UNIVERSITY OF CAPE COAST

SOLID WASTE MANAGEMENT IN THE ASOKWA SUB-METROPOLIS IN THE KUMASI METROPOLITAN ASSEMBLY AREA

BY

BENJAMIN KYE AMPADU

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DECLARATION

Candidate's Declaration

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

Candidate's Name: Benjamin Kye Ampadu

Signature: …… Date: ……..……

Supervisor's Declaration

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

Supervisor's Name: Prof. S. B. Kendie

Signature: …… Date: ……..……

ABSTRACT

The importance of proper solid waste disposal cannot be underestimated since the health implications of poor waste disposal impact negatively on the health of households. It was on the basis of this assertion that an evaluation was conducted into the solid waste management practices within the Asokwa Sub-Metropolis in the Kumasi Metropolitan area. The population for the study was residents of the suburbs in the sub-metropolis. A sample of 160 respondents was selected randomly from Gyinyase, Dompoase, Atonso-Agogo and Ahinsan. A self-administered questionnaire with 25 items was used for data collection. The questionnaire was pre-tested with a sample of 40 respondents from the Oforikrom Sub-Metropolis. Data collected was analyzed using the Statistical Product for Service Solutions with descriptive statistical tools such as frequency tables, and percentages.

Results of the study indicated that some residents dumped solid waste indiscriminately by throwing them into open drains and onto streets for reasons which included ignorance and laziness. Besides, refuse collection was solely done by private waste contractors and it was done daily or weekly. Furthermore, it was found that, officially, residents used refuse bins provided by the Sub-Metropolis. The improper waste disposal brought about high incidence of malaria and cholera. In view of the findings that emerged, it was recommended that residents should be educated on good solid waste disposal practices and were asked to embrace the ‘dump as you pay policy’. Recycling of solid waste was also recommended for adoption, because it is feasible in the long-term.

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DEDICATION

To my Dad, Ex-Chief Insp. Paul Ampadu (of blessed memory), my Mum, Mrs. Catherine Ampadu and my beloved wife Eva Ampadu.

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EPA	-	Environmental Protection Agency
GWC	-	Ghana Water Company
IDS	-	Institute for Development Studies
KMA	-	Kumasi Metropolitan Assembly
NEST	-	Nigerian Environmental Study/Action Team
SAP	-	Structural Adjustment Programme
SPSS	-	Statistical Product and Service Solutions
UNEP	-	United Nations Environment Programme
WMD	-	Waste Management Department

CHAPTER ONE

INTRODUCTION

Background to the study

Solid waste is anything that has served its original intended purpose and is being discarded or stored prior to being discarded (Williams & Langley, 2001). According to Batley (1996), since prehistoric times, the predominant method of dealing with refuse has been to simply dump it in some out of the way spot. Worldwide, land disposal still accommodates the overwhelming majority of domestic waste.

Batley (1996) again notes that in United States of America roughly 90% of residential and commercial waste is disposed of in some type of landfill, ranging from simple open pit sanitary landfills, where the waste is compacted and covered with a layer of clean soil. In a small, but increasing, percentage of cases landfill may be clay or plastic liners to reduce toxins leading into underground water.

In United States, by the last quarter of the nineteenth century odoriferous, vermin–infested garbage dumps in increasingly congested urban areas were identified as a public health threat (Lee, 1997). Large-scale incineration of municipal waste was introduced at that time in both Europe and the United States as an alternative disposal method.

Cunningham and Saigo (1997) stipulate that waste is everyone's business. We all produce wastes in nearly everything we do. According to the Environmental Protection Agency, (EPA) the United States produces 11 billon tons of solid waste each year. Nearly half of that amount consists of agricultural waste, such as crop residues and animal manure, which are generally recycled into the soil on the farms where they are produced.

The case of waste generation is not different in other parts of the world. Cunningham and Saigo (1997) indicate that, in Mexico City, the largest city in the world generates some 10,000 tons of trash each day. Until recently, most of this torrent of waste was left in giant piles, exposed to the wind and rain, as well as rats, flies and other vermin. They further explain that Manila, in the Philippines, has at least ten huge open dumps. The most notorious is called smoky Mountain because of its constant smoldering fires. Thousands of people work on this 30 meter – high heap of refuse. They spend their day sorting through the garbage for edible or recyclable materials. Health conditions are abysmal, but these people have nowhere else to go.

In most African countries today, there is generally little control over the disposal of liquid and solid wastes from individual dwellings, villages, factories, towns and cities. Yet the control of the disposal wastes of all kinds is necessary in order to improve and safeguard public health and to protect water resources. The outbreak of cholera in most towns of the African countries in the 1970 is brought to the forefront the need for proper sanitation and the development of a long–term low cost sanitation programme (Izeogu, 1989).

Songsore (2004) postulates that on the average between 30 to 70 percent of all garbage or solid waste generated in the cities of Africa remain uncollected, although, in some cities, the proportion is much higher. Such garbage is indiscriminately dumped along streets, open spaces, wetlands, and drainage channels among others. These dump sites, therefore serve as breeding grounds for disease vectors, especially flies and rats in these neighborhoods is a health hazard for all inhabitants especially for children in deprived neighborhoods who play on these streets and open grounds contaminated by faecal bearing refuse or in stagnant pools of sullage. These stagnant pools are also important mosquito breeding sites (Rondinelli & Iacono, 1996).

It is significant to note that studies in Bamako (Mali) and Ouagadugou (Burkina Faso) have shown that approximately, 0.6 to 0.7 kilogrammes of waste are generated per person per day in such cities. This amount represents an estimated 600 to 700 tonnes per day for a city population of about one million (Eaton & Hilhorst, 2003). It is even noted that higher income households produce almost four times as much organic waste as lower income households.

Management of solid waste has since time immemorial been a grueling predicament to various government, industrialists and even the ordinary citizens particularly in the urban areas of Ghana with Accra, Kumasi and Tamale already in crises. Ghanaians have realized that imperativeness of effective solid waste management for overall socio – economic development of the country. Ironically, to date, despite the environmental awareness in Ghana no effective solid waste management system has been achieved in Kumasi. This has partly been attributed

to lack of institutional and management capacity to sustain planning and implementation of environmental programmes.

Whether consciously or unconsciously, sections of residents in the Kumasi metropolis are steadily turning all the water resources in the metropolis into garbage grounds where all forms of solid and liquid waste, including faeces, acid and plastic materials are dumped with impurity. Unfortunately, most of these polluted water bodies such as River Nkradan, Susan, Wewe and Subin, which run through the Kumasi metropolis, feed dams such as the Owabi, Barekese and Odaso. While both the Owabi and Barekese Dams are the main sources of potable water for residents in the Kumasi metropolis, Odaso Dam mainly provides potable water to residents of Obuasi municipality and its environs.

Ironically, rivers and steams, which flow through communities in our neighboring countries, are treasured and revered as natural assets and are therefore adequately protected to enhance their lifespan, but those in Ghana are often used as garbage dumps. Most of the solid waste materials dumped into streams are carried down stream into the Owabi Dam compelling the Ghana Water Company (GWC) to treat it at high cost before distributing it to its numerous customers in the Kumasi metropolis and its environs. Few years ago, these rivers served as recreational grounds for the youth in Kumasi. Visitors who trooped to the metropolis in their numbers also found time to have fun along the banks of the rivers.

The need to initiate measure, which will address the problem of massive water pollution in the Kumasi metropolis, thereby reducing the cost of treatment

by GWC, is, therefore key to national development. This is because by preventing the pollutions of these rivers water–borne diseases such as cholera, dysentery, typhoid and diarrhea, which affect communities down stream, will also be minimized.

The incidence of malaria, one of the main killer diseases in the country could also be controlled if residents become conscious of their actions and inactions by stopping environmental degradation and the pollution of water bodies. This is because rivers and streams will flow freely and mosquitoes will not have access to stagnant water to lay their eggs to continue their onslaught against humankind.

At Asokwa Sub–Metropolitan area, people who live along the main roads have their household garbage collected by private waste management companies. Areas that practice the house-to-house refuse collection are Asokwa residential area, Atonsu, Chirapatre, Ahinsan Estates whereas communities like Aprabo, Gyinyase, Kaase and others use the ditches and the vacant sites around their settlements to dispose of their garbage. Those living in areas covered by the collection service could not rely on set days and timetable, so their garbage had to be left at collection points within the community where it often remain there for several days before being collected.

The environmental problems contribute tremendously to health hazards. For instance, acute respiratory diseases are the most common health problems that affect children up to the age of six in particular. The incidence and severity of these diseases are exacerbated by the dampness of the site due to the proximity of

the Susan and Aboabo rivers and poor surface drainage also to the poor quality of the housing in the Sub- Metropoliss. A high level of ambient air pollution from nearby factories is also a serious problem. Diarrhoea related diseases are frequent, especially during the dry season, largely because of the shortage and poor quality of available water, the lack of provision for sanitation, drainage and washing and uncollected garbage. Other infectious skin diseases such as scabies, eczema are also common.

Statement of the problem

The generation and management of waste have been a concern ever since humans started using the resources of the environment. One function the environment performs apart from the provision of resources is that, it serves as waste repository and waste is taken care of by natural process of recycling. However, the increase in generation of waste has made it difficult for the natural waste recycling process to contain. This increasing generation of waste has mainly been due to population growth coupled with high consumption levels of people. This problem is noticed at the international, national and local levels. Ghana's case is alarming (Obeng, et al., 2009).

There have been reports and scenes of choked drainage systems, together with indiscriminate disposal of solid waste materials across the nation. The consequence of this is that, it can deny the nation the way to achieve its set developmental goals. The reasons are that this puts the nation and its people in filth, and poor sanitation pollutes and destroys the aesthetic beauty of the

environment and again, it scares away investors and tourists alike. It also promotes breeding of flies, mosquitoes and germs, which can easily lead to the spread of cholera, malaria and food poisoning respectively. Choked drains can easily cause flooding and will produce a horrid stench (Hoornweg & Thomas, 1999).

In the Asokwa Sub – Metropolis the problem of managing waste has not been different. People throw refuse and human excreta away in the black polythene sacks into gutters and even water bodies. It is often seen that huge piles of solid waste are left at the mercy of the environment. Some of such scenes can be found at Kaase near the Subin River. Plate 1 depicts a free-range refuse dump near the Subin River at Kaase. These pose a threat to human settlements around the areas because any time the wind blows, refuse from the dumpsites is carried along to the surrounding houses, which is unhealthy.

Another danger that this refuse dump poses is, it pollutes the Subin River, which supplies residents of Obuasi town and its environs drinking water.In addition, there is irregular collection and transportation of refuse at the Atonsu Agogo Car Station, which often makes the place stench. This indeed is associated with diseases.

Fuseini (2007) indicates that about 40% of diseases reported at hospitals in Kumasi are directly or indirectly caused by dirty environment. Boadi (2005) also reports that dumping of refuse into the Susan streams has contributed to the periodic flooding in the Kumasi metropolis. These situations make one to ask why

they are so and whether there are measures that can be used to ensure better waste management practices.

Plate 1: A free-range refuse dump site near the Subin River at Kaase

Source: Fieldwork, 2010

Objectives of the study

The main objective of the study was to assess the attitudes and perceptions of the people living in Asokwa Sub–Metropolitan area towards improper solid waste disposal.

- Identify the causes of poor sanitary conditions in the area.
- Examine the various forms of solid waste management practices in the area.
- Assess the attitudes and perceptions of the residents of the Asokwa Sub-metropolitan area towards solid waste management.
- Make recommendations for the solutions of the problem under study.

Research questions

- What are the main causes of insanitary conditions in Asokwa Sub–Metropolis?
- What are the forms of solid waste management practices in Asokwa Sub–Metropolis?
- What are the attitudes and perceptions of the people living in the Asokwa Sub – Metropolis towards solid waste disposal?
- What can be done to mitigate the improper solid waste disposal on the communities of Asokwa Sub–Metropolis?

Significance of the study

In a developing country such as Ghana where solid waste management is crucial to human, social and physical environment are to be effectively protected. The study addressed the issue of attitudes and perceptions of improper solid waste disposal in Asokwa Sub-Metropolitan area. The study reveals to authorities of Kumasi Metroplitan Assembly, what can be done to mitigate the improper solid waste disposal in Asokwa Sub-Metropolis.

The study also highlights on indiscriminate disposal of solid waste, irregular collection of refuse and awareness of solid waste disposal. The study is also designed to make recommendations to such specific challenges identified in the study. Additionally, the results of the study would not only be of interest to the KMA, but also to other Metropolitan, Municipal and District Assemblies in the country, as it would inform such Assemblies facing similar challenge in waste disposal. It would also be of interest to Environmental Protection Agency and Non – Governmental Organisations. Again, the study would add up to knowledge of the problem under study.

Scope of the study

Geographically, the study covered the area within the demarcated zone designated as Asokwa. The study examined the physical facilities (structures) and methods as well as the financial systems put in place by the Asokwa Sub–Metropolis for the management of solid waste. This was to assist in determining the adequacy of:

- the physical facilities in relation to volumes of waste generated and
- the waste management financing in relation to the expenditure requirements of the Sub–Metropolitan Assembly for the management of solid waste and other related functions.

The study assessed the residents' income levels, attitudes and perceptions, their capabilities and willingness to contribute towards the management of solid waste in the Sub– Metropolis.

Limitations

Inadequate research funding made it imperative for the researcher to limit the scope of this study to Asokwa Sub-Metropolitan Area in the Kumasi Metropolis. This would definitely affect the degree of accuracy when generalization is made to cover a wider area.

CHAPTER TWO

REVIEW OF LITERATURE

Introduction

This chapter is devoted to the review of literature related to waste management generally and solid waste management in particular. The literature has been reviewed taking into consideration some theoretical and empirical perspectives of waste management.

Overview of challenges associated with waste management

It must be emphasized that cities and towns across the globe have struggled with how to collect and dispose of the refuse generated by their populations (Doan, 1998). The increasing complexity and cost of waste management are making it difficult for local authorities in many developing countries, to handle the problem efficiently and effectively. Often, solid waste receives scanty attention at the municipal planning stage, yet many account for between 20% and 40% of municipal revenue (Cointreau–Lavine, 1994). Connected to this problem is the issue of inadequate funding and poor cost recovery for solid waste management.

Virtually most urban authorities in developing countries have failed to devise effective mechanisms to mitigate the problem. In addition, several factors

negatively affect contributions to a proper delivery of the service such as the non enforcement of physical planning and planning regulations, erratic land use policies, administrative bureaucracy, corruption, attitudes of residents towards solid waste management and ineffective supervisions and monitoring measures by the local authority as well as residents (Post, 2001). According to Lee (1997), solid waste management continues to be a major challenge in urban areas throughout the world, particularly in the rapidly growing cities and towns of the developing world.

Concepts and definitions

Vigso (2004) defines waste as non–liquid material arising from domestic, trade, commercial, agricultural and industrial activities and from public services. Waste is a combination of various heterogeneous discarded materials. It is commonly known as garbage, refuse, rubbish or trash.

Furedy (1997) also defines waste as residual materials that are considered to be of no use and must eventually be disposed off typically by dumping or incineration. In her deliberations, Furedy used works like ‘would–be–waste” to conceptually qualify waste as a resource with economic value, i.e. To show its potential as a resource for refuse, recycling or composting. Otherwise, waste is something to be discarded or thrown away.

According to Skinner (1995), solid waste management in its broadest sense means integrated system for waste generation, gathering, storage, collection, transportation, recycling, energy recovery, transportation and disposal.

Solid waste management practices include all domestic refuse, commercial and institutional waste, street, sweepings and construction debris (United National Environment Programme, UNEP). Thus, solid waste management is uncovered with how actors get organized for the collection, transport and disposal, refuse recycling and composting of solid waste materials (Obirih–Opareh, 2002).

From all these definitions and characterizations of solid waste management in the literature, it is clear that solid waste management includes the cleaning and sweeping of public areas and streets, as well as the primary and secondary collections, transfer and final disposal of solid waste. Primary collection is the collection of solid waste at the source (from households, businesses, institutions, etc.) or from street containers and its transportation to points of transfer. Secondary collection is the collection of the waste from transfer points for transport to the final disposal site. A further distinction can be made between houses–to–house collection, where citizens have to bring their waste materials to indicated points (Williams, 2005 ; Zurbrugg, 2002).

Solid waste management practices

The technologies for the management of solid wastes have to incorporate the collection of the waste from the source, transportation of the waste from the place of the processing and treatment and final disposing. Usually disposal of solid waste on land is viewed as a better though far from the ideal management operation, compared to dumping of the waste into water bodies (Persson, 2003).

Before final disposal, one can process and treat the waste to reduce the "wasteful wasting of waste". Some techniques of dealing with solid waste are discussed as follows:

Sanitary land filling

Dumping of waste in a scientifically designed land is called sanitary landfill. Sanitary land filling include confining the waste, compacting it and covering with soil. It does not only prevent burning of garbage but also helps in reclamation of land for valuable use (Hickman Jr. & Eldredge, 2005).

Incineration

Incineration is a controlled combustion process for burning combustible waste to gases and reducing it to a residue of non–combustible ingredients. During incineration, moisture in the solid waste gets vapourised and the combustible portion gets oxidized and vapourised. CO_2, water vapour, ash and non – combustible residue are the products of incineration (Van Steenis, 2005).

Paralysis

The heating of combustible portion of solid waste in an oxygen free environment is called paralysis. Paralysis of solid waste results in the chemical breakdown of organic carbon material into three common ends namely gas, liquid and char. Thus, paralysis is chemical combustion (Knox, 2005).

Pelletisation

According to Themelis (2003), pelletisation is the product of fuel pellets from solid waste. The process of conversion of garbage into fuel pellets involves primarily drying, separation of incombustible, size reduction and pelletisation. These pellets may have high calorific value and can be used either independently or as supplementary fuel with other fossil fuels (Chan, 1999).

Composting

In view of Michaels (2009), composting process uses microorganisms to degrade the organic content of the waste. Aerobic composting proceeds at a higher rate and converts the heterogeneous organic waste materials into homogeneous and stable humus like compost. Another form of composting is vermicomposting. This is the process by which decayed organic waste mater is eaten by a mix of bacteria, fungi and bacteria inside the bodies of earthworms to convert waste to a digested soil like excretion of vermin–castings full of microbes.

Plasma gasification

The plasma gasification for waste materials produces a combustible gas, which can be used in a manner similar to the uses of natural gas and an inert solid residue, a glass like material, which can be used within various industrial and commercial markets. The plasma process can be applied to any waste material including municipal solid waste (Spector, 1992).

Types of solid waste management

Historically, the primary objective of solid waste management is that of public health. Solid waste accumulating in densely populated urban areas posed epidemiological health hazards, which local authorities sought to control by providing effective collection, transport and safe disposal services (Weitz, Thorneloe, Nishtala, Yarkosky & Zannes, 2002).

According to Obirih–Opareh (2002), in more recent times, efficient collection and disposal of municipal solid waste is recognized not just as critical for maintaining healthy environment but also as an important indicator of the level of development of a nation. Accordingly, cities in the developed world have devised complex procedures for handling waste and have established variety of institutional mechanisms to ensure that these procedures are adhered to.

Doan (1998) also points out that in the Untied States of America for example, many cities have adopted straight regulations to govern their waste management. These include the kind of materials that can be thrown away by a household or business the type of storage containers and the kind of equipment to use to pick up waste. It also indicates the exact procedure for disposing waste in a sanitary landfill, the specifications for liners, covers and aeration procedures for those landfills and the proportion of the cost of this service to be paid by the consumer.

This is hardly the case in many developing countries. Whilst the rate of waste generation increases very rapidly, resources to manage it grow very slowly, at times negatively. Solid waste collection has always remained an area of

concern for cities around the world became of the public health dangers of poor collection practices.

Furthermore, many solid waste management studies focus on public health challenges through community participation (Schackelford, 2006). They acknowledge the close interrelationship between urban health and the urban environment. Studies focus on how public health can be improved or how to do more with the same amount of money (Morel & Guillemain, 2004).

In African cities especially, the problems has become more visible with the decline of services due to the Structural Adjustment Programmes (SAPS) that have been adopted for the restructuring of economies since the 1980's.

People's attitudes and perceptions towards solid waste management

Attitudes and perceptions have influenced over people's waste management practices. Songsore (2004) stated that the inadequate attention to the analysis of inter urban environment health differentials has been one reason for the perception of urban areas as being better endowed in terms of access to the environmental services. The urban poor remain in the shadow of the city since their conditions are eclipsed with the use of average statistics at the city level.

Attitudes and perception about a phenomenon influence the extent to which individuals regard that phenomenon or object. Attitudes and perception derive from the socialization process and are essentially ingrained (Kendie & De–Graft Johnson, 1999). In addition, Kendie (1999) emphasised that the increase in waste disposal challenges is a result of attitudes and perceptions towards wastes

and the rating of waste disposal issues in peoples' minds and in the scheme of official development plans have not been adequately considered.

Additionally, Adu-Kyei (2010) stressed that in the Ghanaian social settings, cleanliness is embraced as a virtue but most of the time the perception of cleanliness is restricted to one's immediate environs with little care for what happens outside their households. The belief in most urban area is that the Metropolitan or Municipal Assembly will take care of waste generated because they have paid their taxes. Adu-Kyei then cited Kendie (1999) to buttress his point that the orientation that the people have had during the precolonial and post-independence times has affected their attitude and perception toward solid waste management.

Kendie (1999) indicated that sanitation and its related issues were seen as the preserve of the colonial administration that usually employed sanitary officers to take care of the environs. This is very true to a greater extent because the District Assemblies employ sanitary personnel to deal with all manner of waste but the challenge is how effective has that been? The citizenry are to lend a helping hand but they would not. Truly, attitude and perception determines where an individual should dispose off his/her waste.

According to Moser (1982), defecation is in most cultures an extremely personal practice and controlled by strict taboos. Because of its strong cultural dependence, sanitation improvement are difficult introduce to the general public as improving sanitation in practice means intervention to the persons personal life

habits changes in the very basic hygiene practice of a person in most cases at years or rather generation.

On her part, Selby (2010) gives scenarios that depict the Ghanaian attitude towards waste in general and solid waste disposal in particular. In an article, she states that sanitation has been a big problem in the economic and health development of Ghana, despite the numerous campaigns and the refusal of the people to make cleanliness a prime issue, even though they claim to be godly. It has contributed in the spread of diseases in recent years, but yet still, people have not thought it wise to have a change of attitude toward insanitary practices.

According to Selby, some of the attitudes Ghanaians practise in creating a bad sanitation environment are the habits of littering, indiscriminate defecation and dumping of rubbish at unauthorised places.

Abrokwah (1998) reveals that dumping of rubbish indiscriminately is one of the extreme bad habits of Ghanaians toward cleanliness. It is very easy for people to create a dumping ground right beside their home or residence, due to lack of an official dumping ground, or to prevent them from walking a distance. Many gutters in the cities and towns are choked due to people making them dumping sites, some people deliberately, especially those who sell by the road side, sweep and dump their rubbish into nearby gutters. This always results in frequent flooding in many parts of Accra during the rainy season. Traders and street hawkers, who accumulate rubbish at the end of the day, dump their rubbish in nearby bushes, eventually making it a dumping site for all the traders, and even residents around.

Again, Selby (2010) indicates that littering of the environment is an act almost every Ghanaian falls culprit to. The sachet water, which is meant to give Ghanaians a safe drinking water on the street, is gradually turning the whole city of Accra into a dumping ground. Moreover, the black polythene bag used for selling, popularly known as the "take away," also accounts for the immense nature of litter on the environment. It has become the habit of many people to litter the environment with these rubber sachets and black polythene bags when they are through with its purpose.

Irrespective of where they are, they litter the environment even when they are in buses, instead of leaving them in the buses for the drivers to clear them after work. The nature of littering the street is evident when wind blows, as these polythene bags will be flying in the air, with one not knowing where they are coming from (Abankwa, 1998).

Songsore (1992) stated that with the establishment of the Waste Management Department (WMD) of Metropolitan and Municipal Assemblies, the public tend to have the view that the WMD should be solely responsible for managing waste. In view of this members of the public tend to shirk their responsibility of observing proper waste disposal especially solid waste.

This assertion was confirmed by a study undertaken in Nima by Freduah (2004). It was found that a large percentage of the residents of Nima thought that the Accra Metropolitan Assembly WMD was solely responsible for ensuring clean surroundings. Consequently, it was likely that residents may not support

clean up campaigns meant for making the surroundings clean or adopting practices would help keep the environment clean.

Also in a study, Tsiboe (2004) observed that in the Ghanaian societal settings, cleanliness is broadly embraced as a virtue but most of the time the perception of cleanliness is restricted to one's immediate environs with little care for what happens outside their households. The belief is that the state will take care of things hence one should not be bothered. This kind of orientation has some historical underpinning since in the colonial days ; Ghanaians were alienated from events that took place outside their homes. Moreover, sanitation and its related issues were seen as the preserve of the colonial administration that usually employed sanitary officers to take care of the environs (Kendie, 1999 as cited in Tsiboe, 2004).

Managing municipal solid waste in developing countries

In an overview of municipal solid waste in the developing world, it is worthwhile to note that the amount of solid waste generated in many cities in the developing world, has been increasing rapidly over the years, mainly as a result of several factors. Rapid population growth in developing countries has direct implications for human living patterns, leading to a greater concentration of people in urban centers.

However, Kendie (1999) argue that "population pressure and lack of funding are nothing more than convenient excuses used by authorities to justify low investment in the provision of waste disposal facilities''. He added that waste

disposal practices of the local authorities in Ghana have also encouraged improper attitudes regarding waste management programmes and payments towards improved waste disposal services.

In 1995, the urban areas of Asia produced about 760, 000 tons of municipal solid waste or approximately 2.7 million m^3 per day. In 2025, this figure is estimated to increase up to 1.8million tons of waste per day or 5.2 million m^3 per day (World Bank, 1999). While in Latin America, 240, 000 tons of solid waste are generated daily (Moreno, Rivas and Lardinois, 1999).

In developing countries, the approach to managing waste focused on getting rid of the trash, with very little or no attention paid to waste minimization or recovery effects (Poerbo, 1991). If a household can find a nearby site simply to dump the waste, it has solved its disposal problem, regardless of the cost this dumping may impose on others. Thus, low collection is a major problem in most developing countries in general and throughout Africa in particular, contributing to ecological degradation and health hazards.

Even public sector organisation in charge of garbage disposal are inclined to ignore formal guidelines, since waste disposal is often among the worst hit by government financing problems due to the low status association with waste collection activities by relevant authorities within the government hierarchy.

Over the past two decades, these problems have persisted and in some cases even more worsened. Threats to both human and ecological health have also persisted due to the technical, financial, legal, social, and the institutional in

adequacies that have emerged from the use of current solid waste management approaches (Johannessen, 1999).

Challenges of waste collection in Kumasi

Solid waste collection in Kumasi is a big challenge to the city authorities. This assertion is collaborated by several expositions on the subject. According to Asamoah (2010), the generation of solid waste in urban environment in the developing world is becoming alarming making its management extremely difficult. In Ghana, solid waste generation has increased to such an extent that its attendant public, occupational and environmental health hazards have become a national issue. Owing to this the Kumasi Metropolitan Assembly introduced the pay as you dump policy in 2007.

Danso (2007) reporting for the Daily Guide Newspaper cited the former Chief Executive of KMA, Patricia Appiagyei as laying out the policy direction. The report indicated that as part of challenges facing the Assembly concerning solid waste collection, levy collection within the Kumasi Metropolis was going to begin from January 1, 2008.

According to former KMA boss, every house was expected to pay monthly fees ranging from GH¢3.00 to GH¢5.00 as captured in the Assembly's fee fixing resolution. The beneficiaries of door-to-door collection were put in class A, B, and C residential areas and they were going to pay GH ¢5.00, GH¢4.00 and GH¢3.00 respectively. As whether residents were, going to compile with the directive was another issue.

One other issue was whether the private waste collection entities would be able to meet the challenges even if the residents paid the appropriate fees from the KMA or directly to them. There has been an indication that since the introduction of the levy waste collection had improved beside the participation of private operators such as Zoomlion Ghana Limited.

The current Chief Executive of the Kumasi Metropolitan Assembly, Mr. Samuel Sarpong, has also accepted that waste management in the metropolis is a big challenge. According to a Ghana News Agency report published by Modernghana (2010), Mr. Sarpong indicated that with a population of about two million, Kumasi generates an average of 1,500 tonnes of solid waste daily and out of this the KMA is only able to collect about 1,300 tonnes, leaving the remaining 200 tonnes uncared for.

Furthermore, the Chief Executive revealed that the Assembly in concert with the World Bank, the government and other development partners, is mobilising the needed funds to deal with the ever increasing challenge of solid waste management.

Health implications of improper solid waste management

Most of the literature on solid waste issues in African cities focuses on collection options and equipment for collecting wastes and cost recovery through private sector involvement, but the discussion, here, is going to try to outline the waste management context as it relates to the growth of African cities and its health hazards.

O'Connor (1983) made it clear that even though Africa is the least urbanization continent, it is currently experiencing the fastest rate of urbanization. There are several elements of this urbanization trend in African, the most pertinent being the inability of a city's budget to satisfy the various infrastructure and service provision needs that arise due to the fast growth.

Osman (1990) has stated the impact of rural – urban migration as being so massive as to make it impossible for African cities to cope with the demands of solid waste service delivery, a situation responsible for the terrible conditions found in some African cities with respect to solid waste. For instance, Nigerian cities are characterized by open drains, which are never deemed and often dogged with all types of debris and garbage (Coad, 1998).

The rate of urbanization in African countries implies a rapid accumulation of refuse. For example, the Nigerian Environmental Study/Action Team estimated that 20 kilograms of solid waste is generated per capita per annum in Nigeria (NEST, 1991). This amounts to 2.2 million tones per year, given Nigeria's estimated population of more than 100 million. In individual cities in Nigeria, there are indications of rapid increases in the rate of waste generation.

In Lagos an estimated 625, 000 tons of wastes was generated in 1982 (Onibokum & Kumuyi, 1999). This according to the Federal Ministry of Housing and Environment was projected to rise to 998, 000 tons by 2000. Likewise, an estimated 258,000 tons of waste generated in 1982 in Kaduna and this was expected to increase to 431,000 tons by 2000.

There are clear indications of the need for appropriate and adequate management services, which are typically not found in African cities. One part of the argument in the literature states that, the sheer volume of waste alone does not actually constitute the problems; it is inability of governments and waste disposal firms to keep up with it.

The situation in Nairobi aptly illustrates this. Although between 1977 and 1983 the population of this city was increasing at an estimated annual rate of least 6%, the amount of refuse collected fell from 202,229 tones in 1977 to 159,974 tons in 1983, a decline of 21% over 6 years (Onibokun & Kumuyi, 1999).

A similar situation was observed in Malindi where increasing population is major constraint. In 1991, in Malindi, an estimated 36,000 tones of solid waste was produced, but only 7300 tone was transported to dumping sites by the Municipal collection service (Onibokum & Kumuyi, 1999).

Also, refuse removal provided by the Dar as Salaam City Council is plagued by the same difficulties (Stren & White, 1989). In this city, only 24% of daily refuse is collected. In addition, in Kinshasa, household waste is put on the road, on illegal dumps, in storm – water drains, or is buried in open sites (Hardoy & Satterwaite, 1992).

In Nigeria, Nwaka (1990) has estimated that only 30 percent of waste is satisfactorily disposed off, the rest is dumped by the roadside or into nearby rivers and streams. In many African cities, refuse collection is restricted to high – income areas. Collections in other areas of the city are irregular and the uncollected refuse soon attracts rodents, flies and other vermin. Even in places

where the refuse is collected, it is often dumped at the edge of the city (Silitshena, 1996).

According to Onibokum and Kumuyi (1999), in Ibadan, Nigeria, the right – road dumpsite is "encircled by residential areas and has degenerated into several open piles breeding flies and habouring rodents, leading to potential major health hazards.

Similarly, Songsore (2004) is of the view that households living in the slums and shantytowns of large cities and in unserviced small towns are often exposed to numerous hazards and pest within their home and neighbourhood environment. The most common vectors and pests include mosquitoes, houseflies, cockroaches and rats. These vectorss and pests thrive in the tropical environment where high temperatures combine with high rainfall.

Benneh, et al (1993) also stipulate that, past studies suggest that some malaria mosquitoes are adapting to the urban environment in Ghana with, for example increased breeding in households water containers. As a result, malaria, which is already endemic, remains the single most important cause of ill health even in urban areas in Ghana (Chinery, 1984).

Houseflies are also a great risk because of the insanitary condition of towns and cities. Most households use some form of insect control especially for mosquitoes including nets, house screening, mosquito coils, and aerosol and pump insecticides. The use of these chemicals to control insects of course creates its own health risk apart from the added costs (Benneh et al., 1993).

These above discussed situations have led to the African urban environments aesthetic and ecological deterioration. Demanya (2001) has found that the use of an old abandoned quarry site in Accra, Ghana as a dumpsite has led to the pollution of the Densu River which is the primary source of water extraction for providing drinking water to the western part of the city. Also in most of the African cities, there are no effective regulations regarding the handling and disposal of waste and even where there are, they are hardly enforced (Post, 2001).

According to Selby (2010), when rubbish is heaped for long, it becomes the breeding ground for rats, flies and mosquitoes. Mosquitoes bring about the spread of malaria, which has been reported to be killing millions of people on the African continent. Malaria is one of the reasons for the high mortality rate among pregnant women, as well as children.

Another effect of poor waste management is that when rubbish are disposed of indiscriminately it is often carried away by the rain into rivers and water bodies, which are also a source of water for domestic and industrial purposes. In this case when the water is used without being boiled or distilled, it makes way for cholera. The major reservoir for cholera was long assumed to be humans themselves, but considerable evidence exist that aquatic environment can serve as a reservoir of the bacteria.

Some effects of poor waste management

Hickman Jr. and Eldredge (2005) note that due to the poor management of the domestic waste from households, the following are some of the effects on the population and the environment : solid wastes, when improperly disposed off can be an environmental hazard in that the surrounding environment as well as the fish are affected. This improper dumping can lead to death of fish as well as diseases to man e.g. dysentry, cholera and so on.

In addition, some of the wastes alluded to above can also be very harmful to the atmosphere. These wastes when improperly dumped into the atmosphere can lead to the destruction of the ozone layer and may cause diseases such as cancer. As a result there is problem in global warming. Air pollution can also lead to formation of acidic rain which is dangerous to crop life since it fastens the removal of soil fertility from the surface of the ground (Weitz, Thorneloe, Nishtala, Yarkosky & Zannes, 2002).

Improper waste disposal also affects drainage. Hickman Jr. and Eldredge (2005) stress that when solid wastes are dumped in drainage channels and gutters, they block the flow of the sewerage. This may cause flooding. At the same time, solid wastes also affect soil drainage which hinders the growing of crops since some of the waste materials are water proof, they can be dangerous to the aeration system of the soil hence hindering agriculture. It also leads to the reduction of fertile cultivatable land in form of dumping sites. This in turn affects a country’s agriculture production.

Other effects of improper waste management are that :

- Waste materials like toxic if consumed by animals can be very dangerous to life and worse still if these wastes are dumped in water bodies. They are dangerous to aquatic life.
- Poor solid waste has also led to the death of animals (especially domestic animals). Death of animals like cattle leads to poverty and the death of animals like dogs, leads to insecurity in homes.
- Poor Domestic Waste management also displays an ugly scenario of the environment. This can affect the tourism industry, as the tourist may not get attracted to visit the country.
- It has also led to the spread of diseases in such a way that when wastes like broken bottles and these are dumped anywhere, they collect water in them (when it rains) and this may become a breeding ground for mosquitoes. Wastes like human stool cause diseases when poorly dumped, as the flies will carry the germ from the stool.
- It can also lead to human injury. For example, when a person is walking and steps on the broken bottles or nails or even pins, he can get injured which may lead to bleeding (these waste shape objects are infected with germs).
- Uncontrolled dumping of solid waste can lead to waste of land where we find lots of land being used as damping sites for wastes. These same pieces of land are later on neglected by the inhabitants of the area.

- Lastly, poor waste management can be a source of under development around the societies surrounding that particular area. This cause harm to tourist industries of the particular countries (Connett, 2006).

Effective solid waste management

This section of the literature review is devoted to how to deal with effective ways waste can be managed. According to Goodings (2008), solid waste management is concerned with the creation, avoidance, reduction, collection, transport, processing and disposal of waste materials. Properly done, it will ensure that, there are minimal negative effects on human health; that any effect on the environment is manageable; that natural resources are maintained; and the aesthetic and socio-economic values affected communities are not degraded.

Goodings (2008) did not only put the issue of solid waste management into perspective alone, rather he suggested seven ways that it can be managed. These are :

- Prevent waste generation where possible.
- Reuse waste for other purposes.
- Recycle waste through the creation of other useful products.
- Compost the organic fraction of the waste stream and use the resulting composting material.
- Anaerobically bio-degrade the organic fraction of the waste stream to recover methane for energy and use the resulting biodegraded material.

- Incinerate, change the form, and reduce the volume of the combustible fraction of the waste stream, and recover the energy, while safely disposing or using the products of combustion.
- Landfill waste in a safe location, using methane and other gases as a source of energy.

In order to determine the most appropriate solution, engineers follow a process that begins with defining the solid waste management challenge to be resolved, identifying regulatory and other compliance requirements, and then evaluating the technical feasibility, costs, and potential environmental and socio-economic impacts of appropriate options to assist decision makers in determining the preferred alternative (Bartone, 1995).

In the management of waste, education and awareness creation have become very important tool. The Talloires Declaration is a declaration for sustainability concerned about the unprecedented scale and speed of environmental pollution and degradation, and the depletion of natural resources. Local, regional, and global air pollution; accumulation and distribution of toxic wastes; destruction and depletion of forests, soil, and water; depletion of the ozone layer and emission of "green house" gases threaten the survival of humans and thousands of other living species, the integrity of the earth and its biodiversity, the security of nations, and the heritage of future generations.

Several universities have implemented the Talloires Declaration by establishing environmental management and waste management programs, e.g. the waste management university project. University and vocational education are

promoted by various organisations, e.g. Chartered Institution of Wastes Management. Many supermarkets encourage customers to use their reverse vending machines to deposit used purchased containers and receive a refund from the recycling fees. Brands that manufacture such machines include Tomra and Envipco (Wilson, 1993; Kunitoshi, 1990; Thomé-Kozmiensky, 1986).

According to Insam, et al. (2002), compost is composed of organic materials derived from plant and animal matter that has been decomposed largely through aerobic decomposition. The process of composting is simple and practised by individuals in their homes, farmers on their land, and industrially by cities and factories. Compost can be rich in nutrients. It is used in gardens, landscaping, horticulture, and agriculture.

The compost itself is beneficial for the land in many ways, including as a soil conditioner, a fertilizer, addition of vital humus or humic acids, and as a natural pesticide for soil. In ecosystems, compost is useful for erosion control, land and stream reclamation, wetland construction and as landfill cover (Epstein, 2010).

Schackelford (2006) notes that recycling involves processing used materials (waste) into new products to prevent waste of potentially useful materials, reduce the consumption of fresh raw materials, reduce energy usage, reduce air pollution (from incineration) and water pollution (from landfilling) by reducing the need for "conventional" waste disposal, and lower greenhouse gas emissions as compared to virgin production. Recycling is a key component of

modern waste reduction and is the third component of the "Reduce, Reuse, Recycle" waste hierarchy.

Ackerman (1997) states that recyclable materials include many kinds of glass, paper, metal, plastic, textiles, and electronics. Although similar in effect, the composting or other reuse of biodegradable waste – such as food or garden waste – is not typically considered recycling. Materials to be recycled are either brought to a collection center or picked up from the curbside, then sorted, cleaned, and reprocessed into new materials bound for manufacturing. In a strict sense, recycling of a material would produce a fresh supply of the same material—for example, used office paper would be converted into new office paper, or used foamed polystyrene into new polystyrene.

However, this is often difficult or too expensive (compared with producing the same product from raw materials or other sources), so "recycling" of many products or materials involves their reuse in producing different materials (e.g. paperboard) instead. Another form of recycling is the salvage of certain materials from complex products, either due to their intrinsic value (e.g. lead from car batteries, or gold from computer components), or due to their hazardous nature (e.g. removal and reuse of mercury from various items) (Vigso, 2004 ; Medina, 2000 ; Tierney, 1996).

CHAPTER THREE

METHODOLOGY

Introduction

This chapter outlines and discusses the research procedures that were adopted for the study. These include the research design, study area, population, sampling techniques, research instruments, pre–testing of the instruments, procedure for data collection and data processing analysis.

Research design

Research design has been considered as a "blueprint" for research, dealing with at least four problems: what questions to study, what data are relevant, what data to collect, and how to analyse the results (Ader et al., 2008). Also, according to Dawson (2002), it is the philosophy or the general principle which will guide the study. Research design can be divided into fixed, ‘quantitative research designs’ and flexible, ‘qualitative research designs’ (Robson, 1993). The quantitative research design usually uses a very structured approach in which competing explanations are formulated in terms of the relationships between variables (Grix, 2004). Generalisation is the goal so as to establish relationships to demonstrate that these are general features of social settings been studied and to make predictions. According to Dawson (2002), it generates statistics through the

use of survey research using methods such as questionnaires or structured interviews.

In general, qualitative research design tend to work in the interpretive philosophical tradition, using methods of data collection which are flexible and sensitive to the social context in which the data are being produced (Grix, 2004). The approach usually involves “in-depth investigation” of phenomena, involving methods which do not rely on, but can use numerical measurements. Qualitative research explores attitudes, behaviours and experiences through such methods as interviews, observation and focus groups to get an in-depth opinion of the situation (Dawson, 2002).

In spite of its reputation, quantitative research has been criticised on several grounds. According to Preece (1998), the quantitative approach is criticised as using pre-conceived or half-understood concepts, and thus, is open to bias or manipulations in different ways. Furthermore, overdependence, can lead to a neglect of the social and cultural context in which the variable being measured operates (Grix, 2004).

On the other hand, among other criticisms, the qualitative approach is accused of being unscientific, unrepresentative, open to bias and even to manipulation, whether this is conscious or unconscious (Grix, 2004; Bryman, 2004). Again, it is usually small-scale and non representative, generating results that cannot be generalised beyond the cases investigated (Grix, 2004). Therefore, both methodologies have their specific strengths and weaknesses which should be acknowledged and addressed by the researcher (Dawson, 2002).

The weaknesses, according to Dawson (2002), can be counteracted in both methodologies by triangulation. The combination of methodologies is variously referred to as triangulation (Grix, 2004; Blaikie, 2000). However, such writers as Hughes (1990) and Blaikie (2000) have argued against the idea of combining the two research strategies in a single study with the reason that, each carry epistemological commitments and the use of both in a single study creates challenges for such studies.

Contrary to the above position, some writers also emphasise the usefulness of combining the two approaches in spite of their epistemological underpinnings (Grix, 2004; Bryman, 2004). In support of this position, other research methodologists, including Grix, (2004), recognise that there is much to be gained from a fusion of quantitative and qualitative research designs in a single study of social phenomena. According to Robson (1993), there is no rule that says only one method must be used in an investigation. The views of other scholars suggest that the method of quantitative and qualitative combination can complement each other in a single study of social phenomena, Dawson (2002); as also, stated by Grix (2004).

For this research (Solid Waste Management in Asokwa Sub-Metropolis in the Kumasi Metropolitan Assembly), the combined approach as a research design was adopted. This is due to the varied nature of the data required and different sources from which they had to be gathered, requires the use of various data collection methods from both research designs which made the combined approach appropriate. This enabled to crosscheck the data gathered by different

methods, thereby, making the results of the study valid and credible. It made it possible to explore the research questions from different perspectives and afforded the opportunity to obtain in-depth information from the different categories of respondents. In line with this methodological approach, research tools associated with both quantitative and qualitative approaches were combined to collect the data.

Study area

The Asokwa Sub–Metropolitan Area is one of the 10 Sub-Metropolitan Areas created as sub units of the Kumasi Metropolitan Assembly as shown in (Figure 1). Its basic function is to implement the decisions of the Assembly at that level under L.I. 1614 of 1998. The area is made up of 12 electoral areas with 12 Assembly members. In addition, each electoral area has five member unit committee making it 60 as the total number of unit committee members of the Sub-metropolitan area.

The Asokwa Sub–Metropolitan Areas is located at the South Eastern part of Kumasi Metropolis. The area has two major rivers of the Metropolis, River Subin and River Susan, which runs through Kaase and Atonsu respectively.

Some of the prominent towns in Kumasi metropolis, such as Atonsu–Agogo, Old Atonsu, New Atonsu, Asokwa and Ahinsan are located at Asokwa sub-Metropolis. The Asokwa Sub–Metropolitan area also has rural settlements or urban villages like Dompoase, Kaase, Kyirapatre, Gyinyase and Apirabo. There are 10 traditional heads in the area.

INSERT MAP

According to the census of 1984, the population of Kumasi Metropolitan area was estimated at 489,586 and in the year 2000 it was estimated at 1,170,270. Currently, it is estimated at 1,625,180 (Ghana Statistical Service, 2006). The estimated population for the Asokwa Sub–Metropolis was put at 122,358 in the year 2000. Projections for 2010 show an estimated population of 360,395. The population is dense, due to the number of industries available. The population of Asokwa Sub – Metropolis is cosmopolitan in nature.

Population

Population is the number of people living in a geographical area at a specified period. According to Fraenkel and Wallen (2000), this population must include individuals who posses certain characteristics or a set of characteristics a particular study tries to assess or analyse and come out with outcomes.

The population comprises all residents in the communities of Asokwa Sub-Metropolitan area who have attained 18 years and above and they numbered 188,973. The researcher chose Asokwa Sub-Metropolis as a study area for the fact that he was a resident of the area and a witness to the deplorable state by which waste was managed in the area.

The communities which data was collected from comprised Ahinsan, Atonsu–Agogo, Dompoase and Gyinyase. Ahinsan and Atonsu-Agogo are urban areas whilst Dompoase and Gyinyase are village communities. The choice was made to assess the perception of solid waste management in urban towns and urban villages.

Ahinsan has an estimated population of about 34,810 people, Atonsu-Agogo has about 112,341 inhabitants, Dompoase has 3,033 residents and Gyinyasi has 17,353 inhabitants (Ghana Statistical Service, 2006). These put the target population at 167,537 people, which are both males and females.

Targeted population was so identified because Ahinsan, Atonsu–Agogo, Dompoase and Gyinyase are communities that suffer from poor sanitary conditions and it has direct negative impacts on the health of the people living in the area.

Whilst, some parts of Atonsu–Agogo and Gyinyase practice 'door–to–door' refuse collection, other areas practice 'pay-as-you-dump' collection method. Ahinsan and Dompoase practise open dumping of refuse method in addition to 'pay-as-you-dump' method. This practice affects the health of the people living in Ahinsan and Dompoase directly.

Sampling techniques

Sampling is the choosing a smaller, more manageable number of people to take part in the research (Dawson, 2002). It is used to overcome the problem of large population for a research and, limits cost and saves time. When sampling is carefully done using the correct procedure, the result, in the case of quantitative research, can be generalised (Dawson, 2002). Sample size, then is a representative small portion of the population consisting of the relevant features of the population to be involved in the research.

Since it was difficult to study the entire population, the simple random sampling method was adopted to come out with representative sample for the study. Consequently, a sample of 160 respondents was selected randomly from four communities. Since respondents selected were individuals, who were 18 years and above, the electoral registers for the communities constituted the sampling frame.

What was done was that, registered voters list was collected from the electoral commission and the registered numbers on the voters' register were written on pieces of papers, folded and placed in a bowl and the lottery method was used in each case to select 40 respondents from each community. In each case, whenever a number was picked, it was not placed back ensuring that every member had the same opportunity of being selected. This technique was used because individuals in the communities' possessed the same characteristics as required by the study.

Research instruments

Instruments for the research include questionnaire, personal interviews and field observations. The questionnaire were the main instruments for the research. The questionnaire contained 25 items, which were made up of 17 close-ended and 8 open-ended questions. There were two sections, that is Section A contained the personal data of respondents and Section B was the main research items. The main research items were sub-divided into four sections. Section I contained questions on attitudes and perceptions of the residents. Section II

contained questions on forms of waste management practices in the area. Section III contained questions on cause of insanitary conditions. Section IV contained questions on challenge, suggestions and solutions.

The questionnaire was used to collect data from the residents of the study area. The questionnaires were administered to those who agreed to fill it themselves and the rest of the questionnaires were used to interview such respondents to collect data. These methods were employed alongside field observations and personal interviews to have in-depth data on the waste management situations in the study area.

Pre-testing of the instrument

Pre-testing prior to using any instrument ensures its validity and reliability to determine its accuracy and consistency. In line with this, the questionnaires were pre-tested in Oforikrom Sub-Metropolitan area. The pre-testing area was selected for its similarity in characteristics as the study area.

The pre-testing helped to streamline some of the questions on the questionnaires and also properly structured the research procedure which ensured accuracy and reliability of the results.

Procedure for data collection

Similar to what was done during the pre-tesing stage, copies of the introductory letter obtained from the IDS were made and sent to the administrator of the Asokwa Sub–Metropolitan council. This ensured that the researcher had

smooth and official entry into the study area. Therefore, questionnaires were administered, interviews carried out within three weeks.

The first week was used to give out the questionnaires and interview of the sampled respondents. One week was allowed for administered questionnaire to be filled and the last week was used to collect the questionnaires from respondents. Researcher estimated 150 respondents to responds to the questions, which was about 90% of the total number of respondents. However, all the 160 respondents provided answers, which ensured 100% of the total number of respondents and these were used for the data analysis.

Obsrervation and taking of photograph of designated dumping sites were taken to complement the information gathered with the questionnaire. Pictures were taken from paid dumping sites, dustbins placed in front of houses and free range dumping sites.

Data processing and analysis

Each completed questionnaire was edited, serially numbered and tabulated. These data collected were coded and statistically analysed using the statistical package; (Statistical Production and Service Solution, SPSS) version 12.0. This computer aided analysis was used in many forms and allowed the research data to be processed into frequencies, percentages and cross tabulations, which results were presented in tables and discussed.

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CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This chapter presents analysis and discusses the data and findings obtained from the field survey. Frequencies and percentages as well as cross tabulations, for some selected variables were used to analyse and interpret the data. Presentation of the results includes findings from the questionnaires, field observations and personal interviews. In the course of the presentation, relevant literature would be cited to support the findings, particularly, the main research findings. Presentation of the results is done in two main parts, that is, background characteristics of respondents and main research information.

Background characteristics of respondents

The background characteristics of respondents comprised sex, age, marital status, level of education, duration of stay in the Asokwa Sub-Metropolis. On the sex of respondents, data collected showed that out of the 160 respondents, 52.5% were females whilst males were 47.5%. There is no doubt from the information that there are more women in the population than men and that more females than males are directly involved in sanitation management.

Responses elicited from respondents on their age distribution indicated that a cumulative of 70% of them were below 40 years but not younger than 18 years. The remaining 30% were 40 years or more. This mean that most of the respondents were a bit younger.

Regarding the marital status of respondents, the results showed that about 54% were not married while 30% were married. Also, the results showed that widows and divorced people constituted 7.2% and 8.8% respectively.

Table 1: Highest educational level of respondents

Level of education	Frequency	Percent
Primary	5	3.1
JHS/Middle	16	10.0
SHS/Tech/Comm	59	36.9
Tertiary	72	45.0
No formal education	8	5.0
Total	160	100.0

Source: Fieldwork, 2010

On the highest level of education attained, 45% of the respondents had attained tertiary level education; others (36.9%) have studied to the second cycle levels. It was also seen that only 5.0% of respondents did not have formal education. It is expected that the high literacy level of respondents will lead to proper management of waste in the Asokwa Sub-Metropolis.

Responses were also elicited on the occupational status of respondents. Table 2 presents the responses.

Table 2 : Occupation of respondents

Type of occupation	Frequency	Percent
Farmers	8	5.0
Civil/Public servants	48	30.0
Self-employed	72	45.0
Private firm employees	24	15.0
Students	8	5.0

Source: Fieldwork, 2010

Out of the total of 160 respondents, 45% indicated, they were self-employed and 30% were Civil/Public Servants. Also, the Table shows that 15% of the respondents were private firm employees.

Table 3: Number of years respondents have lived in the Asokwa Sub-Metropolis

Number of years	Frequency	Percent
Less than 1	4	2.5
1 – 3	28	17.5
4 – 6	42	26.2
7 and above	86	53.8
Total	160	100.0

Source: Fieldwork, 2010

Though the study area was within a sub-metropolis, 5.0% of the respondents indicated they were farmers. This is explained within the context that the Asokwa Sub-Metropolis is closer to some villages in Bosomtwe district where peasant farming activities are carried out.

From Table 3, it is clear that only 2.5% of the respondents had lived in the Sub-Metropolis for less than a year while 97.5% had lived in the area for various number of years ranging between one year to seven years or more. This group would be a better position to contribute significantly to the issue under consideration.

Forms of solid waste management practices in the Asokwa Sub-Metropolitan area

The way solid waste is managed in the Asokwa Sub-Metropolitan area is the focus of this section. Respondents were asked how they disposed of their refuse and the responses are presented in Table 4.

Table 4: Responses on where residents usually deposit their solid waste

Places for waste disposal	Frequency	Percent
Bins provided by the Sub-Metro	36	22.5
Pay Dump site	90	56.25
Free Range Dump Site	34	21.25
Total	160	100.0

Source: Fieldwork, 2010

Table 4 shows that solid waste disposal practice in the Asokwa Sub-Metropolis is dump site. More than half (56.3%) of the respondents indicated that they deposited their solid waste at pay as you dump sites designated by the Sub-Metropolitan authorities. Available information on solid waste disposal has specifically tackled dump siting as a good waste disposal practice. For instance, Poerbo (1991) asserted that in developing countries, the approach to managing waste focused on getting rid of the trash, with very little or no attention paid to waste minimization or recovery effects. Furthermore, he emphasized that if a household can find a nearby site simply to dump the waste, it has solved its disposal problem, regardless of the cost this dumping may impose on others. In this instant, the dump sites are not arbitrary in that sense but where they are sited pose challenges to those who live close by.

The second solid waste disposal practice which residents of the Asokwa Sub-Metropolis resort to is the use of disposal bins or containers by the Sub-Metropolitan Council. This practice seemed to be the correct way of waste disposal practice in most urban areas. With this waste disposal practice, it is the house–to–house collection, where citizens have to bring their waste materials to a designated bins infront of houses to be offloaded into moving waste disposal vehicles. This practice is mostly done by private waste collectors at a fee. About 23% of the respondents have access to this practice.

Another form of solid waste management practice in Asokwa Sub-Metropolis is the free range dump site. Situation whereby residents throw their refuse indiscriminately at a designated dump site. This form of solid waste

practice is a bad one. From Table 4, it is clear that 21.3% of the respondents do engage in this bad practice.

Although, none of the respondents confirmed that residents threw refuse into gutters and bushes in the Sub-Metropolis, the reseacher observed several scenes of such practices. This poses threat and danger to the residents of the Sub-Metropolis as confirmed by Abrokwah (1998) that dumping of rubbish indiscriminately is one of the extreme bad habits of Ghanaians toward cleanliness. It is very easy for people to create a dumping ground right beside their home or residence, due to lack of an official dumping ground, or to prevent them from walking a distance. Many gutters in the cities and towns are choked due to people making them dumping sites, some people deliberately, especially those who sell by the road side, sweep and dump their rubbish into nearby gutters. This always results in frequent flooding in some parts of the Sub-Metropolis during the rainy season.

Traders and street hawkers, who accumulate rubbish at the end of the day, dump their rubbish in nearby bushes, eventually making it a dumping site for all the traders, and even residents around.

Photographs were taken of the various ways that solid waste was managed in the Asokwa Sub-Metropolitan area. The photographs of the three scenes are presented in (Plate 2, 3, 4 and 5).

Plate 2 depicts the ‘Door-to-Door System of Waste Collection’.With this form of refuse collection, It is a practice where private waste management companies use trucks to collect refuse from residents houses. It can be seen that

refuse are left infront of houses at times three days or more before collection is done. Collection of money is done at the end of the month.

Plate 3 presents the‘Pay as You Dump Site’. This photograph, gives a pictoria view of a dump site with clean environment. This, partly may be due to the fact that collectors do collect money at the dump site as residents pay before dumping is done. Hence, funds are available to hire workers and trucks to clear refuse regularly.

Plate 4 and 5 also show photographs of ‘Free-Range-Dump-Site’. The picture shows a disorganised dump site where residents go and dump their refuse as and when they deemed it fit.

Plate 2 : Refuse not conveyed infront of a house at Gyinyase

Source : Fieldwork, 2010

Plate 3 : Pay-as-you-dump site at Atonsu

Source : Fieldwork, 2010

Plate 4 : A free-range dump site near Subin River at Kaase

Source : Fieldwork, 2010

Plate 5 : Refuse dump site beside a house at Apirabo in Asokwa Sub-Metropolis

Source : Fieldwork, 2010

The next related issue to the waste disposal practice was the body responsible for collecting or managing the solid waste deposited in bins or dump sites. Responses given on the issue are presented in Table 5.

Table 5: Refuse collection in the Asokwa Sub-Metropolis

Responses	Frequency	Percent
Private Waste Management Body	120	75.0
Not Collected	40	25.0
Total	160	100.0

Source: Fieldwork, 2010

Table 5 clearly shows that no respondent indicated that the Asokwa Sub-Metropolitan Waste Management Department was responsible for collecting solid waste in the area. This response may be true to a large extent because the majority (75.5%) of the respondents indicated that a larger portion of the waste was collected by private waste management bodies. These private operators have been contracted by the Sub-Metropolitan Council to work on its behalf, which indicates that the Sub-Metropolitan Council was responsible for waste management, but not direct waste collection.

It is seen from Table 5 that private waste collection companies have been doing most of the waste collection, yet, 25.0% of the respondents indicated that some of the waste were not collected at all. The issue of non-collection of waste is a big challenge to most metropolitan and municipal authorities.

This challenge was observed by the researcher that, residents who do not register with the private waste management companies have their waste not collected. These residents have no option rather than disposing of waste into

gutters, roadsides, behind houses, free range refuse sites and obscure places ussually at night.

Respondents were asked how regular solid waste was collected from the collection points. Their responses are presented in Table 6. The regularity to which refuse generated is disposed off from the households and at designated dumping sites are measures that could help improve waste management in the Asokwa Sub-Metropolitan area.

Table 6: The regularity to which refuse collection was done in the Asokwa Sub-Metropolis

How regular	Frequency	Percentage
Daily	84	52.5
Weekly	76	47.5
Total	160	100.0

Source : Fieldwork, 2010

Table 6 shows that 52.5% of the respondents noted that refuse collection was done on daily basis. Table 6 also shows that 47.5% indicated that waste collection was done weekly. From observation, the weekly collection finding is true because most of the time one would see a heap of refuse in front of households as seen in door to refuse collection system (Plate 2).

Table 7 presents responses to the issue of the major causes of insanitary conditions in the area studied.

Table 7: Major causes of insanitary conditions in the Asokwa Sub-Metropolis

Causes	Frequency	Percent
Dumping waste on the streets	18	11.2
Dumping waste at dump sites	40	25.0
Dumping waste into open gutters	102	63.8
Total	160	100.0

Source: Fieldwork, 2010

Table 7 shows that the major cause of insanitary condition within the Asokwa Sub-Metropolitan area is dumping of waste into open gutters. Another major cause of insanitary condition in the sub-metropolis was attributed to dumping waste at dump sites. Table 7 shows that 25.0% of the respondents alluded to the fact that refuse that accumulate at dump sites for so long cause a lot of inconvenience to people who stay close by. Table 7 further shows that 11.0% of the respondents all indicated that to littering of the streets with waste materials is one of the causes of insanitary condition in the Asokwa Sub-Metropolis.

Respondents were further asked if they sometimes practised indiscriminate dumping of solid waste. About 51.2% of respondents indicated that they sometimes threw rubbish around. The reasons given for these were, inadequate waste bins around the vicinity, ignorance of the consequences, and the refuse site was too far from their houses.

Personal field interview (2010), revealed that most residents threw rubbish away indiscriminately, partly, due to lack of funds to pay for the fees charged.

Residents' attitudes and perceptions towards solid waste management in Asokwa Sub-metropolis

This section examines the perceptions and attitudes of respondents towards solid waste. For instance, Kendie (1999) alluded to the fact that the orientation people have had during the precolonial and post-independence times has affected their attitude and perception towards solid waste management in their localities. In view of this, results of the study showed that 50% of respondents indicated that they dumped solid waste into open gutters because they had no alternative to do so.

Selby (2010) and Abrokwa (1998) made it clear that dumping of rubbish indiscriminately is one of the extreme bad habits of Ghanaians toward cleanliness. They emphasized that many gutters in the cities and towns are choked due to people making them dumping sites, some people deliberately, especially, those who sell by the road side, sweep and dump their rubbish into nearby gutters.

Respondents who answered in the affirmative gave reasons as to why some residents engaged in that practice in (Table 8).

Table 8 : Possible reasons for the indiscriminate waste disposal

Possible reasons	Frequency	Percent
Residents think rains would carry the refuse away	58	36.2
Residents inability to pay at the designated dumping site	24	15.0
Absence of refuse collection bins	8	5.0
Ignorant about the health implications	56	35.0
Dump site is too far	14	8.8
Total	160	100.0

Source : Fieldwork, 2010

Table 8 shows that 36.0% of the respondents pointed to the fact that residents who dump refuse into gutters think that rains would carry them away. The Table further shows that 35.0% of the respondents claimed to be ignorant of the health implications of their actions of dumping solid waste into gutter or littering the streets with polythene bags.

It was also explained that some of the people who dump their refuse in open drains or on the streets are unable to pay the required fee at the designated dumping sites. This view was supported by 15.0% of responses. Beside this, others would dump their refuse indiscriminately because the dump site is too far (9.0%) or there were lack of dustbins to use for waste disposal (5.0%). Abankwah (1998) stresses that irrespective of where people are, they litter the environment even when they are in buses, instead of leaving them in the buses for the drivers to clear them after work. The nature of littering the street is evident when wind

blows, as these polythene bags will be flying in the air, with one not knowing where they are coming from.

Beyond the reasons given as to why some residents dump refuse in open drains and litter the streets with solid waste, respondents were asked how they felt when they saw such insanitary conditions. In their responses, they felt disappointed, bad and ashamed because filth was against their cultural practices since, in the rural areas solid waste is properly disposed off by female members of the community. To explain this point clearer, Tsiboe (2004) proved how traditional beliefs and practices in Ghana are in fact pro-environmental. There are for example dozens of folklores and myths about environmental protection and good sanitation and hygiene behaviour. According to them, the earth is regarded as mother god and must be treated with reverence hence explaining why the rural folks see it expedient to separate waste to avoid contaminating Mother Nature.

In a sense, poor waste management and unhygienic conditions in the communities in the urban areas are often traced to the new wave of urban culture in Ghana. Kendie (1999) put the issue into the right perspective that “This new wave of urban culture has been necessitated by economic hardships and high urban population growth rates in Ghana from the 1980s onwards”.

One other issue that was considered to be influenced by attitude and perception was the issue of paying for the refuse collected at one’s door step or paying at the dumping site. The first item asked respondents if they paid for the refuse that is collected from their house. The responses showed that 52.5% paid and 47.5% did not pay. This revelation of people not paying for the services

rendered could account for the heaps of refuse in front of some houses in the Asokwa Sub-Metropolis. It is also a confirmation of one of the reasons given that some residents dump solid waste into open drains because they did not have money to pay at the refuse collection sites (see Table 9).

Those who indicated paying for refuse collection were asked how much they paid. The responses revealed that about 71.0% of those who paid said they paid up to 20 pesewas and 28.6% paid from 21 to 40 pesewas. One could say that the amount paid for the dumping services is not so much but some residents were not prepared to pay anyway.

Respondents were asked if they were prepared to pay for improved waste management practices. The response was overwhelmingly in favour of payment for improved services. Ninety-five per cent of respondents answered in the affirmative that they would be prepared to pay more than what they paid previously. The fact that the larger section of residents are prepared to pay for improved waste management practice is a good sign (Table 9).

Table 9 : Extra amount respondents are prepared to pay for improved waste management practice

Extra amount to be paid	Frequency	Percent
Up to 50 pesewas	74	48.7
51 pesewas to GHC1.00	34	22.4
GHC 1.00 or more	44	28.9
Total	152	100.0

Source: Fieldwork, 2010

It is clear from Table 9 that the 152 respondents who indicated their willingness to pay for improved waste management services are into categories. The first categories of residents would be able to pay up to 50 pesewas, the least in this case but higher than what they paid in the past. Other residents indicated they could pay up to GHC 1 or more. These are good signs if the Asokwa Sub-Metropolitan Council would put in the appropriate measures to implement the improved waste management paradigm residents are advocating for.

From the responses on the attitudes and perceptions of respondents, it can be concluded that some of the residents have poor attitudes and perceptions about the waste disposal and management, whilst others continue to maintain the traditional sanitation consciousness. Those who exhibit poor attitudes partly think that it is the responsibility of city authorities to manage the waste they create and not them. Some also act out of ignorance, which is equally dangerous for the health on residence.

Table 10 presents responses on the experience residents have had from sanitation related diseases.

Table 10 : Experience of sanitation related diseases

Type of Disease	Frequency	Percentage
Malaria	148	92.5
Cholera	12	7.5
Total	160	100.0

Source : Fieldwork, 2010

It is clear from Table 10 that malaria is the most serious health hazard and results from poor waste disposal practices. This is because the majority (92.5%) of respondents pointed out that some members of their households have been attacked by malaria in the past three months. This finding is confirmed by Songsore (2004) that households living in the slums and shanty towns of large cities and in unserviced small towns are often exposed to numerous vectors and pest within their home and neighbourhood environment. The most common vectors and pests include mosquitoes, house flies, cockroaches and rats.

Table 10 again, shows that 7.5% of respondents revealed that because of the poor waste management in the Asokwa Sub-Metropolis, some members of their communities have suffered from cholera. Selby (2010) revealed that when rubbish are disposed of indiscriminately, they are carried away by the rain into rivers and water bodies, which are also a source of water for domestic and industrial purposes. In this case, when the water is used without being boiled or distilled, it makes way for cholera.

Here, residents without pipe borne water end up drinking the contaminated water which results in cholera attack In a follow-up to the issue discussed above, respondents were asked how many times their family members were attacked by malaria or cholera in the past three months (Table 11).

This situation is indeed alarming and calls for stringent measures to curtail the situation.

Table 11 : Number of times residents were attacked by malaria over the past three months

Number of times	Frequency	Percentage
Once	14	9.2
Twice	30	19.7
Thrice	28	18.4
Four times or more	80	52.6
Total	152	100.0

Source : Fieldwork, 2010

This is because if most members of the community is unhealthy, it will not be possible for them to engage in productive ventures to have enough resources to live on.

Apart from the number of times, residents were attacked by malaria or cholera, the concern was on how many members of a household got attacked. Table 11 presents the responses on that issue.

Dealing with improper waste disposal

It has been an established fact that improper waste disposal has a lot of negative effects on human life. In view of this, research question four was formulated to elicit suggestions from respondents as to the way forward in dealing with the effects of improper waste management in their localities. Firstly, respondents were asked if there were other ways of dealing with the menace of solid waste management. The majority (87.5%) of respondents answered in the

affirmative and a few (12.5%) responded in the negative. Those who thought something could be done went further to offer solutions (Table 12).

Table 12 : Suggestions on how to improve waste collection

Suggested solutions	Frequency	Percent
People should be educated to use the available bins	48	30.0
More bins must be provided	32	20.0
Provision for daily collection and conveyance of refuse	80	50.0
Total	160	100.0

Source : Fieldwork, 2010

From Table 12, it is seen that three suggestions were given for the management of solid waste collection. Provision for daily collection and conveyance of refuse received the attention of a greater number of respondents (50%).

Apart from the daily collection, Table 12 shows that 30% of the respondents indicated that people should be educated to use the existing waste bins in the disposal of solid waste. What had been observed is that people dispose their solid waste anyhow, partly, ignorant of the consequences of their actions. In the same way, 20% of the respondents suggested that there should be additional provision of waste bins to augment the existing ones. People throw polythene

bags and other small waste on the ground because they are unable to locate a dust bin to dispose the article off.

Respondents were also asked to offer suggestions on how to manage solid waste collected in the Asokwa Sub-Metropolitan area. The suggestions given are presented in Table 13.

Table 13 : Suggestions on how to manage solid waste by the local authorities

Suggested solutions	Frequency	Percent
Separate refuse and burn dry leaves	27	16.9
Bury/decompose	13	8.1
Recycling of the waste	120	75.0
Total	160	100.0

Source : Fieldwork, 2010

First and foremost, Table 13 shows that 17.0% of the respondents indicated that authorities of the Asokwa Sub-Metropolitan Council should separate refuse and burn the leaves that are left out. They thought that if this was done it would help in the management of solid waste in the area. From the literature, it does seem that this method is applicable to modern waste management practice.

Eight percent of the respondents suggested that some of the solid waste can be buried or decomposed. This method would depend on the type of waste involved since decomposition is one of the methods suggested by Goodings (2008).

Finally, most of them (75%) advocated for the use of recycling of the waste. It seems that recycling of waste has become the most acceptable form of managing solid waste across the world. This assertion has support from literature. For instance, Schackelford (2006) stressed that recycling of waste amounts to processing them into new products to prevent further waste which has the potential of causing health problems to people living near the dump site or landfill sites. Specifically, Schackelford (2006) indicated that "recycling is a key component of modern waste reduction and is the third component of the 'Reduce, Reuse, Recycle waste hierarchy'.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter of the study deals with the summary of findings, conclusions and recommendations made from the findings. The study was generally concerned with the perception of solid waste management practices in the Asokwa Sub-Metropolitan area of the City of Kumasi.

Summary

The major results of the fieldwork can be summarised as follows :

- The results of the study indicated that some residents dispose off solid waste indiscriminately sometimes on the streets and open gutters for reasons including -
  i. Dump site was too far from the households,
  ii. Residents' inability to pay at the designated dumping sites,
  iii. Absence of refuse collection bins, and
  iv. Ignorance about the health implications of indiscriminate waste disposal.
  v. Irregular conveyance of dustbins infront of houses.

- Again, it was found that residents usually disposed off their waste through the refuse bins deposited in front of their houses and at designated dumpsites.
- It was revealed that about 80% of solid waste generated in the area was collected by private waste collectors whilst the remaining 20% was left unattended to most of the time.
- It was found that the major causes of insanitary conditions in the area were dumping of solid waste into open drains, at free range dump sites and littering of streets.
- Residents experienced frequent attacks of malaria.
- Measures to deal with the improper solid waste disposal and its attendant effects were suggested and they included :
  i. the organisation of public education on acceptable waste disposal practices,
  ii. the provision of adequate refuse bins at vantage points along the streets,
  iii. regular waste collection of refuse by authorised bodies,
  iv. the separation of refuse and burning of dry leaves at final dumping sites,
  v. practising of burying or decomposing the waste and
  vi. recycling of the waste into other uses as practiced in advanced countries.

Conclusions

The waste disposal method whereby residents dumped as they paid seems to be more appropriate. The reason for the appropriateness of the dump as you pay method is that the environment is always kept clean because, it is self-financing.

It was also observed that the door to door solid waste collection method was not effective. This is so because companies who had been tasked to collect the refuse at the door steps of residents hardly discharged their duties as expected leaving the refuse in front of the houses for several days. This neglect leaves in its wake flies and unbearable stench, which tends to pollute the environs almost on daily basis. The door to door method, could have been effective and appropriate like the pay as you dump method because most residents were willing to pay to ensure effective solid waste management in their communities.

Furthermore, it was seen that the free range solid waste disposal method at principally the rural environments of the study area was very deplorable. Dumping of refuse at these sites was not supervised by any officer of the Sub-Metropolis, hence, anyone could dump his/her solid waste anyhow.

Recommendations

Some recommendations are made for the authorities in the Asokwa Sub-Metropolitan Council to adopt as remedial measures towards proper waste management practices. Consequently, it is recommended that:

- Public education towards change of attitude towards solid waste disposal must be intensified by using the Information Services Department through the local radio FM stations, at durbars, in schools, market centers, churches and mosques.
- The Sub-Metropolitan Council should provide adequate refuse bins at vantage points on the streets for the disposal of papers and polythene bags which are thrown about anyhow. With the provision of the bins, people who choose to litter the streets should be prosecuted.
- The Asokwa Sub-Metropolitan Council should ensure that contractors tasked with the door to door collection of refuse live up to expectation, by practising daily collection, since residents are willing to pay for it.
- The authorities of the sub-metropolis should increase the number of refuse containers by placing them at shorter distances. Besides, the containers should be offloaded as soon as they are full to avoid overflow.
- The Sub-Metropolitan Council should intensify the pay as you dump policy which when managed well could help stem the tide of improper waste management.
- As a final resort, the Asokwa Sub-Metropolitan Council should mobilise money to establish a recycling plant at the final waste disposal site so as to prevent further challenges of managing the waste in the long run.

The lack of bins meant that the sub-metropolitan authorities should ensure that adequate litter bins are supplied and emptied regularly so that residents can use them for waste disposal. Regarding the issue of

ignorance, intensive education on refuse management practices can be launched and sustained and finally, the house to house refuse collection should be improved to cater for long distance dumping sites.

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APPENDIX

QUESTIONNAIRE ON SOLID WASTE MANAGEMENT

Dear respondent, the purpose of this questionnaire is to find out the solid waste management in Asokwa Sub-Metropolitan area. Also, the investigator is looking at improper solid waste management and its health implications on teh people of suburbs with teh sub-metro. Your candid responses would be highly appreciated and they would be treated as completely confidential.

Thanks in advance for your cooperation.

Section A: Personal data

Please complete the items by ticking [√] as you deem appropriate.

1. Gender Male [ ] Female [ ]

2. Age 18 – 25 [ ]

26 – 45 [ ]

45 or more [ ]

3. Marital Status Married [ ] Single [ ]

Separated [ ] Widowed [ ]

4. Highest level of education

Primary [ ]

JHS/Middle [ ]

Secondary/Technical/Commercial [ ]

Tertiary level [ ]

No formal education [ ]

5. How many years have lived in this area ?

Less than one year [ ]

1 – 3 years [ ]

4 – 6 years [ ]

7 years or more [ ]

6. What is your occupation ?

Farmer [ ]

Civil/public servant [ ]

Self-employed [ ]

Private Firm employee [ ]

Student [ ]

Any other (specify):……..

Section B : Main research items

7. Do people throw refuse on the street and gutters at night ?

Yes [ ] No [ ]

8. If yes, explain briefly why they do that :

…….

9. How do you feel when you witness refuse on the streets ?

……..

10. Do youp ay for the collection of refuse ?

Yes [ ] No [ ]

11. If yes how much do youp pay ? GHC……

12. Are you willing to pay more for improved waste management practice ?

Yes [ ] No [ ]

13. Where do you deposit your solid waste ?

Bins provided by the sub-metro [ ]

Free-Range-Dump Site [ ]

Pay-As-You-Dump Site [ ]

Thrown into bushes [ ]

Thrown into gutters [ ]

Other, specify:…….

14. Who collects refuse in your area ?

Metropolitan Waste Management Departement [ ]

Private Waste Management Body [ ]

Not collected [ ]

15. How often is the waste collected ?

Daily [ ] Twice a week [ ]

Weekly [ ] Irregular [ ]

16. What is the major cause of insanitary condition in your area ? People throw solid waste on:

Street [ ]

Dump sites [ ]

Gutters [ ]

Waste bins [ ]

17. Which of the following can strongly result in flooding ? Is it throwing solid waste on/into:

Street [ ]

Dump sites [ ]

Gutters [ ]

18. Do you sometimes practise indiscriminate dumping of rubbish ?

Yes [ ] No [ ]

19. If yes, give reasons ……

20. Has any member of your household been down with any of the following diseases this year ?

Malaria [ ]

Diarrhoea [ ]

Cholera [ ]

21. If yes, how many times ? ……..

22. Please indicate the number of members of your household who were affected by the diseases listed in item (20) above ? ……..

23. Are there ways that refuse collection can be improved in your area ?

Yes [ ] No [ ]

24. If yes, what do you suggest should be done to improve upon solid waste collection ?

i. ……..

ii…….

iii……..

iv…….

25. Which other measures will you suggest to be used to manage solid waste in the Asokwa Sub-Metropolis ?

……

……

……

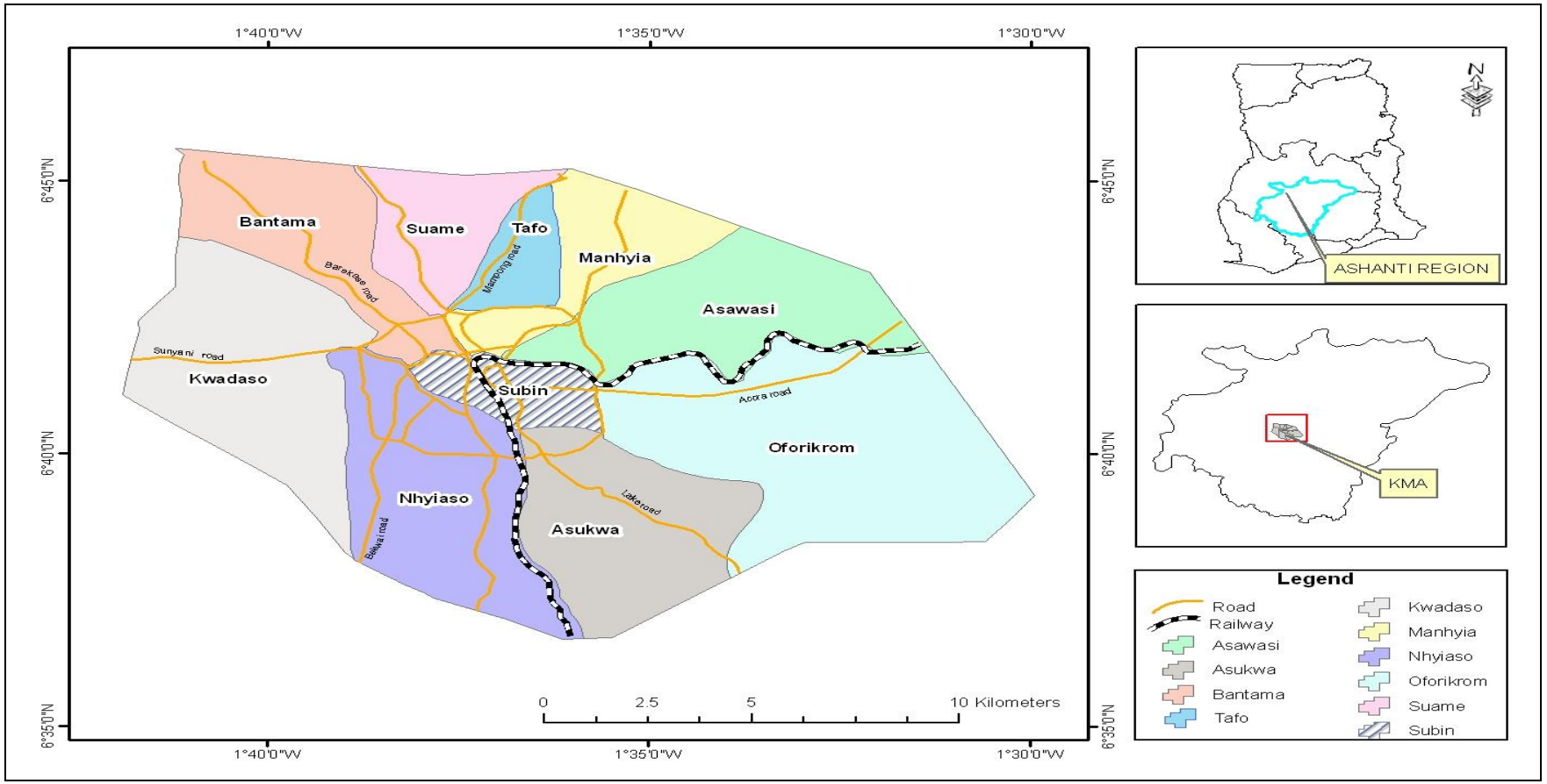

Figure 1: Kuamsi Sub-Metropolitan areas indicating Asokwa Sub-Metropolis

Source: Cartography Unit, Department of Geography and Regional Planning, UCC (2011)