

**LANDFILL SITES MANAGEMENT CHALLENGES: THE PERCEIVED
EFFECT AND WILLINGNESS ON THE PART OF THE PEOPLE IN THE GA
EAST AND SOUTH MUNICIPALITIES TO PAY FOR IMPROVEMENT**

By

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DECLARATION

I hereby declare that this submission is my own work towards the Master of Science in Development Policy and Planning and that, to the best of my knowledge, it contains no material previously published by another person nor materials which has been accepted for the award of any other degree of any other University, except where due acknowledgement has been made in the text.

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ABSTRACT

The purpose of the study was to look at the extent of landfill sites management challenges, perceive effects and the willingness on the part of the people living in the Ga East and South Municipalities to pay for the problem to be addressed without Government intervention.

The Ga East and South municipalities have a stone quarry site which has served to aid development of Accra Metropolis and the construction of Accra-Cape Coast road. These activities created a stretch of hole which later was filled with rain water which acted as breeding grounds for mosquitoes, which transmit, among other diseases, such as malaria and also served as a death trap for children and people who were not familiar with the place.

A sample of 380 respondents was drawn from a combined population of households from Ga East and South Municipalities for the study. The researcher employed both descriptive statistics and the contingency valuation method (CVM) to analyse the data collected from the field.

The analysis of the data brought out the following findings:

There is an incidence of indiscriminate dumping of refuse by both residents and drivers of private waste contractors that come to dump refuse at the landfill sites.

Due to the location of the landfill sites in the communities there was high prevalence of infectious and sanitation related diseases like malaria, cholera, diarrhoea, typhoid fever among others and also un-aesthetic appearance, leachate from waste, odour, rodents and flies which make the environment unpleasant for the people living there.

The findings indicate that those that are directly affected by the landfill sites were more likely to be willing to pay to address the problem posed by the landfill sites without Government intervention.

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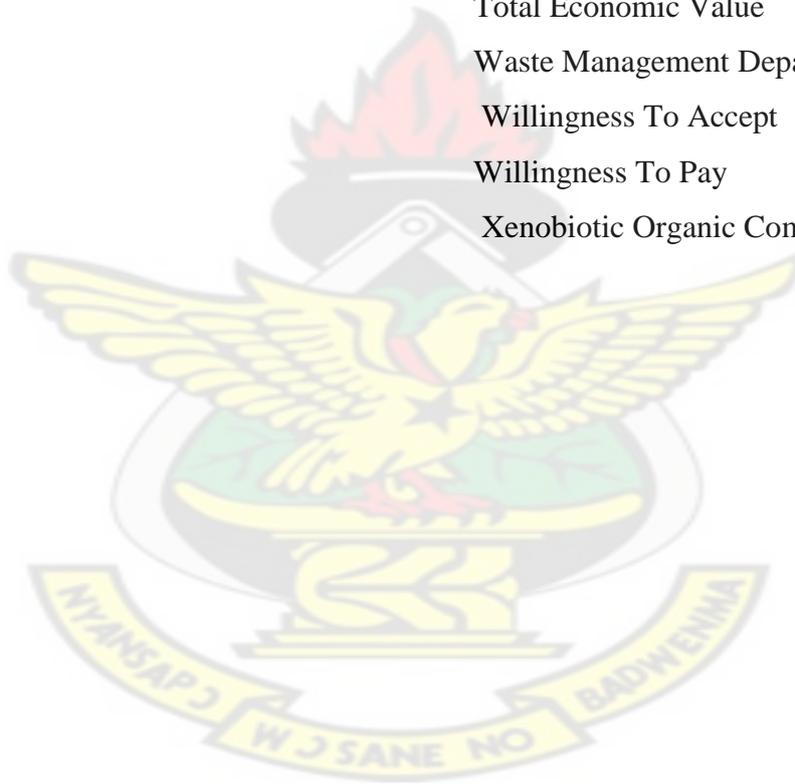
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List of Acronyms

BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
CV	Compensation Variation
CVM	Contingency Valuation Method
EV	Equivalent Variation
MSW	Municipal Solid Waste
SPSS	Statistical Product and Service Solution
TEV	Total Economic Value
WMD	Waste Management Department
WTA	Willingness To Accept
WTP	Willingness To Pay
XOCs	Xenobiotic Organic Compound



CHAPTER ONE

BACKGROUND TO THE STUDY

1.1 Introduction

There has been increased concern over municipal solid waste management in recent years in the country. This expression of increased concern stems from the alarming rate at which, municipal solid waste is generated mostly in the large urban areas. In the year 2002, Ghana's population was estimated to be 20 million and at the same period the country produced a daily per capita waste of approximately 0.45kg and an annual solid waste generation of about 3.3 million tons (EPA, 2002). Much as solid waste management has been privatized, the country is still bedevilled with serious solid waste management challenges which are threatening the potential outbreak of some communicable diseases with its attendant negative effect on human resources (Menel, 1994).

The daily solid waste generation in Accra, with an estimated population of about 3.3 million is 1500 tons. The quantities of waste generated have been increasing rapidly and is projected to reach double figures in the not too distant future (EPA, 2002). As in most developing cities, solid waste in Accra has a high putrescible organic content. The organic fraction is made up of kitchen waste including food leftovers, rotten fruits, vegetables, leaves, crop residues, animal excreta and bones (Asomani-Boateng and Haight, 1999). Plastics, glass, metals and paper account for less than 15% of total waste. High organic and moisture contents coupled with prevailing high temperatures necessitate frequent removals, which place additional burden on an overstrained collection system.

When the waste is not collected in time it emits a foul smell especially in low income areas where the solid waste is often mixed with human waste due to inadequate sanitation facilities (Boadi and Kuitunen, 2003). The District Assemblies are unable to cope with the quantities of waste generated. The Accra Metropolitan Authority, for instance, is only able to collect about 55% of solid waste generated within the city. In the face of increasing costs of waste collection, transportation and disposal in addition

to the long distant location of new disposal sites, the already poor collection performance may deteriorate even further.

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

The statistics seem to suggest that our waste management system as a nation leaves very much to be desired and hence there is an urgent need to find pragmatic measures to ensure effective management of the landfill sites.

1.2 Statement of the Problem

There are several methods to treat waste, but for collected waste in developing countries the most common method is disposal at an open dump site. In most cases, the wastes at the dump sites are never collected for recycling of any form. They are allowed to develop into heaps or burnt locally causing serious pollution to the environment. According to the Ministry of Local Government (1992) this is mainly due to lack of education, low environmental consciousness, long distance from containers and poor enforcement of the law against indiscriminate offenders. The environmental and health hazards associated with this improper disposal of waste are immeasurable.

Nonetheless, Kendie (1999) argues that, the recent upsurge in waste disposal problems stems from the fact that, "attitudes and perceptions towards wastes and rating of waste disposal issues in peoples' minds and in the scheme of official development plans have not been adequately considered". There has been a tendency

to concentrate on the design of waste management technologies and how to apply them in context rather than looking at the problem from a government perspective.

In the wake of the mounting challenges of landfill sites management and the inability of the local authorities to deal efficiently with the menace ranging from their limited expertise as well as their under-resourced status that this study has been necessitated. Despite continuous efforts by local authorities and the government in general to deal with this crisis, little seem to have been achieved perhaps due to the inability of leadership to quantify the magnitude of the problem on the environment and the populace in particular. This study seeks to delve into landfill sites management challenges in the Ga South and Ga East Municipal Assemblies and the perceived effect and the willingness on the part of residents to contribute to address the problems without Government intervention.

The Ga East and South municipalities had stone quarry sites for the development of Accra Metropolis and the construction of Accra-Cape Coast highway. These activities have created a stretch hole which later was filled with rain water that served as breeding grounds for mosquitoes, which transmit, among other diseases, malaria and also served as a death trap for children and people who are not familiar with these places. In an attempt to mitigate these problems and to reclaim the land back, the authorities and stakeholders agreed to use solid waste generated from the metropolis to fill these holes. This was done without taking into account the potential effect it will have on the environment, health related problems and poor sanitation and hygiene conditions in the future.

According to the Government of Ghana, waste in the environment constitute high potential for the spread of infections through run offs during rains and contamination of underground water. Serious leachate generations occur at the Mallam and Oblgo landfill sites in the Ga South Municipality and Abokobi landfill site in the Ga East Municipality especially after rainfall as the leachate can be seen gushing out into areas at the foot of the waste dump where houses are built and the leachate floods enter the residents' compounds. These leachates which obviously contain pathogens are a direct risk to human health and a source of contamination to underground water and surface waters.

The guideline for landfill was also not followed. Thus landfill sites should be at certain distance away from water bodies, airport, residence etc (EPA, 2002). The closeness of the Oblogo landfill site also in the Ga South Municipality to the Densu River at Weija which is a source of drinking water and where treatment of the drinking water takes place is of great concern. In the light of these, there is the need for research to continue to investigate the problems caused by the landfill sites in these municipalities and how it affects the populaces as well as their willingness to pay to address the problem without government intervention. In order to address this problem the following research questions are set to guide the study.

1.3 Research Questions

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

- What are the landfill site management problems in the Ga South and East Municipalities?
- What are the perceived effects of the landfill sites on the people in the Municipalities?
- Are people in the Municipalities willing to pay for improvement in the hazards posed by the dump site?

1.4 Objectives of the study

The following objectives are formulated in order to answer the above research questions: The general objective of this study was to determine the extent to which the landfill site in Oblogo and Mallam all in Ga South Municipal and the one in Abokobi in the Ga East Municipal affect the people living in these areas as well as the willingness to on the part of the people to pay for improvement.

Specific objectives:

- To assess the landfill site management problems in the Ga East Municipality.
- To assess the landfill site management problems in the Ga South Municipality.
- To examine the perceived effect of the dump sites on the people living in this areas.
- To assess the willingness on the part of the people in the municipalities-to-pay to deal with the situation without government intervention.

1.5 Significance of the Study

The importance of the study cannot be under-estimated. It will serve as a useful guide to policy makers to map out efficient and effective ways of financing waste management in the country as a whole. Read (2003) suggests that one other level of integration of solid waste management is to bring the waste treatment facility in close co-operation with the management authorities and the public. In addition to the treatment facility (as suggested by Read), it is important to include the other integral parts of the waste management which are collection, recycling and composting programs. It is vital to involve a wide range of stakeholders (the general public who are the waste generators, the private investors and the management authorities), taking into account their values and interests.

The rationale for sanitation investments is clear and yet is overlooked by governments. While there is strong evidence that it is the single most cost-effective health intervention most governments, including donors, do not count what they are spending on it. The potential for far-reaching development outcomes is huge and yet the sanitation sector remains largely neglected by the aid system and aid recipient governments.

This augments the information available to policy-making and may also improve public trust in society's capacity to control hazards of waste, without necessarily oppressing innovations or compromising science (EPA, 2001). If the environment is seen as a common resource then communalism in solving environmental problems seems to be the best approach. The lessons learnt from this study will help instil a self-help spirit in the Ghanaian populace thereby reducing the over-reliance on government for interventions, which sometimes do not see the light of day.

The UN Development Report (2007) for Ghana adduced serious environmental challenges confronting the country and the need to demonstrate effective commitment in dealing with the crisis. This study will be very significant in providing policy makers with concrete recommendations to deal with the solid waste management crisis. It will also provide the city authorities with information about how the people in the communities want their waste management challenges addressed. The study would also help open eyes on environment management and aid the achievement of

the Millennium Development Goal (MDGs) that intend to ensure environmental sustainability and that of Growth and Poverty Reduction Strategy (GPRSII) that aid at accelerate the provision of sanitation through improving the treatment and disposal of solid waste in the major towns and cities.

1.6 Scope of the Study

Solid Waste Management all over the world is a complex one. The scope of the study was Ga South and Ga East Municipalities in the Greater Accra Region of Ghana. However, the main focus of this research work was the problem of landfill sites management in the Ga East and South Municipalities and also the effect of the landfill sites in the Municipalities on the people living in these areas. The research would also cover the willingness-to-pay on the part of the people to deal with the situation in their municipalities without government intervention.

1.7 Limitation of the Study

The study is limited to solid waste management challenge, thus other types of waste such as liquid, industrial, health care and radioactive waste and their management will not be investigated in this study. This is a deliberate effort on the researcher's part to make the study manageable given the time and resources available to the researcher to complete the study. The study was limited to the perceived effect of landfill site management challenge on the people living in the municipalities, the effects of the landfill sites in some communities in the two Municipalities. The researcher was also interested in finding out the willingness-to-pay to deal with the situation without government intervention. The study was carried out in Ga East and Ga South municipalities in the Greater Accra Region.

1.8 Organisation of the Study

The study has been presented in five chapters. The chapter One deals with the introduction and focuses on the background, statement of the problem, research questions, and objectives, significance of the study, and limitations, definition of terms and organisation of the study. Chapter Two also dwelt on the related literature

review. Chapter Three looked at research design, population and sampling procedure, instrument and the mode of analysis of the data. Chapter Four deal with analysis of the data and findings. Chapter Five finally focused on the discussion, summary of the findings, conclusion and recommendations for government, stakeholder, municipalities and policy makers and also for further studies.

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CHAPTER TWO

CHALLENGES OF LANDFILL SITES MANAGEMENT AND EFFECTS OF THEIR MISMANAGEMENT AND WTP FOR IMPROVEMENT

2.0 Introduction

Traditionally, residents clean their homes and neighbourhoods in preparation for the first visitors of the day. The insufficient capacity and lack of internal resources are the greatest problems for the Waste Management Department. Even with the privatization of garbage collection there is still a severe waste management crisis throughout many parts of Accra.

Throughout the city numerous central waste containers can be seen brimming over with trash from several days of no collection. This situation is further compounded by case base; individuals dispose of this remaining volume of waste wherever they can because it cannot be handled by the existing waste management system (Sam, 2002). The lack of waste collection capacity has resulted in direct and indirect dumping by individuals who are not being served by the current waste management system. Direct dumping occurs when persons dump solid waste directly into water sources or drain structures; indirect dumping occurs when solid waste is left alongside water sources such as streams and drains with the expectation that rains will eventually carry it away (Sam 2002).

Both dumping methods are hazardous to the citizens in these communities. Water sources and drains are then contaminated and silted by waste materials, thereby creating blockages, which results in exacerbating the flood conditions (Sam, 2002). This chapter focuses on solid waste management challenges in general (thus Global and Africa perspective), waste management practices in Ghana, population of people living in an area and the waste they generate, the problems of landfill site management, effects of uncontrolled landfill sites and the willing on the part the people to contribute to solving the problem without Government intervention using contingent valuation method.

2.1 Solid Waste Management (Global)

It was estimated that the amount of Municipal Solid Waste generated worldwide in 2006 was 2.02 billion tonnes. There is a link between growth in wealth and increase in waste — the more affluent a society becomes the more waste it generates. As the less wealthy nations develop, they too are creating more wealth, thus adding to the world's waste output. Arising quality of life and high rates of resource consumption patterns have had an unintended and negative impact on the urban environment - generation of wastes far beyond the handling capacities of urban governments and agencies. Cities are now grappling with the problems of high volumes of waste, the costs involved, the disposal technologies and methodologies, and the impact of wastes on the local and global environment.

But these problems have also provided a window of opportunity for cities to find solutions - involving the community and the private sector; involving innovative technologies and disposal methods; and involving behaviour changes and awareness rising. These issues have been amply demonstrated by good practices from many cities around the world. Simply, solid waste is any unwanted or discarded solid item. Municipal solid waste (MSW) originates in homes, businesses, and other urban areas. There are several different ways to manage the solid waste produced in mining, processing, manufacturing, and using resources, but most can be categorized into two different approaches. The high-waste approach involves leaving it somewhere, burning it, or burying it (in a sanitary landfill or any hole in the ground).

The low-waste approach is twofold: attempting to produce as little solid waste as possible, and diverting as much solid waste away from landfills and incinerators (Miller and McGeehin, 1992). Over the past few years, the former has been viewed as cheap and irresponsible, and the latter has been viewed as initially expensive but morally gratifying. People are sick of looking at and living with the landfills. And the landfills are filling up fast - too fast. We all grew up believing that once we threw something away, it all went to some hole in the ground and that there would always be more space for next week's trash pickup. But the volume of garbage is reaching sizes so immense that we are running out of places to put it. In this country prior to 1988, over 5,500 landfills took 80% of Municipal Solid Waste. Landfills are clearly the largest refuse heaps in the world.

2.2 African Cities and Solid Waste Management

Municipal solid waste management constitutes one of the most crucial health and environmental problems facing governments of African cities. This is because even though these cities are using 20-50 percent of their budget in solid waste management, only 20-80 percent of the waste is collected. The uncollected or illegally dumped wastes constitute a disaster for human health and environmental degradation. Even though more than half of the entire waste management budget is dedicated to waste transportation alone, only a very limited percentage is moved to the waste treatment centre or disposal (Monkam and Tanawa 2000).

The traditional approach where municipal authorities monopolise waste management, ignoring other stakeholders, using command-and-rule strategies, and ill-adapted imported technology is common in African cities. The non-involvement of the major stakeholders worsens the scenario. Asomani-Boateng et al. (1999) in their case study of Lagos, Nigeria to illustrate what looks like a common phenomenon in many African cities, they ranked Lagos as the dirtiest capital in the world and further expanded: in most parts of the city, streets are partially or wholly blocked by solid waste. Similarly open spaces, marketplaces are littered with solid waste. In most cases drains are clogged or totally blocked and many compounds are hemmed in by solid waste.

According to these very authors, similar conditions exist in many other cities including Accra, Ghana where they note that only 11 percent of the 1.4 million people benefit from home collection of their solid waste. Here, as in many other cities, the uncollected waste is illegally dumped in open spaces, water bodies, storm-drainage channels, buried, burnt or deposited along the streets or roadsides. Blocked drainage channels cause flooding in the cities (Ngnikam 2001). Many authors attribute the prevalence of parasites, tetanus, malaria, hookworm, cholera, and diarrhoea so common in many African cities to unsanitary conditions caused by waste being simply strewn around (McMichael, 2000).

2.3 Population and Waste Generation in Accra

Population dynamics have significant influence on the amount of waste generated and its proper handling in the municipality. The population of Accra is rapidly increasing because of the rural-urban migration among other factors. The population of Accra has grown from a mere 450,000 in 1960 to 1,600,000 in 1990 (Leitman, 1993), and in 2002 population stands at 3 million with a floating population of 300,000 (Ghana Statistical Services, 2002). The statistical service observed that approximately 50,000 economic migrants come to Accra daily and about 5,000 stay behind after close of business for weeks or months. While the national population growth rate as at the year 2000 stood at 2.7 per cent that of Accra stood at 3.5 per cent.

This population growth has not been accompanied by increase in housing and basic sanitation facilities. The implications of these are increases in population density with low income settlements, large waste generation and increased pressure on waste management facilities (Ghana Statistical Service 2002). The UN-habitat (2003) observes that today's true builders and planners of cities in developing countries are the urban poor who build houses and establish legal or illegal settlements where they can to make life comfortable no matter what. "Slums have been the only large-scale solution to providing housing for low-income people. It is the only type of housing that is affordable and accessible to the poor in these cities" (UN-habitat, 2003). People in the slum most often do not pay for waste services and the nature of these settlements make no room for access roads for effective waste collection.

Associated with the increasing population are rising levels of affluence, shorter product cycles, and the large number of packaging, consumption and the demand for portable products that have brought increases in the waste stream. Ehrlich and Holdren (1971) established a relationship between the human environmental impact (I) (solid waste generation in this case under review), sub-national population size, growth, and concentration (P), people's affluence (A), and the methods (T) it employs to obtain its livelihood and dispose of its consumed products. This relationship they expressed through a mathematical model, $I = PAT$. Translating this into real life situation, this means that greater waste generation and its environmental impact would accompany a large, rapidly growing, and high density population and this is what has been the situation in Accra.

According to the Waste Management Department (WMD) of Accra Metropolitan Assembly, about 1800 tons of municipal solid wastes are generated per day in the metropolis and the average waste generated per capita per day is estimated at 0.5kg. Holding change in production and consumption patterns constant, future projections are subject to population growth, taking into account the present population of about 3million and growth rate of 3.5 per cent as sited in Anomanyo (2004).

The high proportion of food and plant waste is due to the fact that Ghana's economy largely depends on agricultural products for export and domestic consumption. Apart from the food waste from consumption and food processing factories, post harvest losses due to inadequate storage facilities and ready market for the farm produce contribute the greater percentage of the food and plant waste (Ministry of Food and Agriculture, 2000). Inert waste including rubbles from demolition and construction works are rarely disposed of as waste in Ghana since they are used on site roads in areas of housing and road construction.

According to EPA (2002), hazardous solid wastes generally occur in small quantities, except in the case of specific industrial operations for which the industry concerned takes responsibility and is assisted to put in place management plans guided by standards on effluent and discharges set by the EPA. These wastes though important, are not included in this discussion. The waste generated per day in the metropolis are however, not totally collected from their sites of generation.

2.4 An Overview of Landfill Sites Management in Accra

In the Accra metropolitan area, solid waste collection and disposal is the responsibility of Accra Metropolitan Assembly's Waste Management Department (WMD). The department therefore sees to the collection, transport, treatment and disposal of solid waste. The WMD is thus responsible for the management of the solid waste disposal sites at Mallam, Oblogo and Abokobi waste landfill sites in Accra. Solid Waste Management all over the world is a complex one. The municipality spent about 0.17 percent of its Gross Nation Product (GNP) on solid waste management service in 1994 (World Bank, 1999).

Like most developing cities, the municipality allocates a greater proportion of its solid waste management budget to collection and transporting services than development of proper disposal sites, equipment acquisition, and maintenance (Cointreau-Levine, 2000). Also in most developing cities, collection fees are usually based on communities' wealth, ability to pay and the quality of services desired. This system places low social class areas at a disadvantage since the quality of their primary collection service suffers (World Bank, 1999). Poor mental quality or amenities, due to income elasticity of environmental services only 31 percent, out of 82 percent of the population that relied on communal waste disposal site, pay a levy (Benneh et al, 1993).

2.5.0 Landfill Site Management

The majority of wastes are dumps on open plots, wetlands, and lands with water near the surface (Johannessen and Boyer 1999). They are usually not provided with liners, fences, compactors or soil cover. Waste pickers use this advantage to visit the site and sort valuables for themselves (Adeyemi et al, 2001, Yhdego 1995). According to Korfmacher (1997), South Africa, Uganda, Ghana and Egypt are upgrading their landfills to sanitary ones. One great concern is that in Africa, the landfills are owned and operated by the very body that is supposed to enforce standards. The philosophy of getting waste out of sight and consequently out of mind seems to be the overriding consideration of these authorities. Hence removing the waste is considered paramount giving their limited resources.

This neglect starts from the way aid donor see waste matters. According to Johannessen and Boyer, (1999), 'of all the regions, Africa has the lowest level of investment of World Bank funds in solid waste sector'. This author also notes that even though, African governments spend much on solid waste management the investment on this waste sector, as a fraction of total project costs is very low compared to other regions (Johnnessen and Boyer 1999).

2.5.1 Health Effects of Landfill Sites in the Developed Countries

Geschwind et al. (1992) investigated the risk of congenital malformations in the vicinity of 590 hazardous waste sites in New York State. A 12% increase in congenital malformations was found for people living within 1.609km of a site. For malformations of the nervous system, musculoskeletal system, and integument (skin, hair, and nails), higher risks were found. Some associations between specific malformation types and types of waste were evaluated and found to be significant. A dose-response relationship (higher risks with higher exposure) was reported between estimated hazard potential of the site and risk of malformation, adding support to a possible causal relationship. The study did report an increased risk of central nervous system defects for those living near solvent or metal emitting industrial facilities. Subjects for the first 2 years of this study were also included in Geschwind's study, and 2 more years were studied.

Marshall et al (1997) attempted to improve the exposure measurement in the first study by assessing the probability of specific Contaminant-pathway combinations in 25 sectors of the 1.609km exposure zones (Marshall, 1993). The risk of particular pathways or contaminant groups could not be investigated, however, because of limited numbers of cases in each subgroup a follow-up study of Geschwind's findings (1993) found no relation between two selected types of malformations (central nervous system and musculoskeletal) and living near a hazardous waste disposal site. The study did report an increased risk of central nervous system defects for those living near solvent- or metal emitting industrial facilities

Hall et al, (1996) used the same method of exposure assessment to study renal disease near 317 waste sites in 20 counties in New York State. Increased risks were found for associations between renal disease and residential proximity to a site (within 1.609km), the number of years lived near a site, and a medium or high probability of exposure, although the associations did not reach statistical significance. A study by Croen et al. (1997) based exposure measurement on both residence in a census tract containing a waste site and distance of residence from a site.

Three specific types of birth defects (neural tube defects [NTDs], heart defects, and oral clefts) were studied; little or no increase in the risk was found using either

measure of exposure. Risks of neural tube (2-fold) and heart defects (4- fold) were increased for maternal residence within 402.25m of a site, although numbers of cases and controls were too small (between 2 and 8) for these risk estimates to reach statistical significance. Births were ascertained from non military-based hospitals only, and the authors point out that the increased risk of NTDs may have resulted from lower ascertainment of exposed controls than exposed cases where exposure zones included military bases. Military base residents with pregnancies affected by NTDs may have been more likely to deliver in non military hospitals than residents with unaffected pregnancies.

A first European multisite study recently reported a 33% increase in all non chromosomal birth defects combined for residents living within 3 km of 21 hazardous waste sites in 10 European regions (Dolk et al, 1998). Neural tube defects and specific heart defects showed statistically significant increases in risk. Confounding factors such as maternal age and socioeconomic status did not readily explain the results. The study included both open and closed sites that ranged from uncontrolled dumps to relatively modern controlled operations. This disparity makes it difficult at this stage to conclude, if indeed the association is causal, whether risks are related to landfill sites in general or whether specific types of sites may be posing the risks.

2.5.2 Socio-economic and Environmental Effects of Landfill Sites

Landfill is considered one of the most widely practiced methods for the disposal of Municipal Solid Waste (MSW) since up to 95% total MSW collected worldwide is disposed of in landfills (El-Fadel, et al, 1997). Leachate the potentially polluting liquor which accumulates beneath a landfill site resulting from the infiltration and percolation of rainfall, groundwater, runoff, or flood water into and through an existing or abandoned solid waste landfill site. Leachate contains substantial amounts of dissolved organics (BOD and COD), Xenobiotic Organic Compound (XOCs), inorganic salts, ammonia, heavy metals and other toxicants (Christensen et al, 2001 and Pivato and Gaspari, 2005). According to a research conducted by Paxeus, and Schwarzbauer et al, (2002) revealed that more than 200 organic compounds have been identified in municipal landfill leachate.

According to Bae, et al (1997) 35 of the compounds have the potential to cause harm to the environment and human health. Ammonia is toxic to many living organisms in surface water and contributes to eutrophication, dissolved oxygen depletion. With a concentration of higher than 100 mg/L, untreated NH₃-N is highly toxic to aquatic organisms, as confirmed by toxicity tests using zebra fish. Leachate migrates vertically and laterally into the environment by direct discharge into the adjacent streams. Toxic compounds inside leachate texture effect fish, which are the last chain of the feeding cycle in aquatic eco-system, and cause other animals and human being, which feed on fish, to be subjected to the same toxic effect. If allowed to migrate, the contaminant released from a landfill would also pose potentially serious threats to the surrounding soil and the underlying groundwater.

Since groundwater is the major source of drinking water worldwide, in recent years, the risk of groundwater pollution has become one of the most important environmental concerns, particularly in developing countries, where most of the landfills have been built without any sound engineering design such as engineered liners and leachate interception and collection system. Unless properly treated, leachate that seeps from a landfill can infiltrate and contaminate the underlying groundwater. Once the leachate escapes to the groundwater, it is difficult and expensive to have it controlled and cleaned up, thus posing potentially serious hazards not only to living organisms, but also to public health in the long-term. In most cases, it is extremely difficult to restore the polluted ground water to its former state. For this reason, in recent years, the risk of groundwater pollution due to leachate seepage has become a major environmental concern worldwide.

2.6.1 Regulatory framework for Waste Management in Ghana

There had been no comprehensive legislation on environment in Ghana until the late 1990s. What was happening was that a number of laws that concerned exploitation of natural resources sometimes had specific aspects of the environment. Even then, issues such as industrial effluents and waste were virtually left uncovered. The environmental protection agency (EPA) was established in 1994, under an Act of parliament Act 490 which replaced the EPC. The EPA is empowered to besides

advising the Minister of the Environment, enforce, monitor, and control environmental standards and regulations including the following means: coordinates the activities of bodies concerned with the technical or practical aspects of the environment and serves as a channel of communication between such bodies and the ministry.

Also the EPA is responsible for; secure in collaboration with such persons as it may determine the control and prevention of discharge of waste into the environment and the protection and improvement of the quality of the environment; issues environmental permits and pollution abatement notices for controlling the volume, types, constituents and effects of waste discharges, emissions, deposits or other sources of pollutants and of substances which are hazardous or potentially dangerous to the quality of the environment or any segment of the environment; issues notices in the form of directives, procedures or warnings to such bodies as it may determine for the purpose of controlling the volume, intensity and quality of noise in the environment; prescribes standards and guidelines relating to the pollution air, water, land and other forms of environmental pollution including the discharge of waste and the control of toxic substances (Ministry of Local Government and Rural Development 2003).

2.6.2 Policies and regulations of landfill site management

Solid waste regulations in Ghana are normally coming from the Ministry of Local Government and Rural Development, the Ministry of Environment, and the EPA. In 1999, the Ministry of Local Government Rural Development came out with the national environmental sanitation plan that seeks to develop and maintain a clean, safe and pleasant physical environment for human settlements. Along this policy, local governments have been enjoined to develop strategic environmental plans to implement the programmes proposed in the policy. AMA enforces these policies.

The EPA has designed solid waste management guidelines for municipalities, and has equally established standards for design, construction and management of waste disposal system to protect health and the environment. The purpose of the guidelines is to assist the district assemblies and other relevant stakeholders in the planning and

management of waste. The EPA makes sure the District Waste Management Plan (DWMP) addresses all aspects of solid waste management in the district.

2.7 The Contingent Valuation Method (CVM) as a tool for Assessing WTP

The CVM is a direct method in valuing the environmental assets and it uses surveys to elicit individuals' valuations for hypothetical changes in environmental assets. It can be used to estimate some types of benefits such as the non-use value, which cannot be estimated using the other methods. The CVM reflects the stated preference of these consumers. The use of the CVM approach involves asking a sample of a relevant population about their willingness to pay (WTP) to ensure a welfare gain from change in the provision of a non-market environmental good or willingness to accept (WTA) compensation to endure a welfare loss from a reduced level of provision. Valuation here is contingent on the hypothetical scenario.

For this reason, this method is seen to be suffering from the problem that it asks hypothetical questions and the answers might as well be hypothetical. The strength of this method is that it can capture both the use and non-use values of a recreational site, which will give us the Total Economic Value (TEV) when added together. Under ideal conditions, the CVM answers to the willingness to pay (WTP) or willingness to accept (WTA) go directly to the theoretically correct monetary measures of utility changes. It reflects the stated preference of individuals where individuals will be asked a variety of questions about how much they would be willing to pay to deal with the problem pose by the dump site on their lives and other environmental resources in the area. To capture the full non-use value, the interview should include others who are not living close to the dump site.

The basic question in the application of the CVM approach is whether WTP or WTA is the best indicator of value in a given situation. The answer is really a statement about the entitlements assumed (Perman, 2003). In general, for environmental valuation, WTP would seem to be the appropriate measure for gainers from some resource allocation decision, and WTA right for losers in that resource allocation (Bateman and Willis, 2001). Bishop and Heberlein (1990) have pointed out that it is not often easy to identify losers and gainers since judgement is itself influenced by the valuer's perspective. In the case of Ga East and South, landfill site in the area would

be a loss to the population of interest as it is creating problems for them. Also, on the other hand, if the problem is mitigated, it will be a gain to that population of interest. WTP is chosen because it is more accurate than Willingness to Accept (WTA) - it is more understandable as more people are experienced with buying and paying than selling.

Bishop and Heberlein (1979) have found that WTA results, including actual cash sale, are considerably higher than WTP results, regardless of whether WTP is measured using CVM or not. This is because WTP would be constrained by limited household income whereas WTA is infinite. For the same environmental goods, WTA can be 40% greater than WTP. Navrud and Mungatana (1994) used both WTP and WTA in their CVM approach to elicit consumer preferences. The results showed a mean WTP of US\$27.16 and a mean WTA of US\$126, which is 4.64 times higher than the mean WTP. Basically, WTA usually brings up higher amounts or protest responses, as it does not make sense to most people for them to be paid for natural resources.

According to Sansa and Kaseke (2004) the involvement of the service receivers especially households who are primary producers and generators of significant proportion of solid waste, may provides via same arrangement and participate in making of sound policy decisions to solid waste management but also help the service providers understand households willingness to participate, pay and neighbourhood characteristics. It is important to note that a number of problems may arise from poorly designed CVM surveys due to the fact that respondents may think that they can influence the course of real events by the kind of answers they give and thereby bias their answers accordingly. We have general bias, which consists of strategic, information, hypothetical and part-whole bias; procedural bias consists of only sampling and interviewer bias; and instrument bias is made of payment vehicle bias and starting point bid bias (Smith and Desvousges, 1986).

There are also difficulties with the reference group for pricing, where 'valuation of environmental damage based on contingent valuation methods could be significantly influenced by the group of people that is taken as reference for valuation' (Hussen, 2004). These biases are elaborated below:

1. General biases: This includes free riding and strategic bias whereby individuals may pretend to have less interest in a given collective activity than he really has and therefore understates his WTP for that good on the assumption that others will pay for its provision, which he will then enjoy. Such behaviour in the CV studies depends on both the respondent's perceived payment obligation and his expectation about the provision of the good (Varian, 1984). If that individual feels that others will pay to ensure the provision of the good, he has incentive to free ride by lowering his WTP bid below his true valuation. On the other hand, if the individual would really want the good to be provided and knows that its provision will depend upon the mean valuation of the sample, he may act strategically and overstate his true WTP in order to raise the mean WTP and thereby ensure the good's provision. Strategic behaviour can include both over-payment and under-payment.

Another problem is that of hypothetical bias. This is usually due to the hypothetical nature of the CVM studies, where the use of hypothetical markets rather than real markets can in certain circumstances 'produce its own distinct bias problems' (Bishop and Heberlein 1990). The nature of this bias is also an issue of debate whereby Freeman (1986) see the impact of a very hypothetical scenario as being an increased bid variance, while Mitchel and Carson (1989) extend this to reject the entire notion of hypothetical bias and referring to situations of low model reliability instead. The main challenge with this hypothetical method is about the validity and the reliability of the data, which may be affected by the extent to which the questions are biased. Information bias may occur if the respondent is not presented with sufficient information regarding the resource and the means of payment for the bids presented to him. Therefore, the respondent should be aware of the nature of the environmental good in question through a careful description of the good.

2. Procedural biases: This includes interviewer bias and sampling bias. If the interviewer presents his questions in a way that may influence responses by maybe portraying the environmental good as morally desirable, the respondent may respond by expressing a high WTP bid in order to please the interviewer. To minimise this bias, Mitchel and Carson (1989) recommend that good training be given to interviewers who will help carry out the survey and good a monitoring and supervision be put in place during the field research.

2.8 Theories for landfill site management

In industrialized nations the waste management practices evolved with the 1970's focusing on reducing environmental impacts (Tanskanen 2000). This was done by creating controlled landfill sites, establishing waste transfer stations or redirecting waste collection vehicle routes (Read, 2003). The 1980's and early 1990's focused on new technological solutions for waste management while the mid 1990's until today, the focus is on resource recovery (Read, 2003).

In the developing world however, poor enforcement or non-existence of waste management policies have resulted in the dependence on open dumping. Improvements in the area of constructing sanitary landfills in these regions have most often been supported by the World Bank and other bilateral donor agencies (Johannessen and Boyer 1999).

In this paper the proposed solid waste management concept is based on willingness to pay on the part of the people for improvement of poor waste management in the municipalities without Government intervention using contingent valuation method. According to Sansa and Kaseke (2004) there are benefits from Solid Waste Management (SWM) including reduced contact of the vulnerable population with garbage in streets, reckless dumping and improved management of designated dump sites. In addition, reduced treatment for illness such as diarrhoea and cholera avert health costs and enhance productivity of the population.

According to Bernstein (2004), as a direct impact, improvement in solid waste conditions can lead to better health which in turn can lead help to improve productivity and increase incomes. An indirect impact of improved solid waste conditions can lead to decrease in health problems and hence, savings from spending on health. The savings and better living environment per se would provide the poor with resources, time and most importantly a 'better quality of life' to enrich their skills (and thereby increase their capabilities) to earn higher income and fight poverty. Moreover, an increase in incomes would also enable the poor to pay for the basic environmental services they need.

The most widely used approach to eliciting information about the respondent's WTP is the so-called dichotomous- choice format. A dichotomous choice payment question

asks the respondent if he/she would pay P100 to obtain the good. A frequently used wording of the payment question is whether the respondent would vote in favour of the proposed plan or policy if approval of the plan would cost his/her household P100(in the form of extra taxes, higher prices of products etc). There are only two possible responses to a dichotomous choice payment question: yes and no. The amount P100 is varied across respondents and is usually termed as the did value.

This method has the chief advantage in that it considerably reduces strategic bias (Arrow 1993). Strategic bias arises when respondent attempts to influence the results of a WTP survey by answering in such a way to serve his/her interest rather than reveal his true valuation of the good or service. For instance, the respondent might give very low amount of WTP if he felt that the answer would influence the lowering of the amount he would be charged for improved SWM (Sansa and Kaseke, 2004).

2.9 Chapter Summary

This chapter dealt with solid waste management challenges in general (thus Global and Africa perspective), waste management practices in Ghana, population of people living in an area and the waste they generate, the problems of solid waste management, effect solid waste, effects of uncontrolled landfill site and the willing on the part the people to contribute to solving the problem without Government intervention using contingent valuation method. However literature did indicate whether educational level and income level of an individual have an influence on their willingness to pay for improvement of their welfare.

Since population dynamics have significant influence on the amount of waste generated and its proper handling in the municipality. The population of Accra is rapidly increasing because of the rural-urban migration among other factors and since technology had not improved where most of the waste would be recycled then the volume of that would be dispose at the landfill site would increased and therefore increase the effect of the landfill site on the people living close to the site.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

The study was undertaken to examine issues in land fill site management challenges, perceived effects and willingness on the part of residents to pay for improvement. The study was designed to examine the relationships between solid waste management and the willingness of the people to pay for solving the problem. It was to determine the extent to which the landfill site in the communities in the two districts affects the life of the people living in these communities. This chapter therefore describes the sample and sampling technique, the instruments for data collection, data collection and data analysis procedures.

3.1 Research Design

The basic research design used in this study was a cross-sectional descriptive survey where data collection occurred at a single point in time for each household head (Fraenkel & Wallen, 2006). Surveys enable an examination of “large and small populations (or universes) by selecting and studying samples chosen from the populations to discover the relative incidence, distribution, and interrelations of sociological and psychological variables” (Kerlinger, 1986). Babbie (1990) also stated that there are three major purposes of survey research. These are description, explanations and explorations. This research design was valuable for this study because it allowed for generalisation of findings to reflect the views of the target population especially when a representative sample has been used.

3.2 Population and Sample

The target population was heads of households in the Ga East and Ga South Municipalities in the Greater Accra Region of Ghana. The Municipalities were zoned in to three. These were affected zone, semi affected zone and not affected zone. Also

officers of Environmental Protection Agency (EPA), Ga East Municipal Assembly, Ga South Municipal Assembly, Waste Management Department and Private Waste Operators all of Greater Accra Region of Ghana were included in the population studied. The formula below was used in determining sample size for the study. The formula $n = \frac{N}{1 + N(\alpha)^2}$, where n is the sample size, N is the Population size and α is the confident level at 95 percent. The joint population of households in Ga East and South Municipalities was 46596 house hold and a representative sample of 380 respondents were selected for the study.

3.3 Sampling Technique

The study used both probability and non-probability sampling techniques. In choosing the two districts purposive sampling technique was employed. This is because both municipalities have dump sites which have been in existence for a long time and again most of the environmental problems that have been making the headlines both in the print and electronic media have come from these municipalities. A list of all houses within the Ga East and South Municipalities was compiled as the sampling frame. Each Municipal area was zoned into three (thus highly affected, affected and not affected), within 1km radius from the landfill sites was described as highly affected zone, between 1km and 2km radius from landfill sites was described as affected and more than 2km was described as not affected

In selecting the sample for the study, a quota sampling technique was adopted where 50% of the sample was selected from the highly affected zone while 30% and 20% was selected from the affected and not affected zones respectively. Also in selecting the households systematic sampling technique was used to get fair distribution of respondents within each zone. However the accidental sampling technique was adopted in selecting the households' heads for the interview. Simple random sampling technique was used in selecting private waste contractors for the study. This was done by listing all the waste contractors that work in both municipalities. The method was adopted with the assumption that it would give them equal choice of being selected.

Primary data for the study was gathered using detailed structured questionnaire, interview and direct observation. The sampling frame consisted of communities in the

municipal area. Questionnaires were used in face-to-face interviews with the household heads to elicit information on landfill sites management challenges, effect of the mismanagement of the landfill sites in their vicinity as well their willingness to contribute to address the problem posed by the landfill sites.

3.4 Sources of Data

Data for the work was basically from primary sources and involved the collection of field data on the phenomenon under study. Other sources of data were secondary based and these included reports and bulletins from the various environmental related agencies such as the Environmental Protection Agency (EPA), the Ga South Municipal Assembly, Ga East Municipal Assembly, Waste Management Department, and Private Waste Operators. Newspaper information was also used to boost the study.

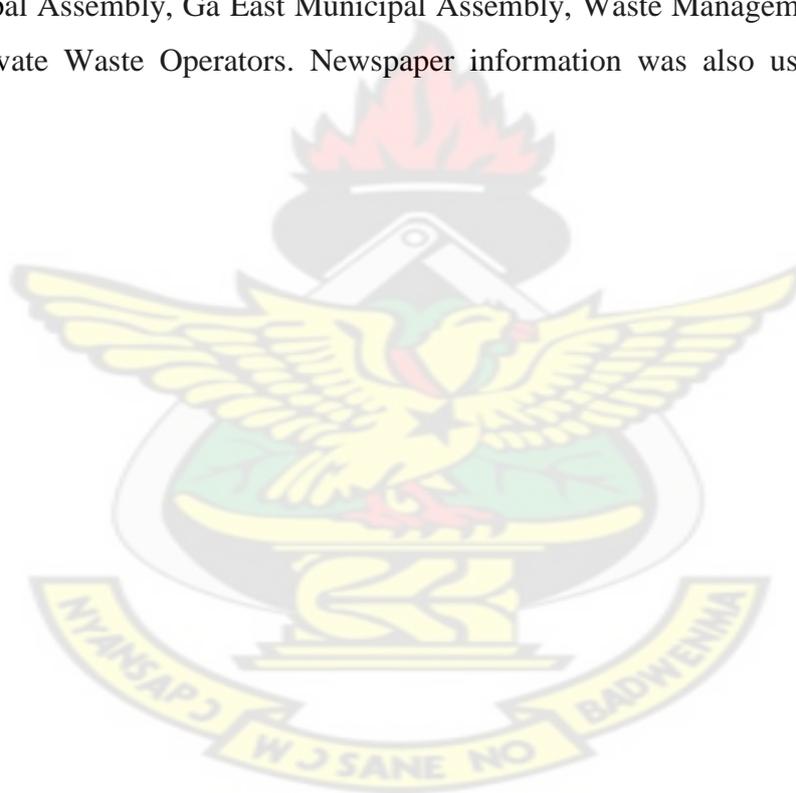


Table 3. 1: Unit of Inquire

Units	Sub units	Issues
EPA	Built Environment	The role of EPA in solid waste management Policy on solid waste management Regulations in constructing landfill site
Waste Management Department	Environmental health	Potential waste management challenges The role of WMD in domestic solid waste management Who is involved in solid waste management
Municipal Assemblies	Waste management department	Population of the area (number of houses) Who is involved in solid waste management Who handles solid waste Potential waste management challenge The role of MAs in waste management Community role in waste management
Community	Households heads	Waste management problem The effect of the dump site in the community Who should handle solid waste management Willingness to pay
Private Waste Operators		The role of the private operators in waste management Waste management problems Funding

Source: Field survey 2009

3.5 Analytical Technique

The researcher made used of the SPSS for the data processing because it was more convenient, accurate and comfortable. The study made used of descriptive statistics such as mean, frequency and percentage for the analyses of the demographic data. Then because the study intended to find the willingness of the respondents to pay for improvement of the waste management problem in the municipalities, the Contingent Valuation Method (CVM) was employed for the analysis where binary logistic

regression was run to obtain an equation to determine the probability of the respondents willingness to pay to address the problem posed by the dump sites in the two municipalities.

The CVM approach involved asking a sample of a relevant population about their willingness to pay (WTP) to ensure a welfare gain from change in the provision of a non-market environmental good or willingness to accept (WTA) compensation to endure a welfare loss from a reduced level of provision

3.6. Theoretical Framework

Binary Choice Model

A dichotomous choice method is used in this study to elicit valuations. This method is also referred to as the binary choice where the format of the questions used to elicit willingness to pay is discrete i.e. the respondent is presented with a single buying price which must be accepted or rejected. Thus, in the dichotomous choice method, questions were formatted in 'take it or leave it' offers such as: 'Would you be willing to pay P100 as a donation for the improvement or addressing the problem posed by the dump site in the Municipal Assembly?' If $WTP > P100$, the answer was 'yes' and if $WTP < P100$ the answer was 'no'. The format mimics day-to-day market decisions (usually of the discrete type) and it also reduces incentives for strategic behaviour of the correspondents.

It leads to a well-defined true answer unless the consumer is exactly indifferent between paying and not paying. Opportunities for free riding are discouraged by the use of this elicitation method. As explained by Hanley et al, (1997), it is assumed that, whilst the representative individuals know their own preferences, these are not completely observed by the researcher. In welfare Economics, we make the assumption that environmental services can be treated as arguments in well behaved utility functions (Perman et al, 2003). A statistical model that is consistent with utility maximization is portrayed through the use of random utility model, which says that when an individual is faced with a choice between two outcomes, he usually chooses the one that yields greater utility.

Suppose the individual knows his Indirect Utility function with certainty:

$$U = U(E_j, y, x) \quad (1)$$

E = level of environmental quality; y = income (and all other goods); x =vector of socio economic characteristics, which may affect preferences and are only partly observable to the researcher. Suppose environmental quality improves from $j=0$ to $j=1$, the researcher acts as though the utility function is

$$V = (E_j, y, x) + \varepsilon_j \quad (2),$$

because this utility function is random from his perspective.

Where ε_j is identically and randomly distributed error term with zero mean and the function assumes additive separability between the deterministic and stochastic components.

The single bounded format will be used to cast a dichotomous valuation question. This format gives only one bid (a specific monetary amount) where the respondent can give a 'yes' or 'no'. Suppose now that the individual is asked if they would pay an amount A for the addressing the problem posed by the dump site or for the project $E^0 \rightarrow E^1$, he would do so if:

$$V(E^1, y - A, x) + \varepsilon_1 \geq V(E^0, y, x) + \varepsilon_0 \quad (3)$$

Thus the utility derived from the improvement outweighs the utility from the case of no improvement.

The probability that they will accept this offer (that is, say "yes") is:

$$Pr ob[yes] = prob[V(E^1, y - A, x) + \varepsilon_1 \geq V(E^0, y, x) + \varepsilon_0] \quad (4)$$

$$\begin{aligned} Pr ob[yes] &= Pr ob[V(E^1, y - A, x) - V(E^0, y, x) \geq \varepsilon_0 - \varepsilon_1] \\ Pr ob[yes] &= Pr ob[\Delta V(A) \geq \eta] \\ Pr ob[yes] &= F\eta(\Delta V(A)) \end{aligned} \quad (5)$$

$$= \sum V(E^1; y-A, x) - V(E^0, y, x) \geq \varepsilon_0 - \varepsilon_1$$

Where $F\eta$ is cumulative distribution function of $\eta = \varepsilon_0 - \varepsilon_1$ and $\Delta V(A) = V(E^1, y - A, x) - V(E^0, y, x)$

This means that the probability of the individual saying yes equates the probability of the utility from an improvement outweighing the probability of the situation remaining the same. And the probability of saying no is $\{ 1 - prob[yes] \}$

Alternatively, this could be written as:

$$Pr ob[yes] = Pr ob[WTP \geq A] = 1 - G_{WTP}(A) \quad (6)$$

Where G_{WTP} is the cumulative distributive function of the random variable WTP.

(i) Equivalent variation and compensating variation

To obtain a monetary measure of an individual's welfare change arising from a reduction in the price of some good C_1 from P_1 to P_2 where $P_2 > P_1$. We also define a second good, C_2 as the composite good i.e. all goods other than C_1 . Let the price of C_2 be unity, and suppose the individual has a fixed income, Y_0 . The consumer's budget constraint prior to the price fall is:

$$P_1 C_1 + C_2 = Y_0$$

A utility maximising consumer will choose C_1 and C_2 so as to maximise $U=U(C_1, C_2)$ subject to this budget constraint. The solution becomes two consumption quantities, C_1^* and C_2^* and a maximised level of utility U_0 .

When the price falls, the budget changes to the new constraint and utility maximisation implies increased consumption levels and a higher utility level. The increase in the consumption level can be decomposed into a substitution effect, and income effect.

There are two Hicksian monetary measures of the utility change associated with a price change: the compensating variation and the equivalent variation. Compensating variation (CV) is the quantity of money income which when taken from the individual together with the price fall, leaves the individual at his initial level of utility i.e. the maximum amount of money that the individual would pay to have the price fall occur.

Equivalent variation on the other hand is the quantity of money income, which, if given to the individual without the price fall would give the same level of utility as he

would have if the price fall had occurred i.e. the maximum compensation which the individual would accept in lieu of the price fall.

Table 3.2 Relationship between Compensation Variation (CV) and Equivalent Variation (EV) and WTP/WTA

Monetary measure for price change effects		
Change	CV	EV
Price fall (Welfare gain)	WTP for the change	WTA compensation for no change
Price rise (Welfare loss)	WTA compensation for the change	WTP for no change

Source: Adopted from Perman et al, 2003

(ii) Specification of the model

Logit model: The functional form used is binary or dichotomous choice model and welfare measures from this format are estimated using the logit statistical model. The respondents were asked the bid amounts to state whether they are willing or not willing to pay by responding “yes” or “no”. The responses were treated as a binary variable taking the value of 0 or 1. Then logistic regression function package was used to estimate the parameters of the function. The non-linear binary Logit model takes the following form

$$WTP_i = \alpha + \beta bid + \beta_1 Age + \beta_2 marital + \beta_3 Edu + \beta_4 Empl + \beta_5 farlive + \beta_6 odour + \beta_6 earn + \varepsilon \quad (7)$$

Where; WTP = the dependent variable or response obtained from respondents in the form of “yes” or “no” answer; WTP=1 if the respondent answers yes; 0 otherwise

ε = random disturbance term; “ a ” is the constant term and “ β ” is the bid coefficient; Age is age; marital is marital status of respondents; Edu is educational level; Empl is employment status; farlive is distance of respondents’ residence from the dump site;

and odour is the odour that emanates from the dump site; earn is earnings of the respondents.

The binary model was selected because the dependent variable takes discrete binary form and it is expressed as probabilities. The coefficient measures the probability of the dependent variable assuming a particular outcome such as answering “yes” to a WTP question. The other response measures the probability of odds occurring or getting an answer of “no” to a WTP question. Therefore the probabilities lie between 0 and 1 and this kind of model is better approximated by Logit than OLS regression methods. In this case the mean of the sample was not computed OLS way because in this case responses are qualitative yes or no answers. Therefore, the mean willing to pay was indirectly computed by dividing the negative of constant term by the bid coefficient produced by the logistic regression.

$\Sigma[\text{WTP}] = \text{Median} [\text{WTP}] = -(a/b)$;where a and b are the logistic regression estimates of α and β respectively.

The logit model used to analyse the determinants of WTP between two discrete alternatives took the following form:

$$P_i = \frac{1}{[1 + e^{-(\beta_1 + \beta_2 X_2)}]}$$

CHAPTER FOUR

ANALYSIS AND DISCUSSION OF RESULTS

4.1. Introduction

This chapter is devoted to the analysis, and discussion of results. The first part of the chapter presents a brief description of the study areas and the analysis and discussion of descriptive statistics, including the interview results while the second part deals with the analysis of the willingness to pay. The chapter ends with a summary of what is discussed.

4.2 Description of Study Areas

The study areas were Ga East Municipal and Ga South Municipal all in the Greater Accra Region. Maps for Ga South Municipal and the Ga East Municipal are in figures 1 and 2 respectively.

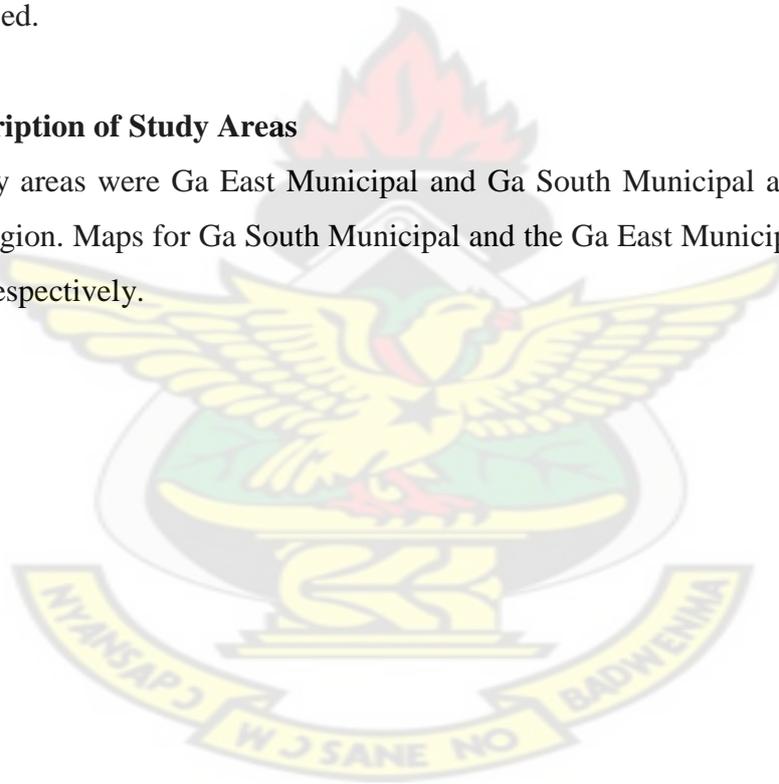
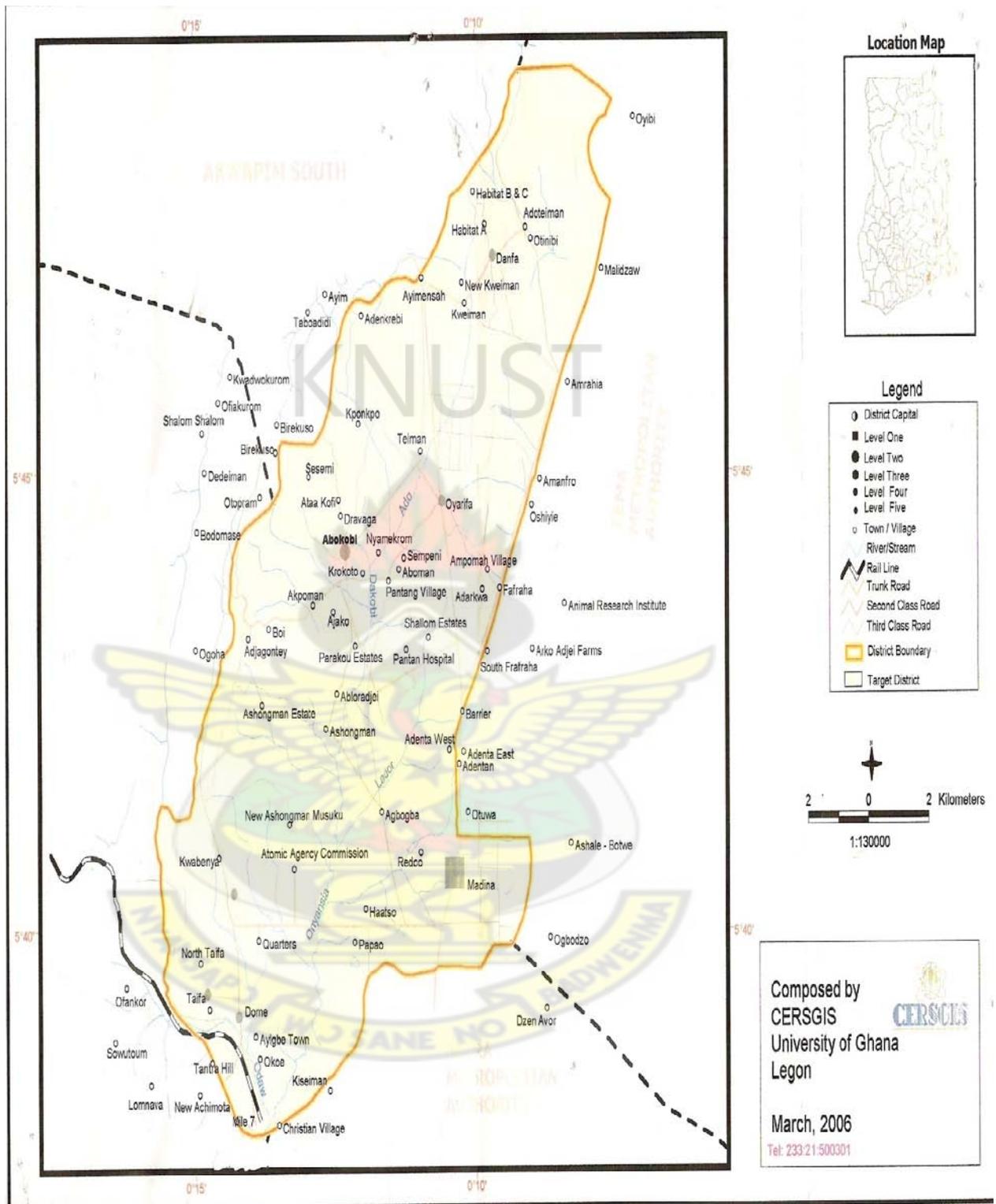


Figure1: Map of Ga South Municipal Assembly



Source: Ga South Municipal Assembly

Figure 2: Ga East Municipal Area



Source: Ga East Municipal Assembly

Ga South Municipal

The Ga South Municipality was carved out of the erstwhile Ga West District in February, 2008 in pursuance of the government’s decentralization and local

government reform policy as enshrined in the LI 1867. The inaugural name of the district was “Weija Municipal Assembly” but the Assembly resolved to have the name changed to “Ga South Municipal Assembly” with its capital at Weija.

It lies within latitude 5°48’ North 5°29’ North and longitude 0°8 West and 0°30’ West. The Municipality shares common boundaries with the Accra Metropolitan Area to the South- East, Akwapim South to the North-East, Ga West to the East, West Akim to the North, Awutu-Effutu Senya to the West, Gomoa to the South-West and the Gulf of Guinea to the South. It occupies a land area of approximately 517.2 sq. km

According to the 2000 National Population and Housing Census, the population of the Ga South Municipal Assembly is estimated at 210,727, with intercensal growth rate of 3.4%. The projected population for the year 2009 is 284,712. The growth rate is as a result of the Municipality’s closeness to the capital city, Accra. The urban population constitutes 76.04% with the remaining 23.96% residing in the rural portion of the Municipality.

Ga East Municipal

The Ga East Municipal Assembly is located at the northern part of Greater Accra Region. The Assembly is bordered on the west by the Ga West Municipal Assembly (GWMA), on the east by the Adenta Municipal Assembly (ADMA), the south by Accra Metropolitan Assembly (AMA) and the north by the Akwapim South District Assembly. It covers a land area of 166sq km and population 201,542 at 2000 Nation Population and Housing Census with an intercensal growth rate of about 2.3%. The projected population for the year 2008 is therefore 241,752. The growth of the population is mainly due to the influence of migration inflows.

The urban/peri-urban population constitutes 82% of the Municipality’s total population with the remaining 18% residing in the rural portion. The population density of the Municipality is 1,214 persons per sq km and average household size is 4.6 persons.

4.3. Analysis and Discussion of Descriptive Results

This section analyses the descriptive results. It involves the use of frequency distribution. It ranges from the demographic results to the perceptions of the respondents towards the issues of landfill sites management.

The descriptive statistics are discussed below:

The first issue to consider is captured in Table 4.1 below. The table provides a breakdown of the locations of the respondents who were contacted to fill the questionnaires.

Table 4.1: Educational background of the respondents

Qualification	No of Respondents	Percent
Degree	31	8.2
Diploma	30	7.9
Professional certificate	59	15.5
Senior high school	55	14.5
Junior high school	97	25.5
Primary school	44	11.6
Others	63	16.6
No response	1	0.3
Total	380	100.0

Source: Field Survey, September, 2009

From Table 4.1 out of the total respondents interviewed 31 of them representing 8.2 percent have obtained first degree, 30 of them representing 7.9 percent have obtained diploma, 59 representing 15.5 percent have professional certificate, 55 representing 14.5 percent were senior high school leavers, 97 (25.5 percent) of them were junior high school leavers, 44 (11.6 percent) were primary school leavers, 63 (16.6 percent) were those that attend other forms and those that did not go to school at all 1 representing 0.3 percent did not indicate their educational background. This can be deduced that more than 60 percent of the people did not have higher educational background and might have migrated to the city from other parts of the country.

Table 4.2: Length of stay in the community

No of years	No of Respondents	Percent
Less than one	54	14.2
1-5	140	36.8
6-10	81	21.3
11-15	41	10.8
16 and above	59	15.5
No response	5	1.3
Total	380	100.0

Source: Field Survey, September, 2009

From Table 4.2 out of the total respondents interviewed, 54 representing 14.2 percent of them have lived in the area less than one year, 140 representing 36.8 percent of them have lived in the area between 1 to 5 years, 81 represent 21.3 percent have lived in the area between 6 to 10 years, 41 (10.8 percent) have lived in the area between 11 to 15 years and 59 representing 15.5 percent have lived in the area about 16 years and above whilst 5 represent 1.3 percent did not indicate the number of years they have live in the area. Most of the respondents have lived in the area for quite some years and therefore know the problems they have with waste management.

Table 4.3: Employment status of the respondents

Employment	No of Respondents	Percent
No	88	23.2
Yes	292	76.8
Total	380	100.0

Source: Field Survey, September, 2009

Table 4.3 captures the employment status of the respondents. The Table 4.8 indicates that majority (292) of the respondents who were interviewed had some kind of gainful employment. It thus indicates a semblance of relative well-being of the respondents. The level of unemployment of the rest of the respondents (88) was also quite on the high side, and this could have implications on their willingness to pay for waste disposal. Even for those who are employed, the next question to ask is, do they earn enough income to take care of themselves and their households. This implies that

though some may be willing to pay for the waste management they do not have the means to afford the amount the waste management department approves for waste contractors to charge for the waste collection in the district.

Table 4.4: Respondents monthly income

Amount in GH ¢	No of Respondents	Percent
Less than 50	101	26.6
50-150	133	35.0
151-250	38	10.0
251-499	22	5.8
500 and above	19	5.0
No response	67	17.6
Total	380	100.0

Source: Field Survey, September, 2009

The monthly income ranges of the respondents were captured above in Table 4.4. The table indicates that majority of the respondents earn incomes which are quite on the low side and brings home the issue of whether with the low levels of income they are capable of adequately catering for themselves let alone their households. This is captured with about 26.6 percent of the respondents earning below 50 Ghana cedis a month, while as much as 35 percent earn between 50 and 150 Ghana cedis per month. Only 5 percent of the respondents were found to earning incomes exceeding 50 Ghana cedis. The income status thus suggests that most of the respondents interviewed were earning incomes that could at best enable them to subsist.

Table 4.5 Household with waste disposal bin

Response	No of Respondents	Percent
No	184	48.4
Yes	195	51.3
No response	1	0.3
Total	380	100.0

Source: Field Survey, September, 2009

From Table 4.5 it can be seen that out of the total respondents interviewed, 184 representing 48.4 percent of them do not have waste disposal bin in their home whilst 195 representing 51.3 percent have waste disposal bin in their home and 1 representing 0.3 percent did not respond to that item. This can be as a result the distance from their homes to the dump or the central waste container point.

Table 4.6: Mode of waste disposal

Mode	Frequency	Percent	Education	Income
At dump site	110	28.9	110	100
Waste collectors	125	32.9	125	99
Burnt	145	38.2	144	114
Total	380	100.0	379	313

Source: Field Survey, September, 2009

From Table 4.6 out of the total respondents interviewed, 110 representing 28.9 percent disposed off their solid waste at the dump site, 125 representing 32.9 percent give their solid waste to waste collectors at a fee whilst the remaining 145 representing 38.2 percent burnt the solid waste they generate. It can be deduced that majority of the respondents try to manage their solid waste themselves.

A cross tabulation of mode of disposal of waste and educational background shows that out of the total respondents 144 of the respondents burnt their solid waste, 110 of the respondents their waste at the dump site and 125 give their waste to waste collectors. Also a cross tabulation with income of the respondents also revealed that 114 of the respondents burnt their waste, 100 of them dump their waste at the dump

site and 99 of them give their waste to the waste collectors. This implies that the mode of waste disposal by respondents does not depend on the educational level or income status of the individual but rather it is an attitude of the person and the distance they live from the dump site.

Table 4.7: Payment for solid waste disposal

Response	No of Respondents	Percent
No	252	66.3
Yes	127	33.4
No response	1	0.3
Total	380	100.0

Source: Field Survey, September, 2009

From Table 4.7 out of the total respondents interviewed, 252 representing 66.3 percent of the respondents do not pay for their solid waste disposal, 127 representing 33.4 percent pay for the management their solid waste while the remaining 1 representing 0.3 percent did not respond to that question. This shows that majority of the respondents do not pay for their waste management. The reason may be that those who don't pay are living closer to the dump site and find it more convenient to dispose of their waste themselves or that they cannot afford the fees charge by the waste contractors for their services. Also it may be an attitude of those who do not pay that they want to manage their own waste and therefore burnt it or dispose of themselves. However this attitude could result in indiscriminate dumping of refuse and health problems in the district.

Table 4.8: Schedule of payment for solid waste disposal

Mode	Frequency	Percent	Education	Income
Daily	49	12.9	49	42
Weekly	32	8.4	32	21
Monthly	45	11.8	45	36
Do not pay	254	66.8		
Total	380	100.0	126	99

Source: Field Survey, September, 2009

From Table 4.8 out of the total respondents interviewed, 49 representing 12.9 percent indicate that they pay daily for the solid waste disposal, 32 representing 8.4 percent pays weekly for their solid waste disposal, 45 representing 11.8 percent pays monthly for their solid waste disposal whilst the remaining 254 representing 66.8 percent did not respond to that item because they do not pay for solid waste disposal.

However, a cross tabulation of mode of payment for solid waste with educational background and income of the respondents was computed. The results shows that, the educational background of those who pay for solid waste disposal is as follows; 49 of them do daily payment, 32 of them paid it weekly and 45 of them paid it monthly. Also with income status of the respondents who pay for their solid waste disposal is as follow; 42 of them do daily payment, 21 of them do weekly payment and 36 of them do monthly payment. This shows majority of the people in the municipalities do not pay for their solid waste disposal.

Table 4.9: Amount paid for solid waste disposal

Amount in GH ¢	No of Respondents	Percent
Do not pay	253	66.6
0.10-0.90	57	15.0
1-5	48	12.4
5.1-10	20	5.2
10.1-15	2	0.5
15.1-20	1	0.3
Total	380	100.0

Source: Field Survey, September, 2009

From Table 4.9 out of the total respondents interviewed, majority of the respondents that is 253 represent 66.6 percent do not pay anything for their solid waste management, 57 representing about 15.0 percent of the respondents pay less than one Ghana Cedis for their solid waste management, 48 representing 12.4 percent of those who pay between one Ghana Cedis and five Ghana Cedis for their solid waste management, 20 representing 5.2 percent pay between five and ten Ghana Cedis for their solid waste management and 3 represent 0.8 percent pay more than ten Ghana Cedis for their solid waste management.

Table 4.10: Perception of poor management of the landfill site

Response	No of Respondents	Percent
No	47	12.4
Yes	331	87.1
No response	2	0.5
Total	380	100.0

Source: Field Survey, September, 2009

From Table 4.10 out of the total respondents interviewed, 47 representing 12.4 percent says they there was no problem with management of the landfill sites in Oblogo and Mallam all in Ga South Municipality and the one at Abokobi in the Ga East Municipality, 331 representing 87.1 percent says they have problem with management of the landfill sites in Oblogo and Mallam all in Ga South Municipality

and the one the Abokobi in the Ga East Municipality while 2 representing 0.5 percent did not respond to that item.

However a cross tabulation was computed to find out whether educational background had any effect on one's ability to tell if there is a problem in a particular area. The results indicates that 30 of the respondents with degree; 26 out of 30 of the respondents with diploma; 54 out of 58 of the respondents with professional certificate; 48 out of 55 of the respondents were with SHS; 85 out of 97 of the respondents with JHS certificate; 33 out of 44 of the respondents with primary school and 58 out of 63 of the respondents also with other certificates were able to respond that there was a problem with the management of the landfill sites in their areas of residence.

This implies that it does not matter the educational level of an individual to be able to perceive problem of poor management of the landfill sites in their areas of residence. Also the income of the respondents does not affect their ability to perceive the problems of poor management of the landfill sites in their area. The age of the respondents also does not affect their ability to identify a problem of poor management of the landfill sites in Oblogo, Mallam and Abokobi.

Table 4.11: Specific landfill management problem

Problem	Frequency	Percent	Waste problem	
			Yes	No
Crude dumping	138	36.3	138	0
Dump site	57	15.6	57	0
Littering	103	27.1	103	0
Littering and crude dumping	20	5.3	20	0
No response	62	16.3		
Total	380	100.0		

Source: Field Survey, September, 2009

From Table 4.11 out of the total respondents interviewed on the specific problem they face with the management of the landfill sites, 62 representing 16.3 percent did not respond, 138 representing 36.3 percent complain of the crude way of dumping refuse at the landfill sites, 57 representing 15.0 percent complain of the location of the landfill sites in the areas, 103 representing 27.1 percent complain of littering of the environment with refuse from waste collection vehicles and individuals and 20 representing 5.3 percent complain of both littering and crude was of dumping of refuse at the landfill sites.

Data from the cross tabulation was computed to find out the specific landfill management problem perceived by the respondents. The result indicates that, out of the total respondents 138 of the respondents identify the specific landfill management problem in their area was crude dumping at the dump site by both residents and drivers of private waste contractors who dump refuse at site; 57 of the respondents identify the specific problem of landfill management in their area as the location dump site in the area, 103 of the respondents identify the specific problem of poor waste management as littering from the dump site, vehicles' over loaded with solid waste etc and 20 of the respondents identify the specific problem of waste management as littering from the dump site and crude dumping of waste at unauthorized places.

Table 4.12: Perception of health effect of the landfill sites

Response	No of Respondents	Percent
No	52	13.7
Yes	321	84.5
No response	7	1.8
Total	380	100.0

Source: Field Survey, September, 2009

From Table 4.12 out of the respondents interviewed, 52 representing 13.7 percent says the poor landfill management does not pose any health problem on the people living in the area, 321 representing 84.5 percent also claim that poor landfill

management pose health problem on the people living in the area while 7 representing 1.8 percent did not respond to the item.

The ability of the one to perceive the health effects of poor landfill management does not depends on their educational background, the income level and the age of the respondents. However 100 of the respondents who dump their waste direct on the dump site; 108 of the respondents who give their waste to the waste collectors and 113 of the respondents who burnt the waste themselves respond that poor landfill management posed health for the people living in the community. Also the most common sickness mention among others were malaria (109 respondents), cholera (35 respondents), diarrhea, typhoid fever, respiratory disease (20 respondents), TB (4 respondents), malaria and cholera (39 respondents) etc.

Table 4.13: Frequent of health problem

Frequent	No of Respondents	Percent
Once every week	30	7.9
Once in a month	39	10.3
Twice in a month	97	25.5
Once in three month	136	35.8
No response	78	20.5
Total	380	100.0

Source: Field Survey, September, 2009

From Table 4.13 out of the total respondents interviewed, 30 representing 7.9 percent fall sick once every week, 39 representing 10.3 percent fall sick once in every month, 97 representing 25.5 percent fall sick twice in every month, 136 represent 35.8 percent fall sick once in every three month and 78 represent 20.5 percent do not fall sick frequently.

Table 4.14: Distance respondents live from the landfill sites

Distant	Frequency	Percent	WTP		How frequent do you fall sick
			Yes	No	
Less than 50m	55	14.5	43	12	46
51m-100m	50	13.2	38	11	37
101m- 500m	58	15.3	40	17	56
501m-1km	50	13.2	34	16	42
1km-2km	98	25.8	78	19	85
2km and above	66	17.4	42	21	39
No response	3	0.8			
Total	380	100.0			

Source: Field Survey, September, 2009

From Table 4.14 out of the total respondents interviewed, 55 representing 14.5 percent lives less than 50m from the dump site, 50 representing 13.2 percent lives at distant of 50m to 100m from the dump site, 58 represent 15.3percent lives between 101m to 500m from the dump site, 50 represent 13.2 percent lives between 501m to 1.0km from the dump site, 98 representing 25.8 percent lives between 1.0km to 2.0km from the dump site and 66 representing 17.4 percent lives 2.0km and above from the dump site.

Data from the table, indicates that 43 out of 55 of the respondents living less than 50m from the landfill site were willing to pay to address the problems posed by the dump site. 38 out of 49 of the respondents living within 50m to 100m from the landfill site were willing to contribute to the address the problems posed by the landfill site. 40 out of 57 of the respondents living within 101m to 500m from the landfill site were willing to contribute to the address the problems posed by the landfill site. 34 out of 50 respondents who live between 501m to 1km from the landfill site were willing to contribute to the address the problems posed by the landfill site. 78 out of 97 of the respondents living within 1.1km to 2km were willing to contribute to address the problems posed by the landfill site. 42 out of 63 of the respondents who live 2km and above were willing to contribute to address the problems posed by the dump site.

This show that distance a respondent lives from the dump site will not affect the willingness to contribute to address the problems posed by the landfill site. However the distance the respondents live from the landfill site do not have direct influence on how frequent they fall sick but rather how they conduct themselves with respect the poor landfill management in the area.

Table 4.15: Willingness to contribute to the provision of recycling plant

Response	No of Respondents	Percent
No	126	33.2
Yes	237	62.4
No response	17	4.5
Total	380	100.0

Source: Field Survey, September, 2009

From table 4.15 out of the total respondents 126 representing 33.2 percent were not willing to contribute to the provision of recycling plant, 237 representing 62.4 percent were willing to contribute to the provision of recycling plant at the dump site and 17 representing 4.5 percent did not respond to the item.

Educational background and income level of the respondents had no effect on the willingness to contribute to the provision of recycling plan.

Table 4.16: Willingness to contribute to addressing the problem posed by the landfill sites

Response	No of Respondents	Percent
No	97	25.5
Yes	276	72.6
No response	17	4.5
Total	380	100.0

Source: field survey, September, 2009

From Table 4.16, out of the total respondents 97 representing 25.5 percent were not willing to contribute to addressing the problem posed by the landfill site, 276

representing 72.9 percent were willing to contribute to addressing the problem posed by the landfill site in the municipality and 7 representing 1.8 percent did not respond to the item.

Table 4. 17: Amount willing to contribute to addressed the problems posed by the landfill site

Amount in GH ¢	No of Respondents	Percent
0.0	77	20.3
0.1-0.9	23	6.0
1-5	123	32.2
5.1-10	44	11.7
10.1-15	4	1.1
15.1 and above	47	12.4
No response	62	16.3
Total	380	100.0

Source: Field Survey, September, 2009

Mean amount willing to contribute = 6.6281 Ghana Cedis

From Table 4.17, 77 representing 20.3 percent of the respondents' were not willing to contribute anything to address the problem posed by the landfill sites in their Municipality. However 23 representing 6.0 percent of the respondents were willing to contribute less than one Ghana Cedis to address the problem posed by the landfill sites while 123 representing 32.2 percent of the respondents were willing to contribute between one and five Ghana Cedis to address the problem posed by the landfill sites in their Municipality. Also 44 representing 11.7 of the respondents were willing to contribute between five and ten Ghana Cedis to address the problem posed by the landfill sites in their Municipality. Out of the total respondents 4 representing 1.1 percent of the respondents were willing to contribute between ten and fifteen Ghana Cedis to address the problem posed by the landfill sites in their Municipality. Moreover 47 representing 12.4 percent of the respondents were also willing to contribute more than fifteen Ghana Cedis to address the problem posed by landfill sites in the Municipality. The mean amount the respondents were willing to contribute to addressed the problem posed by the dump site 6.6281 Ghana Cedis.

4.4 Analysis of Willingness-to-Pay Results

Table 4.18: Case processing summary

Unweighted Cases (a)		Frequency (N)	Percent
Selected Cases	Include in Analysis	298	78.4
	No response	82	21.6
	Total	380	100.0

a. If weight is in effect, see classification table for the total number of cases.

Source: Field Survey, September, 2009

From the above Table 4.18 out of the total respondents, 298 of them were included in the analysis since 82 of them did not respond to the item.

Table 4.19: Classification Table; Step 0

Observed		Predicted		
		Willing to contribute		Percentage correct
		No	Yes	
Willing to contribute	No	0	64	0
	Yes	0	234	100
Overall Percentage		78.5		

a Constant is included in the model. b The cut value is .500

Source: Field Survey, September, 2009

From Table 4.19, given the base rates of the two decision options $64/298 = 21.5$ percent are not willing to contribute to addressing the problems pose by the landfill site in the area, 78.5 percent are willing to contribute to addressing the problem posed by the landfill site in the area, the best strategy is to predict, for every case, that the subject will be willing to contribute to addressing the problems posed by the landfill site in the area. Therefore one would be 78.5percent correct to predict the willingness to pay to addressing the problem posed by the landfill sites of the time.

Table 4.20: Variables in the Equation

		B	S.E.	Wald	Df	Sig.	Exp(B)
Step 0	Constant	1.296	.141	84.466	1	.000	3.656

Source: Field Survey, September, 2009

From the Variable in the equation the intercept model is given as $\ln(\text{odds}) = 1.296$. If the researcher exponentiates both sides of this expression, the researcher find that the predicted odds ($\text{Exp}(B)$) = 1.296. That is, the predicted odds of the willing to contribute to addressing the problems posed by the dump site are 3.656. Since 234 of the respondents are willing to contribute to addressing the problems posed by the landfill sites, the observed odds are $234/64 = 3.656$.

Table 4.21: Omnibus Tests of Model Coefficients

Step 1	Chi-square	Df	Sig.
Step	23.399	10	0.009
Block	23.399	10	0.009
Mode 1	23.399	10	0.009

Source: Field Survey, September, 2009

From Table 4. 21 above the Chi-Square value of 23.399 on 10 df, significant beyond 0. 009. The chi-square is the difference between two -2 log likelihood values. This is a test of the null hypothesis that adding the willingness to pay variable to the model has not significantly increased the ability to predict the decision made by the respondents.

Table 4.22: Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	286.642(a)	.076	.117

Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Source: Field Survey, September, 2009

From the Model summary the -2 Log Likelihood statistics is 286.642 indicates that the model had done better in predicting decisions. The R^2 statistic 0.076 means that 7.6 percent of the variation in the dependent variable is explained by the model.

Table 4.23: Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	3.992	8	.858

Source: Field Survey, September, 2009

Table 4.24: Contingency Table for Hosmer and Lemeshow Test

		Willing to contribute; No		Willing to contribute; Yes		Total Observed
		Observed	Expected	Observed	Expected	
Step 1	1	11	12.978	19	17.022	30
	2	9	10.141	21	19.859	30
	3	11	8.783	19	21.217	30
	4	8	7.484	22	22.516	30
	5	9	6.595	21	23.405	30
	6	5	5.504	25	24.496	30
	7	4	4.626	26	25.374	30
	8	2	3.692	28	26.308	30
	9	3	2.770	27	27.230	30
	10	2	1.428	26	26.572	30

Source: Field Survey, September, 2009

The Hosmer-Lemeshow tests the null hypothesis that there is a linear relationship between the predictor variables and the log odds of the criterion variable. Cases are arranged in order by their predicted probability on the criterion variable. These ordered cases are divided into ten groups (lowest decile [prob < 0.1] to highest decile [prob > 0.9]). Each of these groups is then divided into two groups on the basis of actual score on the criterion variable. This results in a 2×10 contingency table.

Expected frequencies are computed based on the assumption that there is a linear relationship between the weighted combination of the predictor variables and the log odds of the criterion variable. For the outcome = no (decision = not willing to contribute to addressing the problem posed by the landfill sites) column, the expected frequencies will run from high (for the lowest decile) to low (for the highest decile). For the outcome = yes column the frequencies will run from low to high. The chi-square statistic is comparing the observed frequencies with those expected under the linear model. A non-significant chi-square indicates that the data fit the model well.

Table 4.25: Classification Test; (a) Step 1

Observed		Predicted		
		Willing to contribute		Percentage correct
		No	Yes	
Willing to contribute	No	3	61	4.7
	Yes	1	233	99.6
Overall Percentage		76.2		

a The cut value is .500

Source: Field Survey, September, 2009

The classification table shows that this rule allows to correctly classify $233/234 = 99.9$ percent of the subjects where the predicted the willingness to contribute to the addressing the problem posed by the dump site was observed. That is, the percentage of occurrences correctly predicted. The rule also allows the researcher to correctly classify $3/64 = 4.7$ percent of the subjects where the predicted event was not observed. That is, the percentage of nonoccurrence correctly predicted. Therefore is a small decrease in the overall success rate, from 78.5 percent to 76.2 percent are willing to contribute to addressing the problem posed by the landfill sites. Therefore one would be 76.2 percent correct to predict the willingness to pay to addressing the problem posed by the landfill sites of the time.

Table 4.26: Variables in the Equation

		B	S.E	Wald	Df	Sig.	Exp(B)
Step 1(a)	Odour	0.744	0.471	2.489	1	0.115	2.104
	Farlive	0.227	0.103	4.863	1	0.027	1.254
	Howmuch	-0.109	0.084	1.708	1	0.191	0.897
	Solidwastep	0.527	0.422	1.558	1	0.212	1.694
	Earn	0.413	0.182	5.172	1	0.023	1.512
	Employ	-0.911	0.620	2.157	1	0.142	0.402
	Live	-1.026	1.227	0.698	1	0.403	0.359
	Educ	-0.140	0.103	1.835	1	0.176	0.870
	Age	0.043	0.087	0.248	1	0.618	1.044
	Marital	-0.652	0.370	3.115	1	0.078	0.521
	Constant	2.158	1.816	1.413	1	0.235	8.657

Source: Field Survey, September, 2009

a Variable(s) entered on step 1: odour, farlive, howmuch, solidwastep, earn, employ, live, Educ, Age, Marital.

Given the model to predict the odds the willingness to contribute to addressing the problem posed by the dump site. The odds prediction equation is given as $ODDS = e^{a+bx}$, where **a** is the constant, **b** is the coefficients of the variables and **x** is the variables.

For odour, if the response is no (odour = 0), then the $ODDS = e^{2.158+0.744(0)} = e^{2.158} = 8.654$. This means that the respondent is 8.654 as likely to be willing to contribute to addressing the problem posed by the landfill sites. If the response is yes (odour = 1), the $ODDS = e^{2.158+0.744(1)} = e^{2.902} = 18.211$. This means that respondent is 18.211 most likely to be willing to contribute to addressing the problem posed by the landfill sites.

From the above calculation, the ODDS are converted to probabilities in predicting the willingness to pay of the people living in these Municipalities. The probability (Y) = $ODDS / (1 + ODDS)$.

Odour (no=0), $Y = 8.654 / (1 + 8.654) = 8.654 / 9.654 = 0.896$. That is, the model predicts that about 89.6 percent of those who are not affected by the odour from the landfill

sites are likely to be willing to contribute to addressing the problem posed by the sites than not to be willing to contribute to addressing the problem posed by the landfill sites. For those that are affected by the odour from the landfill sites, $Y = 18.211 / (1 + 18.211) = 18.211 / 19.211 = 0.948$. That is, the model predicts that about 94.8% of those affected by the odour from the landfill sites are more likely to be willing to contribute to addressing the problem posed by the landfill sites than are not willing to contribute to address the problem posed by the landfill sites.

Also from the Table 4.33 the odds ratio Exp (B) is 2.104. That tells that the model predicts that the odds of willingness to contribute to addressing the problem posed by the landfill sites are 2.104 times higher for those affected by the odour from the landfill sites than those that are not affected by the odour from the landfill sites to be willing to contribute to addressing the problem posed by the landfill sites. For those affected by the odour from the landfill sites, the odds are 18.211 and those that are not affected by odour from the landfill sites are 8.654.

Therefore the odds ratio is $18.211 / 8.654 = 2.104$. The 2.104 odds ratio for odour indicates that the odds of willing to contribute are more than not willing to contribute to the addressing the problem posed by the landfill sites. Inverting this odds for easier interpretation, for every one percentage increase in the effect of the odour from the landfill sites on the people living in this area there was about 2.104 percent increase in the respondents willing to contribute to the addressing the problem posed by the landfill sites.

However with respect to whether the respondents pay for their solid waste management, if the response is no (solidwastep = 0), then the ODDS = $e^{2.158 + 0.527(0)} = e^{2.158} = 8.654$. This means that those who do not pay for solid waste management there is 8.654 likely to be willing to contribute to addressing the problem posed by the landfill sites. If the response is yes (solidwastep = 1), then the ODDS = $e^{2.158 + 0.527(1)} = e^{2.687} = 14.688$. This means that those who pay for their solid waste management is 14.688 most likely to be willing to contribute to addressing the problem posed by the landfill sites.

Therefore the probability of those who do not pay for the solid waste management is given as $Y = 8.654 / (1 + 8.654) = 8.654 / 9.654 = 0.896$. That is, the model predicts that

about 89.6% of those who do not pay for solid waste management will be willing to contribution to address the problem posed by the landfill sites. Probability of those who pay for solid waste management is given as $Y = \frac{14.658}{1+14.658} = \frac{14.658}{15.658} = 0.936$.

This means that the model predicts that about 93.6% of those who pays for solid waste management are more likely to be willing to contribute to addressing the problem posed by the landfill sites. Also from the table the odds ratio is 1.694. That tells that the model predicts that the odds of willingness to contribute to the addressing the problem posed by the landfill sites are 1.694 times higher for those who pay for solid waste management than those who do not pay for solid waste management. For those who pay for solid waste management, the odds are 14.658 and those who do not pay for solid waste management are 8.654. Therefore the odds ratio is $\frac{14.658}{8.654} = 1.694$.

The 1.254 odds ratio for distance live from the landfill sites indicates that how far the respondents live from the landfill sites shows that as distance one live from the landfill sites increases their willingness to contribute to addressing the problem posed by the landfill sites would reduce. The 1.512 odds ratio for the income earn by the respondent indicates that for every one percent increase in the income of a respondent would increase the respondent's willingness to contribute to address the problem posed by landfill sites by 1.512.

4.5 Analysis on the Effects of Landfill Sites

4.5.1 Problem of landfill sites management

The problems of landfill sites management in the sampled Municipalities were indiscriminate dumping of refuse, littering from the sites and the location of the landfill sites in the Municipalities. From the visits made to various residential areas, and interviews held with private waste contractors and Municipal Assembly officer as well as Waste Management Department officer revealed that these problems existed because there is difficulty of getting land for final disposal of refuse. A survey carried out in low income high density population areas in 365,550 households in Accra

revealed only 41 per cent of these households have solid waste disposal facilities provided in or around their houses (Ghana Statistical Service, 2002).

4.5.2 Human health and social effects of the landfill sites

There is high prevalence of malaria, cholera, diarrhoea, typhoid fever, upper respiratory infections etc. in the municipalities as a result of the landfill sites and how it is being managed. “Common infectious diseases like malaria, intestinal worms, and upper respiratory infections are among the most common health problems reported at the out-patient facilities in Accra, and majority of these cases are residents in and around the slums” (Songsore and McGranahan, 1993) where sanitation is poor.

The usually high temperatures associated with the landfill sites undoubtedly facilitate high decomposition rates and degradation of organic components of the waste to produce landfill gases and leachate. Unhealthy odours almost often emanate from these sites spreading to the surrounding residences.

The disposal of wastes in landfill sites has increasingly caused concern about possible adverse health effects for populations living nearby, particularly in relation to those sites where hazardous waste is dumped.

4.5.3 Environmental effect of landfill sites

As a result of no covering of the landfill sites, and the uncollected waste, adverse aesthetic impacts on the environment occur from windblown litter. The waste, which contains a high amount of plastic bags are blown about by the wind. This windblown litter makes the area unsafe and creates unsightly conditions in the environment. The litter and plastics make parts of the towns very untidy and unhygienic.

Also, the landfill themselves have very un-aesthetic appearance. The locations of the landfill sites raise the problem of decreasing value of land and landed property in these communities where they are located. According to the Ministry of Local Government (2003) report, assets such as land and houses around the dump sites have lost value as a result of the presence of the leachate from waste, odour, rodents and flies, which make people to avoid such environments.

4.5.4 Effect on running Water and underground Water

The interviews held with the waste management officers revealed that the closeness of the Oblogo waste landfill sites does not have any effect on the Densu River at Weija which is a source of drinking water and where treatment of the drinking water takes place because the dump site is in the downstream whilst the dam is at the upper.

Serious leachate generations occur at the Mallam, Oblgo and Abokobi landfill sites especially after rainfall as the leachate can be seen gushing out into areas at the foot of the waste dump where houses are built and the leachate floods enter the residents' compounds (Ministry of Local Government, 2003). These leachates which obviously contain pathogens are a direct risk to human health and a source of contamination to groundwater and surface waters.

Leachate the potentially polluting liquor which accumulates beneath a landfill site resulting from the infiltration and percolation of rainfall, groundwater, runoff, or flood water into and through an existing or abandoned solid waste landfill site. Leachate contains substantial amounts of dissolved organics (BOD and COD), Xenobiotic Organic Compound (XOCs), inorganic salts, ammonia, heavy metals and other toxicants (Christensen et al 2001 and Pivato and Gaspari 2005). These compounds have the potential to cause harm to the environment and human health (Paxeus, 2000).

4.6. Chapter Summary

This chapter has dealt with the descriptive analysis of the data as well as the analysis of the willingness to pay for improvement in the management of Abokobi, Mallam and Oblogo landfill sites in the Ga East and South municipalities in Accra. The results points to the fact that, there is a mismanagement of the landfill sites in these communities with a lot of effect on the people living in these areas. Also majority of the residents in these vicinities was ready to contribute for the effective management of the landfill sites. It also brought to the fore, the need for people to change their attitude towards waste disposal.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter deals with the summary, conclusions and recommendations of the study. The first part recaps the main objectives of the study, population and sample, data processing and analysis. The second part focuses on the main results whilst the third and final focuses on recommendations based on the main findings of the study.

5.2 Summary and Major Findings

The main objective was to determine the extent of landfill site management challenges in the Ga East and South Municipalities and the extent to which the landfill sites in Mallam and Oblogo in the Ga South Municipality and the landfill site in Abokobi in the Ga East Municipality affect the people living in these areas and their willingness to contribute to address problem without Government intervention.

The two Municipalities that is Ga East and Ga South both have landfill sites which have been in existence for a long time and again most of the environmental problems that have been making the headlines both in the print and electronic media have come from these municipalities.

A sample of 380 respondents was drawn from a combined population of households from Ga East and South for the study. The researcher employed both descriptive statistics and the contingency valuation method (CVM) to assess the willingness to pay on the part of the residents to address the problems posed by the landfill sites in Abokobi, Mallam and Oblogo in the Ga East and Ga South Municipalities. The analysis of the data brought out the following findings:

❖ Problems of landfill sites management

There was an incidence of crude/indiscriminate dumping of refuse at the landfill sites by both residents and drivers of waste contractors' who come to dispose of refuses at various landfill sites. It also reveals that littering of refuses from the landfill sites into the areas of residence in these Municipalities as a result of the location of the landfill

sites in these municipalities. The poor service delivery was as a result of inadequate logistics of the service providers and also difficulty of getting land for final disposal sites.

Implication: This shows that because the refuse was not curbed people would not fill comfortable living in these areas and therefore would affect the land and housing value which intern affect the development of the communities.

❖ Effect of the landfill sites

Socio-economic effect: It was revealed from the finding that unhealthy odour emanates from the landfill sites and spread into the residence of the people living in the communities. Also it comes out that leachate from the waste, flies and rodents from the landfill sites into the residences which make the place unworthy for the people living there.

Health effect: Due to the location of the landfill sites and how it is been manage in the communities there is high prevalence of infectious diseases like malaria, cholera, diarrhoea, typhoid fever among others.

Environment effect: The analysis shows that smoke from the burning of refuses at the landfill sites spread to the residence, noise from vehicles bring solid waste to the landfill sites for disposal was a broader for residents. Also the waste, which contains a high amount of plastic bags are blown about by the wind. This windblown litter makes the area unsafe and creates unsightly conditions in the environment. The litter and plastics make parts of the towns very untidy and unhygienic.

Effects on running and underground water: The interviews held with the waste management officers revealed that closeness of the Oblogo waste landfill site does not have any effect on the Densu River at Weija which is a source of drinking water and where treatment of the drinking water takes place because the landfill site is in the downstream whilst the dam is at the upper. However because of the serious leachate generations that occur at the landfill sites and the leachate obviously contain

pathogens contaminate the underground and running water and makes it unhygienic for drinking.

Implications: The findings indicate that people would not be willing to live in these areas and therefore it would affect land value and housing value in these areas. Also this could lead to outbreak of diseases which would put pressure on the districts health insurance scheme. Also because the leachate had contaminate both groundwater and surface water if there is any problem with the current source of water then those living in these areas would have difficulty in getting portable water.

❖ Willingness to Contribute to Address the Problem Posed the by Landfill Sites

The analysis indicates that the average amount respondents were willing to contribute was found to be 6.6281 Ghana Cedis. The predicted odds of the willing to contribute to addressing the problems posed by the dump site are 3.656. The model predicts 76.2 percent to the willingness to pay to addressing the problem posed by the dump site of the time. Educational background and income level of the respondents had no effect on the willingness to contribute to address the problem posed by the dump site.

Also the distance a respondent lives from the landfill sites does not influence their willingness to contribute to address the problem posed by the landfill sites. Those that are directly affected by the landfill sites are more likely to be willing to pay to address the problem posed by the landfill sites without Government intervention.

Implication: The interaction with the waste management officers from the assemblies, the waste management department and private waste contractors revealed that the problem of mismanagement of the landfill sites in the communities can partly be blamed on inadequate funding. The analysis of the willingness to pay shows that the people living in the communities are willing and ready to address the problem posed by the landfill sites. This is a good sign for Municipal Assemblies and waste contractors to contact the communities in managing the landfill sites in the municipalities.

5.3 Recommendations

It is recommended that a thorough investigation into landfill sites management challenges, the perceived effect of mismanagement of landfill sites and the willingness on the part of the respondents to pay to address the problem posed by the landfill sites was undertaken in the sampled region using a larger sample size and to determine the willingness to pay for the problem posed by poor management of landfill sites.

The Municipal Assemblies and private waste contractors should seek to proper management of the landfill sites in the communities. This will reduce the risk of contamination and pollution in the communities. This should be supported by education to change peoples' behaviour towards the proper and consistent use of the landfill sites the incidence of public health diseases may reduce.

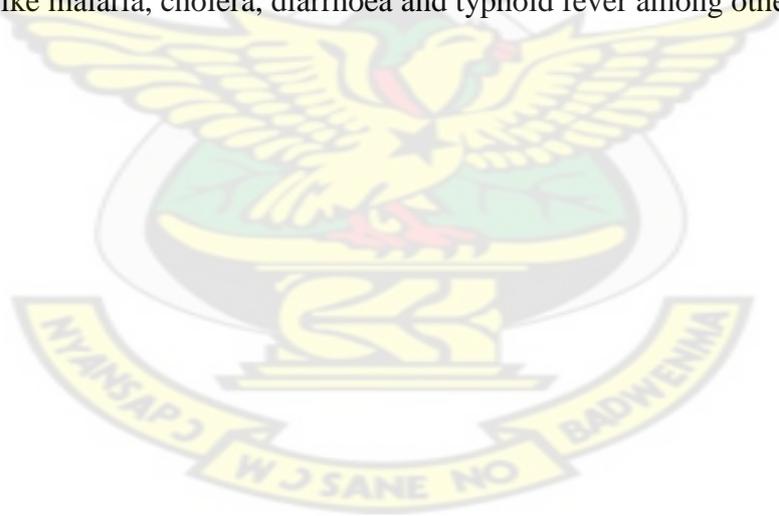
The Assemblies and the waste management department must collaborate with the private waste contractors to effectively manage the landfill sites. Also, the city authorities must ensure that the workers are well trained in solid waste management. They should also supervise and make sure that the landfill sites are covered with sand or gravels to reduce the odour and flies from the waste into the residence. It is also recommended that communities would be educated on the effect of indiscriminate dumping of refuse.

Interacting with the waste management officers from the assemblies, the waste management department and private waste contractors revealed that the problem of mismanagement of the landfill sites in the communities can partly be blamed on inadequate funding. From the study it revealed that the people living in the communities are willing to contribute to address the problem posed by the landfill sites. Therefore it is recommended that Government should introduce sanitation tax to address sanitation problems since the waste at the landfill sites was not from these communities alone. It is also recommended that Government should apply the polluter-pay-principle in order to help the waste contractors to get money to provide quality service.

5.4 Conclusions

It was evident from the study that the effects of the landfill sites on the respondents had a significant relation with the respondents' willingness to contribute to address the problems posed by the landfill sites. That is, households which are exposed to the odour emanating from the site into their residence, coupled with flies from the waste and leachate running to their residence have higher interest in contributing to addressing the problems posed by the landfill sites. The study also showed that majority of households in the sampled municipalities was generally low income earners with relatively low educational backgrounds.

The mode of disposal by some residents was through burning which also can lead to the pollution of the atmosphere with its attendant environmental and health consequences. The study also showed that the landfill sites management problem gets worse off during the raining season. At this time the leachate generates serious decomposition from the landfill sites, which contributes to outbreak of infectious diseases like malaria, cholera, diarrhoea and typhoid fever among others.



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Appendix A: Questionnaire for Household Heads

In recent years, there has been an increasing spate of sanitation challenges which has raised lots of concern in official quarters. This study seeks to delve into the waste management situation and adduce plausible solutions to the menace. You are assured of maximum security and privacy of whatever information you provide us. Thanks in advance for your cooperation.

Instruction: Please tick [✓] in the appropriate box.

SECTION A: PERSONAL DATA

1. Gender : Male Female
2. Marital Status: Single Married
3. Age: 21 -25 years 26 -30 years
31 – 35 years 36 -40 years
41- 45 years 46 -50 years
51 – 55 years 56 -60 years
61+ years
4. No. of children (please specify):
- None 1 – 3
4 – 6 7 – 9
10 – 12 13 or more

5. Educational background/Qualification

- i. Degree Diploma
- iii. Professional Certificate iv. Senior High School
- v. Junior High School vi. Primary School
- vii. Others (please specify)

6. Do you live in this vicinity?

Yes No

7. How long have you lived in this vicinity?

- Less than 1 year 1 -5 years
- 6-10 years 11-15years
- 16 and above

8. Are you employed?

Yes No

9. How much do you earn in a month?

- Less than GH50 50-150 Ghana Cedis
- 151-250 Ghana Cedis 260-490 Ghana Cedis
- 500 and above

10. Do you have a waste disposal bin?

Yes

11. How do you dispose off your solid waste

- At the damp site ste collectors
- Burnt

12. Do you pay for your solid waste management?

Yes No

13. How do you pay for the solid waste?

daily weekly
monthly

14. How much do you pay for your solid waste?

.....

15. Have you ever attended any workshop or course on environmental management?

Yes No

16. Do you have problem with solid waste management in your area?

Yes No

17. What specific solid waste management problem do you have in the area?.....

18. Does the poor waste management pose any health problem on the people living in community?

Yes No

19. If yes what specific health problem does the poor waste management pose.....

20. Have you or members of your family ever suffered this problem before?

Yes No

21. If yes for how long did take?

A day	<input type="checkbox"/>	2 days	<input type="checkbox"/>
3 day	<input type="checkbox"/>	1 week	<input type="checkbox"/>
2 weeks	<input type="checkbox"/>	more than 2 weeks	<input type="checkbox"/>

22. What hospital do or family members normally attend?.....

23.

24. Do you know of anyone in this vicinity who has also suffered a health crisis as a result of the poor waste management?

Yes No

25. Does the poor solid waste management in your area cause flood when it rain?

Yes No

26. Are the gutters and drains in your vicinity choked by the solid waste?

Yes No

27. Are the streams in your vicinity potable for drinking?

Yes No

28. During what time in the year do you experience the effect of the poor waste management more serious?

a. Between January and April

b. Between May and August

c. Between September and December

29. What are the specific causes of the poor waste management in your vicinity?

.....

30. Who is responsible for solving these problems

a. Community Municipal Assembly

b. Government private waste operators

31. In your own opinion how the problems should be solved?

KNUST

32. Is the dump in this municipality beneficial to the people living in this area?

Yes No

33. Do you pick empty containers from the dump site and sell to make your living?

Yes No

34. Do you know somebody in your community who picks empty containers from the dump site and sell to make his/her living?

Yes No

35. Does the dump site in the area pose any health problems on the people living in the community?

Yes No

36. What specific health problems are posed by the dump site in the Municipality?

.....

37. How frequent do you or family members fall sick?

- a. Once every week c. Twice in a month
- b. Once in a month d. Once in three months

38. How far do you live from the dump site?

- a. Less than 50m 50m-100m
- b. 101m- 500m 501-1km
- c. 1km-2km 1. 2km+

39. Do you know of anyone in this vicinity who has suffered a health crisis as a result of the dump site?

- Yes No

40. Does the dump site pose any environmental crisis?

- Yes No

41. Do you think that the nearness of the dump site to the water treatment facility will have any effect on the source of water in the municipal?

- Yes No

42. Does leachate from the dump site run through the town?

Yes No

43. Does odour often emanate from the site to your residence?

Yes No

44. During what times of the year are these problems serious?

a. January – April May-August

b. September- December

45. In your opinion, how can the problem posed by the dump site be solved?

.....
.....
.....
.....

46. Are you willing to contribute to addressing the problem posed by the dump site?

Yes No

47. What percentage of your income you will be want to contribute to have the problem pose by the dump site addressed?

48. Will you be willing to contribute to the provision of recycling plant?

Yes No

49. What percentage of your monthly income will you want to contribute for the provision of a recycling plant?

50. What percentage of your monthly income you will accept as compensation if government want to construct a dump site in your vicinity in the future?

51. If the problem of poor waste management is blame on inadequate finances suggest about three ways resources can be mobilized for effective waste management.

.....
.....
.....
.....



Appendix B: Interview Guide for Institutions

1. Name: Derick Tata-Anku
2. Name of the organization: Ga East Municipal Assembly(Waste Management Department)
3. What is your position in the Assembly: Head of waste management department
4. How long have you been working in your current job: 12 years
5. Do you think domestic solid waste management is a problem and if so why and what are the cause?

Answer

Yes, because most of the indigenous communities are not planned so access to the houses for refuse collection is difficult. Also due to the low income levels, the private waste collectors are reluctant to work in these communities.

6. How do you think this problem can be solved?

Answer

A system of communal collection is to be arranged with the private sector.

7. How do you treat the waste at the dump site?

Answer

It is spread and compacted.

8. Presently what are Municipal Assembly's doing in term of solid waste management?

Answer

The waste management department is being developed to have the capacity to handle all aspect of waste in the municipality. The major activity is the scouting for permanent disposal site to build a landfill.

9. Who are the stakeholders involved in the solid waste management in the Municipal Assembly?

Answer

The stakeholders involved are; residents, private contractors, local council staff, assembly members, municipal assembly and community based organization.

10. Is there any policy on solid waste management and if so who came out with the policy?

Answer

Yes the municipal assembly came out with the policy. The policy basically is targeted at least 80 percent coverage of door to door refuse collection, whereby the policy of polluter pay is being initiated. So the assembly's expenditure on waste management has been going down since the policy got implemented.

11. What is the assembly's role in waste management?

Answer

The assembly plays the role of planning, implementation, supervision and monitoring of waste management activities. The assembly is responsible for providing final disposal site, all waste management infrastructure like skips etc.

12. What is the community contribution to the domestic solid waste management?

Answer

The community is to provide transit points for refuse collection and also pay for waste collection.

13. Are the people in the Municipality where the dump site is willing to contribute to addressing the problem posed by the dump site?

Answer

The people who live close to the final disposal site have cooperated so much with the municipal assembly but when the expected maintenance levels of the site fails, they protest and some time call for the removal of the site from its location. The ministry of health has written so many letters demanding the closure of the site.

14. What percentage of their income do you think they will want to contribute to addressing the problem posed by the dump site?

Answer

Zero percent

15. If the problem of poor waste management is blamed on inadequate finances suggest about three ways resource can be mobilized for effective waste management.

Answer

Inadequate finances are blame for poor waste management. Three ways in which resources can be mobilized are;

- (a) Service fees from polluter payment;
- (b) Setting aside part of building permit or property rate fees for waste management;
- (c) Central Government releasing the total district assembly common fund to the MMDA without paying some of the contractors at source.

16. Do EPA give you any train on how to management waste?

Answer

No, in fact, EPA is a collaborator and not a training institution for waste management.

17. What kind of training do they give to you?

We have collaborative seminar and workshops.

Name: Anthony Adotey

Name of the organization: Ga West Municipal Assembly (Waste management department)

Position in the Assembly: Municipal Waste Management Officer

How long have you been working in your current job: 12 years

Do you think domestic solid waste management is a problem and if so why and what are the cause?

Answer

Yes it is. Most people in the community don't appreciate the essence of a clear environment. Secondly because the Municipal has got many rural areas (undeveloped areas), people tend to dump refuse into undeveloped plots or uncompleted buildings etc. Thirdly, though communal collection sites are provided, some of these residents find it difficult to carry the refuse to the central collection points (containers site) and therefore find it easy to dump the refuse either in open drains or behind another resident's window etc.

How do you think this problem can be solved?

Answer

- a) Public education on the need to keep the environment clear and the effects of improper waste management can cause to the health of the residents i.e. outbreak diseases.
- b) Prosecution of offenders at the law courts.

- c) Areas which are accessible are being provided with door to door service.
- d) Inaccessible areas are provided with communal (container) service.

How do you treat the waste at the dump site?

Answer

No treatment is given to the refuse at the dump site.

Presently what are Municipal Assembly's doing in term of solid waste management?

Answer

The Assembly plays to expand the coverage of the door to door service. Another thing too is that communal containers are regularly picked when full and sent to the final disposal area.

Who are the stakeholders involved in the solid waste management in the Municipal Assembly?

Answer

The metropolitan, Municipal, District Assemblies, private refuse contractors, Zoom lion Ltd and residents (community).

Is there any policy on solid waste management and if so who came out with the policy?

Answer

Yes. Environmental Sanitation Policy from Ministry of Local Government

What is the assembly's role in waste management?

Answer

- a) They register and regulate (monitor) the activities of private refuse contractors.
- b) Collect (evacuate) Assembly's refuse containers to the final disposal areas.
- c) Environmental Health Officers do domiciliary inspections together with Sanitation Guards to ensure that residents keep their environment clean.
- d) Collaborate with Zoom lion in the collection (evacuation) of refuse at the container site for final disposal.

What is the community contribution to the domestic solid waste management?

Answer

- a) To store refuse in their homes and convey some to the communal containers
- b) Occasional clean up exercises by residents, associations, opinion leaders (Assembly members).

Are the people in the Municipality where the dump site is be willing to contribute to addressing the problem posed by the dump site?

Answer

We don't control the dump site. It is Ga East Municipal Assembly and Accra Metropolitan Assembly (AMA)

What percentage of their income do you think they will want to contribute to addressing the problem posed by the dump site?

Answer

The Assemblies are trying to convince the Ministry of Local Government on the polluter pay principle whereby those who pollute the environment will be expected to pay for the cleaning up of refuse created.

If the problem of poor waste management is blamed on inadequate finances suggest about three ways resource can be mobilized for effective waste management.

Answer

- a) polluter will have to pay (polluter pay principle)
- b) Strong injection of capital from the Central Government in the acquisition of equipment, refuse collection vehicles.

Do EPA give you any train on how to management waste?

Answer

Not yet

Name: James Dadu Nyangan

Name of the organization: Ga South Municipal Assembly (Waste Management Department)

Your position in the Assembly: Municipal Waste Management Officer

How long have you been working in your current job: 3 years

Do you think domestic solid waste management is a problem and if so why and what are the cause?

Answer

Yes, service providers are not given good services because the coverage area for each contractor is too big for them to manage properly and lack of logistics. Also the fees they charge are too high for the residents to able to pay and therefore some find it easy to dump refuse into uncompleted building, undeveloped plots etc. Secondly poor road network waste collection vehicle to provide the door to door services. Lastly attitude of some the residents though the communal collection site are provided, they

find it difficult to carry the refuse to the central collection point (container site) and therefore find it easy to dump refuse into open drains or behind another residents window etc.

How do you think this problem can be solved?

Answer

- a) Divide service areas into smaller manageable for the service providers;
- b) Public education on the need to pay for the waste collection that dumping refuse any has some environmental effects and health effects ie outbreak of diseases like malaria, cholera, typhoid fever ect;
- c) Improvement of the road network;
- d) Service providers should seek bank assistance.
- e) There should be bye laws on people registering with waste contractors.
- f) The Assembly should be involved in the waste management rather than private contractors.

How do you treat the waste at the dump site?

Answer

The Assembly is not in charge of the dump site. Accra Metropolitan Assemble who is in charge of the dump site but they don't treat it.

Presently what are Municipal Assembly's doing in term of solid waste management?

Answer

- a) The assembly is planning to acquired a land for landfill site
- b) Subdivide the coverage of the service providers into manageable size.

Who are the stakeholders involved in the solid waste management in the Municipal Assembly?

Answer

The stakeholders that are involved are Central Government, private waste contractors and the Municipal assembly.

Is there any policy on solid waste management and if so who came out with the policy?

There is no policy that spells out what the Assembly should do in terms of waste management is consent. It is the Assembly rather that has made it that the private waste contractors should provide house to house collection whilst the assembly provide the communal service.

What is the assembly's role in waste management?

Collection of the assembly central containers it full and supervision of the activities of the private waste contractors.

Do you think that the nearness of the dump site to the water treatment facility will have any effect on the sources of water?

Answer

No because the dump site is in the downstream of the dam. If there will be any effect it will be at the downstream. More over the people living in this area have access to pipe born water and therefore does not depend on running water or underground water as their source of water.

What is the community contribution to the domestic solid waste management?

Are the people in the Municipality were the dump site is be willing to contribute to addressing the problem posed by the dump site?

Answer

I don't think they will contribute because Accra Metropolitan Assembly (AMA) paid huge sum of money to the chief for the acquisition of that area which the people are aware of it. Also most of the people are squatters.

What percentage of their income do you think they will want to contribute to addressing the problem posed by the dump site?

Answer

Zero percent

If the problem of poor waste management is blamed on inadequate finances suggest about three ways resource can be mobilized for effective waste management.

Answer

- a) Polluter must pay principle
- b) Bank loan
- c) Bye law so offenders could be charge

Do EPA give you any train on how to management waste?

Answer

Not yet

What kind of training do they give to you?

Name: Samuel Kpodo

Name of organization: Waste Management Department

Your position in the Waste management Department: Principal Environmental Health Technologist

How long have you been working on the current job? 10 years

Tell me about what goes into solid waste management?

Answer

Accra with an estimated population of about 4 million generates about 2000 tons of waste on per day. The waste generate per person per day is about 0.5kg on average. Out of the total waste generate a day the department through the service providers is able to collect only 1500 constituting 75 percent with 500 tons forming 25 percent is not collected. The 500 tons of waste which is collected does not get to the container site and this is due to bad attitude of the residents who find it easy and convince to dump the refuse into open drains or burnt the refuse in their homes or litter it around. Also the increase in population with inadequate logistics to collect the waste in the city, however there is political interferences as well as financial constraints for effective service deliver. More over there are good bye laws against littering of refuse around or burning of refuse at home but there is weak enforcement of these bye laws and also difficult in getting land for final disposal site, i.e. dump site.

How is solid waste managed in the city- Accra?

Answer

Solid waste management in the city is collection, transportation, treatment and final disposal. Treatment comes in when waste is seen as a resource. The waste is wash, clean and reused or recycles or turns into energy but here treatment is limited. The treatment is on a small scaled and even that is done by the private sector. The waste that are most treated is the metals and aluminum the plastics do not have much value since 1kg worth 20pessaws because there is no company into recycling plastics.

What are the means of domestic solid waste disposal in the city?

Answer

The means of solid waste disposal are land filling and composing. But composing is on small scale by the private sector whilst almost all the waste generates is sent to the land fill site for disposal.

Do you think solid waste management is a problem and if so why and what are the causes?

Answer

Yes solid waste management is a problem. This is because;

- a) There is limited public awareness and education on waste management;
- b) Weak enforcement of the bye laws;
- c) Political interference;
- d) Difficult in getting land for final disposal site
- e) Inadequate logistics;
- f) Financial constraint;
- g) Population increase.

How do you think this problem can be solved?

Answer

- a) Decongestion of the city centre
- b) Public awareness/education
- c) Enforcement of bye laws
- d) Applied polluter must pay principle
- e) Waste reduction, waste reused, waste recycling.

How do you treat the waste at the dump site?

Answer

Convert the waste for reuse. So far Accra Metropolitan Assembly (AMA) is not doing formally but there are people who are. The statistics show that recycle are metal aluminum and plastics with some into composing.

Presently what is WMD doing in terms of waste management?

Answer

- a) We manage the final disposal site
- b) Monitor the activities of the private waste contractors.
- c) Sweeping of principal street, public cleansing, drains cleansing, weeding
- d) Maintenances of the sanitary tracts eg roll on and roll off, skipper etc

Who are the stakeholders involved in the solid waste management in Accra?

Answer

The stakeholders involved in the solid waste management are Environmental Protection Agency, Metro Health Department, Ministry of Local Government and the private waste contractors.

What is the community contribution to the domestic waste management?

Answer

- a) Control the waste generate;

- b) Make the waste available for the AMA to manage and this done by sending the refuse to the container site or if it is house to house the waste is giving the waste contractor;
- c) Paying for the service provide.

What are the roles of the Municipal Assembly's in solid waste management?

Answer

The role of Municipal Assemble is into collection, transportation, treatment and final disposal.

Do you think that the nearness of the dump site to the water treatment facility will have any effect on the sources of water?

Answer

No because the dump site is in the downstream of the dam. If there will be any effect it will be at the downstream.

Are the people in the Municipality where dump site be willing to contribute to addressing the problem posed by the dump site? No

What percentage of their income do you think they will want to contribute to have the problem posed by the dump site addressed? Zero percent

If the problem of poor waste management is blamed on inadequate finances suggest about three ways resource can be mobilized for effective waste management.

Answer

Polluter must pay principle

Waste reduction, waste reused and waste recycling

Name: peter Dagadu

Name of the organization: Zoom lion Ghana Ltd

Position in the organization: Head land fill unit

How long have you been working on your current job: 2 years

Do you think solid waste management is a problem and if so why and what is the causes?

Answer

Yes, because some people do not find anything wrong with indiscriminate dumping of refuse and therefore find it easy and convince to dump refuse into drains, behind

others windows, uncompleted buildings etc though the communal containers were provided they finds it difficult to carry their to the container site. However some individual also do not see why they should pay solid waste management so instead of sending the refuse to the container site or house to house collection at a fee they preferred to dump the refuse into an uncompleted building or open drains or burnt it.

How do you think this problem can be solved?

Answer

- a) Provide more communal containers
- b) Continue with the free bin promotion
- c) Educate the people on effect of indiscriminate dumping of refuse

What about funding

Answer

Central Government takes a portion of district assembly common fund from source to funds communal containers service. Then residents pay a service fee for the house to house collection.

Are the people in the Municipality where dump site is be willing to contribute to addressing the problem posed by the dump site?

Answer

No, because even the waste that they have generate that they should pay for collection fee they are not willing pay.

If the problem of poor waste management is blamed on inadequate finances suggest about three ways resource can be mobilized for effective waste management.

Answer

- a) Polluter must pay principle
- b) Tax plastic producing companies
- c) Sanitation tax

Name: Hon L. E. A. Nartey

Name of the organization: Yafuru Waste Ltd

Position in the organization: Field Manger

How long have you been working on your current job: 16 years

Do you think solid waste management is a problem and if so why and what is the causes?

Answer

Yes, because stakeholders fail to come to common terms in handling domestic solid waste. The exerciser requires heavy capital injection which is not available and therefore makes it difficult for quality service provision. This is because polluter is not paying but rather Government which also owes us and complains of inadequate fund. Also some individuals are fun of indiscriminate dumping of refuse.

How do you think this problem can be solved?

Answer

- a) Government should work hand in hand with the private solid waste managers;
- b) Government should agree with the private waste managers and introduce the polluter must pay principle;
- c) Government should stop taking a portion district assembly common fund of MMDA to pay some of the waste contractors source leaving other.

What about funding

Accra Metropolitan Assembly funds the communal container service whilst residents pay for house to house service.

Are the people in the Municipality where dump site is be willing to contribute to addressing the problem posed by the dump site?

Answer

No, because they think the waste contractors had bought the problem so why should they pay for addressing the problem.

If the problem of poor waste management is blamed on inadequate finances suggest about three ways resource can be mobilized for effective waste management.

Answer

- a) Application of polluter must pay principle;
- b) Sanitation tax;
- c) 3 percent increase in VAT for solid waste management

The interview results indicates that, the various stakeholders agree that management of solid waste is a major challenge confronting the city and that more drastic measures have to be taken to ensure that we have proper disposal of waste and rid the city of filth which is causing both environmental and health hazards. They also shed light on the need for people to change their attitude towards waste disposal in order to make the management of waste easier for the authorities.

KNUST





The dump site at Abokobi in the GEMA



Waste collection vehicle loaded with refuse to off load at Abokobi dump site (GEMA)



Waste collection vehicle offloading refuse with scavengers (GEMA)waiting at Abokobi dump site (GEMA)



Scavengers picking items at Abokobi dump site



metal picked from the Abokobi dump site by scavengers



Plastics picked from Abokobi dump site by scavengers



The dump site at Oblogo in the Ga South Municipal Assembly (GSMA)



Leachate from the dump site Oblogo (GSMA) to the town

