UNIVERSITY OF GHANA

ASSESSING THE EFFECTS OF UNCOLLECTED WASTE GENERATED BY HOUSEHOLDS IN TEMA NEWTOWN

BY

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DECLARATION

Candidate's Declaration

I hereby declare that this dissertation is the product of my own original work and that no part of it has been presented for the award of another degree in any university within and outside of Ghana.

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DEDICATION

To the Almighty God for being my answer in troubled storms and to my parents for their continuous support and belief in me.

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ABSTRACT

The problem of waste collection and disposal has been a canker to the development of cities and towns across Ghana. Day in day out, there are reports of piles of waste left uncollected around city centres and residences. Huge tonnes of waste are seen scattered in streets and gutters and the effects are enormous especially in the face of rapid urbanization. Some of the effects include flooding, the spread of diseases as a result of cross contaminations, the aesthetic value of the community among others. The city of Tema is one fast urbanizing area with such challenges associated with waste generation. This study therefore sought to ascertain the effects of uncollected household waste generated in Tema Newtown – a community within the Tema Metropolitan Area. The study used a survey of 120 households, key informant interviews of officials within the administrative and traditional jurisdiction of Tema and observations to achieve its objectives. Additionally, the Contingent Valuation Method was used to elicit and analyze respondents' willingness to pay.

The results of the study showed that out of 11.64 tonnes of waste generated per day in Tema Newtown, 3.8 tonnes remains uncollected. The study also revealed that the respondents were aware of the problem of uncollected yet were unconcerned. However, they were aware of the effects of the waste generated and what was left uncollected which included the widespread of diseases, flooding, contamination of water bodies and devaluation of the town due to the odour in some communities within the town. According to the result of the valuation, majority of the respondents are willing to pay a fee for better and improved waste management system. The study therefore encourages the adoption of the Public Private Partnership and the various recycling of waste materials to reduce the rate of uncollected waste and efficient waste management.

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LIST OF ABBREVIATIONS

CVM – Contingent Valuation Method

EPA – Environmental Protection Agency (Ghana)

MLGRD – Ministry of Local Government and Rural Development

MSW – Municipal Solid Waste

MTDP – Medium Term Development Plan

NGO – Non Governmental Organization

OCHA – Office for the Coordination of Humanitarian Affairs (United Nations)

OECD – Organization for Economic Co-operation and Development

TMA – Tema Metropolitan Assembly/

UNEP – United Nations Environmental Programme

USAID – United States Agency for International Development

PRO – Public Relations Officer

WMD - Waste Management Department

WTP – Willingness to Pay

CHAPTER ONE

INTRODUCTION

1.0 Introductory Background

Ghana, like many countries in Sub-Saharan Africa, is undergoing rapid urbanization (Owusu, 2010). The report of the 2010 Population and Housing Census reveals that the growth of the population now stands at 24,658,823 representing a 30.4 percent increment over the 2000 population of 18,012,079. The capital city, Accra and Kumasi are highly populated with over 16 percent and 19 percent of the total population of Ghana respectively. This to an extent explains the increasing rate of poverty, unemployment, urban slums and poor sanitation within the Greater Accra Region.

The pursuit of development is associated with a rise in the living standards of people and the changing patterns of demand for goods and services. These factors contribute to the proportionate increase in per capita waste generated (Oteng-Ababio, 2011). There are, however, other challenges associated with development and these include rapid urbanization, importation of environmentally-unfriendly materials, changing lifestyle, lack of political commitment, insufficient budget allocation and many others (Oteng-Ababio, 2011; Narayana, 2008, Blight & Mbande, 1998).

Although urbanization serves as a driving force for economic growth and development (Tannerfeldt and Per Ljung, 2006), there is an increasing awareness of the effects of it, mainly on human health, livelihoods and the environment. The resulting effects include problems of water supply, shelter and sanitation, which is due to the ever-growing amount of solid and liquid wastes generated by cities (Klundert, 2000). The rapidly changing

composition of waste and quantity of refuse generated by developing countries is a reflection of the dynamics of their culture, the per capita income of the community and the developmental changes in consumption patterns (Blight & Mbande, 1998; Oteng-Ababio, 2011).

The migration of people from the rural area to the cities is one way leading to large concentration of people within the urban cities and towns. Many households prefer to live in densely populated towns within the cities where living conditions are lower as compared to some parts of the city where cost of living is high. These households usually spend about 30 percent of their income on transportation to work and school then back to their homes (Holden, 2008).

With improvement in the health facilities, mortality rates have fallen and so the rate of natural increase in population has also risen due to urbanization. The natural population increases coupled with migration put pressure on the already existing infrastructure leading to the development of slums which are characterized by makeshift housing such as tents, kiosks, containers and attachment to shops or offices as well as inadequate sewage disposal facilities, poor roads and the accumulation of solid waste. Inadequate solid waste disposal systems are very common across cities in developing countries of which Accra and Tema are no exception.

Throughout Sub-Saharan Africa, solid waste generated in most countries exceeds the capacity of collection. Thousands of tonnes of solid waste are generated daily in Africa. In some selected cities and regions, the rate of waste generated ranges from approximately 0.5 kg to 0.8 kg per person per day. While this may seem small compared to the figures in developed countries (between 1 kg and 2 kg), waste collection in African countries is rarely done by

municipal collection systems because of poor management, fiscal irresponsibility, equipment failure or inadequate waste management budget (USAID, 2009).

According to a World Bank report (as cited in UNEP, 2009), it is estimated that for most developing countries about 20 - 50 percent of their municipal budget allocations are channeled toward solid waste management (and this involves the practical norm of open dumping and burning of the solid waste). It also estimates that less than 50 percent of the population benefits from waste collection services and of all the urban solid waste generated, 30 - 60 percent of the waste remains uncollected. As such, most low-income countries spend 80 - 90 percent of their municipal budget on waste collection alone. Middle-income countries spend 50 - 80 percent of their total budget on collection cost.

Waste generated domestically by households is gradually drawing the attention of many. The waste generated is a consequence of household activities such as cleaning, cooking, packaging, huge use of plastics bags and many others. Many residents have begun to make extensive use of both polythene bags and other plastic packaging, which creates an entirely new category of waste (Blight and Mbande, 1998; Oteng-Ababio, 2011). The inadequate management of waste and the improper disposal techniques also lead to clogged drains that lead to the breeding of mosquitoes and widespread diseases such as malaria and cholera that affects the health of people living nearby. It is usually common to find open waste containers households in the Greater Accra Region. Many households store their waste in baskets and plastic bags. The hot and humid weather conditions favour accelerated decomposition of organic matter. If open containers are not emptied, the decomposing material will attract flies (Thompson, n.d) that contribute to the spread of malaria and cholera cases some of which result in death. The surrounding water bodies become contaminated and the land loses its fertility.

It is widely acknowledged that clean and well-kept neighbourhoods are not only good for the health of children but also afford them opportunities for companionship, recreation and social learning (Owusu, 2010). The effects of poor waste management on the well-being of city residents are often expressed in health and environmental terms. The nature of poor urban communities is associated with stigmatization of the population and individuals who dwell in such communities (Owusu *et al*., 2008).

1.1 Statement of the Problem

According to a report by UNEP (2009), It was estimated that in 2006 the total amount of *municipal solid waste* (MSW) generated globally reached 2.02 billion tonnes, representing a seven percent annual increase since 2003 (UNEP, 2009). The report further estimated that between 2007 and 2011, global generation of municipal waste would rise by 37.3 percent, equivalent to roughly eight percent increase per year (UNEP, 2009). These wastes constitute healthcare waste, industrial waste, agriculture waste as well as household waste. Accra produces about 760,000 tonnes of Municipal Solid Waste (MSW) per year or approximately 2000 metric tonnes per day (EPA, 2002 as cited by Anomanyo, 2004). The large quantity of solid waste generated calls for an efficient system of collection, transportation and disposal. It is a requisite that local government, departments of waste management and the collection service have knowledge about the composition of solid waste and how they need to be collected and disposed (Narayana, 2008). Often, there is a discrepancy between the growing population and the increasing demand for sanitation services on one hand and the capacity of the local government to provide these services on the other hand (Klundert, 2000).

The problem of waste generation and collection is a long-term and outstanding issue affecting most municipalities in Ghana. Tonnes of waste are generated daily by households, markets, shops, industries and demolition sites. The predominant wastes are the solid waste, industrial

waste and the liquid waste (Oteng-Ababio 2011). Most residents have begun to make extensive use of both polythene bags and other plastic packaging, which creates an entirely new category of waste. Commenting on the menace of plastic waste in 2005, the then Mayor of Accra described it as "a social menace of a dinosaur, constituting over 60% of the 1,800 tonnes of waste generated within the Metropolis daily" (Daily Graphic Nov 3, 2005, p. 14; Oteng-Ababio 2011).

In Tema, approximately 600[1] tonnes of waste are generated daily however; 15 - 30 percent of the waste generated is left uncollected. The accumulation of solid waste and irregular collection has become a problem for the Tema Metropolitan Assembly. Tema Newtown is one of the communities within Tema which is faced with challenges of improper waste disposal and collection. The tonnes of leftover and uncollected waste coupled with weak local government structures and human factors are reflected in the choked gutters or drains, overflowing garbage heaps and littered pavement of the city as stated earlier. The improper waste disposal and the inability to collect the amount of waste generated have made living conditions unbearable in the cities. The poorer areas in the cities are the least likely to access safe disposal of their household solid waste (Palczynski, 2002), hence greatly affected by its insidious social and health impact (Oteng-Ababio, 2011).

The study seeks to use Tema Newtown, a community within the Tema Metropilitan Assembly to identify the effects of uncollected household waste. Based on that the following research questions would be addressed:

1. What are the methods of waste collection and disposal used by households in Tema Newtown?

[1] The data provided was obtained through an interview with an Official at TMA/WMD in April 2013

2. What are the major components of the solid waste generated by households in Tema Newtown?

3. What are some of the causes and effects of the uncollected solid waste?

4. What is the maximum amount each household will be willing to spend on an improved waste collection and disposal service?

1.2 Objectives of the Study

The main objective of this study is to assess the effects of the uncollected waste on the households in Tema Newtown. Based on the effects examined, the study further seeks to find out if the households are willing to pay for an improved waste collection service.

The study seeks to address the following specific objectives;

- To determine the major components of solid waste generated by households and the quantity left uncollected
- To determine the methods of waste collection in Tema Newtown
- Examine the effects of the uncollected waste to both the household and the environment
- Establish whether the households are willing to pay for improved waste collection and how much they are willing to pay.

1.3 Significance of the Study

The problem of waste management is gradually gaining the attention of all including political leaders, religious leaders and intellectuals. The trends in the growth of cities and towns coupled with the changing lifestyles of people are associated with the general increase in the level of waste generated. This, to an extent, has made waste collection difficult. These

uncollected wastes have effects on the environment as well as on living organisms. This study seeks to solve a part of the whole problem of irregular waste collection and disposal and its corresponding effects on humans and the environment. This study seeks to add to existing knowledge and inform policy makers on the need to step up their development agenda. Again, this study stands to serve as a catalyst for communities facing similar problems.

1.4 Organization of the Study

The study consists of five chapters. Chapter One gives a general overview of the topic in question, the problem statement, the research questions and objectives, significance of the study and the organization of the chapters of the study.

Chapter Two focuses on the literature and the conceptual framework. It outlines the theories and models that give an understanding to the problem under study. It also provides a general overview of some effects of the problem in other parts of the world and explains the methods for estimating the willingness to pay.

Chapter Three comprises a detailed outline of the methodology. This includes a background to the study area, research design and data collection, the sample size and selection, methods used for the analysis of the data collected and limitations of the study.

Chapter Four looks at the analysis of the data collected and a discussion of the results.

Chapter Five (5) is the concluding chapter, which includes a summary of the research findings, conclusion and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter looks at the definitions of waste, the types of waste generated, how to manage solid waste and some of the methods adopted by the municipalities to manage the quantity of solid waste generated. An overview of the challenges of waste management as well as the reasons for the inefficiencies are also featured. The effects and impacts of waste on health and the environment are reviewed. The theoretical section involves theories and models that have attempted to explain the increasing generation of solid waste and sanitation problems. It concludes with an explanation of the contingent valuation method, a common valuation tool used to elicit willingness to pay.

2.1 Definitions and Management of Waste

Waste is defined as an unwanted good that is no longer useful or desirable. According to the United Nations Statistical Division, "wastes are materials that are not prime products (that is products produced for the market) for which the generator has no further use in terms of his/her own purposes of production, transformation or consumption, and of which he/she wants to dispose" (UNEP). Waste is classified into categories such as industrial waste, household waste, municipal waste and liquid waste. Household waste is waste generated through the activities of production and consumption in the home. Household waste is a constituent of municipal waste. Municipal solid waste (MSW) is a term usually applied to a heterogeneous collection of wastes produced in urban areas, the nature of which varies from region to region (UNEP, 2005). Solid wastes are materials with less liquid content, characterised by a reactive and unstable nature when exposed to heat, some include acids or

bases that can corrode metal containers (OECD, 2005). Some solid wastes are toxic and are harmful when ingested or absorbed. Some can also cause fire and explosion when found under certain conditions (Alam & Ahmade, 2013).

A United Nations Environmental Programme report, explains that waste composition varies across and within countries and this is as a result of the size of population, urbanization and affluence (UNEP, 2010). A study by Oteng-Ababio (2011) on the governance crisis and attitudinal change looks at the composition of solid waste as an aspect. The components are organic (food particles), paper, textile, plastics, metal, glass and others. In this study, he identified a significant aspect of solid waste, which involved the changing complexities in the waste stream. Organic waste constituted a major proportion of the solid waste stream as compared to other countries with specific emphasis on London. The vast amount of food particles that goes to the landfills makes a significant contribution to global green house gas emissions. Over the last few decades there has been a steady increase in the use of plastic products resulting in a proportionate rise in plastic waste in the municipal solid waste streams across the nation (Fobil & Hogarh, n.d). These components including the others have tremendous effects on the environment when left uncollected.

Solid waste is an unavoidable consequence of the consumption and production activities of a society. Proper management of waste is becoming a very difficult challenge in cities all over the world (Akliku, 2002). The increase in the population and rapid income growth has led to changes in the lifestyle of urban residents, thereby changing the composition of solid waste generated (Narayana, 2008). The rise in the consumption of products such as paper, plastics and metal has made disposal difficult. The municipalities have not been able to collect and dispose the large quantities of waste generated because they do not have the means to do so. As such, scavengers and rag pickers have come in to help with the collection of waste by

going to collect the refuse or waste from the households to the dumpsites. This forms an important function of waste segregation (Narayana, 2008).

Managing solid waste is an enormous challenge for countries all over the world but the developing countries have much more difficulty because of the poverty rates, population growth and the rate of urbanization (Taiwo, 2011; Selin, 2013). It was argued that waste management is the second most pressing challenge after the problem of inadequate water supply in the developing countries (Selin, 2013). Waste management includes monitoring (handling and storage), collection, transport, processing, recycling and disposal (UNEP, 2005). In Accra, solid waste is generally managed through economic instruments, landfills, incineration, recycling or reuse. There have been new and emerging ways of dealing with waste; albeit the rate of progress has been slow (Holden, 2008).

2.2 Waste Collection and the Problems of Efficient Collection

According to Palczynski (2002), waste collection plays a vital role in waste management processes. Collection is a major aspect in the solid waste management chain, which links the process of generation to disposal. The collection process requires diverse elements involving collection system, special equipments, routes to collection sites including the loading and unloading activities (Baptiste, 2007). The methods of waste collection employed in Ghana include the door-to-door (which also includes curbside method) and the community waste collection.

World Resources Institute (1996) reports that one to two thirds of the solid waste generated in cities of developing countries is not collected. These uncollected wastes are dumped indiscriminately in the drains, and on the principal streets. This contributes to the flooding situations in some of the communities in the cities, breeding of insects and rodents and the spread of diseases (World Resources 1996; Zurbrugg, 2002; Mosler et al., 2005). However,

the waste that is collected is disposed off on land, which is often done haphazardly, or in an uncontrolled manner (Mosler, et al., 2005). The consequences of the uncontrolled waste disposal have grave effects on the economic and welfare of the people as well. The available resources that include land, water and even the atmosphere are degraded as a result of the indiscriminate waste disposal.

The inefficient and ineffective application of waste management approaches has become central to many discussions concerning the progress of Sub-Sahara countries - good governance. Good governance involves the successful management of community affairs through the mixing of private, public and voluntary actors. It encompasses visionary leadership and incorporates legislated bye-laws (Thompson, n.d.). Where there is good governance, there is enforcement of law and people are fined and punished when they fail to comply with the law. Ghana has established sets of comprehensive environmental laws, however, the leaders in authority lack the means to enforce these laws.

In a study by Anomanyo (2004), he explained some problems associated with efficient collection of solid which have been outlined as follows.

- Inadequate funds and logistics. Ghana like other Sub-Sahara countries, is faced with the challenge of providing adequate logistics in terms of collection containers, the vehicles to transport the waste and recycling thereby resulting in inadequate collection. The state of infrastructure facilities are poor and badly managed. All these are as a result of the lack of fund to acquire these items. It was revealed in Anomanyo's work that in Ghana, 80 percent of the waste delivery service is free of charge. The waste management departments are also not geared towards income generation and all the operational costs come from government subsidy. Many of the

vehicles that are used for the collection are old and have not been replaced because there are no funds available to replace them.

- Difficulty applying Service Charges. Due to poor structures and the lack of proper demarcation of houses, there is no good database on the population that do not have access to waste collection services. Municipal assemblies find it difficult to generate funds internally because they do not have access to household locations. Moreover, the areas are not demarcated properly and the houses are scattered. For this reason, it is difficult to apply service charges towards environmental improvement. Coupled with this challenge is the perceived notion by many households that the government does not perform efficient tasks. This provides the leeway for non-payment since many of the households have perceived ideas that the probability of government mismanaging the service is high.

- Nature of roads within the city. The nature of roads in some of the cities and towns in the Greater Accra Region are either under construction or in very bad condition. This has affected the ability of waste providers to access some dumpsites. Usually, these waste trucks are found on the roads either stuck in mud or broken down. They are often left on the road for days. Waste containers become full and are left uncollected for weeks leading into months. These uncollected wastes are brought back into the communities through natural activities such as rainfall and air coupled with human and animal activities.

All the above factors to a larger extent are the result of poor governance. If environmental laws are strictly enforced and culprits punished, people will practice proper waste management.

2.3 Effects of Waste Generation

Waste generation is the creation or handiwork of human activities (which are as a result of economic growth, urbanization and industrialization) and it is the way in which these wastes are handled, stored, collected and disposed of that poses risks to human economics and welfare and the environment (Zurbrügg, 2002). Other ways by which living organisms come in contact with solid waste include soil adsorption, storage or biodegrading, plant uptake, ventilation, leaching, animal activities and through direct dumping of waste into seas, rivers and lakes (Alam & Ahmade, 2013). These toxic materials and pathogens bleed into the leachate of dumps. The leachate is composed of rotten organic waste, liquid waste and infiltrated rainwater. These can contaminate ground and surface water depending on the drainage system and the composition of the underlying soil (USAID, 2009).

In 1998, malaria accounted for 53% of all reported diseases at the Ghana outpatient's facilities and is the leading cause of morbidity in the Greater Accra Region (Thompson, n.d). Data from the Ghana Health Service indicate that six out of the top ten diseases in Ghana are related to poor environmental sanitation, with malaria, diarrhea and typhoid fever jointly constituting 70% - 85% of out-patient cases at health facilities (MLGRD, 2010; Oteng-Ababio, 2011).

A report by the EPA on the state of Ghana's environment reveals that, environmental degradation is a problem of areas along the coast and this coupled with poverty and rapid urbanization inhibits human development. Thus, the lagoons in and around densely populated areas and industrial establishment have been heavily degraded. For instance, the "Korle and Kpeshie Lagoons in Accra, Fosu Lagoon in Cape Coast and Chemu Lagoon in Tema have all been polluted in different states of degradation due to impacts of insanitary practices"(EPA, 2005, p. 73). Dumpsites or landfills in sensitive ecosystems may destroy or significantly damage these valuable natural resources and the services they provide (EPA, 2005). Food

particles contribute significantly to water contamination (Alois, 2007). The Korle Lagoon and its tributary (the Odaw River) serves as the largest drainage basin for population and industry in the environs of Accra. Most of the industries in Accra are located in the lower drainage of the Korle/Odaw basin, which has become grossly polluted with discharges of effluents and disposal of waste. The water quality has deteriorated making the lagoon unsuitable to support a thriving fishery of both fin and shell fishes (UNEP/OCHA, 2011). In a UNEP report, about 1.2 million people have been affected by polluted water and also contribute to the deaths of 15 million children every year (UNEP, as cited by Alois, 2007).

According to USAID (2009) report, when organic wastes are disposed of in deep dumps or landfills, they undergo anaerobic degradation and become significant sources of methane, a gas with twenty-one (21) times the effect of carbon dioxide in trapping heat in the atmosphere. In residential areas, garbage is often burnt in landfills to reduce volume and uncover metals. Burning creates thick smoke that contains carbon monoxide, soot and nitrogen oxides, all of which are hazardous to human health and degrade urban air quality.

A Rapid Disaster Waste Management Assessment report by UNEP/OCHA (2011), revealed that the negative attitudes and practices to waste disposal are partly responsible for the persistent flooding and the associated severe consequences in most urban areas. The June 2010 flooding in Accra and Tema for example claimed 14 lives and destroyed properties worth millions of Cedis. The October 26, 2011 flooding caused a lot of damages to houses and businesses along the Odaw River banks. These included damages and loss of lives (14 people), loss of livelihoods (43,000 people were affected and 17,000 lost their homes) and loss of economic value (damages to roads, waterway and bridges) – UNEP/OCHA, 2011.

The aesthetic value of the town is diminished because of the refuse spreading all over the community. The unpleasant odour and unattractive appearance of piles of uncollected solid waste in the parts of the township discourages investment of business and hence the

development of the area. The exposure of these community containers to the rain and sun contributes to the deterioration of the air quality as well as disturbing human activities. The dumpsites are freely accessed by animals like dogs, cats, hens, goats and others which scatter the waste about in the surrounding areas (Mudzengerere and Chigwenya, 2012).

As clearly stated by Owusu (2010), poor urban sanitation and waste management problems are usually expressed in terms of health and environmental issues, however, there seems to be social consequences associated with this problem. In his article, he outlines some social consequences that arise as a result of poor waste management. One of the social effects is the stigmatization of communities that are characterized by poor waste management. Considering Tema Newtown, one would say that the town is underdeveloped and their inability to contribute towards the control and collection of waste in the area has led to stigmatization of the town. Therefore, it makes it difficult for the assembly to support them in their developmental projects. Various communities in Tema are well developed and structured as compared to Tema Newtown.

In addition, the environment serves as the arena for cultural rules and norms that guide the activities and behaviours which are reinforced and reproduced through the repetition of those daily activities in which people participate (Pellow 2002). Poor living environments have particularly far reaching consequences for children and adolescents as they are more vulnerable than adults to a range of environmental concerns and more likely to be affected in ways that have longer-term repercussions (Bartlett, 1999). According to Bandura's social learning theory, children are able to learn through observation and begin to imitate the actions of people they consider significant persons (Bandura, 1977 as cited by Cherry Kendra, n.d). In most parts of the African countires, parents and the elderly are perceived to be standards for measuring good morals or behaviour (Owusu, 2010). Growing up within an environment of garbage all around and poor sanitary practices, the youths and young children of the

community are unlikely to behave any differently from their older community members who litter the community (Owusu, 2010). This may partly account for some of the youths' undisciplined behaviour towards littering and their lack of appreciation of good sanitary practices.

When these learned behaviour patterns develop over time, they become uncontrollable and may lead to deviant behaviour. This occurs when the social ties that bind a person to a particular social group is weakened as explained by Travis Hirschi's Social Control Theory (Ashley Crossman, nd). Thus, peoples' attachment toward their communities may be broken when they realize there is no strict adherence to that particular value or situation. With regards to waste management, we can say that the systems that control the management of waste in the communities are weak and partly contribute to the undisciplined behaviour of indiscriminately dumping refuse at unauthorized place. This effect can further be explained by the imbalances between cultural goals and structurally available means to achieve this goal can lead people to deviant behaviour (Ashley Crossman, nd). In this particular situation, the means to securing better well paid jobs are not available and therefore people become angry and frustrated by the demand for payment toward trash collection or waste management.

2.4 Valuation of Environmental Goods

Economic valuation of an environmental good is an estimation of the value people attach to that good in question. There are commodities or goods that do not have market prices and in order to give it a price, an environmental valuation technique is adopted to estimate the value that people will attach to that environmental good or service. In other words, it explains how individuals will be better or worse off with or without the good. Because there are no market

values for these environmental goods, a hypothetical or artificial market will have to be constructed so that people can reveal their preferences. Some of the techniques used to estimate non-market goods include Hedonic pricing, Travel cost methods, etc. (Akliku, 2002)

Benefits that people derive from effective and efficient MSW management such as improvement in environmental quality cannot be reflected in normal market prices (Anaman and Jair, 2000) because it has the characteristics of non-market priced good that is non-excludability and non-rivalry in nature (Ezebilo & Animasaun, 2011). It requires a different market situation to be able to determine the optimal value for the resource allocation. One reason for this particular technique is that goods of such nature are either non-priced or underpriced (Anaman and Jair, 2000) and stated preference techniques are the best option for decision making regarding valuing nonmarket benefits. The most commonly used method is the Contingent Valuation Method (CVM).

2.4.1 Willingness to Pay (WTP) and the Contingent Valuation Method (CVM)

Willingness to pay is the amount an individual or household will be willing to pay to obtain a good or service. It is the amount the household is willing to sacrifice or give up to get a good and have their utilities remain the same.

The CVM uses a questionnaire designed to elicit valuations or bids of households about a decrease or increase in the amount of an environmental good and the amount they will be willing to pay in order to get a better and improved quality of that environmental good. The assumption is that a market exists for environmental goods and services (Moffat et al., n.d). There are several means of obtaining the willingness to pay. The methods used to elicit the willingness to pay include bidding games, payment cards, open-ended and closed ended questions for approximating the willingness of households to pay for an environmental good.

2.4.2 Review of Related work that used the Contingent Valuation Method

Literature on the use of valuation tool to estimate an environmental good abound. Several programmes and projects have employed some of these tools to value environmental goods and services such as solid waste, water, electricity, transport, health insurance and others. The CVM is widely used nationally and internationally across the globe. There have been studies to investigate the willingness to pay for water supply, health insurance, power supply and so many other environmental goods and services. Over the world, there have been studies to investigate how households or individuals are willing and able to pay for improved waste management system. The problem of waste has been detrimental that many intellectuals have diverted attention to such areas of study. Below are some related literatures on the willingness to pay for improved waste management that have been reviewed.

In a study to investigate the willingness to pay for improved waste management, Roy and Deb (2013) used the Contingent Valuation Method to determine how much households are willing to pay for improved waste collection and disposal facility in Silchar municipal area under Cachar district in Assam (India). In the study, a systematic sampling technique was used to collect data from a survey of 378 households. The results indicated that 63% the households are willing to share cost for waste management services.

In Mekelle city of Ethiopia, the contingent valuation method was used to determine the willingness of households to pay for improved urban waste management (Hagos, Mekonnen, and Gebreegziabher, 2012). The paper used a cross-sectional survey of 226 randomly selected households in Mekelle to assess the current fees charged for municipal sanitation and the willingness of the households to pay for the improved urban waste management, and suggest mechanisms for cost recovery. From their findings, it was revealed that the willingness of households to pay for the improved waste management was significant to the level of income and how they were aware of the quality of the environment, among other

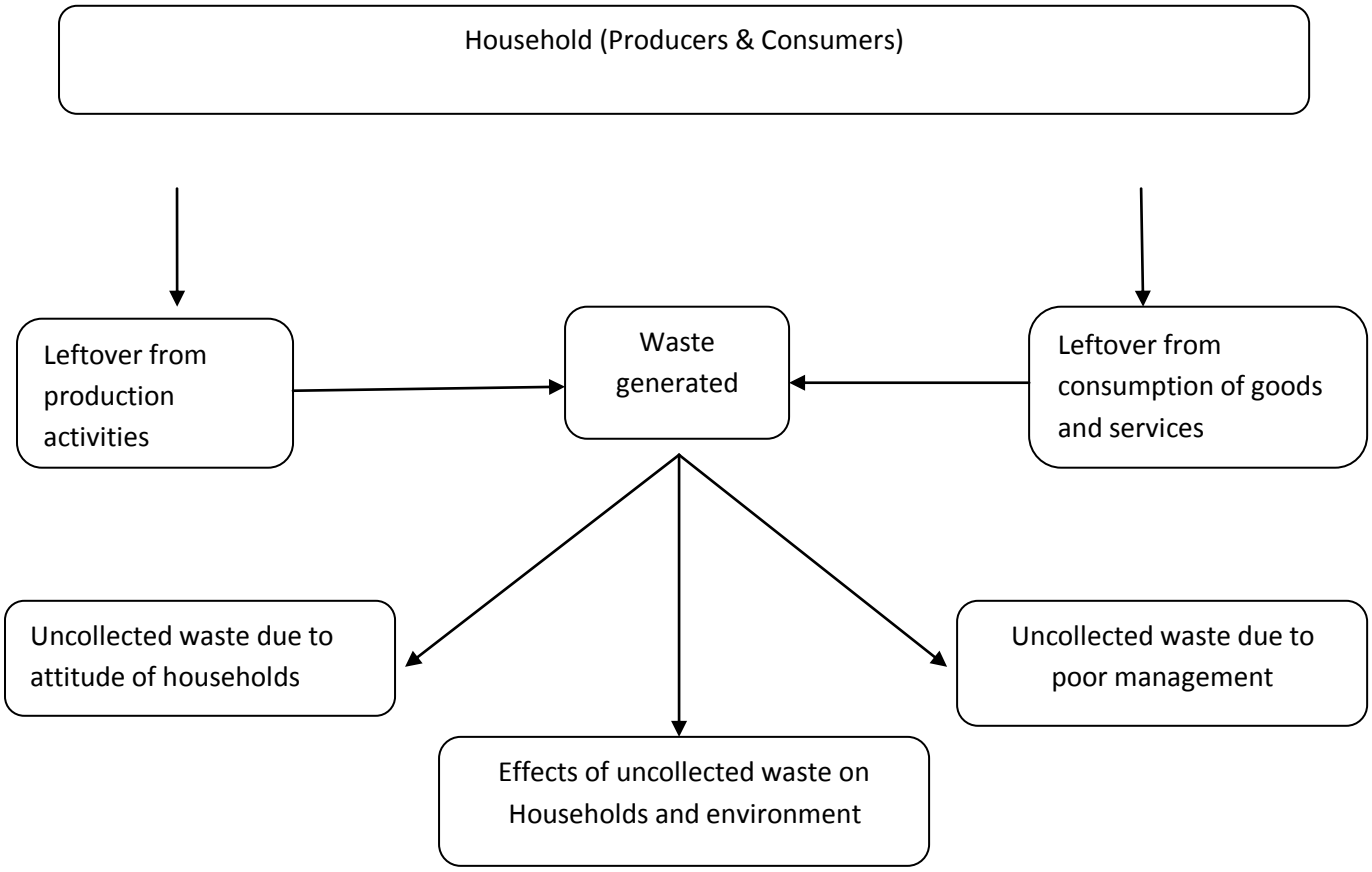
factors. The study revealed that the fees they were currently paying as municipal sanitation fees were far below what they are willing to pay.

The study conducted in both Silchar and Mekelle revealed that, to an extent households were aware of waste management problem. From both studies, the households were willing to pay for improved waste management systems which implied that they valued waste and considered it as an economic good.

A study by Oteng-Ababio (2010) on private sector involvement in waste management revealed that Tema households in the high and middle income areas were willing to pay for waste collection services although the prices were relatively high. However, with regards to Tema Newtown, only one percent of the respondents were willing to pay GH¢0.40 pesewas a month. The residents were reluctant to pay because they had enjoyed the services for free for a very long time. The indigenes perceive that Tema is their land and so they would not pay any amount for waste collection (Oteng-Ababio, 2010).

2.5 CONCEPTUAL FRAMEWORK

Figure 2.1 Conceptual Framework explaining the effects of waste generated by households and uncollected.



Source: Author's Conceptual Framework, 2013

Figure 2.1 provides the basis for which waste is generated from the household level. As the figure depicts, we have producers and consumers constituting the household. Day by day, new products come onto the market and so people identify a number of materials as no longer valuable. This is especially for products that are technologically related. Once an improved version of the old product comes unto the market, people begin to discard their old products. Again, the shorter product cycles and large number of packing, consumption and the demand for portable products have increases in the waste stream. Waste is produced as a result

because when the products are considered no longer valuable, they gather them for its posterior disposal. The waste generation process includes direct and indirect actors (Bilitewski, 1994 as cited in Baptiste, 2007). Those directly involved in waste generation are households and the service sectors, manufacturing and industry. The indirect actors are made up of the local government bodies and regulatory agencies responsible for the overall environmental strategies necessary for managing waste when it is generated in excess (Baptiste, 2007)). The contamination may occur either from the acquisition or during the intermediate production. The environment is polluted by the uncollected waste littered about and uncontrolled (Baptiste, 2007).

There are two groups of people in an economy, the producers and the consumers. The consumer is assumed to be a rational human being who seeks to satisfy his needs (Koutsoyianis, 2003). Given the budget constraints and the market prices of goods and services, the consumer will be willing to spend his or her income in a way that will grant him the highest satisfaction from the consumption of the good or service purchased. This is an axiom of utility maximization. Once he reaches his level of satisfaction, any further consumption will result in a decrease in his utility. The leftovers from the consumption of these goods and services are what constitute the waste we produce (Koutsoyianis, 2003).

These leftovers comprise of food particles, sachet water rubber, papers and many others that results from household production activities. For lack of funds to acquire necessary logistics and proper maintenance of equipment, the municipal assemblies are unable to achieve efficient collection.

Also, one major challenge which is a concern to the environment is the operation of illegal dumpsites which the local government or municipalities tend to turn a blind eye (Mudzengerer. & Chigwenya, 2012). They dump refuse indiscriminately in open spaces

which lie for days and is not collected. Households who live close to these piles of refuse are mostly affected. The uncollected piles of solid waste breed mosquitoes and invite flies and rats, which are effective vectors that spread diseases. The odour created by these dumpsites affects businesses in the area. The value of the town diminishes due to deterioration in the aesthetic beauty. Some solid waste can be highly flammable and can spark wild fires that would destroy lives and property.

2.6 Conclusion

This chapter outlines the various definitions and terminologies used in explaining waste and how waste is managed. It further discusses some of the causes and effects of uncollected waste and how households would be willing to pay for waste collection. The contingent valuation method was adopted to elicit residents' willingness to pay. The conceptual framework provides graphical view on households generate wastes which are left uncollected.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter looks at the research methods employed for the study. It entails a profile on the study area, the research design, the sample size and selection, the procedure for data collection, the means by which the data collected is analyzed and the limitations of the study. Before the research design is explained in detail, an insight into the study area Tema Newtown is provided. A description of the area is given concerning location, population, nature of the area and the methods of waste collection and disposal.

3.1.Study area

Tema Newtown is one of the suburbs of the Tema Metropolitan Area found along the shore of the Gulf of Guinea. Tema serves as the administrative capital of the Tema Metropolitan Assembly and covers a land size of 396 km^2. It is a coastal city situated 25 km east of Accra, bordering south of Gulf of Guinea and situated on the Greenwich Meridian with 0^0 Longitude (TMA- MTDP, 2010-2013). Tema used to be a fishing community until it developed into a deep seaport during the 1950s. For this reason, Tema was nicknamed the Harbour City. Tema became an autonomous council in 1974 and was elevated to the status of a Metropolitan Assembly in December 1990[2]. The city is considered as one endowed with resources and industry and generates high revenues for the country. According to the 2010 Population and Housing Census Report, the population of Tema is 402, 637 (TMA- MTDP, 2010-2013).

The town was initially located where the current deep seaport is situated but the indigenous people of Tema had to be relocated to a new location to make way for the development of the

[2] Data obtained from Tema Development Corporation

seaport. Their new location is and continues to be called Tema Newtown or Tema Manhean; the latter meaning Newtown in the local Ga language. According to the 1960 Population and Housing Census report, Tema Newtown had a human population of 7667 which increased to 58,768 in 2000 (GSS, 2002). The population is estimated to increase by 18,934 in the 2010 Census report. Like many traditional cities in Accra, Tema Newtown maintains an aspect of traditional lifestyle in a modern urban city. The town is divided by a road into three zones and within each zone there are about two or three communities. The facilities in the town include a health centre, educational facilities, a police station, a market square, military barracks (Navy) and many others. From the rate of population, it implies Tema Newtown is growing rapidly and this explains the tendency of the increase in the amounts of solid waste generated in the town. Tema Newtown was selected for the study because it is characterized by rapid population growth and the increasing waste management problems which are of major concern to development and relevant to this study.

3.2 Research Design

The study is largely quantitative; however, there were some aspects that required the use of qualitative research method. Overall data for analysis of the study were generated from primary and secondary data sources. Two methods of data collection were used to collect household data for the study. These include household questionnaires and key informant interviews. Literature from books were used to support the other data provided.

3.3 Sample size and selection

A sample size of 120 households was selected for the study. The sample population was divided into three zones (A, B, C) with 40 respondents representing each zone. The first zone (A) covered households who lived along the shores of the Gulf of Guinea. Zones B and C are to the left of the major road whiles Zone A is to the right of the major road from the Tema Harbour. However, Zones B and C are separated by a minor road that enters into the

communities on the left of the major road. The minor road can be identified after the Police Quarters. A systematic sampling approach was used to randomly select households choosing every fifth house within a specified zone. There were about ten households in one house and the houses were clustered and congested. It was difficult though, but for every fifth house, one household was selected for the study.

3.4 Methods/ Tools for Data Collection

3.4.1 The Household questionnaire

The questionnaire was structured into six sections (A-F) outlined as follows: Section A sought general information or biography of respondents. This section constituted demographic questions on the age, gender, size of household, marital status etc. Section B looked at general concerns on waste and the perception of respondents on the problem. The respondents were required to propose solutions to the challenge of waste for the local government as well as for the individuals themselves. Section C asked questions on the type of waste collection system, the composition of the household waste and where they disposed of their refuse. Section D sought their agreement on the effects of the uncollected waste and disposal of waste at unauthorized places. Section E included open-ended approach/questions on contingent valuation; thus exploring the willingness of the people to pay for better and improved waste collection services. This section was divided into two groups of consumers, those who used and preferred community waste collection service and those who used or preferred the door to-door services. Section F focused on the socio-economic status of the household based on their food expenditure and the electrical appliances used. The questions were structured for both the closed-ended and open-ended questionnaire. Also field observations were captured through photographs.

3.4.2 Key Informant Interview

Two officials of the Metropolitan Assembly's WMD, including the Deputy Director were interviewed on the waste management situation in Tema Newtown. The Public Relations Officer of the Tema Traditional Council and other relevant persons were interviewed and they gave supplementary information concerning the improper disposal of solid waste in the township. There was an interview with one Teacher who had lived for a long time in the community and knew the history of the people of Tema. An interview guide was used to elicit information from the Waste Management Officials. For the others, the unstructured informal interview approach was employed.

3.4.3 Field Observation

Field observation was one of the ways to collect the data from Tema Newtown. Before the actual data collection took place, field trips were organized to the study area to collect data for terminal report. Observations were made to assess the situation of waste collection and disposal in the area. Pictures of the area that reveal the nature of the environment were captured (available in the Appendix III). Through the field trips, some information was gathered about the area with respect to solid waste management.

3.4.4 Contingent valuation method

In order to elicit the willingness of household to pay for the newly and improved waste collection and disposal system, a hypothetical scenario was described. The households were made to assume that in some few months the government would close down their old system of waste collection and would introduce a new legal system as government taking responsibility for the collection and disposal. However, the households would have to pay an amount for the new and improved service. A description of the commodity which is "the new

legal system of waste collection and disposal" was made known to the household respondents. The household respondents were made aware that the new legal system would require all households to pay an amount of money so they can enjoy a better and improved waste collection service. The open-ended question was chosen as the option to elicit their willingness to pay. Therefore the household respondents were to state the maximum amounts they were willing to pay for the new legal system to the introduced to them. The benefits were also explained to them. The information included the fact that the payments would be on a monthly basis. Once the household respondents understood the scenario, they were asked whether or not they were willing to pay for the new legal system of waste collection and disposal. If the respondents said "yes" to pay something, they were asked to put down the maximum amount they are willing to pay. If the response was "no", the respondents were asked to give their reasons for not wanting to pay anything at all. Some options were made available for them to choose from and to also give reasons that were not included in the options available. The mode for payments was not made known. The household respondents were given the option to choose whether they preferred the assembly to deliver the service or the private companies and the reason for their choice.

3.5 Procedure for Data Collection

A structured questionnaire with both open and closed ended questions was used for the data collection. Interviews were also conducted with key informants who included officials from the Waste Management Department at the Tema Metropolitan Assembly, the Public Relations Officer and a Committee Member for Sanitation at the Office of the Paramount Chief of Tema Newtown and a teacher who had lived for a long period in the area. For the valuation of solid waste collection, the contingent valuation method (CVM) was used to create a hypothetical market situation to investigate how much each respondent would be willing to pay for an improved solid waste collection system. The open-ended approach was

adopted and the respondents were to give the maximum amounts they would be willing to pay for the close down of the roadside community waste collection for an improved service. The people in the Tema Newtown area are not used to paying for waste collection. So they are not used to the daily or monthly payment of fees. However, the monthly payment was used since the improved service would require collection and disposal from the houses.

The data collection took the form of hand delivery questionnaires and interviews. There were interviews with some of the key informants which also informed the restructuring of questions in the questionnaire. Due to the nature of question in sections D and E as well as the educational qualification of some respondents, the questions were not self-administered but took the form of an interview. For the literates who understood the questions, copies of the questionnaire was given to them for self-administration. However, for most of the respondents, it took a direct face-to-face interview because it has been shown to be the most reliable method in contingent valuation (Sumukwo, Kiptui & Cheserek, 2012).

3.6 Technique of Analysis

The survey employed the SPSS to analyze and compute the mean and median of some important variables. The frequency distributions in percentages were analyzed to reveal the respondents' selection of the different characteristic options such as ranking of the gravity of the causes and effects of waste disposal, ranking of various options to manage waste and the inability of the household to pay for improved waste collection service in Tema Newtown. Some selected variables including age, gender, education, occupation, marital status and household size were used for the analysis of their willingness to pay. A test for correlation was run to determine the relationship between the causes and the effects of the uncollected solid waste in Tema Newtown.

3.7 Determining the Quantity of Uncollected waste

The aim of this study is to assess the effects of uncollected waste generated by households in Tema Newtown. To be able to assess the effects, the study sought to determine whether or not some communities within the township have access to waste collection services and how often the waste is collected. Usually, it is believed that all the communities have access to the waste collection containers and therefore are considered served but a survey through the communities revealed that most of the communities do not access these waste collection service. Household's solid waste is disposed at dumpsites close to communities and along the seashore. This has necessitated the study to determine the waste generated and uncollected in the township taking into account the average generation of waste (0.56 kg per capita per day).

Formula for calculating the amount of waste generated and uncollected

Qwu(t/yr) = Pu x Ig x 365/ 1000

Where Qwu = quantity of waste generated and uncollected

Pu = unserved population

Ig= per capita generation of the household (average generation index of household)

Note: For Tema, the per capita generation per day by household = 0.56kg

Or For the uncollected waste, it is calculated as follows:

Quantity of uncollected waste = Pu x Ig

Source: Florin Constantin Mihai

3.8 Limitations of the study

The houses within Tema Newtown are densely populated and scattered in nature without house numbers making identification of next household difficult for interview. The houses are close to each other and in some instance joined together. One house consists of about 10 different households such that selection of respondent became challenging becuase there were others around who had wanted to take part in the process. This to an extent influenced the objective decisions of some of the respondents since those interested neighbours would eavesdrop on our interview and interrupt the conversation.

The communities are not properly demarcated thereby making it difficult to identify with the community within which the interview was being conducted. At times, you only realized that you have entered into a different community whiles in the process of an interview.

The sample size could have been larger but for inadequate funds and time factor. The period for the exercise was short, hence the researcher could not utilize the actual sample size that was intended for the study.

Transcribing of information gathered took much of the time during the data collection. Majority of the household respondents had little or no education and communicated in the local languages. This challenge to an extent was exhibited in their approach to answering the questions being asked. There were cases where respondents gave lengthy answers that did not relate to the questions asked. They tended to emphasize on issues of concern to them rather than what the study questions demanded. For instance, at one particular zone, majority of the respondents were concerned about the inadequate toilet facilities in the area and requested for the construction of gutters which were not in any way related to the question asked.

3.9 Conclusion

This chapter provides a detailed description on the methods employed for the study. It further identified the various limitations that were encountered during data collection.

CHAPTER FOUR

ANALYSIS AND DISCUSSION OF RESULTS

4.0 Introduction

This chapter provides basic descriptive statistics of some demographic variables, concerns of improper waste disposal, methods of waste disposal, causes and effects of solid waste and the willingness to pay for improved waste collection service. Other variables that help to answer the objectives of the study are also analyzed. The chapter ends with a detailed discussion of the results of the study.

4.1 Demographic Characteristics of Respondents

One hundred and twenty (120) respondents were considered as sample size for Tema Newtown. Table 4.1 presents the descriptive statistics of the demographic and socio-economic characteristics of the household respondents. Thirty percent of the respondents were males and 70 percent were females. The respondents included heads of households or household representatives. In the absence of either the head or spouse, a household member replaced them. The heads constituted 33 percent, spouses 30 percent and members of household 37 percent. Household size averaged at eight persons, with one person being the minimum and 20 persons being the maximum in a household. The modal household size was five persons. Forty-nine percent of respondents were married, 41% were single, four percent(4%) were separated, one percent (1%) divorced and five percent (5%) were widowed.

Table 4.1 Demographic Characteristics of Respondents

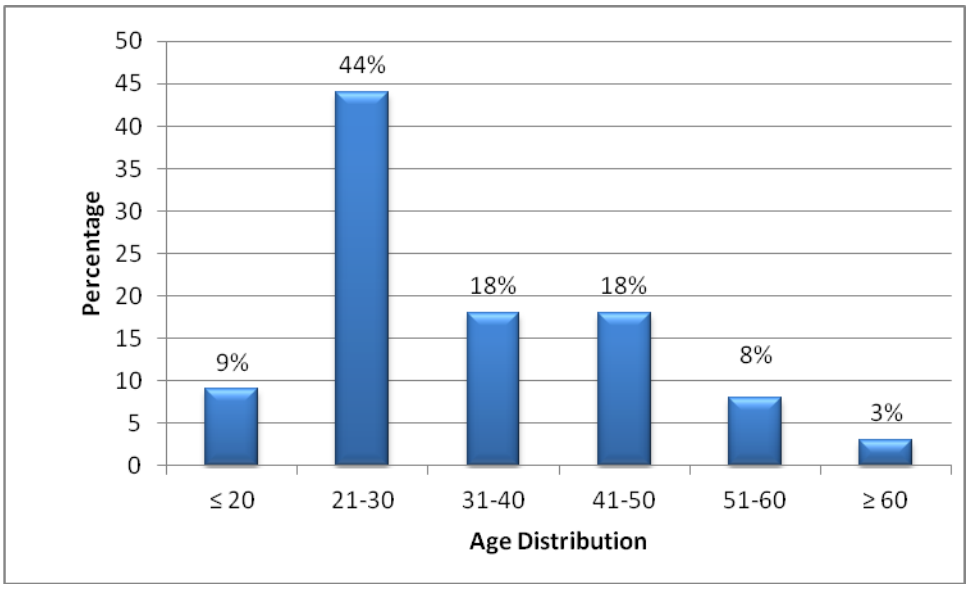
Variables		Frequency(f)	Percent (%)
Gender	Male	36	30.0
	Female	84	70.0
Household representative	Head	40	33.0
	Spouse	36	30.0
	Member	44	37.0
Household size	1-5	51	43.0
	6- 10	41	34.0
	11- 15	18	15.0
	16- 20	10	8.0
Marital status	Single	49	41.0
	Married	59	49.0
	Separated	5	4.0
	Divorced	1	1.0
	Widowed	6	5.0

Source: Field Survey, 2013

4.1 Age Distribution of Respondents

Figure 4.1, reports on the age distribution of the sample. Ages ranged from 18 years to 65 years. The modal age group was between 21 years and 30 years. The ages above 60 years had the lowest frequencies with three percent. The age distribution was such that the ages less than 20 years and those between 51 years to 60 years were about nine percent for both year groups respectively. Both the age groups between 31years to 40 years and 41 years to 50 years had 18 percent each. Drawing inferences from the age distribution, it is evident that the sample population of Tema Newtown has a higher percentage of household respondents in their middle ages (from 21 years to 30 years).

Figure 4.1 Age Distribution of Respondents

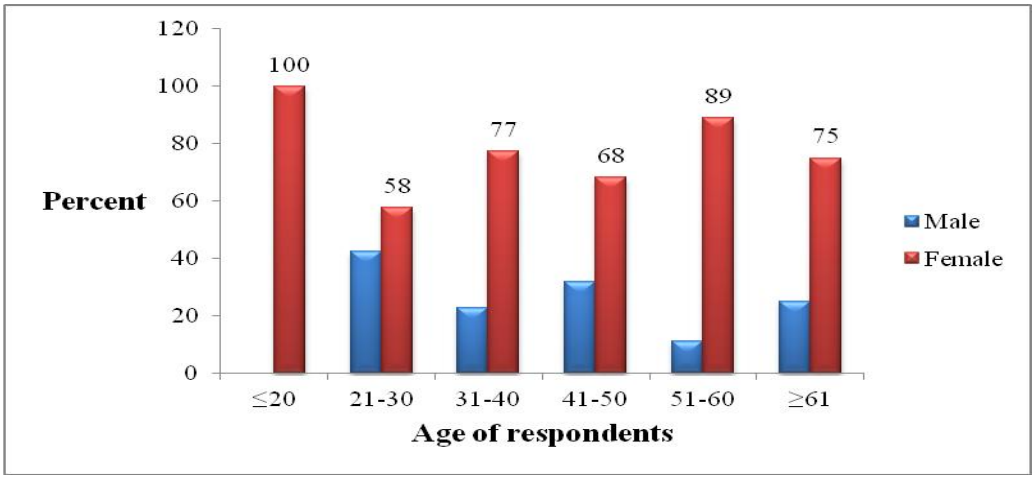


Source: Field Survey, 2013

4.2 Distribution of Gender with Age of Respondents

Figure 4.2, shows that there were no male representation below the age of 20 years. The proportion of females across all age groups is greater than that of males. This can be explained by the sample population since a majority of the respondents were females rather than males.

Figure 4.2 Distribution of Gender with Age of Respondents

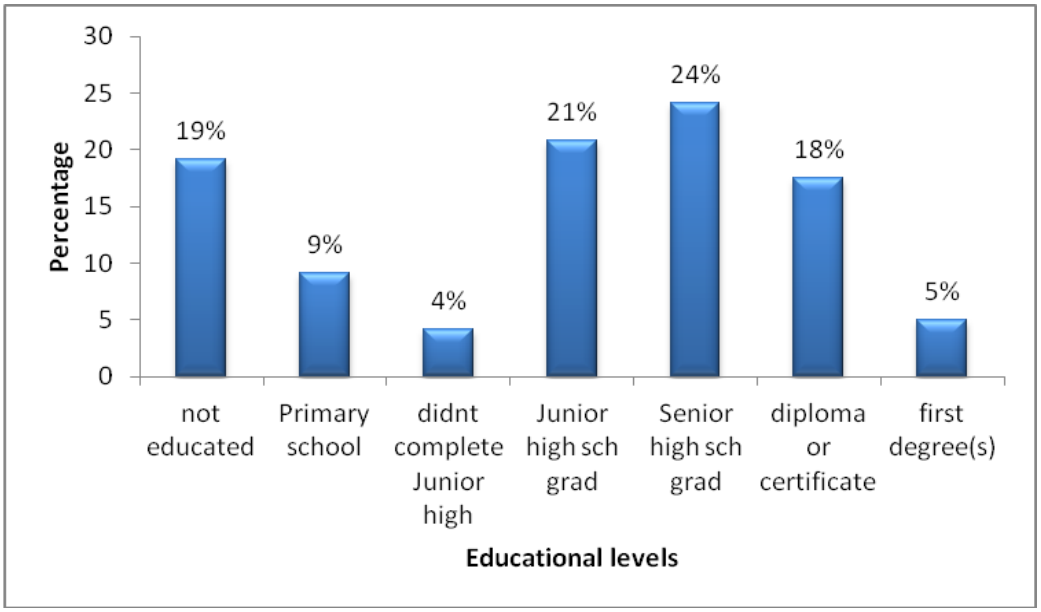


Source: Field Survey, 2013

4.3 Highest Educational Attainment

Figure 4.3 shows the educational levels attained by the respondents. Majority of the respondents (81%) have had formal education. The educational level with the highest frequency was amongst respondents who had attained Senior High School certificate (24%). Of all the respondents, 34 percent had attained basic level education (primary to junior high school), 18 percent had certificates or diplomas from a training college and five percent had attained tertiary education. The results show that most of the respondents had a senior high school certificate. However, their communities are occupied in filth and they seem unconcerned. This can be attributed to one of the social effects poor waste management has on children. From our literature, we stated that children are able to learn through observation and begin to imitate the actions of people they consider significant persons (Bandura, 1986). This may partly be a reason why most of the respondents who have obtained some level of education seem unconcerned.

Figure 4.3 Highest Educational Level

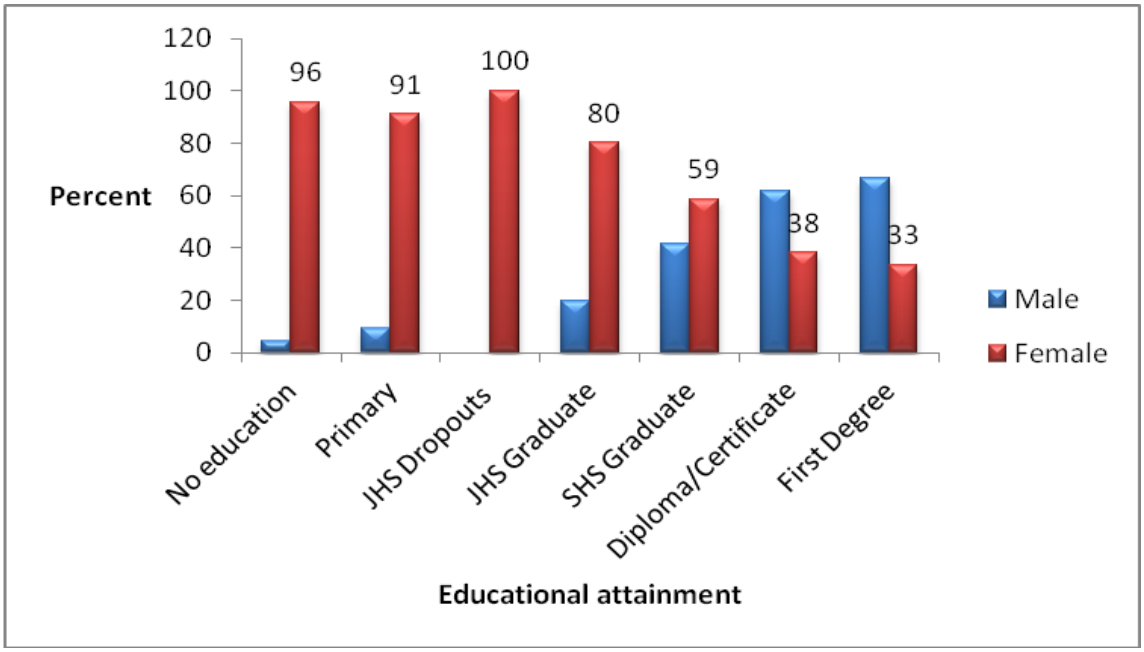


Source: Field Survey, 2013

4.1.4 Distribution of Gender and Educational level

Figure 4.4 depicts the proportion of females to males and their highest educational attainment. The data shows that 96 percent of females had no formal education. However, a majority of females had attained some form of basic education (Primary to Junior High School). Fifty-nine percent of the female and 41 percent of males had attained Senior High School qualification. The distribution of males who had attained some diploma or degree were more compared to that of females. The distribution seems to imply that more males than females are likely to upgrade themselves by acquiring higher education and this may partly explain the reasons for the uncontrollable waste generated.

Figure 4.4 Percentage distribution of Gender and Highest Educational level



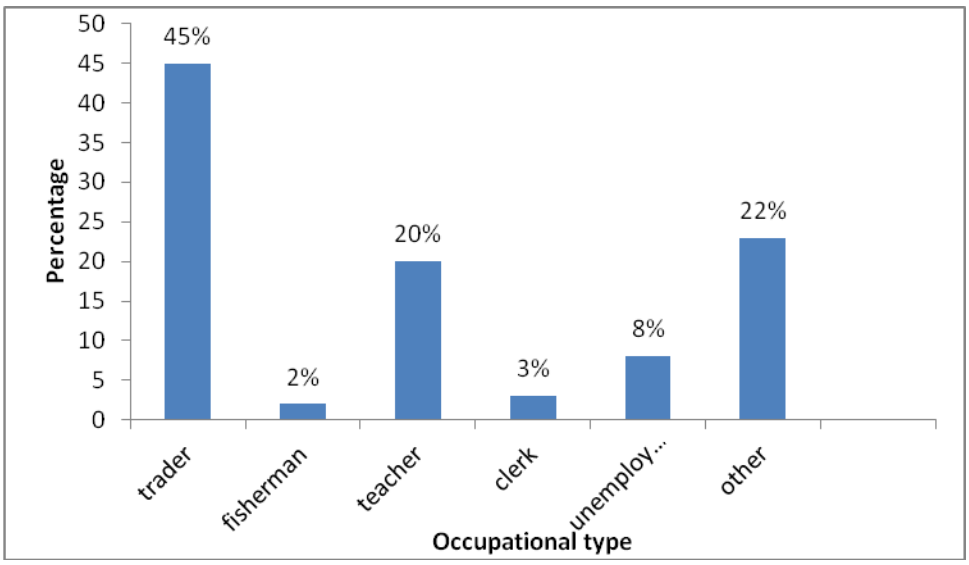
Source: Field Survey, 2013

4.5 Occupation of Respondents

The major occupation of households interviewed in Tema Newtown was trading. Majority of the women were fishmongers. There has been a tremendous fall in fishing in the area; few men are still involved in the fishing occupation. From Figure 4.5, a majority (45%) of the

respondents were traders, with two percent being fishermen. Teachers (20%) also constituted one-fifth of the total percentage of respondents. Most of the teachers were senior high school graduates. Some of the respondents were unemployed accounting for eight percent and 22 percent were engaged in other occupations. These included masons, carpenters, hairdressers, tailors, security personnel, electricians, technicians and so on. As a result of their relatively low educational levels, not many of the households in the area are employed in managerial and professional occupations.

Figure 4.5 Occupation of Respondents



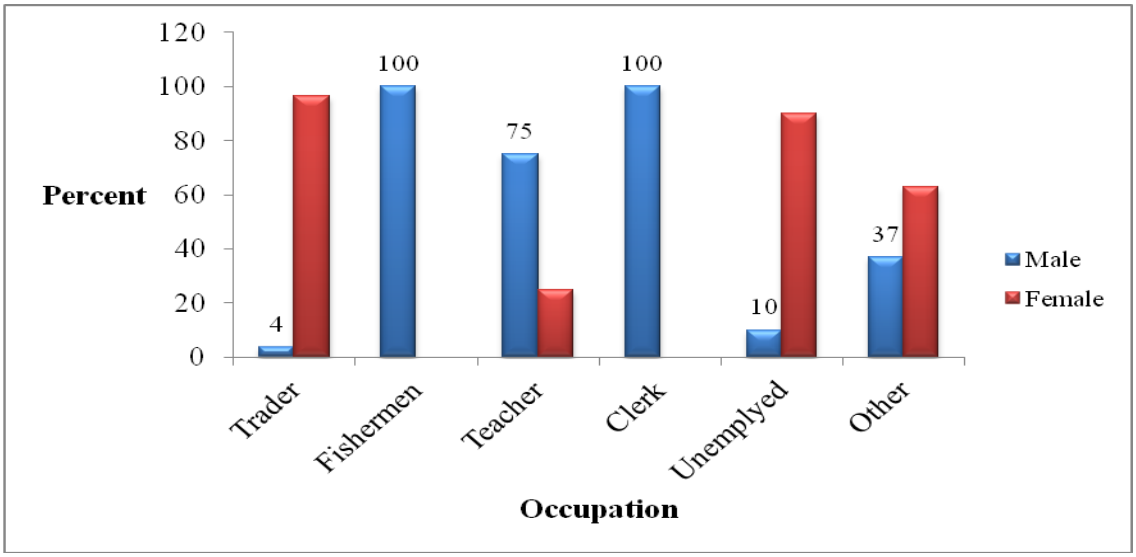
Source: Field Survey, 2013

Coupled with large household sizes, disposable incomes would barely be sufficient to cater for household expenses. For this reason, they are likely to be reluctant in incurring other costs that they may consider as not having direct benefits to them. This point is further elaborated by the imbalances between the cultural goals and the structurally available means of achieving the goals (Ashley Crossman, nd).

4.6 Distribution of Gender and Occupation of Respondents

Figure 4.6 shows the percentage distribution of respondents' gender in various occupations. Ninety- six percent of traders are females as compared to males (4%). With regard to fishing activities, there was no female representation although a majority of the female traders were fishmongers. Seventy-five percent of respondents who were employed in the educational sector were males. For unemployment, ninety percent of them who had no jobs were females comparing to 10% of those being unemployed as males. For other occupations such as hairdressing, tailoring and the others, 63% of them were females and 37% were males. As further noted by Klundert (2000), the rate of urbanization coupled with unemployment contributes to the level of waste generated and uncollected and this is clearly explained by the distribution.

Figure 4.6 Percentage Distribution of Respondents' Gender and Occupation



Source: Field Survey, 2013

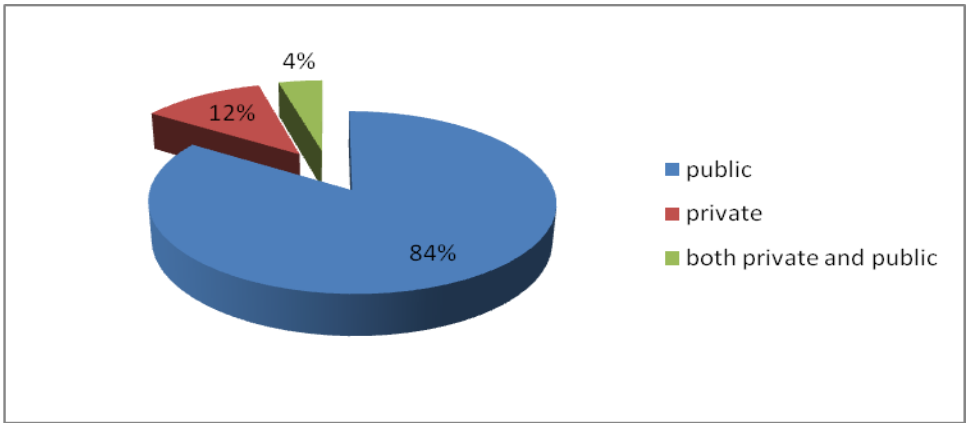
4.2 Waste Collection Type and Management

4.7 Type of Waste Collection

According to Figure 4.7, most of the respondents (84%) have access to the public waste collection service. This is because, the public service is free and households only were to

dispose of their refuse into the waste containers provided by the metropolitan assembly. On the other hand, 12 percent of the household respondents use the private collection service. Some respondents use both the public and private collection service, accounting for the remaining four percent of the total number of respondents.

Figure 4.7 Type of Waste Collection Service

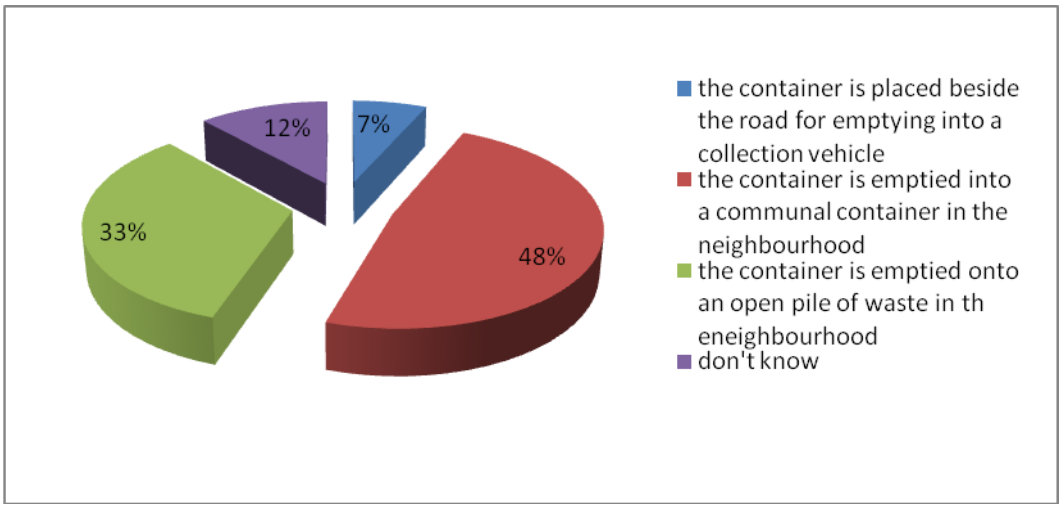


Source: Field Survey, 2013

4.8 Methods of Waste Disposal

The study sought to know the methods household respondents used to dispose of their solid waste. Some of the respondents emptied their refuse into waste collection vehicles. This group of respondents falls under the door-to-door waste collection. In essence, only seven percent of the respondents use the door-to-door method. The second group consists of those who empty their waste into the community containers provided in the neighbourhood. This is the most accessed method. According to figure 4.8, 48 percent of the respondents used the community waste collection containers as their disposal joint. The third group involved those who do not access either the door-to-door or the community waste containers but empty their refuse onto open piles of waste in the neighbourhood. They covered 33 percent of the total respondents. Some respondents (12%) do not know exactly where their refuse are disposed of because they do not throw the refuse away themselves.

Figure 4.8 Methods of Waste Disposal



Source: Field Survey, 2013

Table 4.2 presents the alternative means of disposing of refuse when containers are full and uncollected. Fifty-four percent throw their refuse around the seashores or lagoon. Some of the respondents burn their refuse (9%), about eight percent of the respondents return the refuse to their homes whenever the waste containers were full, about 13 percent throw their refuse in the bushes around the house. Approximately 12 percent had some other alternative means from the categories listed above. These include burying the refuse or filling potholes with them. Nearly, two percent sweep their refuse into gutters and drains; while four percent of the respondents had not been confronted with such a situation hence the issue was not applicable to them.

Table 4.2 Alternative Methods of Disposing waste when Containers are full and uncollected

Alternative method of disposing waste	Frequency	Percent
Burning refuse	11	9
Throw the refuse in the bush area	15	12.5
Throwing the refuse around in the sea or lagoons	64	53
Sweep or put solid wastes in the gutters and drains	2	2
Bring back home and keep for the next day	9	7.5
Other	14	12
Non applicable	5	4
Total	120	100

Source: Field Survey, 2013

4.2.3 Composition of Solid Waste

From Table 4.3, the solid waste generated at Tema Newtown is composed of plastics, food particles, paper, metal and glasses. The data reveals that out of the 120 respondents interviewed, 34 percent regarded plastics as extremely important in the composition of waste generated. Eighteen percent claimed it was very important, 12 percent modestly important, 28 percent less important while eight percent claimed it was non-important. It is one component of waste that blocks and chokes the gutters and drains from the free flow of rain water. It also causes flooding on the streets and communities that live close to dumpsites. Fifty-five percent stated food particles as being important. Eighteen percent of the sample claimed it was a very important component of waste generated. Sixteen percent deemed it modestly important, while eight percent regarded it as less important. About three percent considered it as non-important to the components of waste generation.

Ten percent regarded paper as extremely important of the components of waste generated. Eleven percent claimed it as very important. Eighteen percent suggested it was modestly important but 32 percent and 29 percent considered paper as less important and non-important. Majority of the respondents representing 72 percent regarded metals and glass as a

non-important constituent of the waste they generate. There were, however, others which included leaves, textiles and remains from wigs totaling 28 percent. Thus, out of the 120 respondents, 34 gave other components of the waste that they generate.

Table 4.3 Composition of Solid Waste in Percentage

Level of importance (in %)	**Non-important**	**Less important**	**modestly important**	**Very important**	**Extremely important**
plastics	8	28	12	18	34
Food particles	3	8	16	18	55
paper	29	32	18	11	10
metal & glass	72	13	7	6	3
others	3	6	8	6.7	5

Source: Field Survey, 2013

It is evident from the table that of all the constituents of waste generated, food particles are the most generated. Plastics also form a high percentage of the solid waste generated. However, in recent times there has been a reduction in the overall plastics generated because of the re-use of the sachet rubbers and plastic bottles[3]. This has resulted in the fall of plastic waste although it still remains one of the major constituents of solid waste generated.

Paper, metal and glasses do not account for a high percentage of the waste composition because they are hardly consumed. For instance, most of the paper waste generated is disposed of by burning. The results of these data confirm the findings by Oteng-Ababio (2010) on the composition of solid waste generated in the three major towns of Ghana namely Accra, Tema and Kumasi. In his study, organic materials which consist of the food particles comprised 67 percent of the solid waste generated, followed by plastics accounting

[3] This information was gathered from the Tema landfills site and some respondents who are aware of the plastic recycle business.

for 20 percent of the total solid waste generated (Oteng-Ababio, 2011). This is to say that in Ghana, and especially in the Greater Accra Region, much of the waste is the result of household activities through the production and consumption of food. An interview with an official of the Waste Management Department revealed that, the sorting of components of waste are done on the landfill sites and therefore no available data exist on the quantity of specific components of solid waste generated.

4.3 Determining the Quantity of Uncollected Waste

The amount of waste generated and uncollected by households is calculated as follows:

Qwu = Pu x Ig

Where Qwu = quantity of waste generated and uncollected per day

Projected total number of households in Tema Newtown for 2013 = 20,780

Pu = unserved population/ Total number of households in Tema Newtown (total number of households within Tema Newtown that do not get access to the waste collection service/ door- to-door using the data representation) = 33% of 20, 780 = 6857.4

Ig= per capita generation of the household (average generation index of household) = 0.56

Therefore Qwu = 6857.4 x 0.56

= 6857.4 x 0.56

= 3840.14kg (3.8 tonnes of waste is generated and uncollected per day)

Thus, with a total of 6857.4 unserved households, 3.8 tonnes of waste is generated and uncollected in Tema Newtown.

Total generation for Tema Newtown per day = Number of households x Ig

= 20,780 x 0.56

= 11636.8kg (11.64 tonnes per day)

Amount generated and collected by households in Tema Newtown per day = Total amount of waste generated – Amount generated and uncollected

11.64 tonnes – 3.8tonnes = 7.84 tonnes.

Thus, for every 11.64 tonnes of waste generated by households in Tema Newtown per day, 7.88 tonnes of the generated waste is collected per day.

To estimate for the total generated and uncollected for the year 2013;

Quantity of uncollected waste per year = Pu x Ig x 365/1000

Therefore Qwu(t/y) = 6857.4 x 0.56 x 0.365

= 1401.65 tonnes/year

From the tabulation, the projected waste to be generated and uncollected in Tema Newtown for 2013 is 1,402 tonnes.

This implies that for every 12 tonnes of waste generated in Tema Newtown per day, a third of the waste (4 tonnes) is left uncollected. Thus, two-thirds of the waste generated is collected. This poses a huge threat to the environment as well as the inhabitants. From the data, food particles (organic) constitute a greater proportion of the waste.

4.4 Concern on Waste and Causes of Uncollected Waste

The study sought to know the level of awareness and respondents concern toward the problem of uncollected waste in the area. Table 4.4 shows that most of the respondents (86%) were aware of the seriousness of the problem of waste in Tema Newtown. A few respondents

(12%) did not consider the waste problem as a serious one. This implies that a majority of the households in Tema Newtown are aware of the seriousness of uncollected waste in the area. The study also revealed that, they fail to do anything about it because they think it is the responsibility of government to ensure that communities are kept clean. An interview with a committee member for sanitation for the Tema Newtown Traditional Council revealed that the households were used to obtaining services free of charge and this has resulted in their lackadaisical attitude towards proper waste management.

Table 4.4 Awareness of the Problem of Waste in the Area

Degree of Awareness	Frequency	Percent
very serious	90	75.0
somewhat serious	13	11.0
not serious	15	12.0
don't know	2	2.0
Total	120	100.0

Source: Field Survey, 2013

4.4.1 Causes of uncollected waste

Table 4.5 shows the relationship between the number of years respondents had lived in Tema Newtown and their awareness of the seriousness of the waste problem. Seventy-seven percent of the respondents who had lived in Tema Newtown for less than nine years were aware of the seriousness of the problem of waste. In addition, the proportion of respondents (84%) who had lived in Tema Newtown between 10 to 19 years was aware and concerned about its seriousness. Also, for respondents who had lived there between 20 to 29 years (100%), 30 to 39 years (91%), 40 to 49 years (82%) and 50 to 59 years (67%) were aware of the seriousness of the problem respectively. It was interesting, although not surprising that 33 percent of the

respondents who had lived in Tema Newtown for 50-59 years thought the problem was not serious.

Results in Table 4.5 also show that there was no significant relationship between the number of years lived in Tema Newtown and the awareness of respondents to the problem of waste generated and uncollected.

Table 4.5 Relationship between Number of years lived in Tema Newtown and Awareness

Years Lived in Tema Newtown	**Awareness & Concern of the degree of seriousness**				**Total (%)**	**Total (N)**
	very serious	**somewhat serious**	**not serious**	**don't know**		
0-9	70	7	20	3	100.0	30
10-19	78	6	13	3	100.0	32
20-29	80	20	0	0	100.0	30
30-39	73	18	9	0	100.0	11
40-49	82	0	18	0	100.0	11
50-59	50	17	33	0	100.0	6
Total	**75.0**	**10.8**	**12.5**	**1.7**	**100.0**	**120**

Pearson Chi-square=15.619; p=0.408; Cramer's V=0.208

Source: Field Survey, 2013

4.4.2 Respondents' Recommendations for the Causes of uncollected waste

Respondents were asked to provide recommendations for the government with respect to the causes of the uncollected waste. A majority of them recommended that government should provide adequate waste containers and educate households on proper waste management. Some stated that, the Waste Management Department needed to clear the dumpsites and collects the waste generated periodically. Another group thought that, in order for the activities to run effectively, there must be caretakers on the dumpsite to manage and make sure the environs are well kept and clean and to direct people especially children as to where

exactly they should dispose of their refuse. Those respondents who live close to the dumpsites suggested a relocation of the dumpsite since they were affected anytime it rained. Others suggested a strict regulation of the laws of the environment. They stated that people who dispose of refuse indiscriminately should be prosecuted and punished by the law enforcement agency when they are caught. These suggestions from respondents, to a large extent, are the required actions needed to be encouraged by the assembly.

The study also sought for recommendations that would help reduce the uncollected waste on the environment. The following were their responses; they suggested that individuals should advise and educate their neighbours found disposing refuse indiscriminately, household and neighborhood clean-up activities should be organized in the areas and households must be encouraged to get their personal storage container for refuse. A few also suggested that households must report improper actions which may be harmful to the people or environment.

4.5 Relationship between Variables

From Table 4.6, the study sought to know the gender proportion and their awareness to the problem of waste generated and uncollected. Eighty-nine percent of males regarded the waste generated and uncollected as a serious problem that required concern. Eleven percent of the males disagreed to that effect. With respect to females, 84 percent of them considered the situation serious while 13 percent thought otherwise. Although the male representatives are not many, they seemed to have a sense of awareness and concern for the waste generated and uncollected. There is, however, no significant relationship between gender and the degree of awareness.

Table 4.6 Relationship between Gender and Awareness of the seriousness of waste generated and Uncollected

Gender	Awareness of the degree of seriousness of the problem of waste				Total (%)	Total(N)
	very serious	somewhat serious	not serious	don't know		
Male	72	17	11	0	100	36
Female	76	8	13	3	100	84
Total	75	11	12	2	100.0	120

Pearson Chi-square=2.605; p=0.457; Cramer's V=0.147

Source: Field Survey, 2013

From Table 4.7, 99 percent of respondents who were aware and considered the problem of waste generated and uncollected as very serious also considered attitude of people as an important cause of uncollected waste. A hundred percent of the respondents were aware of the seriousness of the problem and agreed that attitude was one important cause of uncollected waste. For those who regarded the problem as not serious, 94 percent agreed that attitude of the people was a factor leading to uncollected waste.

There is a strong relationship at a significance of 0.008. However, there is a weak association between the two variables. This to an extent supports the argument raised in the earlier paragraphs regarding learned attitudes of indiscriminately disposing off refuse as being a factor to the persistent problem of waste management in Tema Newtown (Owusu, 2010).

Table 4.7 Relationship between Awareness (degree of Seriousness) and Attitude of people as a cause of uncollected waste

Awareness	**Attitude of the people as a cause of the uncollected waste**					**Total (%)**	**Total (N)**
	Not important	**Less important**	**Modestly important**	**Very important**	**Extremely important**		
Very serious	1	5	9	37	48	100.0	90
Somewhat serious	0	0	31	38	31	100.0	13
Not serious	6	27	27	33	7	100.0	15
Don't know	0	0	0	100	0	100.0	2
Total	**1.7**	**7.5**	**13.3**	**37.5**	**40.0**	**100.0**	**120**

Pearson's Chi-square=26.934; p=0.008; Cramer's V=0.274

Source: Field Survey, 2013

Table 4.8 shows the relationship between educational qualification and the degree of seriousness with respect to awareness. Ninety-one percent of uneducated respondents considered the problem of waste generated and uncollected as a very serious problem while nine percent thought otherwise. A majority (82%) of those who had attained primary qualification were aware of the seriousness, 72 percent of respondents with junior high qualification and 86 percent with senior high qualification were aware of the seriousness of the problem of waste generated and uncollected. Ninety-one percent of those with diplomas and certificates and 100 percent of degree holders were aware of the seriousness of the problem of waste generated and uncollected in Tema Newtown. There is no significant relationship between educational attainment and awareness.

Table 4.8 Relationship between Highest Educational Attainment and Awareness of waste generated and Uncollected

Education qualification of respondents	**Awareness of the degree of seriousness of the problem of waste**					
	very serious	**somewhat serious**	**not serious**	**don't know**	**Total (%)**	**Total (N)**
Not educated	91	0	9	0	100.0	23
Primary	73	9	18	0	100.0	11
Didn't complete junior school	100	0	0	0	100.0	5
Junior high school	56	16	20	8	100.0	25
Senior high school	83	3	14	0.0	100.0	29
Diploma/certificate	67	24	9	0.0	100.0	21
First degree	67	33	0	0	100.0	6
Total	**75.0**	**10.8**	**12.5**	**1.7**	**100.0**	**120**

Pearson Chi-square=24.972; p=0.126; Cramer's V=0.263

Source: Field Survey, 2013

Table 4.9 shows the causes of uncollected waste in Tema Newtown. Most of the respondents made known some of the causes they believe to be an important cause of the problem of uncollected waste. Majority of them (74%) were of the view that because waste collection containers were not enough, there is likely to be the problem where some waste would not be collected especially when the containers become full. Eighty of them representing 67 percent of the sample also believed that the inadequate collection of the waste by the municipality leaves much of the waste uncollected. With reference to Anomanyo (2004), we realize that inadequate logistics greatly affects the quantity of waste collected. It is therefore prudent that, service charge be rendered to offset costs that are incurred by the assemblies, although that also poses a challenge.

Table 4.9 Causes of the Uncollected Waste in Percentage

	Non-important		Less important		modestly important		Very important		Extremely important	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
weak enforcement of laws	23	19	28	23	20	16	17	14	32	27
inadequate waste collection containers	1	1	3	3	4	3	23	19	89	74
attitude of the people	2	2	9	8	16	13	45	38	48	40
inadequate collection of waste by municipality	-	-	7	6	5	4	28	23	80	67

Source: Field Survey, 2013

With respect to attitude of the households towards the waste problem, 40 percent considered it as an extremely important cause of the waste that remains uncollected. This is so because they believe that some households are not informed about the risks of waste pollution and are also not bothered by the consequences. Therefore, they will dispose their refuse at places which may be unauthorized dumping sites for waste. Weak enforcement of the law is another cause but it was not considered as being of extreme importance, 27 percent attested to that. The findings from the table confirm earlier studies by Thompson (n.d) and Songsore (n.d) on the inefficiency of the assemblies to collect the amount of waste generated due to their lack of funding and weak enforcement of the law. Holden (2008) also attested to the fact that, the lack of regulation and enforcement affects the sustenance of policies and programmes.

Table 4.10, depicts the relationship between the educational qualification of respondents and their attitude towards improper disposal of waste that leads to uncollected waste. Ninety-six percent of the respondents who were uneducated considered attitudes of people toward

improper management of waste as an important cause of waste generated and uncollected. A 100 percent of the respondents who had primary to senior high qualifications regarded attitude as an important cause of the uncollected waste. Ninety-five percent of them who had had some diploma or training certification agreed that attitude was an important cause and all (100%) of those who had attained tertiary qualification claimed attitude was an important cause.

Considering the significance of 0.208, it is implied that there is no significant relationship between education and attitude. Under normal circumstances, one's educational qualification should predict their attitude towards proper management of waste; however, this is exceptional.

Table 4.10, Relationship between Highest Educational Attainment and Attitude of People as a cause to the problem of uncollected waste

Educational qualification of respondents	**Attitude of the people as a cause of Uncollected waste**					**Total (%)**	**Total (N)**
	not important	**less important**	**modestly important**	**very important**	**extremely important**		
Not educated	4	4	9	39	44	100.0	23
Primary	0	9	18	46	27	100.0	11
Didn't complete junior high	0	0	20	40	40	100.0	5
Junior high school	0	0	20	56	24	100.0	25
Senior high school	0	20	3	28	48	100.0	29
Diploma/certificate	5	5	14	19	57	100.0	21
First degree(s)	0	0	33	50	17	100.0	6
Total	**1.7**	**7.5**	**13.3**	**37.5**	**40.0**	**100.0**	**120**

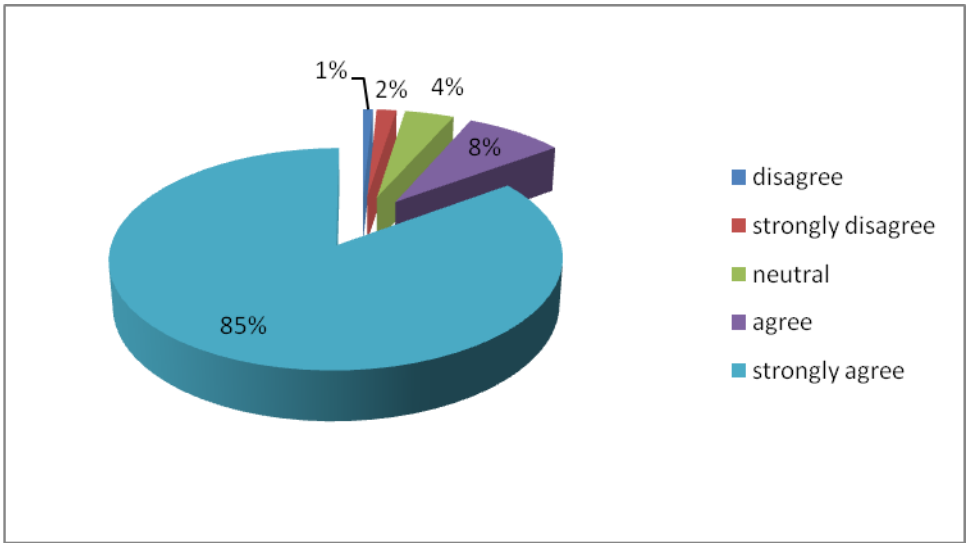
Pearson Chi-square=29.329; p=0.208; Cramer's V=0.247

Source: Field Survey, 2013

4.6 Effects of the Uncollected Waste

Figure 4.9 depicts the results of the consequence of uncollected waste. Ninety-three percent of the respondents agreed to the fact when waste was left uncollected, the place where they dump refuse become naturally dirty and smelly and this leads to cross contamination. The odour is produced from the leftover food particles that remain uncollected. Cross contamination occurs when households especially children are exposed to dirt and do not treat the dirt. For instance, if children consume their meals without washing their hands after they return from the refuse dump, the food is likely to be contaminated which eventualy lead to diseases. In another instance, the children may get involved with friends and expose them to the dirt or contamination. Only three percent of the respondents disagreed. The odour generated also contains some gases that are harmful for human breath. Inhaling these gases from the decomposed material leads to severe headaches, coughs, sore throats etc. The air quality is also affected by the smelly pollutants and this disturbs human businesses and activities.

Figure 4.9 Odour and Cross contamination

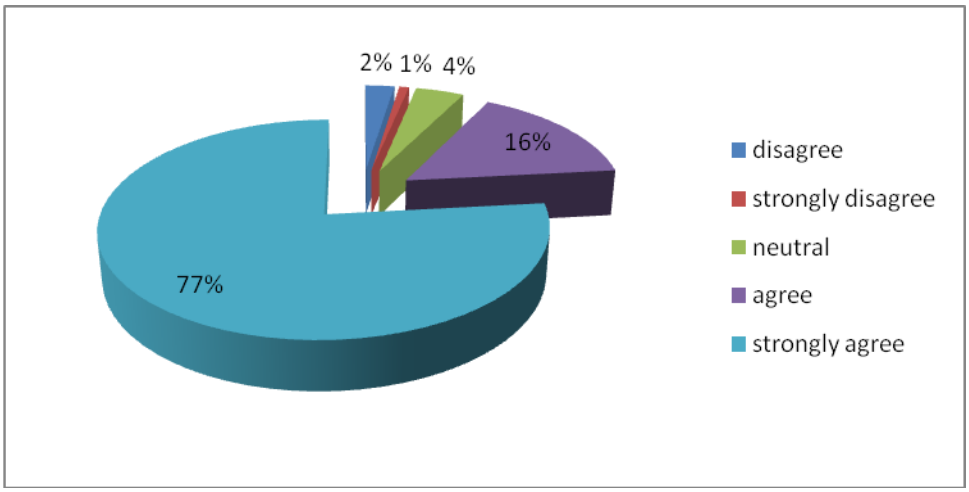


Source: Field Survey, 2013

A report by EPA (2005) on the state of Ghana's environment has proven that when waste is disposed into water bodies, they become contaminated leading to loss of biodiversity. Figure 4.10 shows the effect of uncollected solid waste on water bodies. Ninety-three percent of respondents agreed to this effect. Relatively a low percentage (3%) disagreed to the fact that water bodies become contaminated when waste is disposed of into them. When the water bodies become dump sites for waste, their water quality are affected leading to the deterioration of the quality of the aquatic environment. The state and quality of water deteriorates in terms of its depths and transparency. The bottom oxygen that supports aquatic environment is diminished with high concentration of nitrogen, water phosphorus and sediments. Food production contributes significantly to water contamination. Nitrogen concentration increases the amounts of nitrates, which have been shown to have a very harmful effect on plants, animal and human life (Alios, 2007). A report by United Nations Environmental Programme claims that about 1.2 billion people are affected by polluted water, and this contributes to 15 million child deaths every year (Alios, 2007).

The contaminated water becomes dark, smelly and choking with algae. It also leads to the occurrence of water-borne diseases such as cholera, typhoid. Water bodies are contaminated with chemicals from rusted metals and decomposed food particles. It is expensive to treat such water bodies. The aesthetic effects of the water include the loss of scenic beauty with water unsuitable for recreation. In an interview with the PRO at the Office of the Paramount Chief of Tema, he stated "look at the Chemu, it used to be a source for aquatic life such as tilapia but now what do you see? Some also consumed the water and used it for irrigation but now it's an eyesore". He added that it was the source of livelihood for some households; however, uncontrolled dumping of refuse into the lagoon has affected its water quality.

Figure 4.10 Contaminated lagoons and water bodies

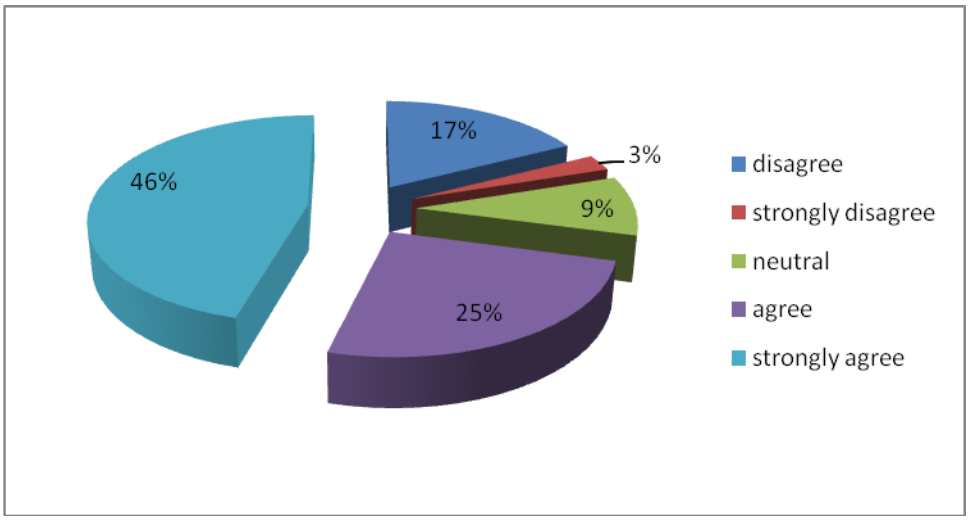


Source: Field Survey, 2013

According to Figure 4.11, seventy-one percent of respondents agreed[4] that their homes are affected during the rainy season. In Tema Newtown, communities such as Ziggy Shore and Waterland are mostly affected by the floods during heavy rainfall. Most of the households in these communities flee their homes at the slightest rainfall. They live very close to the dumpsite that is an open pile of waste disposed of in the lagoon. This has affected the free flow of water and therefore brings back the waste into the communities after rainfall. The houses are constructed with wood and therefore cannot withstand the rains. Lives have also been lost as a result of the flooding in the area. Twenty percent of the respondents disagreed to experiencing any form of flooding leading to their properties been affected. Most of the respondents who disagreed, agreed that flooding is profound in the Ziggy Shore and Waterland areas (Zone B). Some took neutral stance on this particular issue.

[4] Agreed refers to both strongly agree and agree. The vice versa is true for disagreed

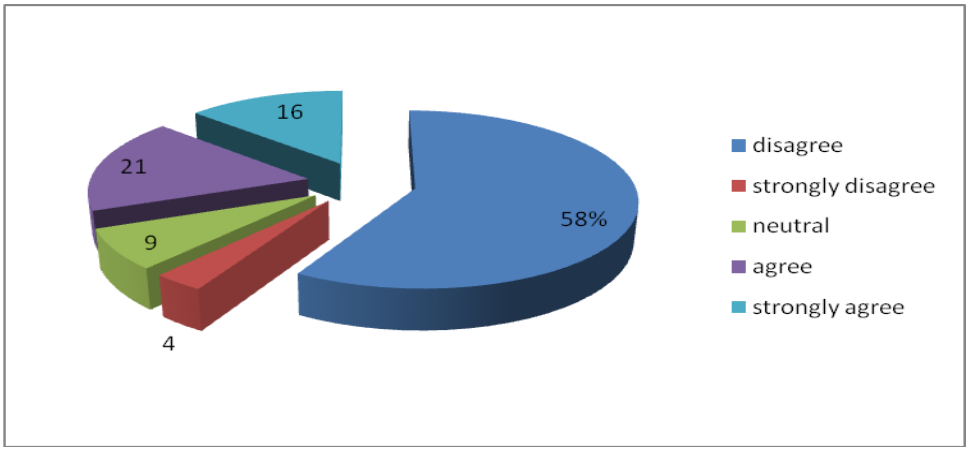
Figure 4.11 Flooding due to Blocked Gutters and Drains



Source: Field Survey, 2013

Figure 4.12 shows that majority (62%) disagreed[5] that the land becomes contaminated and infertile for agriculture produce and a total of 37 percent agreed. Most of them disagree to this effect because the town is largely occupied by traders and fishermen but not farmers. But they agreed that when the land is littered with solid waste, it becomes dirty and contaminated. Because of improper disposal, people get exposed to injuries and dangers associated with sharp objects like broken glasses, blades and tins.

Figure 4.12 Land Contamination and weak for cultivation

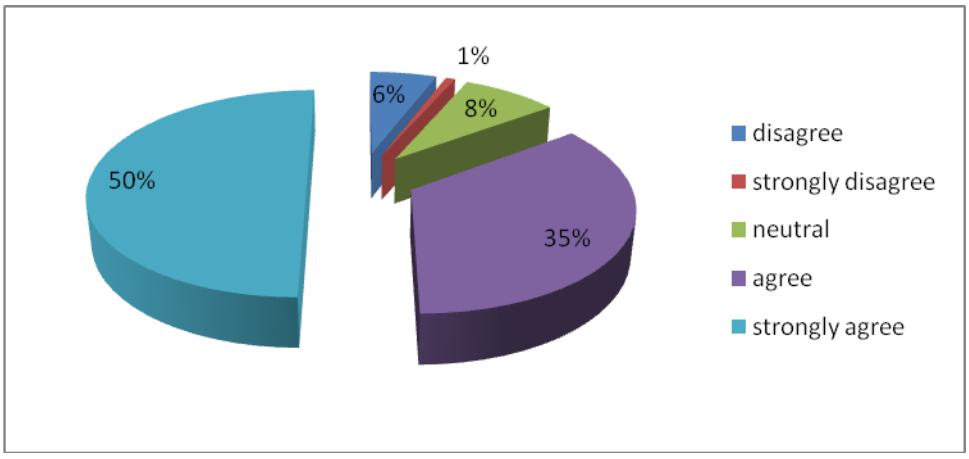


Source: Field Survey, 2013

[5] Agreed refers to both strongly agree and agree. The vice versa is true for disagreed

Malaria is one of the killer diseases in Ghana as stated in the literature. The incidence of malaria has been high in Tema Newtown. From figure 4.13, we realize that a majority (85%) of the sample population attributed the spread of malaria and cholera to the state of the lagoon and water bodies. They claimed that the water bodies have become breeding places for mosquitoes, flies and other rodent vectors that spread diseases. A few respondents (7%) disagreed to this effect. The incidence rate for malaria and other diseases have been provided in the paragraph below.

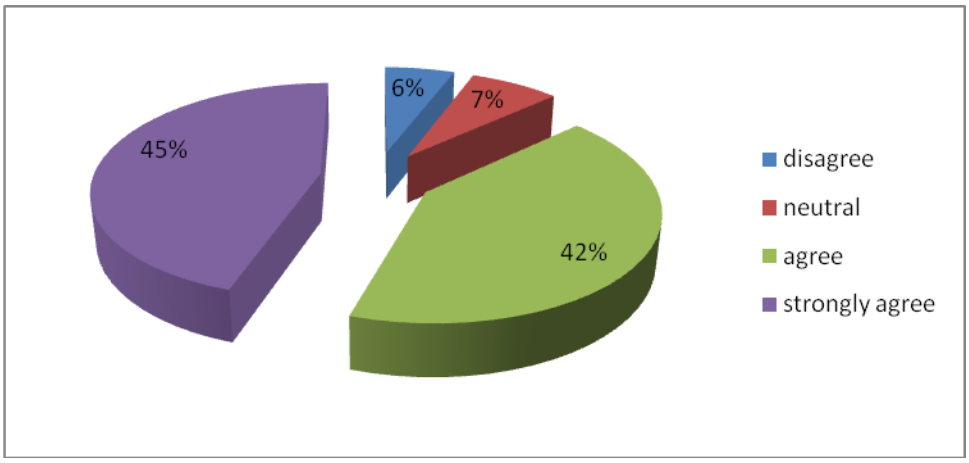
Figure 4.13 High Incidence of Malaria and Other diseases



Source: Field Survey, 2013

It is obvious from the previous paragraphs that uncollected waste leads to the spread of diseases, which implies that there would be an increase in demand for health services. Eighty-seven percent agreed that there is high demand for health services as a result of the spread of malaria and other diseases as shown in figure 4.14. A small proportion of respondents (6%) disagreed. The high demand for health services leads to a fall in disposable income. This, to some extent, also affects their ability to accept any further costs such as any environmental improvement costs.

Figure 4.14 High Demand for Health Services



Source: Field Survey, 2013

Table 4.11 gives the incidence of some related diseases associated with poor sanitation. The figures given are representative of out-patients morbidity at the Tema Newtown Clinic. There are some common diseases that affect people who are exposed to filth or dumpsite. When people are exposed to broken bottles, nails or any sharp metallic object, they are injured which requires treatment from the health delivery centres. Some of these injuries if not treated early may result in death.

Table 4.11 Incidence of Diseases related to Waste generation

Diseases	**2009**	**2010**	**2011**
Malaria	10,921	11,571	14,697
Diarrhoea	174	131	1035
Typhoid	1040	-	-
Skin diseases	686	1301	1225

Source: GHS – Manhean Health Centre (January 2009- December 2011 Monthly reports)

Table 4.12 shows that 73 percent spend less than 10 minutes to get to the dumpsite to dispose of their refuse. Some travel between 10 to 30 minutes to dispose of their refuse and they represent nearly 26 percent of the sample. Only one respondent travels more than 40 minutes

to dispose of refuse. The distance travelled to dispose of refuse can be considered as contributing to the level of waste generated and the amount left uncollected. The result also reveals that children are mostly the ones who usually take the refuse to the dumpsites. Hence, in their attempt to quickly come back and play, they throw the refuse anywhere.

Table 4.12 Minutes Travelled for Refuse Disposal

Minutes	Frequency	Percent (%)
1 - 10	88	73
11 - 20	15	13
21 - 30	16	13
41 - 50	1	1.0
Total	120	100.0

Source: Field Survey, 2013

Regarding respondents' ownership of containers for storing waste, Table 4.14 shows that 76 percent of the respondents had metal or plastic containers that they stored refuse in. Others also had baskets or carton (8%) that served as waste containers but 16 percent of the respondents did not have any container to store refuse. They usually used polythene bags as their waste bags.

Hitherto, it is observed from the analysis that the effects outlined in the literatures clearly agree with the arguments established under this analysis. Although, the effects did not relate to the social aspect, some of the identified issues correspond to the arguments raised under the social effects.

Table 4.13 Whether or Not Respondents have Containers for Storing Waste

	Frequency	Percent
yes, we have a metal or plastic container	91	76
we have basket or carton container	10	8
no, we do not have a container	19	16
Total	120	100.0

Source: Field Survey, 2013

4.7 Willingness to Pay

Respondents were given options to choose between community waste collection services and the door-to-door waste collection services. Ninety-two households preferred the community waste collection service only, which makes up for the 77 percent of the sample population and 10 households preferred the door-to-door only representing nine percent of the sample population. However, 18 households representing 14 percent were indifferent. They were not concerned about the options as long as they can effectively dispose of their refuse.

4.7.1 Willingness to Pay (WTP) – Door-to-Door Collection

Table 4.14 depicts a question that required either a "yes" or 'no" answer. Out of the total number, 28 respondents opted for door-to-door waste collection service. From the 28 respondents, 23 respondents (19%) answered "yes" to pay GH¢5.00 for improved door-to-door but five respondents answered "no" to the question. A follow up on why they were not willing to pay the GH¢5.00 attracted reasons such as inability to pay but requested to pay amounts less than the GH¢5.00. Four respondents out of the five (4%) stated GH¢2.00 while one opted to pay GH¢3.00. This implies that at a price of GH¢5.00, some households consider the rate for waste collection as expensive hence their inability to afford that amount.

Perhaps the households who were indifferent to either choice cannot afford to pay the initial amount. Also, should the management go ahead and charge at that rate, only a few people will patronize the service, which in the long run lead will to the existence of the problem.

Table 4.14 Households that Prefer the Door-to-door

Pay GH¢5	Frequency	Percent
yes	23	19.0
no	5	4.0
Total	28	

Source: Field Survey, 2013

4.7.2 Willingness to Pay (WTP) – Community Waste Collection

From Table 4.15, it is realized that 26 respondents (22%) out of the 110 were not willing to pay anything for the following reason; inability to pay (2 respondents), 7 unreliability of the service, 2 consider the service as unimportant, 10 perception that they are taxed, 3 unemployment and 2 considered it as a governments responsibility. In an interview with one of the waste officials, he stated that they had wanted to introduce the franchise system of waste collection to Tema Newtown but they were unable to do so because the households have said they will not pay for waste collection. At most, 84 respondents were willing to pay a certain amount for the improved waste collection and disposal service. The minimum amount in value that they are willing to pay is GH¢0.50 and the maximum amount is GH¢20.00. The other fees given by the respondents ranged from GH¢1.00 to GH¢10.00. The modal maximum amount respondents are willing to pay is GH¢5.0 representing 27 percent. Twenty-seven respondents representing 23 percent of the sample are willing to pay GH¢2.00 and 14 respondents (12%) are willing to pay GH¢1.00.

Table 4.15 Amounts Households Are Willing To Pay To Use Community Waste Collection

Maximum Amount	Frequency	Percent
0	26	22
0.5	1	1
1	14	12
2	27	22.5
3	5	4
5	32	27
6	1	1
10	3	2.5
20	1	1
Total	110	

Source: Field Survey, 2013

4.7.3 Calculating for the Mean and Median Willingness to Pay

Table 4.16 shows the frequencies of respondents with a non-zero value willingness to pay. Eighty-four respondents were ready to pay a certain amount for the new and improved service. From the tabulations, the mean amount respondents were willing to pay was GH¢3.57, but the median value was GH¢2.50. By extrapolation, at the median value, half of the sample population would be willing to pay the fee of GH¢2.50 to enjoy the service. However, if the service charge is set at any amount above the median price, more than half of the population will be excluded from patronizing the service; however, if the median price of GH¢2.50 is charged, more than half of the population will be able to access the service including those willing to pay above the median. This implies that if the mean price is charged as waste collection fee, the problem will still persist because half of the population

cannot afford the mean price and so resort to disposal on open piles of solid waste in the community.

Table 4.16 Willingness to Pay – Response for Preference for Community Waste Collection

WTP Values (x)	Frequency (f)	fx	Cumulative Frequency
.50	1	0.5	1
1.00	14	14	15
2.00	27	54	42
3.00	5	15	47
5.00	32	160	79
6.00	1	6	80
10.00	3	30	83
20.00	1	20	84
Total	84	299.5	84

Source: Field Survey, 2013

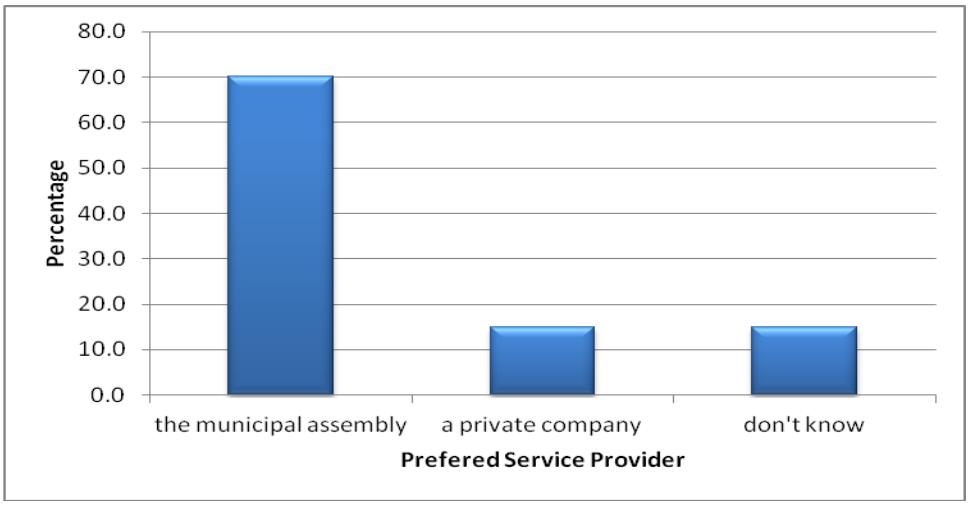
From Table 4.16, Mean Willingness to Pay = $\sum fx / \sum f = 299.5/ 84 =$ GH¢3.57

For Median Willingness to Pay = $(\sum f/2) =$ GH¢2.5

4.7.4 Preferred Service Provider

Figure 4.15 shows the percentage of respondents who prefer either the government or the private company to provide the improved collection and disposal of waste. Seventy percent of respondents opted for government to provide the waste management service while 15 percent would want private companies to handle the waste collection and disposal. There were some (15%) who did not choose either option, and were not concerned about the service provider.

Figure 4.15 Preferred Service Provider



Source: Field Survey, 2013

A follow-up on why the response as shown in figure 4.15 suggested that, 70 percent respondents preferred the government to provide the improved service because they were of the view that the fees will be affordable and the government can be influenced by the people. The 15 percent who preferred a private company did so because of efficiency and reliability of service. The remaining 15 percent were indifferent. It was interesting that, households would still prefer the services of government to private companies even though they agree that governmental services are inefficient and unreliable.

4.8 Conclusion

Further to the data analyzed, we determined that a total of 11.64 tonnes of waste is generated per day by households, however, 3.8 tonnes of that waste generated is not collected in Tema Newtown. Again, respondents were interested to pay a mean amount GH¢.3.75 for a better and improved waste collection service while some are reluctant to pay any amount. To an extent, the level of unemployment play a role in their unwillingness to pay.

CHAPTER FIVE

CONCLUSION AND POLICY RECOMMENDATIONS

5.0 Introduction

This chapter provides the summary of the study findings, conclusion of the study as well as recommendations for policy makers to consider.

5.1 Summary of the Study

This study examined the effects of the uncollected waste generated by households in Tema Newtown, a town within the Tema Metropolitan Assembly in the Greater Accra Region of Ghana. The study revealed the awareness and concern of the households towards the problem of solid waste collection in the town, which largely showed the seriousness of the problem towards the degradation of the environmental quality. The study further analyzed the composition of solid waste and methods of waste disposal used in the area.

Findings on the composition of solid waste in the township, showed that most of their household waste mostly comprised food particles. Other components of waste generated were plastics, paper, metal and glass. Further findings revealed that, the households had three methods of disposing of solid waste. They included the use of community waste containers, the open piles/ dumpsite and the door-to-door method. However, a majority of the households preferred to use the community waste containers to the door-to-door service.

The study found that inadequate waste collection containers and the irregular collection by the municipal authorities were extreme causes of the uncollected waste in Tema Newtown. The other causes included the attitude of households and the weak enforcement of the laws. The former was considered a very important cause and the latter the least important cause of

uncollected solid waste. Although, weak enforcement of the law is widely considered in the literature as a major factor contributing to the problem, the household respondents graded it as being of least importance which is agreeable to their situation. Since the town has over 13,000 households and the available community waste containers were not sufficient to collect all the solid waste generated in the town, some resorted to open piles. It is obvious that the respondents are aware of the problem and request for more waste collection containers as well as efficient collection by the assembly.

With respect to the effects of the uncollected waste, the respondents agreed that the effects of the uncollected waste include the creation of odour and cross contamination, degraded water quality, increased malaria cases and flooding which all increase the demand for health services. The other effect was contamination of the land leading to inability of soil to support plant life. According to the results of the study, most of the respondents (93%) agreed[6] that the uncollected waste leads to the creation of odour and cross contamination and affects the water quality of lagoons and other water bodies in the township.

The findings show that a majority of the respondents are willing to pay for improved waste collection and disposal services in Tema Newtown. Owing to the degrading state of their environment and the effects thereof, the households are willing to pay a certain amount for improved waste collection and disposal. Averagely, the respondents are willing to pay GH3.70 per month. This implies that the households of Tema Newtown regard solid waste management as important and therefore as an economic good. From that, we can infer that they have interest in a change for improved system of waste collection and disposal. Based on the findings and discussions, households are aware of the problem of uncollected solid waste and the consequent effects and are therefore willing to pay an amount of money, which was something they would not have been willing to do some years ago (Oteng-Ababio, 2010).

[6] Agreed refers to both strongly agree and agree and Disagreed refers to both strongly disagree and disagree

5.2 Conclusion

Food particles and plastics are the major components of households solid waste generated. These solid wastes are disposed of into collection containers or open pile of waste near the neighbourhood. Some have resorted to throwing their refuse on piles close to the lagoon or sea. These improper disposal methods have resulted in severe consequences on the environmental quality.

The study realized that the households were aware and concerned about the seriousness of the problem of uncollected waste. They were conscious of that inadequate collection containers and irregular collection by the municipal assembly are major factors contributing to the problem of uncollected waste. Inaccessibility to community waste containers and distance provided avenues for dumping of refuse into open piles of waste near the Chemu lagoon and the seashore. The effects of the uncollected waste were enormous and inclined towards environmental and health risks. The pressing ones include the incidence in malaria and other diseases, deteriorated water quality of lagoon, diminishing aesthetic value and odour in the area. All these have increased households demand for health services in Tema Newtown. For these reasons, many are willing to pay an amount to improve waste collection in the area.

The study revealed that households in Tema Newtown considered solid waste collection as an important economic good and are willing to pay an amount for improved waste management services. Some households are not willing to pay any amount because they consider the service as unaffordable, unreliable, unimportant and exploitative. Many of the households preferred the public waste collection service to the private. The interesting revelation is that although some considered the service as unreliable and unimportant, preferred that the service is rendered by the local government. This implied that majority of the households believe the local government can provide cheaper and efficient services. It was also realized that, should the service provider charge above the median price of GH¢2.5, half the sample

population would be excluded from accessing the service. It is important to note that households are willing to pay only if the waste collection is improved as the hypothetical scenario presented it.

5.3 Policy Recommendations

The following policy recommendations have been outlined based on the results of the study.

5.3.1 Recommendations for Efficient Waste Collection and Management

From the study, it was realized that inadequate collection by the metropolitan assembly as well as inadequate community waste containers contribute to why some solid waste remain uncollected. To address this challenge, the Public Private Partnership should be encouraged where the metropolitan assembly contract the private companies because most of these private companies have the logistics to provide waste collection services to some of the communities that do not access these waste collection services. With this partnership, the private companies can provide the required logistics necessary to undertake an efficient and effective collection process. First of all, consideration must be given to the provision of adequate community waste containers and the availability of trained human skills to perform the task. The metropolitan assembly should also encourage the positioning of waste bins at vantage points on the streets and in town for collection of solid waste.

Again, there are relatively young men and women who are unemployed and have no educational qualification in the area. As the results stated, approximately eight percent of the household respondents are unemployed while a number of them (19%) had no formal education. The pre-collection system can also be adopted so that some women and unemployed youth within the community can be tasked by the small organizations and micro enterprises to collect the waste and dump in collection containers for final disposal. The women and young men should be considered because they are the most vulnerable and

marginalized in society. This system should be practiced in areas that do not have access to waste collection services.

For an efficient and effective performance of duty, the authorities should ensure on-the-job training activities that involve the necessary human resource requirements. The training may include appropriate training manuals that seek to develop employees.

One of the important causes of the uncollected waste was weak enforcement of the laws. Effective and successful waste management requires strict legal enforcement. The regulations on the environment should be strictly enforced and punishment meted to all who fail to comply with the laws. The current centralized approach to waste management needs to be reviewed. There should be a restructuring of the organizational structure of the waste management system. Some roles and responsibilities should be delegated to some independent bodies like NGOs or Micro enterprises to enable easy monitoring and evaluation of their activities.

According to the study, some households were willing to pay for waste collection service. It will be prudent then to include the amount to be charged by the service providers to the property rate levied on the households. The PRO of the Tema Traditional Council stated that, the households pay their property rate to them and it is done regularly. The metropolitan assembly can negotiate with the traditional leaders on the terms of payments and the additional charges to be levied.

Alternatively, the Polluter pay principle can be adopted as the basis for charging the households for the waste management activity. A non-profit making or independent body can take the responsibility to take the charges or the public participation programme can be employed so that the people themselves become responsible for charging and managing the solid waste generated. A better and efficient waste management system requires the

participation of people (households) who are also the ultimate producers of the solid waste. This will require the involvement of key actors in the community such as the traditional rulers, religious leaders and teachers. Influential associations in the township can also be consulted. This will begin with a sensitization programme to educate households on waste management and the willingness to pay for waste collection.

Periodic sensitization on the effects of solid waste should be encouraged in the town with focus on the various associations and groups in the communities as well as the schools. The municipal assembly should collaborate with the Traditional council of Tema Newtown and organize communal activities in the area. The Health Delivery Centres within the town should be tasked to provide seminars on proper waste disposal and the consequences of indiscriminate littering of solid waste in water bodies and on the streets.

5.3.2 Recommendation for Recycling and Recovery of Resource

Food particles, which are usually biodegradable, form a major component of the waste generated by households. Therefore, one way to reduce the solid waste in the environment is by composting. The households can be advised to separate the organic from the non-organic before disposal. Some of the unemployed youth who do not have any formal education can be tasked to go to the households and collect the organic or biodegradable waste. Once they are segregated, the treatment process becomes easier for composting. The agricultural sector can serve as a ready market for the compost which would enhance agriculture production.

The Metropolitan Assembly can run a pilot study to determine the characteristics and quantity of the specific components of waste generated. With current growth rates provided in the census data, the metropolis can estimate the rate of population increase and make forecasts. The quantities of waste generated must be segregated into the various components as biodegradable, recyclable or hazardous. With the projected increase in population, proper

waste disposal methods can be employed for treating the various types of waste. This will enhance the control and treatment of solid waste and convert them into resource.

From the study, 33 percent of the respondents access the open pile or dumpsite. Upgrading of dumpsite is one way to manage and control the solid waste in the environment. The upgrading process is not an alternative to a new dumpsite but a means to an end (thus, a way of reducing the impact of waste on the environment). Depending on the available funds, the assemblies can begin a step-by-step process towards achieving a controlled, engineered landfill with a reduced level of environmental pollution. This can be done by converting the open dumpsites through a gradual stage-by-stage process into sanitary landfills.

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APPENDIX I

MA DEVELOPMENT STUDIES
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SURVEY FOR ASSESSING THE EFFECTS OF UNCOLLECTED WASTE GENERATED BY HOUSEHOLDS IN TEMA NEWTOWN

NAME OF RESPONDENT:

RESPONDENT (HEAD OF HOUSEHOLD OR SPOUSE):

ADDRESS:

TELEPHONE NUMBER:

SURVEY CODE NUMBER:

****
****

SECTION A (GENERAL INFORMATION)

1. Gender of respondent

a. Male [ ] b. Female [ ]

2. What is your age? Ans……

3. Your highest educational qualification?

a. Junior High School graduate [ ] b. Senior High School graduate [ ]

c. Diploma or certificate [ ] d. First Degree(s) [ ]

e. Other (specify) …….

4. What work do you do?

a. Trader [ ] b. Fisherman [ ]

c. Farmer [ ] d. Teacher [ ]

e. other (specify)……

5. How many children live in your household? Ans……..

6. How many people (both adults and children) live in your household?

7. How long have you been living in Tema Newtown?
Ans.....

8. Are you currently *(check **only one**)*

a. Single [ ] b. Married [ ]

c. Separated [ ] d. Divorced [ ]

e. Widowed [ ]

SECTION B (AWARENESS AND CONCERN)

9. How serious will you consider the problem of solid waste collection 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 improper disposal of solid waste in the area?
a. Very serious
b. Somewhat serious
c. Not serious
d. Don't know

11. In your opinion, which of the following do you regard as most important cause of the waste problem in your area? **Please circle the number most closely representing your opinion noting that a score of 5 is "extremely important", 4 is "very important", 3 is "modestly important", 2 is "less important" and 1 "not important").**

	Extremely important		Important		Not
a. weak enforcement of laws	5	4	3	2	1
b. inadequate collection of waste by municipality	5	4	3	2	1
c. inadequate waste collection containers	5	4	3	2	1
d. attitude of the people	5	4	3	2	1
e. other (specify)……	5	4	3	2	1

12. Could you please indicate what you think could be done by local government to tackle the improper disposal and collection of solid wastes in your area.
.....
.....
.....
.....

13. Could you please indicate what you think could be done by Individual to tackle the improper disposal and collection of solid wastes in your area.
.....
.....
.....

SECTION C (HOUSEHOLDS WASTE: TYPE, COLLECTION & MANAGEMENT)

14. What type of waste collection service (public/ private) do you use in your community?
…… •

15. For how long has your household been patronizing this type of waste collection service?
a. One year
b. Two years
c. Three years
d. other specify……

16. Does your household have a durable metal or plastic container for storing solid waste?
a. Yes, we have metal or plastic container
b. We have basket or carton container
c. No, we do not have a container
d. Don't know

17. What materials does the waste usually consist of? **Please circle the number most closely representing your opinion noting that a score of 5 is "extremely important", 4 is "very important", 3 is "modestly important", 2 is "less important" and 1 "not important").**

a.plastic	5	4	4	2	1
b. Food particles	5	4	3	2	1
c. paper	5	4	3	2	1
d. Metal & glasses	5	4	3	2	1
e. Other (specify)	5	4	3	2	1

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

a. Daily
b. Once a week
c. Twice in a month
d. Other specify……..

19. Where is your container taken to be emptied?

a. The container is placed beside the road for emptying into a collection vehicle.
b. The container is emptied into a communal container in the neighborhood.
c. The container is emptied onto an open pile of waste in the neighborhood.
d. Don't know.

20. Approximately, how far or how many minutes walking time does it take you to empty your container?
a. ..... meters b..... minutes walking

21. Who usually takes the waste container to be emptied? Ans……

22. Which places do you usually dump your refuse, when the dumpsites/containers are full?

a. Burning garbage around your house

b. Throwing the wastes in the bush area around your house .

c. Throwing the wastes around in the sea or lagoons

d. Sweep or put solid wastes in the gutters and drains

e. Other (specify).....

23. When is the Community waste container usually emptied?

a. immediately it becomes full b. a day after it becomes full
c. two days after d. several days after, specify……

24. What happens to the place when the community waste container is over-filled and has not been collected for days?
……
……
……

SECTION D (EFFECTS OF THE WASTE)

To what extent do you agree with each of the following statements? Please indicate your answer using the following 5-point scale where: **Please indicates whether Strongly agree(SA) =1, Agree(A)=2, Neutral(N)=3, Strongly Disagree (SD)=4, Disagree(D)=5**

25.When the waste is not collected and disposed in the unauthorized places	SA	A	N	SD	D
a. the area is smelly (odour) and always dirty which leads to cross contamination	5	4	3	2	1
b. the lagoons and river bodies become dumpsites and contaminated and unsafe for consumption and aquatic dwelling	5	4	3	2	1
c. there is spread of cholera and malaria	5	4	3	2	1
d. there is high demand for health services due to the spread of diseases	5	4	3	2	1
e. some properties are affected by flood due to the waste blocking gutters and drains	5	4	3	2	1
f. the land is contaminated and weak for cultivation	5	4	3	2	1

SECTION E (WILLINGNESS TO PAY FOR WASTE COLLECTION)

HOUSEHOLDS WHO PREFER OR ARE USING COMMUNITY WASTE COLLECTION POINTS FOR DISPOSAL OF SOLID WASTE

26. Are you charged any amount for disposal at the dumpsite/ community waste container?
a. Yes b. No

27. How much are you charged for waste disposal per day? Ans…….

28. Assume *hypothetically* that in some few months, the Government closes down the roadside community waste collection services and institute a new legal system that requires households to pay for the collect and disposal of their household solid wastes.

What do you think is the maximum amount *per month* that your household will be willing to pay in order to ensure the proper collection and disposal of waste?

a) per month …….
b) Won't pay any fee
c) Don't know

29.If there are some suggestions that the Government should close down the roadside community collection centres and force all householders to hire private or public waste management companies for the collection and disposal of their household solid wastes.

What is your view on this suggestion?
.....
.....
.....

30. If the suggestion is accepted and passed as law, how much will you be willing to pay to for a better and improved service collection?

a) per month …….
b) Won't pay any fee
c) Don't know

31. If no, what is your reason for not being willing to pay a fee to cover the cost of a waste collection service?

a) Can't afford to pay for the fee
b) Don't believe that the service will be reliable
c) Don't consider the service important enough to pay for
d) Other, please explain
…….....
.....
.....

32. Which would you prefer to provide the service to you?
a) The Municipal Assembly
b) A private company
c) Don't know

HOUSEHOLDS WHO PREFER DOOR-TO-DOOR COLLECTION FOR DISPOSAL OF SOLID WASTE

33. How much are you charged for waste collection service per month? Ans……

34. At what time of the day will be most convenient for the vehicle/wheel barrow to collect your waste?
…….

35. The cost of collection for an improved door-to-door service is **Gh¢5.00** per household per month. Would you be willing to pay this fee to cover the cost of the waste collection service?

a. Yes •
b. No •
c. Don't know •

36. If no, how much will you be willing to pay per month?.....

37. Which would you prefer to provide the service to you?
a) The municipal Assembly
b) A private company
c) Don't know

38. Why that choice of preference in Question (2)
……
……
……

SECTION F (Socio-Economic)

39. How many people in your household are working? Ans…….

40. Which of the following gadget do you use in your household?

a. television
b. radio
c. fridge
d. iron
e. other
(specify)……

41. What is the minimum amount spent by the HH in a month in the last year?	GH¢……
42. What is the maximum amount spent by the HH in a month in the last year?	GH¢……
43. What is the minimum amount spent on food in a month in the last year?	GH¢……
44. What is the maximum amount spent on food in a month in the last year?	GH¢……

APPENDIX II

MA DEVELOPMENT STUDIES
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QUESTIONNAIRE GUIDE FOR INTERVIEWING WASTE MANAGEMENT OFFICIALS

This question guide is to be administered to the Director/ Deputy Director, Waste Management Department, Tema Metropolitan Assembly as well as the Assembly man for the area. It is aimed at generating information on the general solid waste management in Tema Newtown

1. What is your role in the management of solid waste?
2. What are the main sources of waste in Tema Newtown?
3. What constitute the waste generated by household in Tema Newtown?
4. How much solid waste is generated from the Tema Newtown area?
5. What is the average kilogram (kg) of solid waste generated per person/ household?
6. How much waste are you able to collect and how much is left uncollected per month?
7. What it the capacity of the department in solid waste management (Vehicles, tractors, facilities, Human power etc)?
8. Is your staff well trained to handle solid waste?
9. Does the municipality have a designated dumpsite?
10. How does the management transport waste to the dumpsite(s)?
11. How does the municipality dispose of the solid waste?
12. How often does the assembly collect the solid waste generated by households in Tema Newtown?
13. What are the challenges faced by the municipality in the collection of waste in Tema Newtown?
14. In your opinion how can solid waste collection be enhanced in the Tema Newtown?

APPENDIX III

FIELD PICTURES OF TEMA NEWTOWN

Plate 1: Children defecating at a dumpsite

Source: Field Survey, 2013

Plate 2: Wooden Structures (Houses) close to dumpsite

Source: Field Survey, 2013

Plate 3: Polluted Chemu Lagoon (2004)

Source: EPA, 2005 (State of Ghana's Environment, 2004)

Plate 4: Chemu Lagoon (2013)

Source: Field Survey, 2013

Plate 5: Chemu Lagoon

Source: Field Survey, 2013

Plate 6: Dumpsite at the Seashore

Source: Field Survey