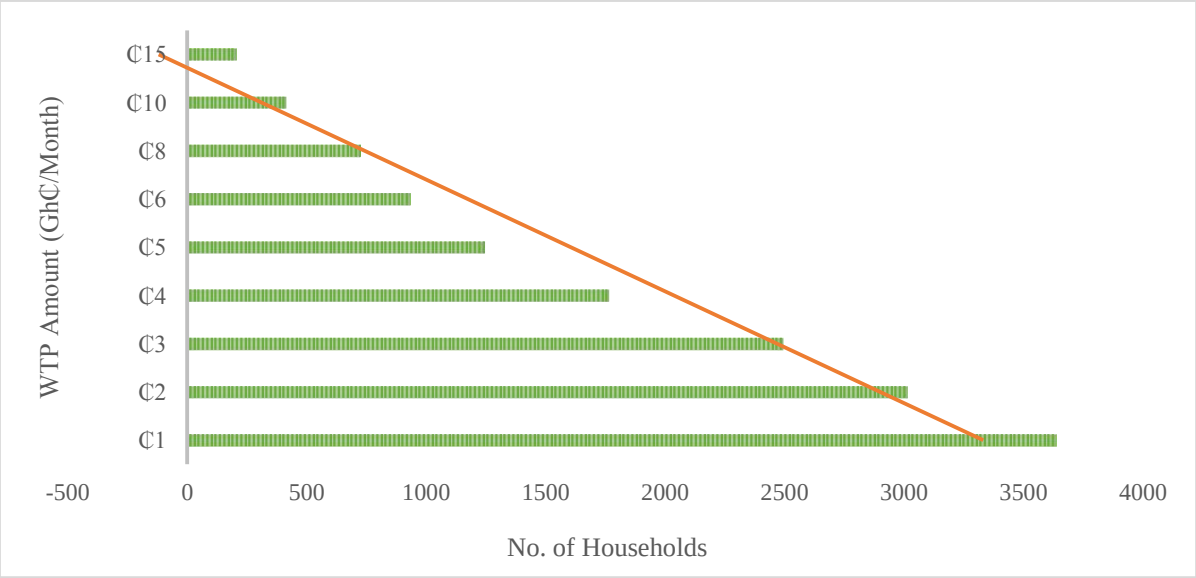

Figure 4.3 Estimated Demand Curve for Improved Solid Waste Management Service in Effutu Municipal
Source: Author's Survey, 2013

The demand curve has a negative slope like most economic goods under normal conditions. This implies that increasing price has a disincentive effect on the demand for improved solid waste management, ceteris paribus.

4.3 Management of revenue from waste disposal fee

On the management of the revenue that would be accrued from the waste management fee collection, about 59.3% of the respondents households think that the monies can be safe and properly managed by private companies since they can be held accountable at any time and also better services can also be demanded if services

rendered does not commensurate with what the households are paying and would absolutely be devoid of politics.

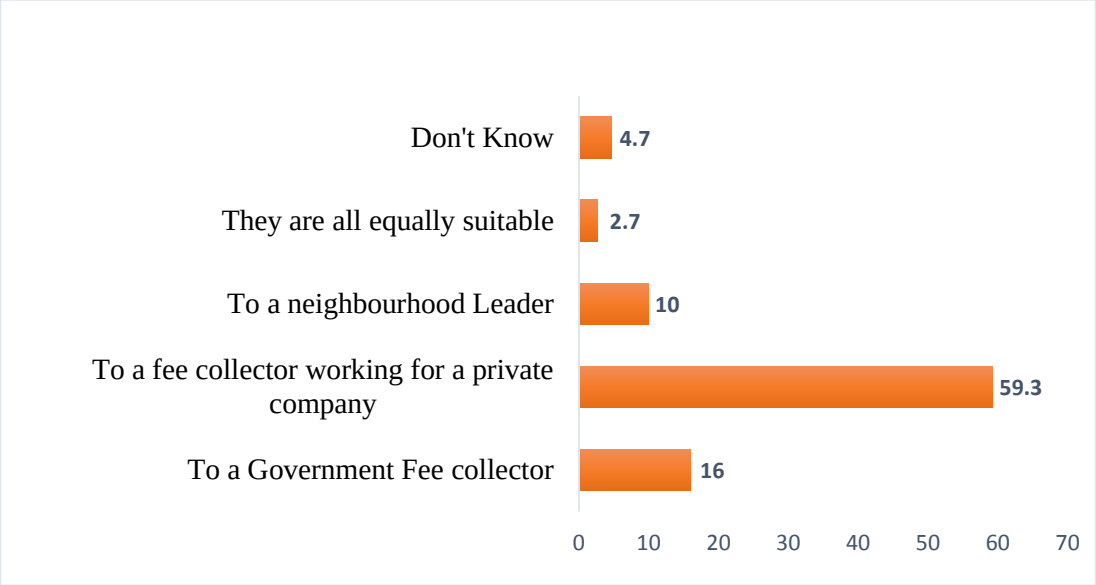

Figure 4.4 Waste Disposal Fee Stewardship
Source: Author's Survey, 2013

Many people do not believe the government can be a proper steward of the revenue therefore only 16% of the respondent household agreed that the municipal assembly should be in control. Also, 10% of the respondents also think that a respected neighbour can be mandated to steer the affairs of the revenue that would accrued from the collection.

CHAPTER FIVE
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

The Effutu Municipal Assembly is bedevilled with waste especially around the beaches and other places. The residents do not have the luxury of alternatives of disposing of their waste therefore there is indiscriminate dumping and improper management of the waste at the final disposal site. Therefore the objectives of the study were to elicit Households' Willingness to pay for an improved Solid Waste Management and assess the determining factors that influenced their willingness to pay. For this, the Contingent Valuation Method (CVM) was used to elicit the value households in the Effutu Municipal give for an attempt to improve solid waste management. One hundred and fifty (150) randomly selected households were interviewed after stratifying the municipal into different income groups.

5.1 Summary of Major Findings

5.2 Extent of littering and illegal pile of waste

From the Results, it could be deduced that the illegal piles of waste and littering in the municipality poses serious challenges for the residents. About 35% saw that the disposal of solid waste poses serious challenges. About the same percentage also thought that the situation of waste disposal was somewhat serious which needs immediate attention. Just on the opposite side, 21% of the respondents did not see any big deal with waste management in the municipality. Those who did not see anything serious about the situation had their own means of waste disposal, ranging from digging a hole, burning and dumping at the beaches. They have practiced these waste

disposal means and have entrenched their position to the extent that they do not see anything wrong with that.

5.3 Determinants of Willingness to pay for improved SWM

The multivariate analysis results showed that the respondents' age, level of education and time spent in the area did not significantly influence willingness to pay for improved SWM.The gender of respondents showed positive and significant relationship with willingness to pay for improved SWM.The household size significantly affected WTP for improved SWM services. This was due to the fact that the more number of people in the household, the more the waste generated, hence disposal becomes a problem. Households are thus more willing to pay in order to keep a clean environment.The marital status of household respondents affected the WTP for improved SWM services significantly.Respondents' household income variable is positive and significant at 5% level of significance indicating that improved solid waste management is a normal good since its demand increases with income.The responsibility of SWM showed positive sign as expected and was statistically significant.

5.4 Estimated Demand for Solid Waste Management

From the analysis, 25.2% of the respondents were willing to pay GH₵ 1.00, while 20.9% of the respondents were also willing to pay GH₵ 2.00 and 17.3% were also willing to pay GH₵ 3.00 per month for an improved solid waste management in Ghana. Therefore with the estimated household number of 15,590, the mean monthly total willingness to pay for improved SWM wasGH¢ 49,178.15029 and annual mean total WTP would be GH¢ 590,137.8035 for the Effutu Municipal. These figures

present a brilliant business opportunities to private investors to take advantage of the situation.

5.5 Conclusions

Even though the municipal has done tremendously well in keeping the municipal clean and habitable, it could be seen that much needs to be done in terms of educating the residents on waste management, regular collection of waste and proper management of the final waste disposal site. Therefore since the waste management practices of the households and the municipal are not satisfactory enough, and the households have shown their willingness to share the cost of it management, it can be concluded that, the Effutu municipal has express its readiness in keeping the place clean and present a viable business opportunities for investors.

5.6 Recommendations

It is recommended that the waste management charges should be based on willingness and ability to pay than making it flat and compulsory across all income groups. This means service charges should be set at a level that does not encourage illegal dumping and maximize cost recovery. As a result most of them suggested a sanitation fee much lower than what the market reflects.

The result showed that there is illegal dumping and pile of waste, meaning the residents are not adhering to the Assembly's bye laws on environmental sanitation. Therefore it is recommended that the municipal assembly should institute strict punitive measures to offenders as well as strengthen the assembly environmental sanitation team to enforce the provisions of the bye-laws.

Some of the reasons that contributed to the upsurge of illegal dumping according to the results revealed that not all the resident have waste storage bins, therefore it is recommended that the municipal assembly or any private investor should make available enough waste bins to the households.

The figures of the demand for improved SWM also depicted that venturing into waste management in Effutu Municipal would be a very viable business opportunity.

Reference

Achankeng, E. (2003). Globalisation, Urbanisation and Municipal Solid Waste Management in Africa. Africa on a Global Stage. A Paper Presented at the Annual Conference of the

African Studies Association of Australasia and the Pacific.

Afroz R., Hanaki K., Tudin R. 2010 Factors affecting waste generation: A study in waste management program in Dhaka City, Bangladesh. Environ. Monit. Assess. 2011; 179:509–519. doi: 10.1007/s10661-010-1753-4.

Altaf. A.A. and Deshaz O. J. (1996). "Household Demand for Improved Solid Waste Management: A Case Study of GujarwalaPakistan'.Word Development, Vol. 24, No. 5, pp 857-868.

Amiga Aklilu, 2002, Households' Willingness To Pay For Improved Solid Waste Management: The Case Of Addis Ababa

Arrow K.J., Solow R.S., Leamer E., Portney P., Radner R., Schuman H. Report of the NOAA Panel on Contingent Valuation, Federal Register 58. CSUEB; Hayward, CA, USA: 1993.

Chalmin, P., Gaillochet, C. 2009. *Du rare al'infini.* Panorama mondial des déchets 2009. Paris, Economica

Coffie, FaustinaMamley, 2010, Landfill Sites Management Challenges: The Perceived Effect and Willingness on The Part of the People in the Ga East and South Municipalities to Pay for Improvement

Cointreau Sandra, 2005, Solid Waste Management Conceptual Issues on Cost Recovery, Financial Incentives, and Intergovernmental Transfers,Solid Waste Management Advisor, The World Bank, Washington, DC;

DadsonAwunyo-Vitor, ShaibuIshak, and GodfredSeiduJasaw, 2013, Urban Households' Willingness to Pay for Improved Solid Waste Disposal Services in Kumasi Metropolis, Ghana, Hindawi Publishing Corporation Urban Studies Research Volume 2013, Article ID 659425, 8 pages http://dx.doi.org/10.1155/2013/659425

Davis R.K. The Value of Outdoor Recreation: An Economic Study of the Maine Woods; Unpublished Ph.D. Dissertation. Harvard University; Cambridge, MA, USA: 1963.

Fraenkel, J. R. &Wallen, N. E. (2006). How to Design and Evaluate Research in Education. 6th edition. Boston McGraw-Hill. pp 394

Ghana Statistical Service, 2012, 2010 Population and Housing Census Post Enumeration Survey Report

Hoornweg, D., Bhada-Tata, P., 2012. What a Waste: A Global Review of Solid Waste

Management. Washington D.C., World Bank, Urban Development & Local Government Unit, March 2012, No. 15, 98.

Kelly, T., Matos, G. 2011. Historical Statistics for Mineral and Material Commodities in the United States. U.S. Geological Survey, Data Series 140 (Jan. 10, 2011), available at http://minerals.usgs.gov/ds/2005/140/. /

Kessides, I. N. 2004. Reforming Infrastructure: Privatization, Regulation, and Competition. Oxford and New York, Oxford University Press for the World Bank

Lardinois, I. and Klundert, van de A. (1995). Plastic Waste: Option for Small-Scale Resource Recovery. Tool publications, Amsterdam.

Le Courtois Alexandra, 2013Municipal Solid Waste: turning a problem into resource, Urban Specialist, World Bank

Mitchell, R. and Carson, R., Using surveys to value public goods: the contingent valuation method, (John Hopkins Press, Baltimore,1989).

Nunes, P.A.L.D. and P. Nijkamp (2007) "Contingent Valuation Method" in M. Deakin, G. Mitchell, P. Nijkamp and R. Vreeker (Eds.), Sustainable Urban Development (Volume 2): The Environmental Assessment Methods, Chapter 8, Routledge, UK.

O"Garra, T., Bequest values for marine resources: how important for indigenous communities in less-developed economics?*Environmental Resource Economics, 44,* 2009, 179-202.

Roy, AshishTaru and Deb,Uttam 2013, Households Willingness to Pay for Improved Waste Management in Silchar Municipal Area: A Case Study In Cachar District, Assam. *IOSR Journal of Humanities and Social Science (IOSR-JHSS) ISSN: 2279-0837, ISBN: 2279-0845. Volume 6, Issue 5 (Jan. - Feb. 2013), PP 21-31*

Richard J. Palczynski 2002 STUDY ON SOLID WASTE MANAGEMENT OPTIONS FOR AFRICA PROJECT REPORT *Final Draft Version*

Sewerage and Solid Waste Project Unit. 2000. *The solid waste management programme*. Sewerage and Solid Waste Project Unit, Barbados.

United States Environmental Protection Agency 2002 Solid Waste Management: A Local Challenge with Global Impacts EPA530-F-02-026 (5306W)

http://www.ghanabusinessnews.com/2012/06/08/world-bank-predicts-annual-cost-of-treating-solid-waste-rising-to-375b-by-2025/#sthash.k80BFeP8.dpuf-accesed25/7/2013

http://www.ghanabusinessnews.com/2012/06/08/world-bank-predicts-annual-cost-of-treating-solid-waste-rising-to-375b-by-2025/- accessed 25/7/2013

http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTURBANDEVELOPMENT/EXTUSWM/0,,menuPK:463847~pagePK:149018~piPK:149093~theSitePK:463841,00.html 2001-accessed 25/7/2013

APPENDIX I

Multivariate Analysis of Variance Test

A one-way between-groups multivariate analysis was performed to investigate WTP differences in improving solid waste management. Eight dependent variables were used: Gender, Age, Marital Status, Family size, Level of Education, Monthly Household Income, Time spent in the area and Responsibility of SWM. The independent variable was WTP. Preliminary assumption testing was conducted to check for normality, linearity, Univariate and multivariate outliers, homogeneity of variance-covariance matrices, and Multicollinearity, with no serious violations noted.

Multivariate Test

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
WTP	**Pillai's Trace**	0.377	10.676[a]	8	141	0	0.377
	Wilks' Lambda	0.623	10.676[a]	8	141	0	0.377
	Hotelling's Trace	0.606	10.676[a]	8	141	0	0.377
	Roy's Largest Root	0.606	10.676[a]	8	141	0	0.377

Source: Author's Survey, 2013

Table 7.0 Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared

WTP	**Gender of Respondents**	0.215	1	0.215	0.981	0.324	0.007
	Age of Household Head	0.173	1	0.173	0.298	0.586	0.002
	Marital Status	4.78	1	4.78	25.854	0.000	0.149
	Family Size	2.653	1	2.653	9.057	0.003	0.058
	Level of Education	0.007	1	0.007	0.004	0.952	0.000
	Monthly Household Income	4.196	1	4.196	4.857	0.029	0.032
	Time Spent in the Area	0.194	1	0.194	0.196	0.659	0.001
	Responsibility of SWM	15.427	1	15.427	19.576	0.000	0.117

Source: Author's Survey, 2013

There was a statistically significant difference between those who were willing to Pay (Yes) and those who were not willing to pay (No) on the combined dependent variables, F=10.676, p= 0.00, Wilks' Lambda = 0.623; partial eta squared = 0.377. When the results for the dependents variables were considered separately, the only difference to reach statistical significance, using a Bonferroni adjusted alpha level of 0.00625, was marital status, F=25.854, p = 0.00, and partial eta squared = 0.149. An inspection of the mean scores indicated that those who were willing to pay (Yes) reported slightly higher levels of marital status (*M=1.2302, SD=0.42249*).

Also Family size had F= 9.057, p = 0.03, and partial eta squared = 0.058. The mean scores also showed that those willing to pay (Yes) had larger family sizes (*M=2.2374, SD=0.53274*). Finally Responsibility of SWM reported F= 19.576, p = 0.00, and partial eta squared = 0.177. Statistics from the mean table indicated that those willing to pay (Yes) in the Responsibility of SWM category had *M=2.2302*and*SD= 0.42249*

APPENDIX II

Household Questionnaire

This survey is being undertaken by a student of Kwame Nkrumah University of Science and Technology (KNUST School of Business) for the award of MBA in Environmental Engineering. This questionnaire is designed to obtain information on the current situation of solid waste and households' willingness to pay for an improved solid waste management in Effutu Municipal. The information collected will be confidential and for academic purpose only.

Section A.Socioeconomic Characteristics of Sample Households

1. Gender
a. Male [ ]
b. Female [ ]

2. What is the age of the Household Head?
a. 20-40 years
b. 41-60 years
c. Above 60 years

3. What is your marital status?

a. Married

b. Single

c. Widow/Widower

d. Divorced

4. What is the Total size of the Family?

a. Less than 2 [ ]

b. 3-6 people [ ]

c. More than 6 [ ]

5. What is the highest level of education you have completed?

No Formal Education	☐
Basic	☐
Secondary	☐
Professional Certificate	☐

Tertiary	☐

6. In which sector are you employed? (Check only one)

Civil servant and company employed	☐
Traders	☐
Self-employed and daily labourers	☐
Unemployed	☐
Fisherman	☐
Others	☐
Not applicable (e.g., student, housewife)	☐

7. Please tell me about your monthly household income, in Ghana Cedis (GH₵)

< GH₵ 500	☐
GH₵ 501–1,000	☐
GH₵ 1,001–2,000	☐
Above GH₵ 2,000	☐

8. How long have you stayed in this area?

a. Less than I Year [ ]

b. 2-5 years [ ]

c. 6-10 years [ ]

d. More than 10 Years [ ]

Section B. Current Situation of Solid Waste Management

9. In your opinion, how serious is the problem of littering and illegal piles of solid waste in this area?

a. Very serious [ ]

b. Somewhat serious [ ]

c. Not serious [ ]

d. Don't know [ ]

10. In your opinion, how serious is the problem of solid waste collection in this area?

e. Very serious [ ]

f. Somewhat serious [ ]

g. Not serious [ ]

h. Don't know [ ]

11. In your opinion, how serious is the problem of nuisance from solid waste disposal or dumping in this area?

a. Very serious [ ]

b. Somewhat serious [ ]

c. Not serious [ ]

d. Don't know [ ]

12. Do you have a storage receptacle for solid waste in your house or in your compound?

a. Yes [ ]

b. No [ ]

13. How do you dispose off your solid waste?

a. Private collectors take it [ ] *Go to 14*

b. Take it to the nearby storage receptacle [ ]

c. Dig a hole around the house and bury or burn it [ ]

d. Dump it at the Beach [ ]

e. Throw it on an open space or on the street [ ]

f. Any other (specify)……..……...

14. How do you assess the private company in terms of the following:

a. How much do you pay for this service per month? ……..

b. How many times they collect your waste per week?.....

c. Are you satisfied with their service?.....

15. Is your household getting the services of solid waste collection or disposal from the Municipal?

a. Yes *Go to16* [ ]

b. No *Go to 17* [ ]

16. How frequently is your container usually taken out to be emptied?

a. Daily [ ]

b. Three times a week [ ]

c. Once a week [ ]

d. Less frequently [ ]

e. Don't know [ ]

17. What is your opinion of the service that you are receiving for collection of solid waste from your household?

a. Very satisfied [ ] *Go to 19*

b. Reasonably satisfied [ ]

c. Not satisfied at all [ ] *Go to 18*

d. Don't know [ ]

18. If you are not satisfied with the service, would you state your primary reason?

a. The service is not reliable

[ ]

b. Frequency of service – the interval between collections is too long

[ ]

c. The location of the communal container or pick-up point is unsatisfactory

[ ]

d. Lack of clean appearance of the neighbourhood

[ ]

e. Other problem, Please explain…….....

19. Do you know where the collected waste is taken for final disposal when it leaves your neighbourhood?

a. Yes [ ] *Go to Question 20*

b. Don't know [ ] *Go to Question 22*

20. Are you concerned about whether the final disposal is environmentally safe and acceptable?

a. Yes [ ] *Go to 20*

b. No [ ]

c. Don't Know [ ]

21. What do you suggest to improve this condition?.....

……..

22. Who do you think is responsible to properly manage solid waste (for instance financing it) in Effutu Municipal?

a. The Municipal only [ ]

b. Households only [ ]

c. Both [ ]

23. Which of the following do you think is the best institute to handle solid waste management in Effutu Municipal?

a. The Assembly [ ]

b. Private companies [ ]

c. No idea

Section C. Households' Willingness to Pay for Improved Solid Waste Management

Description of Improved Solid Waste Management

Suppose that has been decided to offer a new solid waste collection service to households in this neighbourhood. A person would pick up the waste from your house each day. The waste from all the houses subscribing to the service would be disposed of properly. It would be hauled away from this neighbourhood in trucks to a municipal landfill. It would not be left around the neighbourhood in rubbish heaps or municipal bins. This waste collection service would thus address two problems: your

waste would be picked up regularly from your house, and your waste would not be left around the neighbourhood to create a sanitary problem. This kind of service can only be offered if a sufficient number of households agree to purchase it and agree to pay a monthly charge on a regular basis. The service can be offered by the municipal corporation or by a private firm. In either case each household could decide whether it wanted to accept this service or not.

24. Suppose the municipal assembly were to offer this improved waste collection and disposal service in this neighbourhood, and the monthly charge was **Gh₵ 1** per month. Would you accept this service?

a. Yes [ ]

b. No [ ]

25. Suppose the municipal assembly decided that the monthly fee for the improved waste collection and disposal service was GH₵ 2 per month. Would you still accept the new service?

a. Yes [ ]

b. No [ ]

26. Suppose the municipal assembly decided that the monthly fee for the improved waste collection and disposal service was **GH₵ 3** per month. Would you still accept the new service?

a. Yes [ ]

b. No [ ]

27. Suppose the municipal assembly decided that the monthly fee for the improved waste collection and disposal service was **GH₵ 4** per month. Would you still accept the new service?

a. Yes [ ]

b. No [ ]

28. Suppose the municipal assembly decided that the monthly fee for the improved waste collection and disposal service was **GH₵ 5** per month. Would you still accept the new service?

a. Yes [ ]

b. No [ ]

29. Suppose the municipal assembly decided that the monthly fee for the improved waste collection and disposal service was **GH₵ 8** per month. Would you still accept the new service?

a. Yes [ ]

b. No [ ]

30. Suppose the municipal assembly decided that the monthly fee for the improved waste collection and disposal service was **GH₵ 10** per month. Would you still accept the new service?

a. Yes [ ]

b. No [ ]

31. If the municipal assembly decided that the monthly fee for the improved waste collection and disposal service was **GH₵ 15** per month. Would you still accept the new service?

c. Yes [ ]

d. No [ ]

32. What is the maximum monthly bill you would be willing to pay for this new waste collection and disposal service?

a. Maximum bid GH₵…….

b. Don't want service at any price. [ ] *Go to question* 34

33. If you have said that you are willing to pay for a collection service, to whom would you prefer to pay the fee?

a. To a government fee collector

b. To a fee collector working for a private company

c. To a neighbourhood leader

d. They are all equally suitable

e. Don't know

34. Could you tell me the main reason why you do not want to pay anything for an improved waste collection service?

a. Don’t trust/ like a private company

b. We are poor and we cannot pay

c. Satisfied with existing system

d. Government’s responsibility to provide waste collection free

e. Service would probably not be reliable

f. Other (specify)