

**PERCEPTIONS AND ATTITUDES INFLUENCING THE
MANAGEMENT OF SOLID WASTE IN THE KUMASI
METROPOLIS, GHANA**

By

AMOS ALFRED NEIZER

B.A. (HONS) SOCIOLOGY AND SOCIAL WORK

A Thesis submitted to the Department of Sociology and Social Work,

Kwame Nkrumah University of Science and Technology In

partial fulfillment of the requirement for the degree

of

MASTER OF ARTS IN SOCIOLOGY

FACULTY OF SOCIAL SCIENCES

MAY, 2014

KNUST



DECLARATION

I hereby declare that this submission is my own work towards the attainment of Master of Arts in Sociology and that, to the best of my knowledge, the work contains no material previously published by another person nor material that has been accepted for the award of any other degree of the University or elsewhere, except where due acknowledgement has been made in the text.

AMOS ALFRED NEIZER
SIGNATURE DATE

CERTIFIED BY:

DR. KOFI OSEI AKUOKO
SIGNATURE DATE

SUPERVISOR'S NAME
CERTIFIED BY:

DR. J.M DAPAAH
SIGNATURE DATE

SUPERVISOR'S NAME
CERTIFIED BY:

DR.KOFI OSEI AKUOKO

HEAD OF DEPARTMENT'S NAME SIGNATURE DATE

ABSTRACT

Rapid uncontrolled urbanization in Ghana has saddled the country's cities with problems of physical, socio-economic and environmental nature. Besides the physical problems of poor infrastructure, inadequate housing, congestion and poor accessibility, solid waste management is a worsening situation in urban settlements in Ghana. Solid Waste Management is defined as the direct generation, collection, storage, transport, source separation, processing, treatment, recovery and disposal of solid waste. The study was therefore an attempt to examine the socioeconomic factors influencing the management of solid waste in the Kumasi Metropolis particularly in Asawase and Nhyiaeso communities in Kumasi. Nhyiaeso and Asawase were chosen as a way of comparing how solid waste is managed in residential areas where there are wealthy individuals at the expense of communities where individuals have a lower income. Nhyiaeso represented communities with higher income whereas Asawase represents communities with lower income. The study uncovered the fact that wastes generated in the metropolis are generally non-poisonous since they are mostly from food items. They also serve as a source of food for some farm animals. The study also revealed that bigger waste bins are needed in the collection of daily waste. Uncollected refuse accumulates in drains, roads, and open spaces; disrupting community life and creating additional problems in the operation of other public services. These and other facts came to light as a result of interviews conducted in Nhyiaeso and Asawase households. The research was a case study and the sampling technique was simple random sampling. The researcher therefore made recommendations for aggressive policies and measures to address the challenges identified in order to promote a sustainable solid waste management in the Kumasi Metropolis.

DEDICATION

This research work is fondly dedicated to my father of blessed memory Pastor Nathanael Daniel Alfred Neizer, for his prayers and support which enabled me to complete this research work with less difficulty.



TABLE OF CONTENTS

| | | |
|-------------------|-------|------|
| Declaration | ..... | i |
| Abstract | ..... | ii |
| Dedication | ..... | Iii |
| Table of Contents | ..... | iv |
| List of Tables | ..... | viii |
| List of Figures | ..... | ix |
| Acknowledgement | ..... | x |

CHAPTER ONE: INTRODUCTION

| | | |
|-------------------------------|-------|---|
| 1.1 Background to the Study | ..... | 1 |
| 1.2 Statement of the Problem | ..... | 4 |
| 1.3 Research questions | ..... | 5 |
| 1.4 Objectives of the study | ..... | 6 |
| 1.5 Significance of the study | ..... | 6 |
| 1.6 Definition of concepts | ..... | 7 |
| 1.7 Organization of the study | ..... | 8 |

CHAPTER TWO: LITERATURE REVIEW

| | |
|---|----|
| 2.1 Introduction | 10 |
| 2.2 The concept of waste management | 10 |
| 2.3. Concepts in waste management | 11 |
| 2.3.1 Waste | 11 |
| 2.3.2 Classification of waste | 13 |
| 2.3.3 The goals of waste management | 15 |
| 2.3.4 The principles of waste management | 18 |
| 2.3.5 Integrated waste management | 19 |
| 2.3.6 Sustainable waste management | 20 |
| 2.4 Social problems of solid waste management | 21 |
| 2.5 Theoretical framework of solid waste management | 22 |
| 2.5.1 Ecological modernisation theory | 22 |
| 2.5.2 Waste management theory | 24 |
| 2.6 Nature of solid waste problem in developing countries | 26 |
| 2.7.1 Causes of solid waste problem in developing countries | 33 |
| 2.7.1.1 Financial and economic constraints | 34 |
| 2.7.1.2 Inadequate personnel for waste management | 35 |
| 2.7.1.3 Technological constraints | 37 |
| 2.7.1.4 Institutional constraints | 38 |
| 2.7.1.5 Lack of legislation and enforcement | 39 |
| 2.7.1.6 Lack of good governance and civil society | 40 |

2.7.1.7 Political neglect 42

2.8 Spatial disparities in the magnitude of the solid waste problem 45

CHAPTER THREE: RESEARCH METHODS

3.1 Introduction 54

3.2 Research Design 54

3.3 Ontological paradigm and epistemological underpinning of the study 55

3.4 Methodological approach 56

3.5 Research population 57

3.6 Sources of data 58

3.7 Methods of data collection 58

3.7.1 Interviews 59

3.7.2 Field Observation 59

3.8 Data analysis 60

3.9 Ethical issues 60

3.10 Theoretical problems 62

CHAPTER FOUR: DATA INTERPRETATION, DISCUSSION AND ANALYSIS

4.1 Introduction 63

4.2 Interpretation, discussion and analysis of data 63

CHAPTER FIVE: FINDINGS, CONCLUSION AND RECOMMENDATIONS

| | |
|---------------------------|----|
| 5.1 Introduction | 77 |
| 5.2 Major findings | 77 |
| 5.3 Conclusion | 81 |
| 5.4. Recommendation | 82 |

| | |
|---------------------------|----|
| Bibliography | 85 |
|---------------------------|----|

| | |
|--|----|
| Appendix A: Interview with households | 88 |
|--|----|

| | |
|---|----|
| Appendix B: Interview with officials of municipal waste department in Kumasi | 90 |
|---|----|

LIST OF TABLES

| <u>TABLE</u> | <u>PAGE</u> |
|---|-------------|
| 2.1 Classification of Waste | 13 |
| 2.2 Solid Waste Collection in Selected Cities in Developing Countries | 32 |
| 3.1 Key Stakeholders in the Study | 58 |

LIST OF FIGURES

| <u>FIGURE</u> | <u>PAGE</u> |
|---|-------------|
| 2.1 Conceptual model of the factors affecting the quality of solid waste management | 44 |

ACKNOWLEDGEMENT

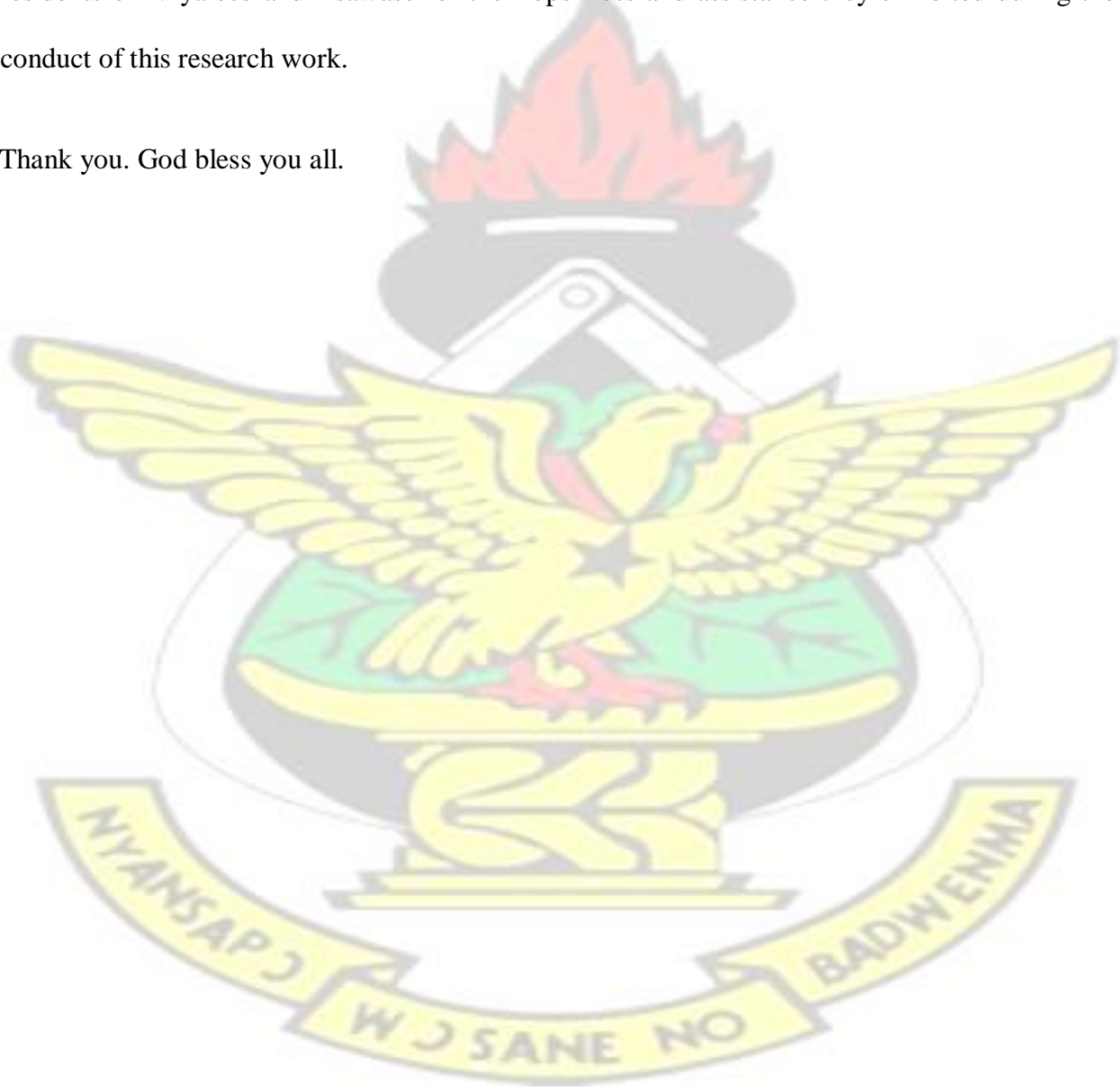
I give thanks and praise to my Almighty Lord and Saviour Jesus Christ for His guidance, strength and abundant mercies that has led me to come out with this thesis.

I am very much grateful to Dr. Jonathan Mensah Dapaah and Dr. Kofi Osei Akuoko, my supervisors who greatly contributed to the weaving of ideas in the organization of this work.

Their deep insight, constructive criticism and critical display of knowledge served a good purpose.

Again, my sincere gratitude goes to the Management of Kumasi Metropolitan Assembly and the residents of Nhyaieso and Asawase for their openness and assistance they exhibited during the conduct of this research work.

Thank you. God bless you all.



CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND TO THE STUDY

In countries around the world, one major environmental problem that confronts municipal authorities is solid waste disposal. Most city governments are confronted by mounting problems regarding the collection and disposal of solid waste. In lower-income countries like Ghana, the main problems are related to collection, with between one-third and one-half of all solid waste generated in Third World cities remaining uncollected” (Pacione, 2005). Today, municipal solid waste collection and disposal are particularly problematic in the cities of developing countries, but many Western cities have also grappled with this problem in the past (and some probably still do). In his book *Rubbish*, Girling has observed that before the 20th century, many cities in Europe “drowned in a sea of garbage” with most of their municipal solid waste being dumped into rivers and open sewers. Municipal waste services were then poor and rivers like the Rhine and Thames were nothing more than open sewers as they were heavily polluted with waste and were major sources of infectious diseases (Girling, 2005).

Nowadays, Western countries generally rely on land filling to overcome the problem of waste accumulation (Girling, 2005; Pacione, 2005). The landfill seems to have a special attraction for municipal waste managers because it offers a cheap and convenient option for waste disposal compared with other strategies such as reuse, recycling and energy recovery (Charzan, 2002). In fact, with the exception of few countries like Austria, the Netherlands and Denmark who recycle

substantial proportions of their waste, most countries in Europe and North America still dump the bulk of their municipal solid waste in landfills (OECD, 2000; Girling, 2005).

Recent developments, however, seem to suggest that burying waste in landfills is not sustainable solution to the mounting solid waste problem. In May, 2008, the lack of waste disposal land created mayhem in the Italian city of Naples when the streets became laden with waste, blocking traffic and causing nuisance and hazards. As part of the solution to the problem of landfill space scarcity, many Western countries are resorting to shipping their waste to developing countries, especially in Asia and Africa, where they are supposedly being recycled (Coonan, 2006). This raises concerns about environmental justice as to whether the trans-boundary shipment of waste, which sometimes contains hazardous components, constitutes useful trade between the countries involved or an opportunity for rich countries to find disposal space for their waste. Faced by the fact that landfills cannot provide a sustainable option for waste management, Western countries are making efforts to move up the waste hierarchy but the pace of progress is rather slow.

Studies in Africa have shown that the problem of waste management has become intractable and threatens to undermine the efforts of most city authorities. Kirondi (1999) has observed that the city environment in most developing countries is characterised by heaps of garbage, overflowing waste containers, choked drains, clogged streams and stinking gutters. Hardoy *et al.* (1993) have, therefore, aptly described the Third World urban environment as “among the most health and life threatening of all human environments”.

Unable to provide adequate waste disposal and other environmental services within their entire jurisdictions, municipal authorities in most developing countries tend to concentrate their waste

collection efforts in official and wealthy areas while the poorer areas receive little or no service for waste removal even though waste collection operations are usually funded with public resources (Lohse, 2003). Besides, waste disposal facilities, which are usually poorly maintained, are frequently cited in the neighbourhoods of the poor and other vulnerable population groups (Camacho, 1998; Bullard, 2005) which implies the shifting of environmental burdens on the poor.

The above situations lead to the spatial concentration of environmental problems (brown agenda concerns) in the poor enclaves of cities (Elliot, 2005), thereby helping to create a situation in which the urban poor face multiple burdens, living in unhealthy local environments characterised by a complex of interrelated risks, involving overcrowding, sanitary hazards, unsafe or insufficient water, indoor air pollution, accumulation of waste and disease bearing pests (Hardoy *et al.*, 2001; McGranahan, 2002; Elliot, 2005). This multiple tragedy of the poor remains a worry and raises concerns about social and environmental justice in urban management. The generally poor waste situations in developing country cities and the perpetuation of social and environmental injustice against the poor remain critical challenges and deviate from the objectives of the Millennium Development Goals (MDGs). In line with the situation in poor country cities generally, Ghanaian cities are grappling with mounting solid waste and other environmental problems with socio-spatial inequalities in the distribution of the waste burden.

These issues invite research attention.

1.2 STATEMENT OF THE PROBLEM

Nabila (1993) has blamed the worsening environmental conditions in the cities on the rapidly growing urban population in an unfavourable economic environment whereby city governments lack the resources to provide basic infrastructure and services for environmental management. On

the other hand, Tamakloe (2006) attributes the poor environmental conditions in the cities to low institutional capacity for urban management, poor physical planning and the lack of enforcement of development laws, poor provision of infrastructure and services for environmental maintenance and low public awareness of environmental hygiene.

Rapid, uncontrolled urbanization in Ghana has saddled the country's cities with problems of physical, socio-economic and environmental nature. Besides the physical problems of poor infrastructure, inadequate housing, congestion and poor accessibility, major cities in the country are confronted by socio-economic challenges including increasing levels of unemployment and poverty, social exclusion and rising crime and violence (Songsore, 2003).

The problem under investigation in this study is the worsening solid waste situation found in urban settlements in Ghana. Among the many problems that confront cities in Ghana, solid waste disposal is a particularly worrying issue that seems to overwhelm the authorities. In fact, the problem appears intractable and can be likened to a 'monster' staring the authorities in the face while they look on helplessly (Kironde, 1999). Tamakloe (2006) has referred to it as "a nightmare" and it would seem that many of the Millennium Development Goals (MDGs) are far from achievable by the target year of 2015 in the waste-laden city environments since solid waste disposal affects most of the issues to be addressed by the MDGs including child health and mortality (Goal 4) maternal health (Goal 5) the incidence of malaria and other diseases (Goal 7) and environmental sustainability (Goal 7).

In spite of the concerns frequently raised by concerned groups, institutions and individuals among the populace, the solid waste situation in the cities continues to worsen, thereby posing serious

threats to public health and the environment. Besides, the environmental burdens associated with the worsening solid waste situation appears to fall more heavily on the poor even though waste removal and disposal are public funded and regulated.

The problem under investigation in this study is the worsening solid waste situation found in urban settlements in Ghana. The concentration of population and business activities in Ghanaian cities is being accompanied by a rapid increase in the volume of solid waste generated. As a result, urban settlements in the country are saddled with a worsening solid waste situation which proves to be very difficult to deal with and threatens public health and the environment. A cursory observation within the cities shows visible aspects of the solid waste problem including accumulation of garbage, heavy street litter, waste-clogged drains and water bodies and stinking gutters. This study is therefore being undertaken in order to gain understanding of perceptions and attitudes influencing solid waste management in Kumasi in order to find a lasting solution to this canker.

1.3 RESEARCH QUESTIONS

1. What are the perceptions and attitudes that influence the management of solid waste in the Kumasi Metropolis?
2. How would you describe the solid waste situation in Kumasi?
3. What factors militate against solid waste management in Kumasi?
4. How is solid waste managed in the Kumasi Metropolis?

1.4 OBJECTIVES OF THE STUDY

1.4.1 GENERAL OBJECTIVE

The general objective of this study was to identify the perceptions and attitudes influencing the management of solid waste in the Kumasi Metropolis.

1.4.2 SPECIFIC OBJECTIVES

The specific objectives were:

- 1) To describe the solid waste situation in Kumasi.
- 2) To identify the factors that mitigates against solid waste management efforts in Kumasi.
- 3) To identify ways of management of solid waste in Kumasi.
- 4) To make appropriate recommendations to improve solid waste management efforts in Kumasi.

1.5. SIGNIFICANCE OF THE STUDY

The worsening solid waste disposal situation in Ghanaian cities has attracted attention among the populace. High profile government officials including Ministers of State, parliamentarians and even the presidency have expressed concern about the deplorable solid waste situation in cities in the country. The solid waste problem is also receiving a lot of media attention shown by the frequent featuring of waste disposal issues in newspapers, Television and radio discussions. This topic had been undertaken before, so the researcher has decided to take this topic to review the existing literature on this topic and find out if any changes had taken place over the years. The aim of the study is to review any scanty information already existing on this topic.

The solid waste situation in Ghanaian cities remains under-researched and hence poorly understood. This situation creates a knowledge gap and makes it difficult to find solutions to the worsening solid waste situation in the country. In view of the above, this study can be justified on the grounds that it will broaden the understanding of the solid waste problem affecting Ghanaian cities and provide a useful starting point for addressing an otherwise intractable problem. The study will also contribute to both the theory and practice of urban solid waste management in poor countries generally.

Waste issues seems to be a boring subject not many get excited about; however its consequences if overlooked can wreck the health and existence of any well meaning people. Managing solid waste well and affordably is one of the key challenges in the Kumasi Metropolis. There is very little or no supervision of garbage dumping sites. Garbage is deposited on the bare ground without any engineering mechanism to properly store solid waste.

Efforts are been made by waste management companies but more ought to be done by communities themselves to ensure a clean environment where waste will not only be a negative element, but also a resource that can actually enhanced living standards of communities.

1.6. CONCEPTUAL DEFINITIONS

- **Waste:** Waste includes all items that people no longer have any use for, which they either intend to get rid of or have already discarded. Additionally, wastes are such items which people are required to discard, for example by law because of their hazardous properties.(EIONET, 2012)

- **Waste Management:** Waste management is the collection, transport, processing or disposal, managing and monitoring of waste materials. (Wikipedia, 2012)
- **Solid Waste Management:** Solid Waste Management is defined as the direct generation, collection, storage, transport, source separation, processing, treatment, recovery and disposal of solid waste. It is a polite term for garbage management.
- **Urbanization:** Urbanization is the physical growth of urban areas as a result of ruralurban migration and even suburban concentration into cities, particularly the very largest ones. The United Nations projected that half of the world's population would live in urban areas at the end of 2008. It is closely linked to modernization, industrialization, and the sociological process of rationalization. Urbanization can describe a specific condition at a set time, i.e. the proportion of total population or area in cities or towns, or the term can describe the increase of this proportion over time. So the term urbanization can represent the level of urban relative to overall population, or it can represent the rate at which the urban proportion is increasing. Urbanization is not merely a modern phenomenon, but a rapid and historic transformation of human social roots on a global scale, whereby predominantly village culture is being rapidly replaced by predominantly urban culture (Wikipedia, 2011).

1.7 ORGANISATION OF THE STUDY

The study has been divided into five (5) chapters. Chapter one is concerned with the background to the study, statement of the problem, research questions, objectives of the study, significance of the study, definition of concepts and the organization of the study. Chapter two deals with the literature review. This chapter looks at the views of other writers or what other

people have said about the issues under discussion as well as review of previous studies in solid waste management. Chapter three talk about the methods by which the data or information for the study was collected. Chapter four also deals with the analysis and presentation of data in this study. Chapter five deals with the discussion of major findings, conclusion and recommendations of the study.



CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter presents a review of the literature on solid waste management. The first section discusses some basic concepts related to waste management while the second part focuses on the urban solid waste problem in developing countries, discussing the nature and causes of the problem.

2.2 THE CONCEPT OF WASTE MANAGEMENT

The business of keeping our environment free from the contaminating effects of waste materials is generally termed waste management. Gbekor (2003), for instance, has referred to waste management as involving “the collection, transport, treatment and disposal of waste including after care of disposal sites”. Similarly, Gilpin (1996) has defined waste management as “purposeful, systematic control of the generation, storage, collection, transportation, separation, processing, recycling, recovery and disposal of solid waste in a sanitary, aesthetically acceptable and economical manner” while Schubeller *et al.* (1996) focus on municipal solid waste management which they define as “the collection, transfer, treatment, recycling, resource recovery and disposal of solid waste in urban areas”. It can be deduced from these definitions that waste management is the practice of protecting the environment from the polluting effects of waste materials in order to protect public health and the natural environment. Thus, the priority of a waste management system must always be the provision of a cleansing service which helps to maintain the health and safety of citizens and their environment (Cooper, 1999). Further, Gilpin (1996) regards the business of waste management as a professional practice which goes beyond the physical aspects of handling waste. It also “involves preparing policies, determining the environmental standards, fixing

emission rates, enforcing regulations, monitoring air, water and soil quality and offering advice to government, industry and land developers, planners and the public” (Gilpin, 1996). Waste management, therefore, involves a wide range of stakeholders who perform various functions to help maintain a clean, safe and pleasant physical environment in human settlements in order to protect the health and well-being of the population and the environment. Effective waste management is, however, a growing challenge to all municipal governments, especially in developing countries.

2.3. CONCEPTS IN WASTE MANAGEMENT

2.3.1 WASTE

Much has been written about the waste problem yet the definition of the term waste is quite rare in the scholarly literature on the topic. As noted by Palmer (2005: online) “the term is frequently left as an undefined primitive in spite of its critical importance” and ... “frequently, a list of types of waste is substituted for the underlying definition”. Definitions of ‘waste’ are rather commonly found in such documents as dictionaries, encyclopaedia and technical reports of governments and organizations. For example, the *Longman Dictionary of Contemporary English* defines waste as “the unwanted material or substance that is left after you have used something”.

Gilpin (1996) provides a more elaborate definition of the term waste. According to him, the concept of waste embraces “all unwanted and economically unusable by-products or residuals at any given place and time, and any other matter that may be discarded accidentally or otherwise into the environment” (Gilpin, 1996). Gilpin also suggests that what constitutes waste must

“occur in such a volume, concentration, constituency or manner as to cause a significant alteration in the environment”. Thus, apart from waste being an unwanted substance that is discarded, the amount of it and the impact it makes on the environment also become important considerations in defining waste.

McLaren (1993) has also referred to waste as the “unwanted materials arising entirely from human activities which are discarded into the environment”. This notion that waste results entirely from human activities is corroborated by Jessen (2002) who has noted that “waste is human creation” and “there is no such thing as waste in nature where cut-offs of one species become food for another”. On his part, Palmer argues that, “there is no constellation of properties inherent in any lump, object or material which will serve to identify it as waste ... an item becomes waste when the holder or owner does not wish to take further responsibility for it”. As a default definition, Palmer (1998) suggests that “any substance that is without an owner is waste”.

Davies (2008) further notes that “what some people consider to be waste materials or substances are considered a source of value by others” This relative attribute of waste can be compared with the concept of ‘resource’ which has also been defined as material that has use-value (Jones and Hollier, 1977) and “a reflection of human appraisal” (Zimmermann, cited in Jones and Hollier, 1977). Just as a material becomes a resource when it gains use-value, it also becomes waste when it loses its use-value. Like resources, waste is also a relative concept or human appraisal because what constitutes waste can vary from one person to another, one society to another and over time. As noted by Jessen (2002) “our waste stream is actually full of resources going in the wrong direction”. Drawing from the views expressed above, the definition of waste to be used in this

study is any substance (liquid, solid, gaseous or even radioactive) discarded into the environment because it is unwanted, which causes significant nuisance or adverse impact in the environment.

2.3.2 CLASSIFICATION OF WASTE

A number of criteria are usually employed to classify wastes into types including their sources, physical state, material composition and the level of risk associated with waste substances (Table 2.1). Such classification of waste provides a basis for the development of appropriate waste management practice.

Table 2.1 Classification of waste

| Criteria for waste classification | Examples of waste types |
|--|--|
| Sources or premises of generation | Residential, commercial, industrial, municipal services, building and construction, agricultural |
| Physical state of waste materials | Liquid, solid, gaseous, radioactive |
| Material composition of waste | Organic food waste, paper and card, plastic, inert, metal, glass, textile |
| Level of risk | Hazardous / Non-hazardous |

The source classification of waste is based on the fact that waste emanates from different sectors of society such as residential, commercial and industrial sources. A good example of the source classification was provided by the World Bank (1999) in a study in Asia which identified the sources of waste as residential, commercial, industrial, municipal services, construction and demolition, processing and agricultural sources.

In the *Stakeholders' Guide: Sustainable Waste Management*, the UK Environment Council (2000) also employed source classification to identify the major sources of waste as municipal sources, commerce and industry, agricultural sources, demolition and construction activities, dredged spoils, sewage sludge and mining and quarrying operations. Classifying wastes by their sources is a useful way of determining the relative contributions of the different sectors of society to the waste stream and how to plan for their collection and disposal. Frequently, the material composition of the waste stream is also used to classify wastes into such types as organic waste, paper and cardboard, plastic, glass, ceramics, textiles metal and inert waste. An example of waste classification based on material composition was conducted by the Surrey County, UK in 2002/2003. An analysis of household waste streams in the county identified nine main types of materials: paper/card, plastic film, dense plastic, textiles, miscellaneous combustibles, glass, ferrous metal, garden waste and food waste (Surreywaste.info).

Furthermore, the potential health or pollution risk of waste materials is used to classify wastes into hazardous or non-hazardous waste (Table 2.1). On the one hand, hazardous waste refers to wastes with properties that make them potentially harmful to human health or the environment (DELM, 1993; US EPA, 2008). According to the US EPA (2008), hazardous wastes can be liquids, solids, contained gases, or sludge and can be the by-products of manufacturing processes or simply discarded commercial products like cleaning fluids or pesticides. Because of their potential pollution danger, hazardous waste materials require rigorous and cautions means of disposal (DELM, 1993). In the EPA's *Hazardous Waste Listings* (2008) the categories of hazardous wastes include ignitable waste, corrosive waste, reactive waste, toxicity characteristic waste, acute hazardous waste and toxic waste. Special waste is one type of hazardous waste which is usually so dangerous to treat, keep or dispose of that it requires special disposal arrangements (US.EPA,

2008). Examples include hard clinical waste such as human parts, contaminated swabs and sharps. On the other hand, non-hazardous waste does not pose a danger and can be dealt with easily, examples being inert materials such as uncontaminated earth and excavated waste such as bricks, sand, gravel and concrete slates (Environment Council, 2000).

Waste can also be classified by whether it is biodegradable or non-biodegradable waste. Biodegradable waste typically originates from plant or animal sources and can easily be broken down by bacterial action or by other living organisms and so has a relatively short lifespan in the environment. This type of waste is commonly found in municipal solid waste as food waste, yard waste and paper. Other biodegradable waste materials include human excreta, animal droppings, sewage and slaughterhouse waste (Lapidos, 2007). In contrast with biodegradable waste, nonbiodegradable waste, which includes most plastics, metals and ceramics, are waste substances that cannot be broken down by natural processes or living organisms (Lapidos, 2007). The classification of waste into types, as discussed above, is very important for waste management planning. Among other things, it provides useful information that enables municipal authorities to organize waste management operations including the frequency and means of collection, and appropriate disposal methods. The developed countries have made great advances in waste data generation and analysis which have enabled them to improve waste management over the years. In most developing countries, however, even the most basic data on waste such as the quantities generated and composition of the waste stream are lacking, making it difficult to organise waste management effectively (Hardoy *et al.*, 2001).

2.3.3 THE GOALS OF WASTE MANAGEMENT

In 1976, the United States Congress enacted the Resource Conservation and Recovery Act (RCRA) which authorized the EPA to regulate waste management and disposal practices. The goals of waste management that were set by the RCRA included:

1. The protection of human health and the environment from the hazards posed by waste disposal
2. The conservation of energy and natural resources through waste recycling and recovery
3. Reducing or eliminating the amount of waste generated, and
4. Ensuring that wastes are managed in an environmentally-safe manner (RCRA, 1976)

Other writers agree with these objectives of waste management. For example, Schubeller *et al.* (1996) have stated the goals of municipal solid waste management as protecting environmental health, protecting the quality of the environment, supporting the efficiency and productivity of the economy and the generation of employment and income for people. On her part, Cointreau (2001) argued that “the overall goal of urban solid waste management is to collect, treat and dispose of solid waste generated by all urban population groups in an environmentally and socially satisfactory manner, using the most economical means available”. Similarly, the Ghana Environmental Protection Agency has noted that waste management is essential in the present day context for the following reasons:

1. To protect human health against waste-related hazards and risks
2. To prevent pollution of the environment and its natural resources like air, water and land
3. To produce energy which could be an alternative for the fast depleting fossil fuels and other conventional sources of energy.
4. To make optimum use of the waste generated
5. For a better and sustainable future.

(Ghana EPA, 2002)

It can be concluded from the above that the main objective of waste management is to protect public health against waste-related hazards and risks, and to maintain ecosystem services by preventing the pollution of the natural environment and its resources such as land, water and air as well as the aesthetic quality of the environment. The objectives of waste management are also in line with the goals of the Millennium [Ecosystems] Assessment (MA), the United Nations' 2005 study of the consequences of ecosystem change for human wellbeing. Chapter 15 of the MA report focuses on 'waste processing and detoxification' and points out that failure in waste management is the cause of the growing incidence of wastewater-borne diseases, human health impairment and ecosystem damage (Millennium Assessment Report, 2005). The report emphasises the necessity of waste management at local, national and global scales in order to protect and conserve the world's ecosystems and their resources. To achieve the goals of municipal solid waste management, it is necessary to establish sustainable systems of solid waste management which will meet the needs of the entire urban population including the poor. The systems put in place for solid waste management must be appropriate to the particular circumstances of the city and its various localities. To achieve sustainable waste management, such a system must harness and develop the capacities of all stakeholders in the waste sector (Schubeller *et al.* 1996) including civil society, businesses, private sector waste companies and government agencies. Due to their low technical, financial and managerial capacities, most municipal authorities in developing countries fail to achieve the goals of waste management and are, therefore, unable to achieve the basic objective of waste management which is to protect public health and the natural environment against waste pollution (Hardoy *et al.*, 2001; Pacione, 2006).

2.3.4 THE PRINCIPLES OF WASTE MANAGEMENT

The principles of waste management, as identified by Schubeller *et al.* (1996), are “to minimize waste generation, maximize waste recycling and reuse, and ensure the safe and environmentally sound disposal of waste”. This means that waste management should be approached from the perspective of the entire cycle of material use which includes production, distribution and consumption as well as waste collection and disposal. While immediate priority must be given to effective collection and disposal, waste reduction and recycling should be pursued as equally important longer-term objectives (Schubeller *et al.*, 1996).

Cointreau (2001: online) has also identified ten principles that should guide a sustainable and integrated solid waste management programme. According to her scheme, such a programme should:

1. Be supportive of good governance
2. Provide economic service delivery
3. Establish cost recovery mechanisms for long-term financial sustainability
4. Conserve natural resources
5. Embrace public participation
6. Foster environmentally appropriate technologies and sites
7. Seek appropriate levels of source segregation, recycling and resource recovery
8. Conduct strategic facility planning and development
9. Build institutional capacity
10. Invite private sector involvement

In line with Gilpin’s (1996) notion of waste management, this means that waste management involves much more than the practical organization of waste collection, transportation, treatment and disposal. While these are important aspects of waste management, several other issues are

equally important including good governance, public and private sector participation (Cointreau, 2001). The waste management situations in most developing countries show that the goals and principles of waste management are far from being achieved (Schubeller *et al.*, 1996; Hardoy *et al.*, 2001; Pacione, 2005).

2.3.5 INTEGRATED WASTE MANAGEMENT

In recent years, the concept of integrated waste management (IWM) has become popular as a new approach to waste management. As defined by the World Resource Foundation (WRF, cited in Environment Council, 2000), IWM refers to “the use of a range of different waste management options rather than using a single option”. In other words, IWM is an approach which relies not only on technical solutions to the waste problem, but on a wide range of complementary techniques in a holistic approach. The approach involves the selection and application of appropriate technologies, techniques and management practices to design a programme that achieves the objectives of waste management (Tchobanoglous *et al.*, 1993). The concept of IWM seems to have emerged from the realization that technical solutions alone do not adequately address the complex issue of waste management and that there is the need to employ a more holistic approach to waste management. As argued by Rhyner *et al.* (1995), “a single choice of methods for waste management is frequently unsatisfactory, inadequate, and not economical”. Use of an integrated approach to managing solid waste has therefore evolved in response to the need for a more holistic approach to the waste problem. In this approach, all stakeholders participating in and affected by the waste management regime are brought on board to participate in waste management. Furthermore, issues such as social, cultural, economic and environmental factors are considered in

the design of an IWM project (Tchobanoglous *et al.*, 1993; Rhyner *et al.*, 1995; Schubeller *et al.*, 1996).

These elements most commonly associated with integrated solid waste management are waste prevention, waste reduction/minimization, re-use of materials and products, material recovery from waste streams, recycling of materials, composting to produce manures, incineration with energy recovery, incineration without energy recovery and disposal in landfills in that order of priority (Durham County Council, 2007: online)

2.3.6 SUSTAINABLE WASTE MANAGEMENT

Another important concept of waste management is ‘sustainable waste management’ (SWM). SWM is an integral part of sustainable development (the Brundtland Commission’s approach to development which seeks to “meet the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987) because the amount of waste generated and how it is managed has profound implications for the quality of the environment and for the prospects of future generations. Thus, in keeping with the objectives of sustainable development, sustainable waste management can be regarded as an approach to waste management that, in addition to protecting human health and the environment, ensures that the scarce resources of the earth are conserved for both present and future generations of humanity. It therefore becomes important to minimize natural resource extraction and consumption by recycling waste materials, and conduct waste management efficiently to curtail the environmental impacts of waste disposal and protect ecosystem services for both current and future generations (Millennium Assessment Report, 2005). In line with the waste hierarchy, the best way to achieve sustainable waste management is to reduce the amounts of waste we produce (Girling, 2005). Where waste is

unavoidable a sustainable approach is to encourage re-use and recycling of products to prevent them from getting into the waste stream. Finally, where waste prevention/ reduction, re-use and recycling are economically impossible, waste is processed to recover their intrinsic values such as energy. Sustainable waste management also seeks to increase co-ordination between the producers of goods, retailers, manufacturers, the public, local authorities and all concerned with the management of waste and reusable materials and equipment (London Waste Action, 2007).

In spite of the enormous benefits associated with sustainable waste management strategies such as re-use and recycling, only a handful of countries are able to put them into practice. For instance, most of the economically developed countries are still unable to recycle much of their waste. The fact that even the rich industrialized countries find it difficult to move up the waste hierarchy is evidence that sustainable waste management is not easy to achieve. As would be expected, the waste management performance of the poor countries is even worse as most of them still grapple with the mere removal of waste from human settlements with hardly any arrangements for recycling apart from the operations of informal recyclers. Thus developing countries in general remain at the bottom of the waste hierarchy, dumping most of their waste in uncontrolled landfills or open dumps or, worse still, in rivers and other water bodies. If the rich industrialized countries are struggling to implement sustainable waste management, the concept only remains a distant dream in developing countries.

2.4. SOCIAL PROBLEMS OF SOLID WASTE MANAGEMENT

From research and observation over the last decade or two, these are some of the social problems faced by towns and cities in addressing the waste problem. Negligence on the part of authorities responsible and the citizenry to deal with waste as a priority issues in society. These challenges are many and include unavailability of properly engineered disposal sites and waste treatment

plants, inadequate haulage equipment and the lack of expertise and appropriate technical knowhow.

Increasing population alongside rapid urbanization has come with increasing challenges to waste management.

Poor financial capacity of authorities in dealing with the waste problem, waste business has become increasingly expensive for city authorities alone to handle.

Lousy transportation system where the garbage being conveyed in trucks are left uncovered and end up falling off the trucks and littering the very street they are trying to keep clean.

2.5. THEORETICAL FRAMEWORK OF SOLID WASTE MANAGEMENT

2.5.1. ECOLOGICAL MODERNISATION THEORY

Ecological Modernisation is a theory of environmental sociology, which provides a sociological interpretation of environmental reforms. The theory suggests that the need of a national policy of SWM and effective system for sustainability of SWM. The ideas of EM have been used to describe the ways in which environmental problems come to be framed as issues that are politically, economically and technologically solvable within the context of existing institutions and power structures and continued economic growth (Murphy and Gouldson, 2000).

In broad outline, EM refers to a series of institutional, operational, economic, governance, social and political shifts that are set in motion by environmental drivers. These drivers push new social arrangements, new discourses, new scientific and technical developments, and a shift in responsibilities and interests between public and private sectors, between governments and their

citizens, between civil society and other economic actors, and between the formal and informal sectors and arrangements within a wide range of disciplines. Although political institutions have contributed to poor environmental outcomes in the past, Ecological Modernisation Theory argue that they can be readily reformed to better address ecological issues (Mol, 2000; Mol and Sonnenfeld, 2000). Proponents hope that, through marginal shifts in focus, political actors could be responsible for building new and different coalitions to make environmental protection politically feasible. Thus, Ecological Modernisation research has examined the institutional changes that accompany a shift from government to environment governance.

(Berger *et al.*, 2001).

Ultimately Ecological Modernisation treats all environmental issues, solid waste included, as a challenge to eliminate inefficiency via better design. It promotes the use of more eco-efficient technology as well as the redesign of economic and political institutions to create incentives that will effectively decouple economic growth from raw material use, waste and environmental damage (Berger 2001; Dryzek 2003; Howes, 2005). Waste is seen as an indicator of inefficiency. Businesses use their desire to cut costs by innovating to find new ways of reducing their raw material and energy use, cutting pollution in the process. Governments correct markets failures that encourage environment damage and create incentives to innovate by penalizing damaging behavior and rewarding eco-efficient improvements. They also act as a clearing house for information about the state of the environment and support the research, Ecological Modernisation Theory allows research into institutional and policy, how the management has evolved and worked and what the outcomes of the current approach have been implemented in countries. EMT can be used to examine what has transpired in waste management

in Ghana, to look at the process of management, the opportunities of such an approach to achieve sustainability of Solid Waste Management.

Much of the early investigation of Ecological Modernisation ideas was based on European case studies and less work has been done on applying the theory to developing countries particularly in Ghana, providing an opportunity for some original research. However, the three studies in Vietnam and likewise the two studies in Thailand as outlined in the EMT showed the limited role and the obstacles faced by the states in Solid Waste Management (Sonnenfeld, 2000).

2.5.2. WASTE MANAGEMENT THEORY

Waste Management Theory (WMT) has been introduced to channel environmental sciences into engineering design. The Theory of Waste Management is a unified body of knowledge about waste and waste management, and it is founded on the expectation that waste management is to prevent waste to cause harm to human health and the environment and promote resource use optimization. It is an effort to organise the diverse variables of the waste management system as it stands today. WMT is considered within the paradigm of Industrial Ecology, and built side-by-side with other relevant theories, most notably Design Theory. Design Theory is a relatively new discipline, still under development. Following its development offers valuable insights about evolving technical theories. According to Love (2002), it is crucial to theory development to integrate theories from other bodies of knowledge, as well as the clarification of the definitions of core concepts, and mapping out key issues, such as domains, epistemologies and ontologies.

At the present stage of WMT development, scientific definitions of key concepts have been offered, and evolving of WMT under the paradigm of Industrial Ecology is in progress.

The function of science is to build up systems of explanatory techniques; a variety of representative devices, including models, diagrams and theories (Toulmin 1953). Theories can be considered milestones of scientific development. Theories are usually introduced when previous study of a class of phenomena has revealed a system of uniformities. The purpose of theory is then to explain systems of regularities that cannot be explained with scientific laws (Hempel 1966). Formally, a scientific theory may be considered as a set of sentences expressed in terms of a specific vocabulary. Theory will always be thought of as formulated within a linguistic framework of a clear specified logical structure, which determines, in particular, the rules of deductive inference (Hempel, 1965).

Take the example of the definition of waste. The European Commission and Member States were gathered for a two-day workshop in Leipzig on February 25-26 2004, to discuss the classification of treatment operations and of the waste definition. One of the observations of the Leipzig workshop was that “using the definition of waste is a tricky affair when determining when something becomes waste and when it stops being waste.” To the first situation belongs among others the placing of re-use, the application of the definition of waste to end-of- life vehicles. To the second belong for example treated construction and demolition waste (ISWA 2004). The basic proposal of WMT is that it is able to define waste unambiguously. Four waste classes have been defined (Table 1).

Research continues to evolve the Theory of Waste Management, which will assist in incorporating environmental concerns into industrial process and product design.

2.6 THE NATURE OF THE WASTE PROBLEM IN DEVELOPING COUNTRIES

While data is generally lacking in the waste sector of developing countries, available studies on the topic suggest that solid waste management is generally characterized by inefficient collection methods, insufficient coverage of the collection systems and improper disposal of municipal waste (Onibokun and Kumuyi, 1999; Hardoy *et al.*, 2001; Pacione, 2005). Major urban settlements are, therefore, characterised by waste accumulations and poor environmental sanitation (Habitat, 1997; Onibokun and Kumuyi, 1999; Hardoy *et al.*, 2001; Pacione, 2005; Palczynski and Scotia, 2002). In 2002, the United Nations Centre for Human Settlement (UNHabitat) raised concern about the solid waste situation in poor country cities in the following words:

“The need for the collection and disposal of solid waste in urban settlements is far from adequately recognized. Uncollected refuse accumulates in drains, roads and open spaces, disrupting community life and creating additional problems in the operation of other public services” (Habitat 2002:online)

In many Third World cities, writers suggest that large proportions (between 30 and 50 percent) of the solid waste generated by the residents are never collected for disposal and end up rotting on the streets, in drains and in streams (Hardoy *et al.*, 2001; Pacione, 2005; Ali, 2006). Hardoy *et al.* (2001) for instance have reported the extensive lack of solid waste collection in cities across the developing world. Pacione (2005) has also commented on the lack of provision for urban waste management in poor countries and the resulting poor environmental conditions in the cities. According to him, most poor city governments have great difficulty regarding the collection and safe disposal of solid wastes. He estimates that between one third and one half of all solid waste generated in Third World cities remains uncollected and the collection rate could be as low as 10 – 20 percent in some cases. Depicting a similar picture of the problem, Cointreau (2001), has

estimated that in some cases, up to 60 percent of solid waste generated within urban centres in poor countries remains uncollected and such refuse accumulates on waste lands and streets, sometimes to the point of blocking roads. From different parts of Africa, studies have documented the abysmal solid waste situation in major cities. In 1989 for example, Adelibu and Okenkule investigated the solid waste situation in Nigeria's commercial capital Lagos, where they found that: "... in many parts of the city, streets are wholly or partially blocked by solid waste". Similarly, open spaces and marketplaces are littered with solid waste. In most cases, drains are clogged or totally blocked and many compounds are hemmed in by solid waste" (Cited in Achankeng, 2003).

Another Nigerian city reported to have a severe municipal waste problem is Port Harcourt, River State. According to Palczynski and Scotia (2002) the city which was once known as the "Garden City" for its trees and clean streets has now gained the nickname "Garbage City" because of the dire waste situation which now characterizes it. Still in West Africa, the Senegalese capital, Dakar has a very poor waste disposal situation. Home to some three million out of the 8.5 million Senegalese, the city of Dakar produces about 1,100 tonnes of solid waste each day but most of the waste remains uncollected (Palczynski and Scotia, 2002). According to Palczynski and Scotia (2002), "discarded paper, fruit skins, old cloths and other wastes have become part of the landscape of the West African town where just about every street is lined with waste and overflowing refuse bins go unemptied for many days". In a four-city study of *Urban waste and governance in Africa* sponsored by Canada's International Development Research Centre

(IDRC) in 1999, which investigated the solid waste situations in Abidjan (Cote d'Ivoire), Ibadan (Nigeria), Dar es Salaam (Tanzania) and Johannesburg (South Africa), all the investigators found the solid waste situations in the cities to be abysmal. Onibokun and Kumuyi (1999) who

investigated the topic in Ibadan found the Nigerian city to be contaminated with decomposing solid waste which could be found everywhere in the city including the streets, drains and water bodies. Generalizing for Africa, the co-authors have observed that “a visit to any African city will reveal aspects of the solid waste problem such as heaps of uncollected garbage, roadsides littered with refuse, streams blocked with junk, waste disposal sites constituting a hazard to residential areas and inappropriately disposed toxic waste” (Onibokun and Kumuyi, 1999).

Similarly in Abidjan, Cote d’Ivoire (Ghana’s western neighbour), Koffi Attahi (1999) found that only some 54 percent of the solid wastes generated by residents of the capital city were removed for disposal with the remaining waste piling up in mounds all over the city and clogging drains and streams.

Likewise in Johannesburg, South Africa, Swilling and Hutt (1999) who took part in the IDRC sponsored four-city study reported waste collection in the city to be inadequate, giving rise to waste accumulations with implications for public health and the environment, and Kironde (1999) who investigated the topic in Dar es Salaam, Tanzania, reported that most parts of the city never benefited from a public waste disposal service. He quoted several East African newspapers including the *Sunday News* (Nov. 2, 1998) and the *African Event* (Nov. 1985,) which have referred to Dar es Salaam as a ‘garbage city’ and a ‘litter city’ respectively and the *Weekly Review* (Jan, 25, 1985,) which referred to Nairobi as a “city in a mess” due to the appalling waste situation. Kironde also reports that in most urban areas in Tanzania, only a fraction of the waste generated is collected and safely disposed of by the municipal authorities. According to Kironde

(1999), “common features of African urban areas are stinking heaps of uncollected waste; waste disposed of haphazardly by roadsides, in open spaces or in valleys and drains; and waste water overflowing into public lands”. Other studies have presented similar findings. In a

UNEP commissioned study of waste management in Kenya in 2001, the investigators reported that: “In Nairobi, like many developing country cities, the solid waste sector is largely characterized by low coverage of solid waste management services, pollution from uncontrolled dumping of waste, inefficient public services, chaotic or unregulated private sector participation and a lack of key solid waste management infrastructure” ... “Not surprisingly therefore, only 23 per cent of the estimated 1500 tonnes of solid waste generated daily get collected in Nairobi, a city of about three million people. Furthermore, the city is surrounded by four fast growing satellite towns which do not have waste disposal facilities” (UNEP, 2001).

In Bamako, the capital city of Mali, Klundert and Lardinois (2005) have reported the “depressing waste disposal situation which has become an environmental issue of major concern”. The solid waste disposal situation in Lusaka, Zambia, is also reportedly bad, with 90 percent of the 1400 tonnes of daily waste output left uncollected, causing a nuisance and public health risk to the population (Hardoy *et al.*, 2001; Palczynski and Scotia, 2002) while in Uganda, a study by the Namilyango College (2001) of *Domestic waste management in Kampala city* reported that too much garbage was lying in the streets uncollected, creating a nuisance and environmental pollution and posing a risk for public health. Even though the municipal authorities were applying all the means at their disposal, according to the researchers, the piles of waste only seemed to grow from day to day. Also in Kinshasa (Congo), most of the waste generated in the city is said to be put out on the road, on illegal dumps, in storm water drains or buried in open sites (Hardoy *et al.*, 2001). In Kumasi, Ghana, a study by Devas and Korboe (2000) showed that most areas of the city had inadequate waste collection services in addition to other environmental problems. The waste accumulation problem is not only limited to African cities. Asian and Latin American cities equally face daunting solid waste problems and many are unable to provide adequate waste disposal

services for their residents. In 2007, a study of the urban solid waste situation in the eleven countries that form the Asian Productivity Organization (APO, 2007) showed that solid waste management is a major challenge in Asian cities. The report of the study which was edited by the Environmental Management Centre – Mumbai, India showed that:

“despite huge expenditures in waste management, urban areas in most APO member countries are still grappling with the challenge of preventing environmental degradation due to the nonsystematic solid waste management. Solid waste has therefore become an important concern in the Asia Pacific Region and it needs to be resolved through an integrated community, private sector and policy based approach”. (APO, 2007)

In 1994, a survey conducted by Ghosh and others (cited in Hardoy *et al.*, 2001) in Baroda, Bhilwara, Sambalpur, and Siliguri (all in India) pointed to “great inadequacies in the provision for rubbish collection as well as for water, sanitation and drainage”. Similarly, a study of waste management operations in 35 Indian cities with more than one million populations was conducted by the Federation of Indian Chambers of Commerce and Industry in February 2007 which showed that most cities in the country fared badly in handling solid waste (FICCI, 2007).

In Sri Lanka, Perera’s (2003) overview of solid waste management in major cities reported that solid waste management was a major problem in Sri Lankan cities. Perera described Colombo, the capital city, as “facing a crisis situation” with regard to the disposal of around 1500 tonnes of solid waste materials per day. He found illegal dumping of solid waste on roadsides, vacant lots or river banks to be some of the problems associated with solid waste management in Colombo and other Sri Lankan cities. Furthermore, Perera (2003) observed improper discharge of garbage which led to poor sanitary conditions and waste-clogged drains in the cities with associated health problems.

Even China, with its speedy industrial development, seems to have left the waste problem largely unsolved. Liu (2007) has observed that, “As China undergoes its historic drive towards industrialization; it is also witnessing the rapid accumulation of urban garbage.

The nation’s 668 cities generate an estimated 150 million tons of rubbish each year, accounting for roughly one-third of the world total. Currently, as much as 7 billion tons of this garbage remains untreated and two thirds of China’s cities have been inundated by rapidly spreading garbage mounts” (Liu, 2007).

The urban waste situation in Latin American cities seems to be much better than in Africa and Asia. For instance, while most African and Asian cities have very low levels of waste collection, about 70 percent of the population in many Latin American cities are reported to have waste collection services (Hardoy *et al.*, 2001).

However, this is not to say that Latin American cities have no problems with waste disposal.

Arreaza, for example, has observed that: “waste accumulation is one of the biggest environmental concerns in Latin American cities and is a key contributor to the urban environmental crisis that many Latin American cities face. Despite several programs and studies about the problem and potential solutions such as recycling, the concern remains”.

Hardoy *et al.* (2001) also report abysmal waste situations in a number of Latin American cities including Bogota (Columbia), where some 2,500 tonnes of solid waste is left uncollected every day and is simply left to rot in small tips or in canals, sewers and streets; and Sao Paulo (Brazil) where one-third of the population is living in areas without any service to collect solid waste. Furthermore, 70 per cent of waste collected in the municipality of Sao Paulo is said to be improperly discarded in terms of both the treatment process and the location of waste dumping

areas. Hardoy *et al.* (1993) have provided statistics on the levels of waste collection in selected cities across the developing world (Table 2.1) which shows abysmal performances.

TABLE 2.2: SOLID WASTE COLLECTION IN SELECTED CITIES IN DEVELOPING COUNTRIES

| CITY (COUNTRY) | PERCENTAGE OF SOLID WASTE COLLECTED | YEAR |
|----------------------------------|--|-------------|
| Accra (Ghana) | 10 | 1989 |
| Addis Ababa (Ethiopia) | 60 | 1998 |
| Ahmedabad (India) | 65 | 2000 |
| Baroda (India) | 05 | 1994 |
| Kampala (Uganda) | 10 | 1993 |
| Kumasi(Ghana) | 30 | 2000 |
| Latin American cities | 50-70 | 1999 |
| Lusaka and other cities (Zambia) | 10 | 1997 |
| Mombassa (Kenya) | 40 | 2000 |
| Ouagadougou (Burkina Faso) | 30 | 1995 |
| Sao Paolo (Brazil) | 70 | 1998 |

Source: Hardoy et al 1993 pages 59-60; Hardoy et al, 2001 pages 80-81

The above analysis has shown that even though cities in poor countries generally have low levels of solid waste collection and disposal, there seems to be great variations in the scale of the waste problem across regions and countries (Hardoy *et al.*, 2001). Regionally, Latin American cities appear to have better environmental management than African and Asian cities. What this means is that while all developing country cities grapple with solid waste collection and disposal, some are doing relatively better than others. Regionally, Africa seems to have the worst situation with regard to urban solid waste management (Hardoy *et al.*, 2001).

2.7.1 CAUSES OF THE SOLID WASTE PROBLEM IN DEVELOPING COUNTRIES

Researchers have identified several factors that militate against solid waste management efforts in poor country cities. In a GEF/UNDP/IMO Regional Programme report, for instance, Linden *et al.* (eds.) (1997) identified ten common constraints to be militating against solid waste management efforts in Asian countries. These were:

1. Inappropriate technologies/processes
2. Enforcement inefficiencies/non-existent; illegal dumping
3. Lack of financing
4. Lack of training/human resource
5. Lack of political support
6. Lack of legislation
7. Policy conflict among levels of government/overlapping responsibilities
8. Rapid increase in waste generation/limited data
9. Lack of awareness among public, and
10. Limited land areas; land tenure issues

(Linden *et al.*, 1997). These factors, according to the report, frustrated the waste management efforts of municipal authorities in Asia and made it difficult for them to keep their city environments clean and safe for the populations. After studying the solid waste problem in Tanzania, Kironde (1999) has also attributed the abysmal performance of the waste sector to resource constraints including the scarcity of financial, physical, human and technical resources for the organization of waste management operations. In a study of the solid waste problem confronting the city of Kampala, Uganda, researchers from the Namilyango College (2001) identified several causes of the waste

problem including the lack of dumping sites, ignorance of the masses about the need for proper waste disposal, inefficient collection methods, poor government attitude towards waste management, poverty of the people, corruption among public officials and lack of trained personnel for waste management. These have posed serious constraints to the waste sector and dampened efforts towards waste management in the city. Many other writers have elaborated on how the factors cited above interact to aggravate the solid waste problem in poor country cities. What follows from here is a detailed examination of the factors responsible for the abysmal waste situation in poor country cities.

2.7.1 FINANCIAL AND ECONOMIC CONSTRAINTS

Many writers have cited the scarcity of funds as a major constraint to solid waste management in all developing countries (Cointreau, 2001; Ogawa, 2002; Lohse, 2003; Pacione, 2005). Lohse (2003) has described the problem of municipal finance in developing countries as “the gap between financial resources and municipal expenditure needs”. According to him, this fiscal gap is widening as urban populations expand, increasing the demand for infrastructure and services including waste disposal. Lohse (2003) explains that one reason for the municipal finance gap is that “most municipalities lack the autonomy to establish their tax basis, rate structures, and enforcement procedures, and so cannot raise revenues commensurate with their expenditure requirements”. In the context of Nigeria, Onibokun and Kumuyi (1999) have blamed the lack of fiscal autonomy among municipal governments on excessive central government control of the lucrative sources of revenue, a situation which leaves local governments with few options. Ogawa (2002) has also observed that the finance problem in developing countries is most acute at the municipal government level where the local taxation system is inadequately developed and

therefore the financial basis for public services is weak. He attributed the problem of finance to the low capacity of local governments for cost recovery and their heavy reliance on state subsidies for waste management operations. This view is corroborated by Attahi (1999) who investigated the waste problem in Abidjan, Cote d'Ivoire, and found that even with an elaborate system of taxes and levies such as the drainage tax levied on landed properties; state subsidies sustain most municipal programmes including waste management. According to his study, only 30 percent of the cost of waste management is recovered in Abidjan.

2.7.2 INADEQUATE PERSONNEL FOR WASTE MANAGEMENT

The poor waste disposal situation in poor country cities has also been attributed to the general dearth of qualified personnel in the waste sector (Onibokun, 1999; Ogawa, 2002). According to Onibokun (1999) most municipal authorities are unable to attract suitably qualified personnel for the various aspects of waste management such as planning, operations and monitoring. Ogawa (2002) corroborates this observation when he notes that developing countries characteristically lack the technical expertise required for solid waste management planning and operation and this is usually the case at both national and local levels. He argues that many officers in charge of solid waste management have little or no technical background training in engineering or management. Without sufficiently trained personnel, however, solid waste management projects cannot be effective and sustainable. Ogawa (2002) has observed that in many cases, solid waste management programmes initiated by external consultants have collapsed in the hands of local management due to the lack of expertise and loss of funding. Lohse (2003) has also observed that local governments in developing countries generally lack the required capacity and technical expertise to accomplish effective and sustainable waste management programmes. Several studies in Africa and elsewhere

in the developing world confirm the dearth of qualified waste management personnel and how this results in failure to undertake effective and sustainable waste management in the cities. One example was the study carried out by researchers at the Namilyango College in Kampala (Uganda) who found that the failure of waste management programmes in Kampala and other Ugandan cities was largely the result of a lack of trained manpower/personnel to execute waste management programmes. Kironde (1999) also found that human resources for waste management in Dar es Salaam were very inadequate in terms of managerial and technical staff and even labourers. The lack of qualified waste management personnel has been blamed on the lack of training and poor conditions of service in the sector. Generally, employees in the waste sector are poorly paid and have very poor conditions of service which makes many people shun jobs in the sector, including labourers (Kironde, 1999). Thus, besides the difficulty of attracting professional waste management staff, it is also difficult to attract labourers to the waste sector in spite of the high levels of unemployment in poor country cities (Onibokun, 1999; Kironde, 1999). The unwillingness of people to work in the waste sector has also been attributed to meagre wages for the cleansing staff in spite of the tedious work they do. Kironde (1999), for instance, cites examples from Tanzania where wages for waste workers are very low even though they work for long hours. Majira (cited in Kironde, 1999) reports that in July 1995, waste workers in Dar es Salaam, went on strike to protest against poor working conditions including the lack of protective gear and the fact that they were all casual workers even after a year of being employed, and therefore had no other benefits apart from receiving their low daily wages. In Kampala, waste labourers are also said to work under very dehumanizing conditions, sometimes loading waste trucks with bare hands or using polythene bags as gloves (Namilyango College study, 2001).

2.7.3 TECHNOLOGICAL CONSTRAINTS

The technologies employed in municipal solid waste management in most developing countries are also said to be inappropriate and inadequate. Zurbrugg (2002) has observed that adoption of the conventional waste collection vehicles used in rich countries constrain solid waste management operations in developing countries. Apart from the high acquisition and maintenance costs involved, developing countries actually lack the engineering capacity to support the operation and maintenance of such sophisticated equipment like compactors and skip lifts. Yet, this is the equipment usually employed by municipal authorities and private sector waste contractors in many poor countries (Armah, 1993; Achankeng, 2003). Besides, the high cost of new equipment compels many poor country municipal governments to import used equipment from western countries. Such vehicles arrive already near the end of their useful life and so frequently require repairs due to breakdowns. In the absence of spare parts and the required engineering skills to maintain the trucks, only a small part of the fleet usually remains in operation after a short period of their use (Achankeng, 2003).

In Tanzania, Kironde (1999:153-154) found that shortage of equipment was a major problem facing the waste disposal operations of the Dar es Salaam City Council. Onibokun and Kumuyi (1999) have also noted of Ibadan and other Nigerian cities that equipment for waste management are unavailable in the desired quantities and the existing ones are difficult to maintain due to lack of expertise and funds to purchase the needed spare parts. At the time of their study in 1999, only about one-third of the pieces of equipment for the Ibadan waste management office were in working order. In Uganda, the waste management department in the capital city, Kampala, was said to lack basic equipment like trucks for waste collection and equipment for maintenance of disposal sites (Namilyango College, 2001). Besides the shortage of suitable equipment, the poor

spatial organization of many developing country cities, characterized by unplanned housing developments, poor road quality and poor access within settlements does not support use of the large and heavy western type waste collection vehicles (Armah, 1993). Usually, the large waste trucks cannot gain access to many unplanned residential areas due to poor roads (Hardoy *et al.*, 2001). There is, therefore, the need to design and manufacture appropriate but inexpensive waste management equipment that is suitable for the conditions in developing countries. This calls for research into waste management technologies that will suit local conditions.

2.7.4 INSTITUTIONAL CONSTRAINTS

Inefficient institutional arrangements adversely affect urban management in poor countries generally and environmental service delivery in particular (UN-Habitat, 1989; Ogawa, 2002; Zurbrugg, 2002). According to UN-Habitat (1989), it is characteristic of developing countries to have several agencies involved in the delivery of solid waste and other municipal services. Furthermore, Ogawa (2002) has observed that there are often no clear roles or functions of the various agencies involved in urban environmental management. At the same time, no single agency is usually designated to coordinate the activities of waste sector agencies (Armah, 1993; Attahi, 1999). Ogawa (2002) has, therefore, observed that the lack of coordination among the relevant urban sector agencies often results in different agencies duplicating one function. In the case of externally supported solid waste management projects, it is common for different agencies within the same country or city to act as counterparts of external support agencies for different waste management projects without any collaboration of efforts (Ogawa, 2002). Institutional inefficiencies of this nature can lead to duplication of functions, gaps in service delivery and waste of already scarce resources, or even the collapse of solid waste management programmes (UN-

Habitat, 1989). Zurbrugg (2002) has also noted deficient management capacities of institutions involved in urban environmental management in poor country cities. Solving the waste problem in poor cities will, therefore, require improvements in the institutional arrangements and capacity building for waste management and other aspects of the urban environment. Ogawa (2002) has suggested that in large metropolitan areas where there is more than one local government, coordination among the different local governments and among agencies in urban management is critical to achieving the most cost effective alternatives for solid waste management for the entire city.

2.7.5 LACK OF LEGISLATION AND ENFORCEMENT

The lack of legislation on solid waste management has also been cited as being partially responsible for the undefined roles of agencies in the waste sector as well as the lack of coordination among them. In the report of their African Development Bank (ADB) sponsored literature-based study of solid waste management options for Africa, Palczynski and Scotia (2002) noted that “no country [in the study] has specific waste management legislation even though legislation is being drafted now in some countries”. Ogawa (2002) has also observed that legislation related to solid waste management in developing countries is usually fragmented and several acts (such as public health, local government and environmental protection acts) include clauses relating to solid waste management. A case in point is that of Dar es Salaam which reportedly has 58 pieces of legislation dealing in one way or the other with the environment including solid waste (Onibokun, 1999). Such rules and regulations are, therefore, to be enforced by different agencies with duplication of responsibilities and gaps in the regulatory provisions which constrain the development of effective solid waste management systems. Furthermore, some

of the laws are completely out of date and therefore of little use. The lack of adequate legislation makes it difficult to assign clear mandates to urban sector institutions connected with waste management, a situation which greatly constrains the waste sector. Besides the scarcity of legislation on waste management, Onibokun (1999) has also noted the inability or unwillingness of municipal officials to enforce existing laws on environmental sanitation including the scanty legislation on waste disposal. This situation is particularly grave in the major cities where there is a general lack of public compliance with waste disposal laws (Ogawa, 2002) if they exist at all. The non-enforcement of waste disposal laws engenders lack of fear of the law among the public and encourages negative waste handling practices such as littering and dumping of waste in drains and at roadsides. Such practices worsen the waste disposal situation and increase the burdensome tasks of waste collection, transportation and disposal for the resource-constrained municipal authorities. Thus, inadequate legislation and non-enforcement of waste disposal laws greatly constrain efforts to address the solid waste problem that currently confronts developing country cities.

2.7.6 LACK OF GOOD GOVERNANCE AND CIVIL SOCIETY

The low status of environmental services in poor country cities has also been blame on the lack of good governance which promotes the well-being of the people, and on the lack of civil society action to exert pressure on governments to live up to their social responsibilities (Devas, 1999; Kwawe, 1995; Hashmi, 2007). Due to 'bad governance', municipal governments in poor countries show little regard for the wellbeing of the citizens and so renege on their responsibility to provide basic infrastructure and services to keep the cities clean, healthy and safe (Hashmi, 2007).

Commonly, autocratic styles of administration by supposedly democratic regimes alienate public opinion and participation in urban management (Devas, and Korboe, 2000; Hashmi, 2007), a situation which does not augur well for effective waste management. From a governance point of view, the fact that the ordinary residents of cities, especially the poor, are denied participation in decision-making about issues that affect them means that their concerns may never be taken on board and their needs for such services as water, sanitation and waste disposal are therefore unlikely to be met (Devas, 1999; Devas and Korboe, 2000). The problem of poor urban governance is further compounded by the lack of effective civil society action to compel governments to enact and enforce environmental laws, and to carry out their responsibilities to the citizenry. In fact, some writers see a fledging civil society as the panacea for the ills plaguing the developing nations of the world (Cohen and Arato, 1992; Kwawe, 1995) even though others have questioned the ability of civil society to achieve political accountability in undemocratic poor countries (Devas, 1999). According to Hashmi (2007) a strong civil society is necessary for the promotion of “a robust liberal democratic order in the Third World” where governments are generally unaccountable and unresponsive to the problems of society. Hashmi sees strong civil society as a solution to the political latitude of developing country governments. This view is collaborated by Cohen and Arato (1992) who also regard civil society as important for the promotion of democracy and rights.

2.7.7 POLITICAL NEGLECT

While the various factors discussed above are important contributors to the poor solid waste situation in poor country cities, some researchers find political neglect to be the root cause of the waste problem in poor country cities. Both national and municipal governments in poor countries

seem to lack the political will to manage the rapidly growing cities and to provide infrastructure and services for environmental maintenance. Several studies point this out including Onibokun and Kumuyi (1999) who have noted the fact that “most local governments in Nigeria do not accord high priority to waste management”. The authors refer to Koehn’s (1992) work in Northern Nigeria which showed that waste management and general environmental sanitation ranked very low on the priority lists of local governments with none of them including waste management among their priority functions. In Koehn’s study the five functions that were accorded most importance by local governments in Northern Nigeria were, in descending order of importance, education, revenue collection, agricultural services, medical services and water supply while those that were identified in the ‘other important functions’ category were “community development, road construction and maintenance, maintenance of law and order, and market and motor vehicle parks”. Surprisingly, sanitation and waste management were neither considered to be priorities nor important functions by any of the local governments that participated in Koehn’s study. (Onibokun and Kumuyi, 1999) concluded that this would explain why the status of waste management was very poor in the country as a whole.

Similarly in a study conducted by the Namilyango College in Kampala (2001), the researchers attributed the root cause of the waste problem in the Ugandan capital to “poor government attitude towards waste management”. From the citizens’ point of view, according to the study, “it is realized that little attention is paid to environmental sanitation in Kampala so very few resources are committed to waste management”. The researchers therefore blamed the issue of poor waste management on the lack of political interest in the sector. In Dakar, Senegal, KaMbaya *et al.* (2006) also found a steady decline in urban environmental quality as the government had completely

ignored the issue of waste management. According to Ka-Mbaya *et al.* (2006) the central government as well as the various municipal councils in Senegal had

“relegated the issue of solid waste to the background” as though it was not important.

From the analysis above, it can be concluded that the quality of solid waste management is directly affected by the level of financing and investment in waste management equipment, the level of training and motivation of waste management personnel, the level of enforcement of waste disposal legislation and the level of public education and involvement in the planning and organisation of waste management, factors which are themselves affected by the level of political commitment to the solid waste problem (Figure 2.1).

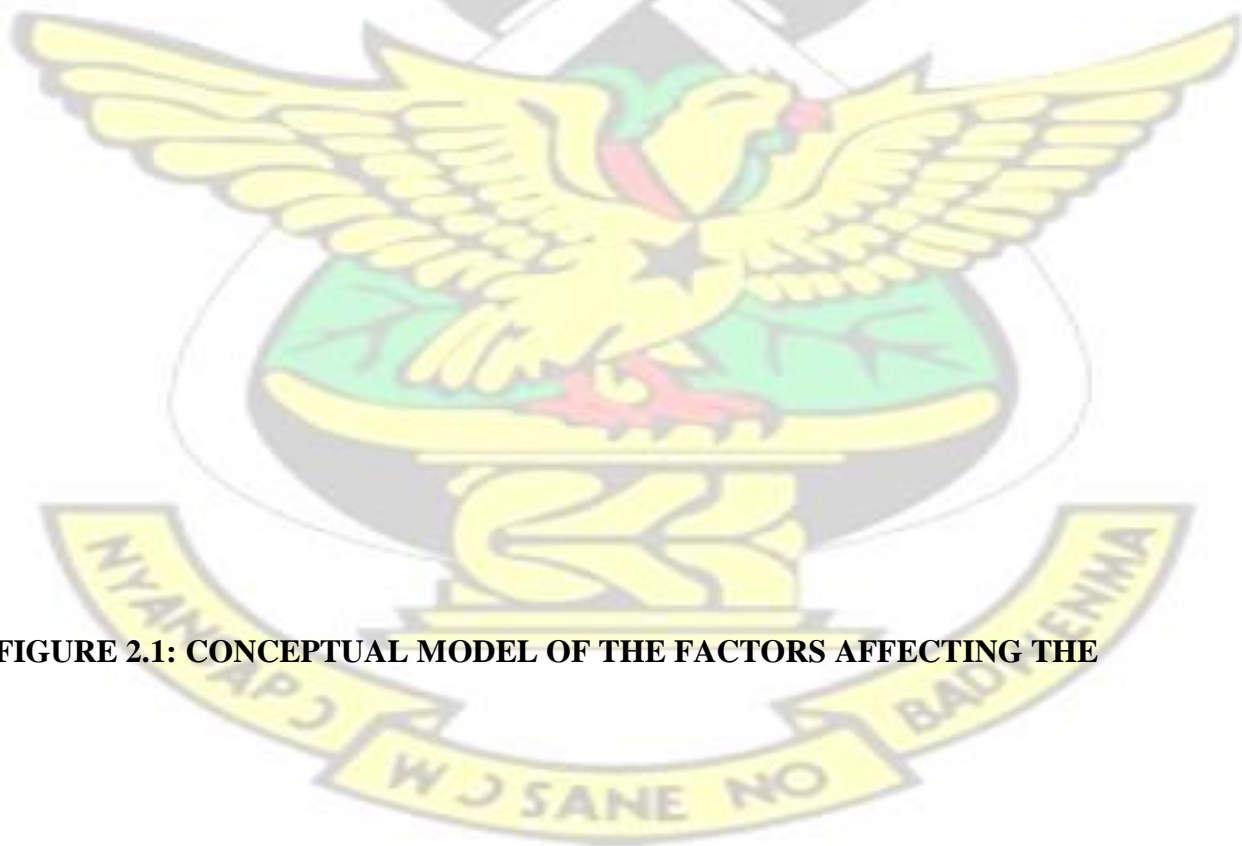
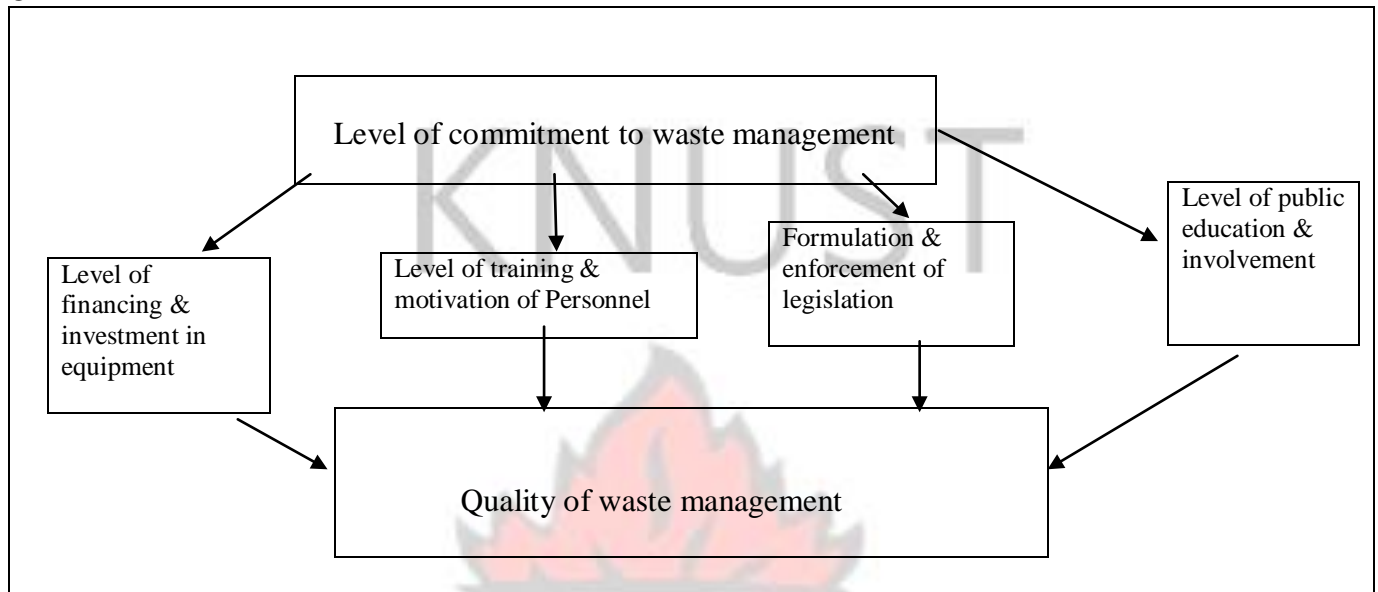


FIGURE 2.1: CONCEPTUAL MODEL OF THE FACTORS AFFECTING THE

QUALITY OF SOLID WASTE MANAGEMENT



A government that regards waste management as a priority would demonstrate its commitment by providing an enabling framework within waste management can be organised effectively to protect public health and the environment. Strong political commitment to solving the waste problem in any city therefore is reflected in adequate investment. The poor solid waste disposal situation that currently confronts developing country cities can therefore be ultimately attributed to the low political commitment of their governments to the issue of solid waste management. As a typical developing country, Ghana also has a serious waste management problem in all its major cities. Urban settlements in the country are characterised with worsening waste disposal situations which the authorities seem unable to deal with. A survey of literature on the waste disposal situation in the country remains under-researched and hence poorly understood. This was a contributory factor that motivated the researcher to embark on this research. In the analysed chapters of this research, the solid waste problem in Ghanaian cities could be examined in relation to the situation in other poor country cities examined in the above review.

2.8 SPATIAL DISPARITIES IN THE MAGNITUDE OF THE SOLID WASTE PROBLEM

While city authorities in developing country cities are generally unable to provide adequate solid waste disposal services within their jurisdictions, the literature on the topic also shows that there are spatial disparities in the scale of the waste disposal problem within cities. These disparities are socio-spatial in nature as waste collection services are concentrated in, if not confined to, official areas and wealthy residential neighbourhoods while the low-income communities receive little or no attention. In particular, many writers have described solid waste collection services in the cities which show enormous disparities between rich and poor residential areas. In the IDRC sponsored study of *Urban waste and governance in Africa* (cited above), Koffi Attahi (Abidjan), Onibokun and Kumuyi (Ibadan) Kironde (Dar es Salaam) and Swilling and Hutt (Johannesburg) all reported enormous disparities in the qualities of waste disposal services provided by municipal authorities for residents of the cities that they investigated. In the East African city of Dar es Salaam, Tanzania, Kironde (1999) found that the collection of solid waste is usually confined to the city centre and high-income neighbourhoods while other areas never benefit from public solid waste disposal. Consequently, most residents of the low-income areas in the city have to bury or burn their waste or dispose of it haphazardly. From Johannesburg in the extreme south of the continent, Swilling and Hutt (1999) also reported “a highly uneven distribution of resources for the delivery of solid waste service”. According to them, the legacy of apartheid policies has led to massive differences in the quality of service between rich/white and poor/black areas of Johannesburg. From Abidjan in West Africa, Koffi Attahi (1999) reported an arrangement for waste removal which favours the rich with a very regular home collection service but neglects the waste collection needs of the poor, leaving them to bear the filth. A study by Songsore and McGranahan (1993) of *Urban household environmental problems in the Greater Accra Metropolitan Area* (GAMA - Ghana) also found that

the areas most affected by the non-collection of solid wastes were the poor residential settlements, commercial areas and lorry stations which constitute the living and working places of the low income populations. The co-authors observed that the wealthy and formal residential areas which enjoy regular waste collection services in the city are largely occupied by wealthy and influential government officials, businessmen and professionals. Also in Kumasi, Ghana, Devas and Korboe (2000) found that the waste collection service provided by the metropolitan authorities was skewed in favour of a small group of wealthy residential areas where home collection was very regular. In poor neighbourhoods in the same city, however, most residents only had access to an erratic communal skip service, frequently located at great distances from some residential units. Moreover, many peripheral communities in Kumasi had no service, compelling households to dump their waste in any available space (Devas and Korboe, 2000). Other examples of the spatial disparities in the quality of waste disposal services within cities abound in the literature.

In Ibadan, Nigeria, Onibokun and Kumuyi (1999) found that the Ibadan Urban Sanitation Committee (IUSC) which is responsible for solid waste management in the city covered the relatively better off local government areas of the metropolis. The rest of the metropolis was without any waste collection service and residents used every means convenient to dispose of their refuse. Again in Nigeria, a study by Meekyaa and Rakodi (1990) in the towns of Aliade, Ihugh and Ugba, revealed that while refuse disposal is a local government responsibility, this was not performed effectively with refuse collection services limited to wealthy neighborhoods.

Consequently, most households had no waste removal services and dumped refuse in their backyards, burnt it or buried it. Achankeng's (2003) study of Yaoundé, Cameroon, also revealed that the authorities failed to remove large amounts of solid waste trapped in inaccessible residential quarters inhabited mostly by lower-income members of the population even though wealthy

neighbourhoods received regular services for waste removal. In Nairobi, Kenya, a report written in 1994 noted that house-to-house collection was provided in formal settlements while in the informal settlements, collection was limited to clearing large piles of waste when they became a health hazard, and even this was not undertaken regularly. Poor areas in the city were therefore heavily littered with refuse and contaminated with rotting waste with attendant health risks (Alder, 1995, cited in Hardoy *et al.*, 2001). Even though Latin American cities are reported to have better waste collection rates, Arroyo *et al.* (1999) and Ferguson (1996) (both cited in Hardoy *et al.*, 2001) found that in most cities in the region, it is usually the high and middle income areas that enjoy regular waste collection service while the low-income neighborhoods can count only on erratic services, if any at all. In Montego Bay (Jamaica) for example, waste is meant to be collected from all residential areas twice a week but the actual frequency of collection is said to vary from twice a week in formal sector residential areas to never in some of the largest informal settlements (Ferguson, 1996, cited in Hardoy *et al.*, 2001). The socio-spatial disparity in waste collection service provision is, therefore, a common occurrence in developing country cities.

The abysmal waste situations in developing country cities can have enormous implications for public health and the environment. The decomposing piles of wastes, especially in communities of the poor, have the potential to attract and harbour vermin and rodents which spread diseases (Hardoy *et al.*, 2001). The accumulated wastes also attract foraging animals like dogs and goats which scatter infected waste materials, spreading diseases and causing a nuisance (Songsore and McGranahan, 1996). Besides, accumulated waste in the cities become hot beds for the breeding of pathogens that cause diseases like dengue fever, malaria, leprosy and even elephantiasis while the blockage of drainage systems by waste materials creates stagnant waters which also become ideal breeding grounds for mosquitoes and other vectors that spread disease pathogens (Hardoy *et al.*,

2001; Perera, 2003). Moreover, solid waste materials that find their way into water courses like drains, streams and lagoons block the flow of flash waters during storms and cause extensive flooding in some of these cities (Zahari, 2007). Waste pollution in the cities also causes the pollution of both surface and underground water and cause damage to natural ecosystems (Perera, 2003). Thus, the poor solid waste situation in the cities “constitutes a disaster for human health and environmental degradation” (Achankang, 2003). In view of the public health and environmental effects of inadequate waste favours the rich with a very regular home collection service but neglects the waste collection needs of the poor, leaving them to bear the filth. A study by Songsore and McGranahan (1993) of *Urban household environmental problems in the Greater Accra Metropolitan Area (GAMA - Ghana)* also found that the areas most affected by the non-collection of solid wastes were the poor residential settlements, commercial areas and lorry stations which constitute the living and working places of the low income populations. The co-authors observed that the wealthy and formal residential areas which enjoy regular waste collection services in the city are largely occupied by wealthy and influential government officials, businessmen and professionals. Also in Kumasi, Ghana, Devas and Korboe (2000) found that the waste collection service provided by the metropolitan authorities was skewed in favour of a small group of wealthy residential areas where home collection was very regular. In poor neighbourhoods in the same city, however, most residents only had access to an erratic communal skip service, frequently located at great distances from some residential units. Moreover, many peripheral communities in Kumasi had no service, compelling households to dump their waste in any available space (Devas and Korboe, 2000). Other examples of the spatial disparities in the quality of waste disposal services within cities abound in the literature.

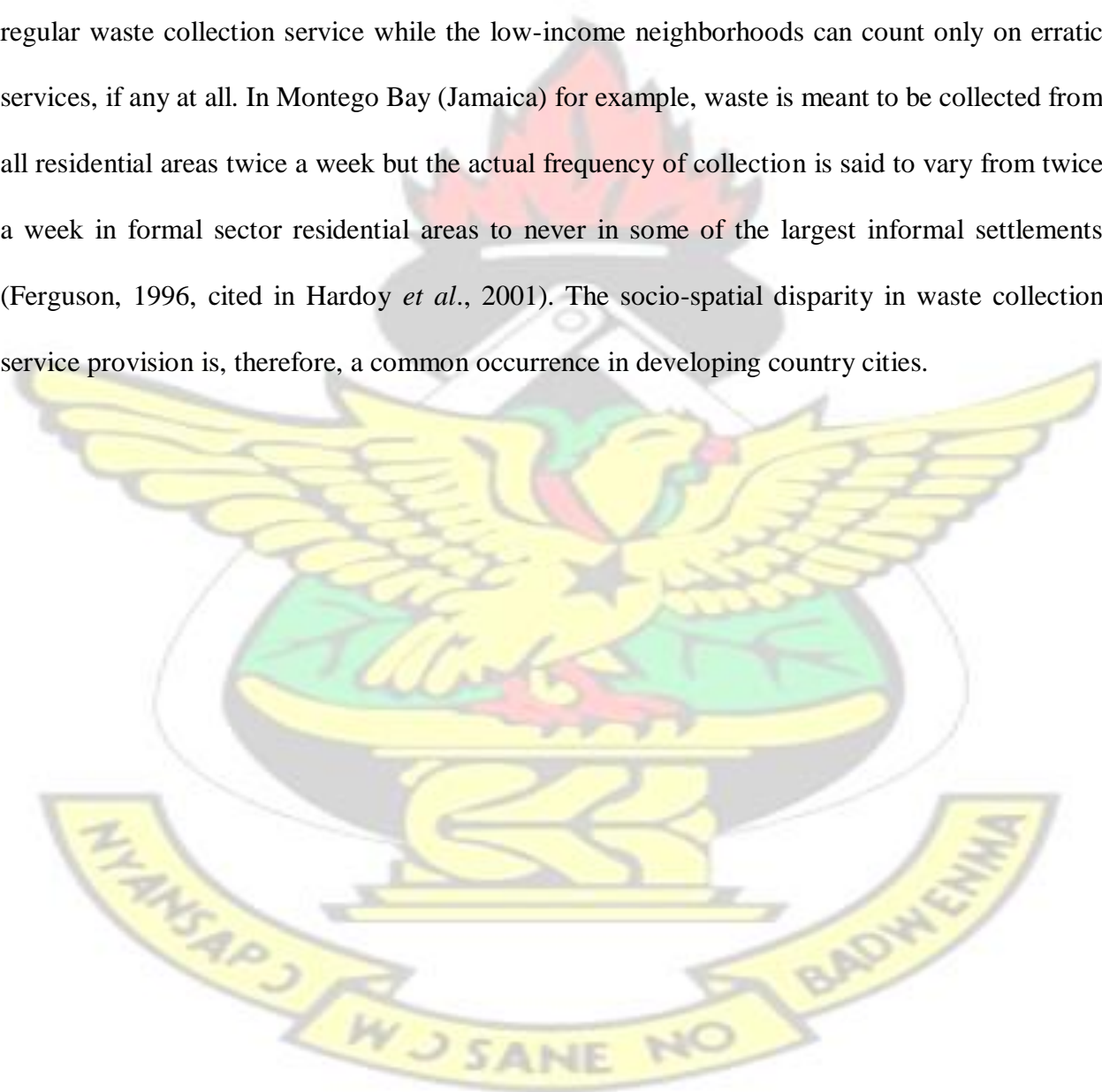
In Ibadan, Nigeria, Onibokun and Kumuyi (1999) found that the Ibadan Urban Sanitation Committee (IUSC) which is responsible for solid waste management in the city covered the relatively better off local government areas of the metropolis. The rest of the metropolis was without any waste collection service and residents used every means convenient to dispose of their refuse. Again in Nigeria, a study by Meekyaa and Rakodi (1990) in the towns of Aliade, Ihugh and Ugba, revealed that while refuse disposal is a local government responsibility, this was not performed effectively with refuse collection services limited to wealthy neighborhoods. Consequently, most households had no waste removal services and dumped refuse in their backyards, burnt it or buried it. Achankeng's (2003) study of Yaoundé, Cameroon, also revealed that the authorities failed to remove large amounts of solid waste trapped in inaccessible residential quarters inhabited mostly by lower-income members of the population even though wealthy neighbourhoods received regular services for waste removal. In Nairobi, Kenya, a report written in 1994 noted that house-to-house collection was provided in formal settlements while in the informal settlements, collection was limited to clearing large piles of waste when they became a health hazard, and even this was not undertaken regularly. Poor areas in the city were therefore heavily littered with refuse and contaminated with rotting waste with attendant health risks (Alder, 1995, cited in Hardoy *et al.*, 2001). Even though Latin American cities are reported to have better waste collection rates, Arroyo *et al.* (1999) and Ferguson (1996) (both cited in Hardoy *et al.*, 2001) found that in most cities in the region, it is usually the high and middle income areas that enjoy regular waste collection service while the low-income neighborhoods can count only on erratic services, if any at all. In Montego Bay (Jamaica) for example, waste is meant to be collected from all residential areas twice a week but the actual frequency of collection is said to vary from twice a week in formal sector residential areas to never in some of the largest informal settlements

(Ferguson, 1996, cited in Hardoy *et al.*, 2001). The socio-spatial disparity in waste collection service provision is, therefore, a common occurrence in developing country cities. The abysmal waste situations in developing country cities can have enormous implications for public health and the environment. The decomposing piles of wastes, especially in communities of the poor, have the potential to attract and harbour vermin and rodents which spread diseases (Hardoy *et al.*, 2001). The accumulated wastes also attract foraging animals like dogs and goats which scatter infected waste materials, spreading diseases and causing a nuisance (Songsore and McGranahan, 1996). Besides, accumulated waste in the cities become hot beds for the breeding of pathogens that cause diseases like dengue fever, malaria, leprosy and even elephantiasis while the blockage of drainage systems by waste materials creates stagnant waters which also become ideal breeding grounds for mosquitoes and other vectors that spread disease pathogens. In effect, it leads to the outbreak of cholera. (Hardoy *et al.*, 2001; Perera, 2003). Moreover, solid waste materials that find their way into water courses like drains, streams and lagoons block the flow of flash waters during storms and cause extensive flooding in some of these cities (Zahari, 2007). Waste pollution in the cities also causes the pollution of both surface and underground water and cause damage to natural ecosystems (Perera, 2003). Thus, the poor solid waste situation in the cities “constitutes a disaster for human health and environmental degradation” (Achankang, 2003). In view of the public health and environmental effects of inadequate waste favours the rich with a very regular home collection service but neglects the waste collection needs of the poor, leaving them to bear the filth. A study by Songsore and McGranahan (1993) of *Urban household environmental problems in the Greater Accra Metropolitan Area* (GAMA - Ghana) also found that the area’s most affected by the noncollection of solid wastes were the poor residential settlements, commercial areas and lorry stations which constitute the living and working places of the low income populations. The

coauthors observed that the wealthy and formal residential areas which enjoy regular waste collection services in the city are largely occupied by wealthy and influential government officials, businessmen and professionals. Also in Kumasi, Ghana, Devas and Korboe (2000) found that the waste collection service provided by the metropolitan authorities was skewed in favour of a small group of wealthy residential areas where home collection was very regular. In poor neighbourhoods in the same city, however, most residents only had access to an erratic communal skip service, frequently located at great distances from some residential units. Moreover, many peripheral communities in Kumasi had no service, compelling households to dump their waste in any available space (Devas and Korboe, 2000). In Ibadan, Nigeria, Onibokun and Kumuyi (1999) found that the Ibadan Urban Sanitation Committee (IUSC) which is responsible for solid waste management in the city covered the relatively better off local government areas of the metropolis. The rest of the metropolis was without any waste collection service and residents used every means convenient to dispose of their refuse. Again in Nigeria, a study by Meekyaa and Rakodi (1990) in the towns of Aliade, Ihugh and Ugba, revealed that while refuse disposal is a local government responsibility, this was not performed effectively with refuse collection services limited to wealthy neighborhoods. Consequently, most households had no waste removal services and dumped refuse in their backyards, burnt it or buried it. Achankeng's (2003) study of Yaoundé, Cameroon, also revealed that the authorities failed to remove large amounts of solid waste trapped in inaccessible residential quarters inhabited mostly by lower-income members of the population even though wealthy

neighbourhoods received regular services for waste removal. In Nairobi, Kenya, a report written in 1994 noted that house-to-house collection was provided in formal settlements while in the informal settlements, collection was limited to clearing large piles of waste when they became a

health hazard, and even this was not undertaken regularly. Poor areas in the city were therefore heavily littered with refuse and contaminated with rotting waste with attendant health risks (Alder, 1995, cited in Hardoy *et al.*, 2001). Even though Latin American cities are reported to have better waste collection rates, Arroyo *et al.* (1999) and Ferguson (1996) (both cited in Hardoy *et al.*, 2001) found that in most cities in the region, it is usually the high and middle income areas that enjoy regular waste collection service while the low-income neighborhoods can count only on erratic services, if any at all. In Montego Bay (Jamaica) for example, waste is meant to be collected from all residential areas twice a week but the actual frequency of collection is said to vary from twice a week in formal sector residential areas to never in some of the largest informal settlements (Ferguson, 1996, cited in Hardoy *et al.*, 2001). The socio-spatial disparity in waste collection service provision is, therefore, a common occurrence in developing country cities.



CHAPTER THREE

RESEARCH METHODS

3.1. INTRODUCTION

This chapter presents the general approach and specific techniques that would be adopted to address the objectives for the research. It begins with a discussion on the research design. There is also a discussion of the ontological and epistemological underpinnings of quantitative and qualitative research and the arguments for and against combining the two approaches in a single research. The strengths and weaknesses of the two opposing approaches are briefly pointed out and the rationale for combining them in a single study is further explained. The chapter also presents the methods used in the selection of the research participants and for data collection. The chapter concludes with a look at the limitations of the methodology employed in the conduct of the study.

3.2. RESEARCH DESIGN

The research design refers to the overall strategy adopted by a researcher to integrate the different components of a study in a coherent and logical way. It constitutes the blueprint for the collection, measurement, and analysis of data. The research design of this study is a case study. A case study is an in-depth study of a particular research problem rather than a sweeping statistical survey. It is often used to narrow down a very broad field of research into one or a few easily researchable examples. The case study research design is also useful for testing whether a specific theory and model actually applies to phenomena in the real world. It is a useful design when not much is known about a phenomenon (Stake, 1995).

3.3 ONTOLOGICAL PARADIGM AND EPISTEMOLOGICAL UNDERPINNING OF THE STUDY

The methodological approach we follow in pursuing a research project, such as the methods we employ in collecting data and the sources we contact for such data, are all closely connected to the ontological and epistemological assumptions we hold about reality (Grix, 2004). Historically, the two dominant ontological perspectives that have inspired social science research have been positivism and interpretivism (Robson, 1993; Guba and Lincoln, 1994; Bryman, 2001; Grix, 2004).

Positivism holds reality to exist independently of our knowledge of it (Grix, 2004) and regards the social world as something revealed to us, not constructed by us (Miller and Brewer, 2003). It follows from the positivist ontology that 'objective knowledge' is possible, for there is a fixed and unchanging reality which research can accurately access and tap. Positivism, therefore, subscribes to the application of natural science methods and practice to the social sciences (Denscombe (2002). Thus, the fundamental characteristic of positivism is the contention that the methods, concepts and procedural rules of the natural sciences can, and should be applied to the study of social phenomena (Bryman, 2001; Grix, 2004).

The epistemological assumption that follows from positivism is that in a world made known to us through our sense experience, people simply receive the sensory stimuli and recount the response and thus contribute very little to knowledge (Miller and Brewer, 2003). In positivist thinking, therefore, the confirmation or refutation of theory can only be revealed from data gathered through the way the world is observed and experienced via our senses - in this case, 'objective, official statistics' (Miller and Brewer, 2003). Data for the positivist model of social research is thus called

‘hard data’ implying that it is untainted by the interpretative and meaningendowing processes of the researcher or the researched (Creswell, 2003) and such data is numerate, seeking to measure and describe social phenomena by the attribution of numbers (Miller and Brewer, 2003). In the words of Weber (cited in Miller and Brewer, 2003), “this gives an elective affinity between the natural science model of social research and those data collection techniques which give best access to sense-experience data”. “These techniques notably include questionnaires, social surveys and experiments which generate numerate data and supposedly render social phenomena ‘objective’, untouched by people’s interpretative and realityconstructing capacities” (Miller and Brewer, 2003).

Ontology refers to the philosophical study of the nature of being or the nature of reality. It deals with questions about what exists or could be said to exist. For example, is the social world external to social actors or something that people are in the process of constructing? Ontological assumptions underpin epistemological assumptions. Ontology is defined by (Crotty: 2003) as “the study of being”. It is concerned with “what kind of world we are investigating, with the nature of existence, with the structure of reality as such”. Guba and Lincoln (1989) state that the ontological assumptions are those that respond to the question ‘what is there that can be known?’ or ‘what is the nature of reality?’

Epistemology is ‘a way of understanding and explaining how we know what we know’, (Crotty,2003). Epistemology is also ‘concerned with providing a philosophical grounding for deciding what kinds of knowledge are possible and how we can ensure that they are both adequate and legitimate.’ (Crotty,2003).

3.4 METHODOLOGICAL APPROACH

As stated in chapter one, the purpose of this study is to identify the perceptions and attitudes influencing the management of solid waste in the Kumasi Metropolis with a view to understanding the nature of the solid waste problem and its causes, and issues in solid waste management. The varied nature of the data required and different sources from which they have to be gathered has made the mixed methods approach appropriate. In line with this methodological approach, research tools associated with both quantitative and qualitative approaches such as interviews, questionnaires, field observation and documentary analysis were combined to collect the data. The choice of the mixed methods approach is informed by a number of reasons. First, it is meant to achieve the ‘logic of triangulation’ Denzin (1989) since no single method (such as questionnaire, interviewing of documentary analysis) could completely capture all the relevant features of the study. Furthermore, the combination of qualitative and quantitative methods enabled me to crosscheck the data gathered by different methods, thereby, making the results of the study valid and credible. As observed by Bryman (2004) “combining different methodologies in a single study enhances the researcher’s claim for the validity of his or her conclusions if they can be shown to provide mutual confirmation”. The decision to combine quantitative and qualitative methods in this study was also justified on the grounds that it made it possible for me to explore the research questions from different perspectives which led to broader understanding of the issues connected with solid waste management in Ghanaian cities. Bryman (2004) has argued that while quantitative research is associated with the researcher’s perspective, qualitative research is concerned with seeing the object of study through the eyes of the people being studied. Thus, combining qualitative and quantitative methods in the present study has made it possible for the issues relating to waste management in the Kumasi Metropolis to be captured

from the perspectives of key stakeholders in the waste sector as well as from my own perspective. Furthermore, combining different methods of data collection and analysis has provided me with the opportunity to obtain in-depth information from the different categories of participants including waste disposal service providers, clients for the service, public institutions involved in waste management in one way or the other and communities hosting waste disposal facilities in the study areas. Without this mixed methodological approach, reliance on any single approach to data gathering could lead to loss of valuable information.

3.5 THE RESEARCH POPULATION

The target population for the study was the Kumasi Metropolis since all residents of the Kumasi Metropolis are involved in some aspect of solid waste management. However, Nhyiaeso and Asawase communities in Kumasi were chosen as the study population. For the purpose of the fieldwork, however, key stakeholders in the waste sector were identified to include waste disposal service providers and their clients, public institutions whose functions affect waste management and communities affected by solid waste disposal facilities.

This is shown in Table 3.1 below.

TABLE 3.1: KEY STAKEHOLDERS IN THE STUDY

| Category of stakeholders | Actual participants targeted for study |
|---|---|
| Waste disposal service Providers | <ul style="list-style-type: none"> □ Waste Management Departments • Private sector waste companies • Informal waste collectors/waste pickers |
| Public institutions with functions affecting solid waste management | <ul style="list-style-type: none"> Environmental Protection Agency • Town & Country Planning Department • Lands Commission • Department for Urban Roads |

| | |
|--|--|
| Waste disposal service clients | Households • Businesses • Institutions |
| Communities near solid waste disposal facilities | Residents living in close proximity to final waste disposal facilities |

3.6 SOURCES OF DATA

The major source of data included raw information gathered from the field which constitutes the primary source of data. To supplement the primary data information derived, is the secondary source which include various articles, books, journals, publications on solid waste management and accredited past project work of other researchers which attempts to investigate the socioeconomic factors influencing the management of solid waste in the Kumasi Metropolis.

3.7. METHODS OF DATA COLLECTION

After carefully considering the research questions, the nature of the data needed for the analysis and the prevailing conditions on the research field, it became evident that the way to collect adequate data for the research was through the use of a qualitative approach. This was because some of the data required are qualitative in nature and could best be obtained through interviews Furthermore; aspects of the data were physically observable and could be gathered through direct field inspection or observation.

3.7.1. INTERVIEWS

Interviewing is a useful way of collecting qualitative data because the technique is ‘introspective’ and allows respondents to report on themselves, their views, their beliefs, practices, interactions and concerns (Freebody, 2003). Besides, most people are more willing to talk in an interview than

the case would be if they were asked to write or fill out a questionnaire (Robson, 1993). The interview technique is associated with a number of advantages over questionnaires. Interview creates the opportunity for interviewees to ask for clarification when they do not understand a question just as the interviewer can ask for elaborations on answers given by interviewees. Furthermore, there is the guarantee that all questions would be answered or, at least, attempted by the interviewee (once he/she can allow enough time for the interview) which ensures a high response rate. Moreover, it becomes possible to check on the reliability of a response by asking the same question differently and at different stages of the interview (Freebody, 2003). The interview technique was employed to obtain data from a number of stakeholder groups in the study. These were officials of the municipal waste departments, private waste companies and informal waste collectors, owners/operators of businesses and staff of institutions as well as residents of communities residing around waste disposal facilities.

3.7.2 FIELD OBSERVATION

According to Yin (1982), observations are a form of evidence that do not depend on verbal behaviour, and the method enables the investigator to observe the phenomenon under study directly. Miller and Brewer (2003) have categorised observation into ‘unobtrusive observation’ and ‘participant observation’ based on the degree of participation by the researcher, and into ‘covert’ and ‘overt’ observations based on the level of awareness subjects have of being observed. The phenomenon under study, solid waste, is one which lends itself to direct field observation. Thus, in addition to interviews, the researcher conducted field observation as part of the data collection exercise. This involved the observation of waste situations and other conditions that affected waste management in the study areas such as the layout of settlements and road access

within residential communities. Waste disposal sites were also observed to gather data on such things as standard of maintenance and environmental quality in the surrounding or nearby communities.

KNUST

3.8. DATA ANALYSIS

Qualitative data was gathered for the study using questionnaires, interviews, field observation and documentary sources. The qualitative data from interviews conducted with all other categories of respondents was analysed manually by making summaries of the views of the respondents and supporting these with relevant quotations that captured those views, supported with data from documentary sources and my own field observations of the waste situations in the case-study city. The analysis was organised under themes derived from the data and the research questions that guided the entire investigation.

3.9. ETHICAL ISSUES

A number of ethical issues were addressed in the course of the research including informed consent, access and acceptance, and confidentiality and anonymity. Robson's (1993) advice on these issues was a useful guide. With regard to consent, Robson (1993) has advised that "whenever possible, the investigator should inform all participants of the objectives of the investigation and all aspects of the research or intervention that might reasonably be expected to influence willingness to participate". The investigator is further required to "explain all other aspects of the research or intervention about which the participants require" (Robson, 1993).

In the conduct of this research, the principle of informed consent was given the required attention by explaining the purpose of the study to participants and making them aware that participation was optional and they could choose to answer or not answer any questions in the course of the interview. Another ethical issue that was addressed in the conduct of this study was access and acceptance which were closely related to the issue of informed consent. Access and acceptance involve obtaining permission to carry out research in a community, institution or organisation (Bell, 1991). Access and acceptance involve both allowing an investigator into a given physical space and also permitting him/her to conduct the investigation in a particular way (Homan, 2002). In the conduct of this study, access to all premises such as institutions, organisations, businesses, communities and homes were duly negotiated. Prior to the conduct of the interviews, letters were written to all institutions and organisations identified to participate in the study, informing them of the impending study and seeking their consent to visit their premises for the interview discussions.

Confidentiality and anonymity issues were also addressed in the study. To achieve anonymity of the data gathered from respondents in the household survey, personal data such as names and addresses of householders who will answer the questionnaires will be left out in the design of the instruments. This way, it becomes impossible to trace any information to a particular householder or participant.

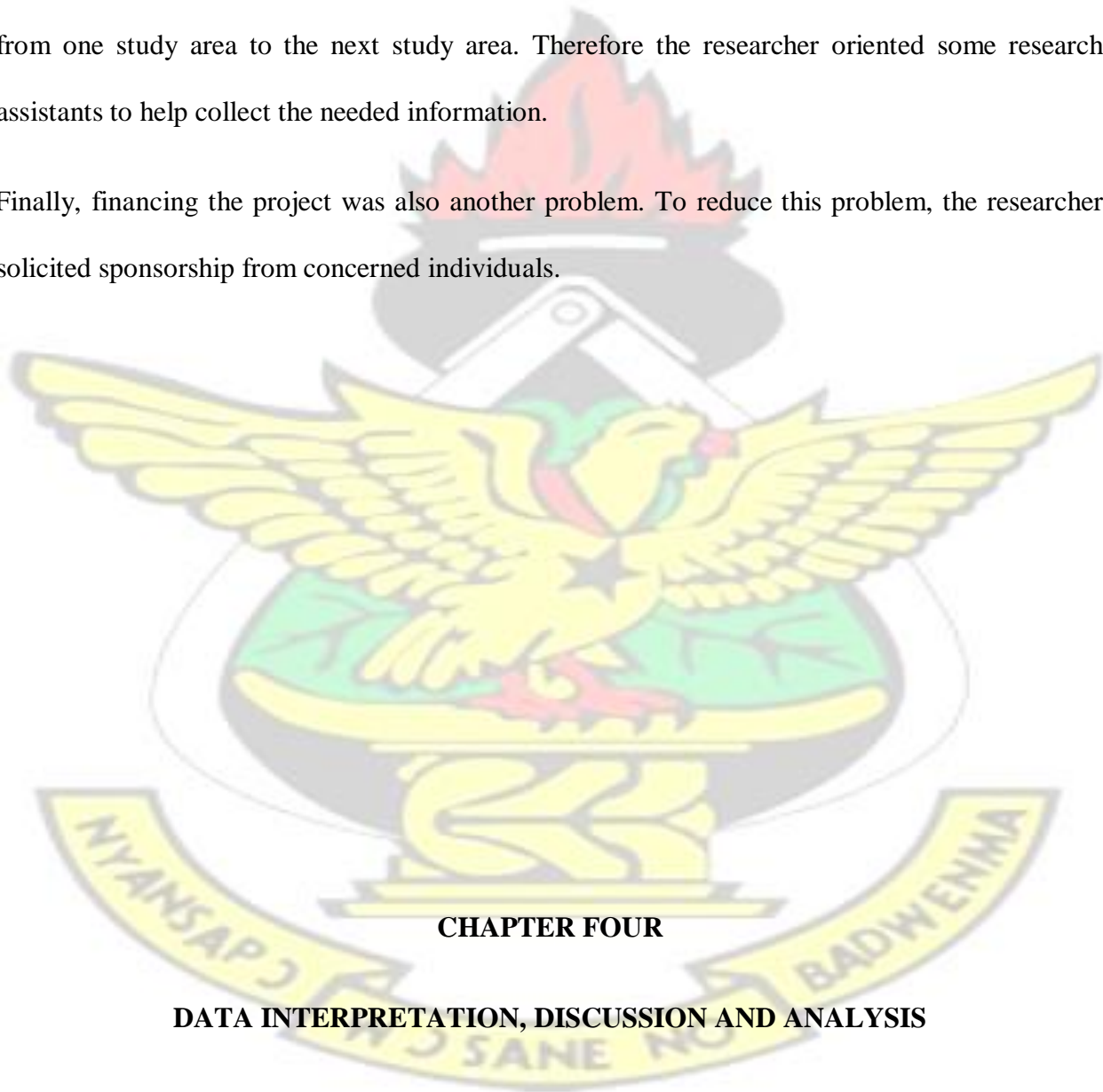
3.10 THEORETICAL PROBLEMS

The limitations of the study refer to possible situations or factors that caused restraints in the research. It also refers to the problems that arose in the research.

In the process of conducting interviews, participants proved difficult in the delivery of information. When this problem arose, the researcher exercised patience and explained matters to the participants in order to ensure continuation of the study. This also ensured proper understanding of the study.

Moreover, the conducting of interviews demanded more time since the researcher had to move from one study area to the next study area. Therefore the researcher oriented some research assistants to help collect the needed information.

Finally, financing the project was also another problem. To reduce this problem, the researcher solicited sponsorship from concerned individuals.



CHAPTER FOUR

DATA INTERPRETATION, DISCUSSION AND ANALYSIS

4.1 INTRODUCTION

This chapter presents the empirical results from the focus group interviews with household and management of solid waste. The results are divided into three different sections: household waste generation and disposal practices, how often is solid waste generated and finally, what type of waste collection service is available to households in the metropolis. All the above aimed at achieving the objective of the study, which include; to describe the urban solid waste situation in Kumasi, to identify the factors that militate against solid waste management efforts in Kumasi, to identify ways to improve solid waste disposal in Kumasi and finally, to make appropriate recommendations to improve solid waste management efforts in Kumasi.

4.2 INTERPRETATION, DISCUSSION AND ANALYSIS

Analysis of Response from Households perspective

Household Waste generation

All the households interviewed mentioned that their waste generation is mostly normal household waste.

-[...] “the major waste we generate in this house is peeled cassava, plantains and food leftovers of which we give them to a farmer who rears farm animals with few waste that are not consumable by these animals are the polyethylene bags, papers and any other material that might be dangerous to the health of the animals”. (Woman from

Asawase)

The household waste generated in the metropolis is generally non-poisonous since they are mostly from food items and sometimes serve as a source of food for some farm animals with few papers and polyethylene bags which are generated on daily basis. This means that, if more farms that will need these peels of food stuffs are found, almost the waste generated from food stuff will be re-used to serve other purposes and hopefully the papers and polythene bags which are poisonous can be burnt to reduce its exposure.

The above household knowledge about waste further confirms and affirms some renowned definitions of the term among them include: Gilpin (1996) who provides a more elaborate definition of the term waste. According to him, the concept of waste embraces “all unwanted and economically unusable by products or residuals at any given place and time, and any other matter that may be discarded accidentally or otherwise into the environment” (Gilpin, 1996). Gilpin also suggests that what constitutes waste must “occur in such a volume, concentration, constituency or manner as to cause a significant alteration in the environment”. Thus, apart from waste being an unwanted substance that is discarded, the amount of it and the impact it makes on the environment also become important considerations in defining waste.

McLaren (1993) has also referred to waste as the “unwanted materials arising entirely from human activities which are discarded into the environment”.

Household waste disposal

Storage of household waste before disposing off is very important in the metropolis. Upon interviewing the various households in the study area, majority of them have dustbins for the storage of their daily wastes.

- [...] *“yea we have a dustbin provided by the waste collectors which we store all household wastes before they come for the waste to dispose off”.*
- [...] *“we have been provided a big dustbin to store our waste but we do put the waste in polyethylene bags in the kitchen before putting them into the dustbin for the waste collectors to finally dispose them because we cannot keep the dustbin inside the kitchen”.* (Woman from Nhyiaeso)

Majority of the respondents in the households interviewed confirmed using the dustbins provided by the waste management companies at a monthly charge and consequently, these monthly charge paid motivates collectors and help respondents to enforce the collection. The major problem has to do with the rate at which they come to collect and dispose waste. Looking at the congested nature of the houses in the study area, bigger dustbins will be appropriate. This confirms the statement by Habitat, 2002 *“The need for the collection and disposal of solid waste in urban settlements is far from adequately recognized. Uncollected refuse accumulates in drains, roads and open spaces, disrupting community life and creating additional problems in the operation of other public services”*. Moreover, the study hitherto buttress the concerns raised by some earlier researchers who suggested that large proportions (between 30 and 50 percent) of the solid waste generated by the residents are never collected for disposal and end up rotting on the streets, in drains and in streams (Hardoy *et al.*, 2001; Pacione, 2005; Ali, 2006). Hardoy *et al.* (2001) for

instance have reported the extensive lack of solid waste collection in cities across the developing world. Pacione (2005) has also commented on the lack of provision for urban waste management in poor countries and the resulting poor environmental conditions in the cities. According to him, most poor city governments have great difficulty regarding the collection and safe disposal of solid wastes.

Household commitment to solid waste management

Most households confirm the payment of monthly bills for the collection of their waste by the waste management companies.

-[...] “the payment for the collection of wastes by the waste management companies is made every month since we own their dustbin and also comes for the waste from time to time”. (Woman from Nhyiaeso)

-[...] “yea, we pay those people who uses tricycles for waste collection and the payment is always in the form of pay-as-you-dump. They collect the waste from us at a fee depending on the size of the waste and further dump them at designated disposal sites”. (Woman from Asawase)

The waste management companies in the light of wisdom has levied an amount to be paid monthly by various households that they extend their services to and others engage in the pay as you dump way and it is attested by respondents who said that, the amount per the size of your waste and the rate at which your waste is collected. A problem arises when collectors have problems with their trucks or tricycles or are not properly motivated.

Perception and assessment of services provided by waste collectors

The attitude of the waste management companies to the communities was discussed by the households interviewed as follows;

-[...] “the service provided is good because we make regular payments they also serve us well even though sometimes they delay in the collection of the waste as a result of equipment break down”. (Woman from Nhyiaeso)

The frequency at which the waste generated from the various households are collected for final disposal by the waste management companies are considered to be not encouraging by some section of the households interviewed.

- [...] “the service provided by Zoomlion is very bad. Human activities will definitely generate waste everyday but personnel of zoomlion do not come for the waste frequently which makes the vicinity always not tidy”. (Woman from Asawase)

Majority of the respondents from Nhyiaeso appreciated the services provided by the waste management companies whilst few respondents from Asawase households had a reverse opinion. A lot of people who believe the quality of service is good also raised the issue of delays in collection of the waste by these companies which makes the environment untidy.

The study reveals that all the households interviewed in Nhyiaeso agree that the quality of service of the waste management companies is very good whilst households from the Asawase community disagree. I think a missing point here is that, majority of respondents do not have it at the back of their minds that, environmental cleanliness is a collaborative affair, for which they have a role to play.

In West Africa, Koffi Attahi (1999) reported that waste collection is frequently done in the residents of the rich than the poor. Besides, waste disposal facilities which are usually poorly maintained, are frequently cited in the neighbourhoods of the poor and other vulnerable population groups which implies the shifting of environmental burdens on the poor (Camacho, 1998; Bullard, 2005).

Spatial Disparities in the Magnitude of the Solid Waste Problem

The attention paid to the communities by the waste management companies varies as identified by the households interviewed. The information gathered reveals that, waste collection for residents at Nhyiaeso is quickly done. On the contrary, respondents at Asawase are treated the opposite of those at Nhyiaeso.

-[...] “to compare my neighbourhood to that of Asawase, I would say here is far better as compared to where I used to stay (Suame), the waste issue here is better and the attention paid to waste issue in Nhyiaeso is very good”. (Woman from Nhyiaeso)

-[...] “there is vast difference between the services given to Nhyiaeso community and Asawase community because the waste management companies themselves has made it known to us that people living residential areas pay frequently and so the attention given to them is special”. (Woman from Asawase)

The responds on the spatial disparities in the municipal waste management are nothing different from the existing literature. One interesting thing to note is the fact that the situation pertain in both developed and the under-developed world. According to IDRC

sponsored research ‘City authorities in developing country cities are generally unable to provide adequate solid waste disposal services within their jurisdictions. The literature on the topic also shows that there are spatial disparities in the scale of the waste disposal problem within cities. These disparities are socio-spatial in nature as waste collection services are concentrated in, if not confined to, official areas and wealthy residential neighbourhoods while the low-income communities receive little or no attention. In particular, many writers have described solid waste collection services in the cities which show enormous disparities between rich and poor residential areas. In the East African city of Dar es Salaam, Tanzania, Kironde (1999) found that the collection of solid waste is usually confined to the city centre and high-income neighbourhoods while other areas never benefit from public solid waste disposal. Consequently, most residents of the low-income areas in the city have to bury or burn their waste or dispose of it haphazardly.

People’s Attitude towards waste management

All the households interviewed revealed that waste management issues in the two communities vary from Nhyaeso to Asawase in terms of cleanliness in the neighborhoods. The attitude of the residents towards waste can be seen differently from both communities.

- *[...] “the waste management issue in this community is very bad because most people dump their household wastes at the backyards of other people’s houses or into the main gutters. People just don’t care about littering around which makes the environment very messy”. (Woman from Asawase)*

- [...] *“the general attitude of the residents here towards waste management is good. No one wants to see waste near his or her house so the surroundings always look attractive just that sometimes school children would litter the place with papers which is not a serious thing”.* (Woman from Nhyiaeso)

How people see waste sometimes depend on the environment and the locality most people find themselves. From the study, the attitude of the residents in upper class areas towards waste were appropriate as compared to those in the lower class residential areas. Also, residents at the upper class areas are literates who know the effects, both positive and negative in proper handling of waste. On the other hand, residents at other areas like Asawase do not pay much attention to waste and look down on its proper collection and disposal.

Information/communication

The flow of information and some kind of communication between the waste management companies and the communities came up through the interviews conducted with the various households.

- [...] *“the waste collectors do not come for the waste regularly sometime once a month and they do not bother to let us know why they are not coming for the waste and the dates they will be coming for our waste”.* (Woman from Asawase)
- [...] *“the flow of information is somehow ok since they come for the waste regularly and in times of long delays, they inform us either they are having problems with their trucks”.* (Woman from Nhyiaeso)

This shows some kind of discrimination among the two communities in terms of information flow from the waste management companies to the individuals being served. But with respect to the fact that respondents are stakeholders, they have the right to be informed on current trends and if possible to know when collection and disposal will be done and be informed to take other measures when there comes a failure.

Analysis of Response from Management perspective

Organization of waste

The generation of waste is done daily by individuals but its management is of great concern in the metropolis.

- [...] *“The waste management department of Kumasi Metropolitan Assembly is responsible for waste management in Kumasi Metropolis but there are departments such as the Environmental Protection Agency (EPA), the Metro Works Department and the Environmental Health Departments of the various assemblies who are directly involved in the management of the waste”.* (Assistant Engineer-WMD/KMA)

- [...] *“the waste management department is in charge of collection of waste but has sublet it on contract to nine companies. Zoomlion is in charge of three sub-metros”.* (Miss. Augustina Agyei-Boateng, WMD/KMA)

The issue of which institutions and their roles in waste management rises and as far as these bodies are concerned, I strongly believe that individual's can be educated and encouraged to help in the proper management of waste, thus seeing it as a collaborative assignment.

Collection of waste

The collection of waste by the waste management department of the KMA and their affiliate private waste management companies needed to be discussed by the study.

- *[...] “We have primary storage which is also known as the door-to-door services or the house-to-house services where people keep their waste in 120 or 240 litter bins and compacted trucks would be sent to collect them at regular intervals. This is done predominantly in the 1st class and 2nd class residential areas”. (Assistant Engineer-WMD/KMA)*
- *[...] “Communal services is also done at the 3rd class residential areas where replaceable disposal containers of 14 and 15 cubic containers are kept at a designated disposal sites for individual households to dispose off their waste. The processes involved here is that, individuals dispose off their waste into these disposal containers at a cost depending on the size of the waste”. (Assistant Engineer-WMD/KMA)*

As indicated by Lohse, (2003), municipal authorities are unable to provide adequate waste disposal and other environmental services within their entire jurisdiction, making municipal authorities in most developing countries tend to concentrate their waste collection efforts in official and wealthy

areas while the poorer areas receive little or no service for waste removal even though waste collection operations are usually funded with public resources.

Besides, waste disposal facilities which are usually poorly maintained, are frequently cited in the neighbourhoods of the poor and other vulnerable population groups which implies the shifting of environmental burdens on the poor (Camacho, 1998; Bullard, 2005).

Transportation

- [...] “the transportation of the waste to the final disposal sites is done by the waste management companies to dispose off at the landfill site. In Kumasi the landfill site is located at Dompase near Atonsu. Normally when it rains, the landfill site becomes muddy which makes it difficult for the trucks to dispose-off the waste and this also account for delays of waste collections”. (Assistant Engineer-WMD/KMA)

The landfill seems to have a special attraction for municipal waste managers because it offers a cheap and convenient option for waste disposal compared with other strategies such as reuse, recycling and energy recovery (Charzan, 2002). In fact, with the exception of few countries like Austria, the Netherlands and Denmark who recycle substantial proportions of their waste, most countries in Europe and North America still dump the bulk of their municipal solid waste in landfills (OECD, 2000; Girling, 2005).

Influencing factor to serve an area

There are some factors that influences the type of service to be provided in some communities

- [...] *“if the area is within the city, why won’t they serve the area? It might occur when the contractor is having problems such as equipment breakdown or nonpayment on the part of the assembly. Government subsidy must be paid by the Assembly and it is not frequent. If the contractors are not having enough money, then there will be problems at the sites”.* (Assistant Engineer-WMD/KMA)

- [...] *“there is no consideration because it is mandatory by law to serve every area in terms of waste management but the type of service is determine by the characteristics of the area. If the roads are good and the area is affluent, they do house-to-house collection of the waste but if not they rely on the communal sites”.* (Miss. Augustina Agyei-Boateng, WMD/KMA)

Clear set parameters by waste management companies can help them reach majority of areas within the metropolis and by so doing, their services will be quite appreciated.

Method of waste disposal

Officials from the waste management department of KMA make use of both house-to-house and the communal approach of waste collection in the municipality.

- [...] *“a mix of both methods are used but Asawase has more of communal sites than house-to-house collection. The reverse is applied in Nhyiaeso because the community is well laid out with motor able roads. Also Nhyiaeso people pay more for the house-to house collection than those living in Asawase”.* (Miss. Augustina Agyei-Boateng, WMD/KMA)

The information gathered means that, though there are two methods of disposal, residents of the Asawase community have more than enough communal sites with few or no house to house services, which exposes some residents to the risks associated with moving to communal sites.

Also, residents of Nhyiaeso tend to pay more for house to house collection.

Quality of service

The quality of service provided to the households by the solid waste management companies is of great concerns to the households.

- [...] “quality here is more of frequency and picking the refuse on time. For communal collection, quality would be in terms of site husbandry but for house-tohouse; quality comes in when refuses are not picked on time as a result of equipment breakdown and sometimes financing”. (Assistant Engineer-WMD/KMA)

On the whole, quality of services at both areas is considerably accepted as majority of the respondents applauded the waste management companies.

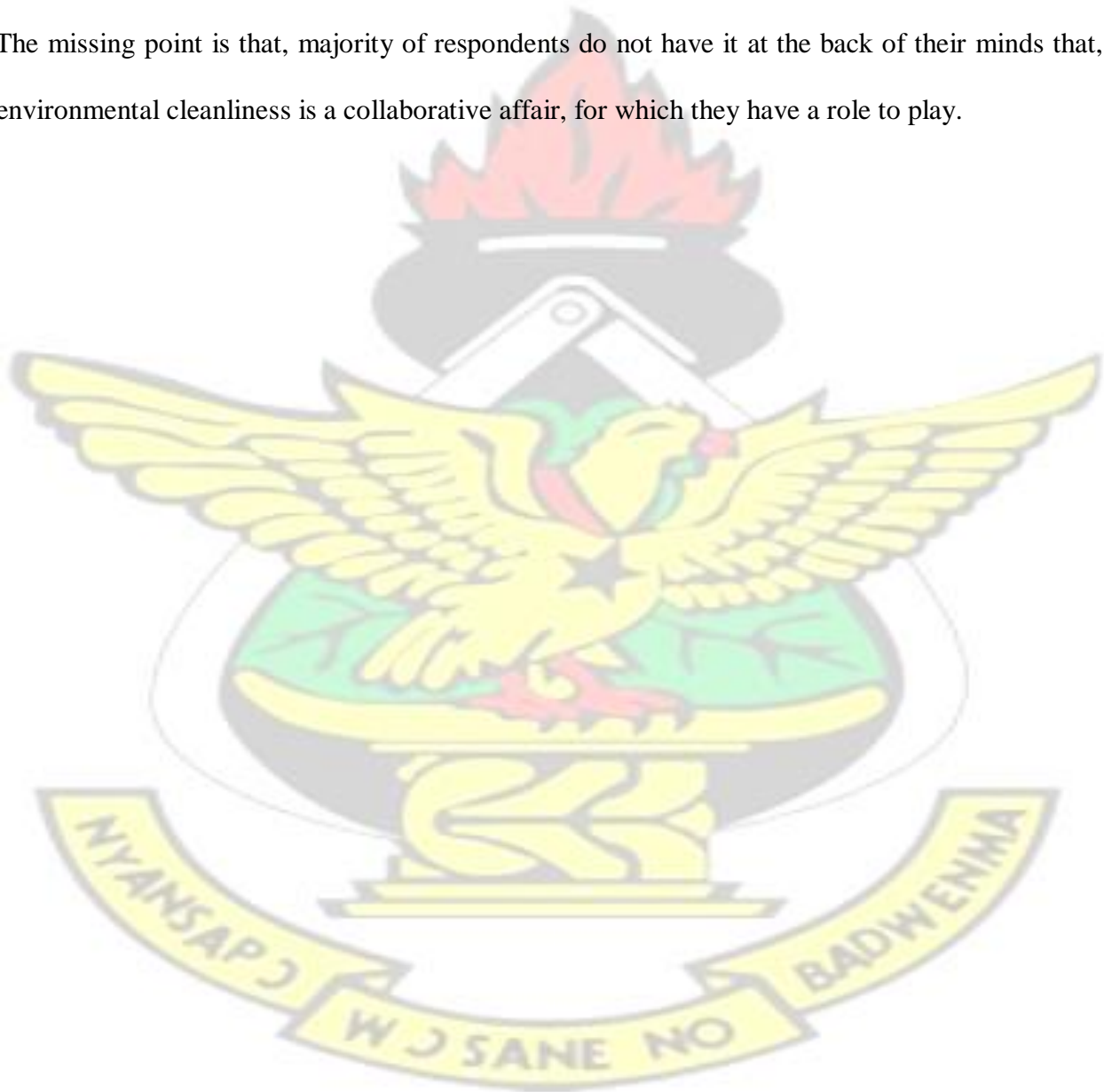
To achieve sustainable waste management, such a system must harness and develop the capacities of all stakeholders in the waste sector (Schubeller *et al.* 1996) including civil society, businesses, private sector waste companies and government agencies.

Public Attitude

The attitude of the general public towards waste generation, collection and its management as a whole is of great concerns to this study and from the management’s perspective are as follows;

- [...] *“people think that waste collection must be free. They also have some kind of nimble attitude. People instead of paying for disposing off their waste, they will rather bring them to the CBD and put them into the litter bins so they litter the city with household waste. Sometimes we need to create dump sites in certain areas and nobody wants it at his backyard”.* (Assistant Engineer-WMD/KMA)

The missing point is that, majority of respondents do not have it at the back of their minds that, environmental cleanliness is a collaborative affair, for which they have a role to play.



CHAPTER FIVE

MAJOR FINDING, CONCLUSION AND RECOMMENDATIONS

5.1. INTRODUCTION

This chapter of the study presents the major findings, conclusion, and also offers recommendations to help manage solid waste in the Kumasi Metropolis.

5.2 MAJOR FINDINGS

In this section the major findings emanating from the study are presented in relation to the research objectives.

First and foremost, it was revealed that, the household wastes generated in the metropolis are generally non-poisonous since they are mostly from food items. They also serve as a source of food for some farm animals with few papers and polyethylene bags which are generated on daily basis. This means that, if more farms that will need these peels of food stuffs are found, almost the waste generated from food stuff will be re-used to serve other purposes and hopefully the papers and polythene bags which are poisonous can be burnt to reduce its exposure. This notion confirms and affirms some renowned definition of waste such as the one by Gilpin (1996) who provides a more elaborate definition of the term waste. According to him, the concept of waste embraces “all unwanted and economically unusable by products or residuals at any given place and time, and any other matter that may be discarded accidentally or otherwise into the environment”

Moreover, it was found out that, majority of the respondents use the dustbins provided by the waste management companies at a monthly charge and consequently, these monthly charges paid motivates collectors and help respondents to enforce the collection. The major problem currently is the rate at which wastes are collected for disposal. This again confirms the statement by Habitat, 2002 “The need for the collection and disposal of solid waste in urban settlements is far from adequately recognized. Uncollected refuse accumulates in drains, roads and open spaces, disrupting community life and creating additional problems in the operation of other public services”. More to the above, the study hitherto buttress the concerns raised by some earlier researchers who suggested that large proportions (between 30 and 50 percent) of the solid waste generated by the residents are never collected for disposal and end up rotting on the streets, in drains and in streams .

Similarly, the study revealed that, the waste management companies has levied an amount to be paid monthly by various households that they extend their services. Others engage in the pay as you dump way. Respondents attests that this depends on the amount per the size of your waste and the rate at which your waste is collected. A problem arises when collectors have problems with their trucks or tricycles or are not properly motivated. The frequency at which the waste generated from the various households are collected for final disposal by the waste management companies are considered to be not encouraging by some section of the households interviewed.

In addition, majority of the respondents from Nhyiaeso commended the quality of services provided by the waste management companies whilst respondents from Asawase households were dissatisfied with their services. The study reveals that all of the households interviewed in Nhyiaeso support that the quality of service provided by the waste management companies whilst

households from the Asawase community find the quality of their services questionable. A missing point here is that, majority of respondents do not have it at the back of their minds that, environmental cleanliness is a collaborative affair, for which they have a role to play.

More so, the responds on the spatial disparities in the municipal waste management are nothing different from the existing literature. One interesting thing to note in this study, is the fact that the situation pertain in both developed and the under-developed world. In particular, many writers have described solid waste collection services in the cities which show enormous disparities between rich and poor residential areas.

Moving on, all the households interviewed revealed that waste management issues in the two communities vary from Nhyiaeso to Asawase in terms of cleanliness in the neighborhoods. The attitude of the residents towards waste can be seen differently from both communities. How people see waste sometimes depend on the environment and the locality they find themselves. From the study, residents in upper class areas have proper attitude towards waste as compared to the attitudes of those in the lower class residential areas. It is also believed that, residents at the upper class areas are literates who know the effects, both positive and negative in proper handling of waste. On the other hand, residents at other areas like Asawase do not pay much attention to waste and look down on its proper collection and disposal.

Findings from K.M.A waste management revealed that, the management of the daily wastes generated by individuals is of great concern. The management department of Kumasi Metropolitan Assembly is responsible for waste management in Kumasi Metropolis but there are departments such as the environmental Protection Agency (EPA), the Metropolitan Works Department and the environmental health departments of the various assemblies who are directly involved in the

management of the waste, (Assistant Engineer-WMD/KMA). The waste management department is in charge of collection of waste but has sublet it on contract to nine companies. For instance, Zoomlion is in charge of three sub-metros (Miss. Augustina Agyei-Boateng)

Furthermore, managers of waste admitted that they have primary storage which is also known as the door-to-door services or the house-to-house services where people keep their waste in 120 or 240 litter bins and compacted trucks would be sent to collect them at regular intervals. This is done predominantly in the upper class residential areas.

Communal services is also done at the lower class residential areas where replaceable disposal containers of 14 and 15 cubic containers are kept at a designated disposal sites for individual households to dispose off their waste. The processes involved here is that, individuals dispose off their waste into these disposal containers at a cost depending on the size of the waste. Transportation of the waste to the final disposal sites is done by the waste management companies at the landfill site. In Kumasi the landfill site is located at Dompase near Atonsu. Normally when it rains, the landfill sites becomes muddy which makes it difficult for the trucks to dispose-off the waste and this also account for delays of waste collections.

There are some factors that influence the type of service to be provided in some communities, if the area is within the city, why won't they serve the area? It might occur when the contractor is having problems such as equipment breakdown or non-payments on the part of the assembly. Government subsidy must be paid by the Assembly and it is not frequent. If the contractors are not having enough money, then there will be problems at the sites, (Assistant Engineer WMD/KMA).

There is no consideration because it is mandatory by law to serve every area in terms of waste management but the type of service is determined by the characteristics of the area. If the roads are good and the area is affluent, they do house-to-house collection of the waste but if not they rely on the communal sites.

Clear set parameters by waste management companies can help them reach majority of areas within the metropolis and by so doing, their services will be appreciated, the information gathered means that, though there are two methods of disposal, residents of the Asawase community have more than enough communal sites with few or no house to house services, which exposes some residents to the risks associated with moving to communal sites. Also, residents of Nhyiaeso tend to pay more for house to house collection.

Findings from quality of service indicated that the two areas are considerably accepted. They also have some kind of nimble attitude. People instead of paying for disposing off their waste; they will rather bring them to the Central Business District (CBD) and put them into the litter bins so they litter the city with household waste. Sometimes we need to create dump sites in certain areas and nobody wants it at his backyard.

5.3 CONCLUSION

The study concludes that, the supervision, planning and coordination of solid waste management in the metropolis is conducted by the Waste Management Department (WMD) of Kumasi Metropolitan Assembly (KMA) through sub-contracts to other private waste management companies with some companies managing more than one sub-metropolitan within the metropolis.

Secondly, the study further concludes that much attention is given to people in the upper class residential areas than those in the peripheries. This has supported the preponderance of literature available of spatial disparities in municipal waste management across the globe. The situation is same in both developed and underdeveloped worlds.

In addition, the study concludes that although there are obvious differences in the way and manner in which solid waste is being managed, residents of the two sub-metros were somewhat satisfied in spite of the disparity.

The study finally concludes that, the major challenges that mitigate against effective management of solid waste in the metropolis includes, heavy downpour (rainfall), equipment breakdown, delays in government payments of salaries of workers and general attitude of both residents and personnel of the solid waste management companies have a role to play.

5.3 RECOMMENDATIONS

In view of the findings made and conclusions drawn from the study, the following recommendations are provided to help enhance an accelerated and sustained growth in the waste management department and other waste management sectors in the municipality and the nation as a whole.

First of all, the environmental protection agency, together with major waste management agencies must embark on media campaign to create awareness and to educate the general public and waste management bodies on the need to effectively manage waste and its likely effects associated with its mishandling. This can be possible, when they apply the three (3) R's in waste management;

reduction, re- use, and recycling in their educational programs at the study area and to the nation at large.

Additionally, workshops, seminars and symposiums must be conducted at the communal levels, with resource personnel being experts and translators. With respect to the areas of study, the experts and translators must be well versed in English, Hausa and Twi languages.

From the analysis of the data gathered, it is further recommended that, the respective waste management bodies, in the quest to ease their job, must provide dustbins and refuse collectors at lorry parks, junctions, market areas and other public arenas. This though will not curb littering, but will go a long way to reduce it and will make collection very simple.

More so, a team of volunteers must be set up to serve as checks on offenders who litter around and culprits brought before law and made to pay damages. This, when implemented will deter other neighbors from following suit.

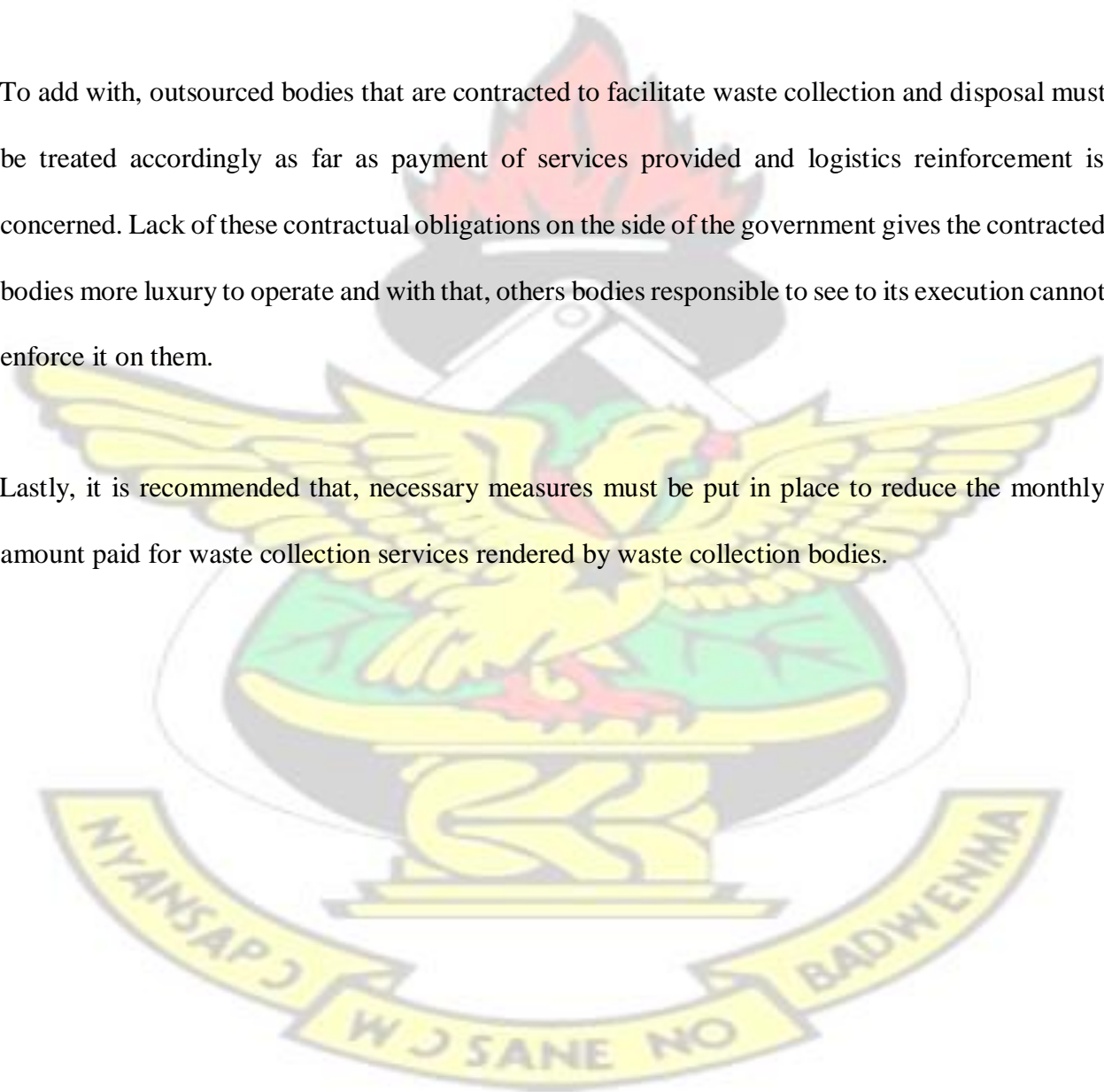
With respect to the data gathered, it is recommended that, the waste management companies must increase the rate at which they report for waste collection and disposing off at the study areas. Though the waste management companies involved are doing a good job, their job will be much appreciated when they visit communal dump sites and respective household at least three times in a week to help reduce the rate at which residents pile waste for close to three weeks without being attended to.

Lot more, it is recommended that, logistics, tools and equipments for waste collection must be maintained frequently and users must also be educated regularly on their proper usage.

Apart from the various communal sites for waste disposal at Asawase, the environmental protection agencies and other waste management bodies must make provision to start the house to house collection of waste to help ease residence of walking to sites and its related consequences.

To add with, outsourced bodies that are contracted to facilitate waste collection and disposal must be treated accordingly as far as payment of services provided and logistics reinforcement is concerned. Lack of these contractual obligations on the side of the government gives the contracted bodies more luxury to operate and with that, others bodies responsible to see to its execution cannot enforce it on them.

Lastly, it is recommended that, necessary measures must be put in place to reduce the monthly amount paid for waste collection services rendered by waste collection bodies.



BIBLIOGRAPHY

Adu-Boahen, A. K. (1975). *Ghana: Evolution and Change in the 19th and 20th Centuries*. London: Longman.

Adamu-Issah, M., Elden, Liv., Forson, M. and Schrofer, T. (2007). *Achieving Universal Primary Education in Ghana by 2015: A Reality or Dream?* Division of Policy and Planning. New York :UNICEF.

Agyemang, O.A, Chirwa, B. and Muya, M. (1997). *An Environmental Profile of the Greater Lusaka Area: Managing the Sustainable Growth and Development of Lusaka*. Lusaka City Council: Zambia

Armah, N.A. (1993). Waste Management. *The Future of Our Cities. Proceedings of the Ghana Academy of Arts and Sciences*. Volume XXVIII, 78-83. Accra: GAAS.

Asamaa Ndeh, (2007). Waste, Waste Everywhere in Accra, and Not a Place to Dump Daily Graphic Newspaper, page 6. May 17, 2007. Accra: Graphic Corporation of Ghana

Atkinson, A. (2001). International Co-operation in Pursuit of Sustainable Cities. *Development in Practice*. Volume 11, Number 2-3, 273-291. Stanford Encyclopaedia of Philosophy.

Basel Action Network (BAN), (2008). Turn Back the Toxic Tide. Accessed at: <http://www.ban.org/index.html>. 23/12/07

Bell, J. (1991). *Doing Your Research Project*. Milton Keynes :Open University Press.

Bendana, A. (2006). NGOs and Social Movements. *Civil Society and Social Movements Programme*. Project Paper No. 22. June, 2006. Geneva :UNRISD.

Bilitewski, B., Hardetle, G. and Marek, K. (1997). *Waste Management*. Berlin: Springer Publications

Blaikie, N. (2000). *Doing Social Research*. Cambridge: Polity Press/Blackwell

Bryman, A. (2001). *Social Research Methods*. Oxford: Oxford University Press

Bryman, A. (2004). *Social Research Methods (2nd Edition)*. Oxford: Oxford University Press

Bullard, R. D. (Ed) (2005). *The Quest for Environmental Justice: Human Rights and the Politics of Pollution*. San Francisco: Sierra Club Books

Bullard, R. D. (1993). Environmental Racism and the Environmental Justice Movement. *Bullard, R. D. 1993 (Ed). Confronting Environmental Racism: Voices from the Grassroots.* 53-62. Cambridge: MA. South End Press

Burgess, R. G. (1984). *In the Field. An Introduction to Field Research.* London: Routledge Burns, R.B. (2000). *Introduction to Research Methods.* London: Sage Publications

Cable, S., Hastings, D.W. and Mix, T.L. (2002). Different Voices, Different Venues: Environmental Racism Claims by Activists, Researchers and Lawyers. *Human Ecology Review*, Vol. 9, No. 1, 2002

Accessed at: <http://www.humanecologyreview.org/pastissues/her91/91cableetal.pdf>.

Camacho, D. (1998) (Ed). *Environmental Injustices, Political Struggles: Race, Class and the Environment.* Durham: Duke University Press

Claveland, D. A, (1991). Migration in West Africa: A Savannah Village Perspective. *Africa: Journal of the International African Institute*, Vol. 61, No. 2 (1991), 222- 246

Chazan, D. (2002). A World Drowning in Litter, *BBC. Full Text Data Base. BBC News Online.* Accessed at: <http://news.bbc.co.uk/1/hi/world/europe/1849302.stm>. 12/05/08

Cohen, J.L and Arato, A. (1992). *Civil Society and Political Theory.* Cambridge, Massachusetts: MIT Press

Cohen, L., Manion, L. and Morrison, K. (2000). *Research Methods in Education.* London: Routledge Falmer

Cointreau, S. (2001). *Declaration of Principles for Sustainable and Integrated Solid Waste Management.* Accessed at: <http://web.worldbank.org>. 17/06/07

Coonan, C. (2007). Sent from Britain: Our Waste, Pollution and a Poisoned Sky. *The Independent.* Friday 26th. January, 2007.

Cowling, A., *Principles of Waste Management.* University of Leeds. Accessed at: <http://www.leads.ac.uk/safety/waste/intro/principles.htm>. 12/02/07

Creswell, J.W. (2003). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches (2nd Edition).* Thousand Oaks, Sage

Crotty, M. (2003): *The Foundations of Social Research: Meaning and Perspectives in the Research Process*, London: Sage Publications, 3rd edition, 10.

Davies, A. R. (2008). *The Geographies of Garbage Governance: Interventions, Interactions and Outcomes.* London: Ashgate

Denscombe, M. (2002). *Ground Rules for Good Research. A 10 Point Guide for Social Researchers*. Buckingham: Open University Press

Denzin, N. K. (1989). *The Research Act. A Theoretical Introduction to Sociological Methods* (3rd Ed). New Jersey: Prentice Hall

Devas, N. (1999). *Who Runs Cities? The Relationship Between Urban Governance, Service Delivery and Poverty. Urban Governance, Poverty and Partnerships. Theme Paper 4*. Birmingham: The School of Public Policy. University of Birmingham.

Devas, N. and Korboe, D. (2000). *City Governance and Poverty: The Case of Kumasi. Environment and Urbanization*. Vol. 12 No. 1. 123-136.

Elliot, J. A. (2006). *An Introduction to Sustainable Development. Third Edition*. New York: Routledge

Girling, R. (2005). *Rubbish! Dirt on Our Hands and Crisis Ahead*. Eden Project Books. London: Transworld Publishers Ltd.

Gbekor, A. (2003). *Domestic Waste Management. Ghana Environmental Protection Agency (EPA) Newsletter Vol. 47 No. 5*. Accra: Ghana EPA.

Ghana Government-Ministry of Food and Agriculture,(2006). *Agriculture in Ghana. Facts and Figures*. Accra: Presbyterian Press

Ghana Environmental Protection Agency Newsletter. Vol. 5 no. 2 July-December 2002. Accra. EPA

Gilpin, A. (1996) "Dictionary of environment and development". John Wiley and sons, Chester and New York, pp 103-106

Grix J. (2004). *The foundations of research*, London, Palgrave pp 15-20

Guba and Lincoln (1989) *Fourth Generation Evaluation*. London: SAGE Publications,83.

Hardoy, J. E. *et al.*, (2001). *Environmental Problems in an Urbanizing World*, London: and Stirling, VA. Earthscan

Hempel, C.G. (1965) *Aspects of scientific Explanation. And other Essays in the Philosophy of Science*. The Free Press, A Division of macmillan Publishing Co., Inc. New York.

Kironde, J.M.L., (1999). *Dar es Salaam, Tanzania. Onibokun, A.G. (Ed). Managing the Monster. Urban Waste and Governance in Africa*. 101-172. Ottawa: IDRC.

Lohse, U. (2003). *Improving Municipal Finance – A Global Challenge. Habitat Debate*.

Innovative Urban Financing. UN-HABITAT April, 2003. Vol. 9 No. 1. Accessed at: <http://www.unhabitat.org/hd/hdv9n1/default.asp>. 22/07/07

McGranahan, G. and Satterthwaite, D. (2000). Environmental Health or Ecological Sustainability? Reconciling the Brown and Green Agendas in Urban Development.

Miller, G. R., & Nicholson, H. (1976). *Communication inquiry*. Reading, MA: Addison-Wesley.

Pugh, C. (2000). Ed. Sustainable Cities in Developing Countries. London and Sterling: VA. Earthscan

Pacione, M. (2005). *Urban Geography. A Global Perspective*. 2nd. Edition. London and New York: Routedge, Taylor & Francis Group

Peet, R.(1998). *Modern Geographical Thought*. Oxford: Blackwell Publishing

Perera, K.L.S., (2003). 'An Overview of the Issue of Solid Waste Management in Sri Lanka'. *Bunch, M.J., Suresh, V.M. and Kumaran, T.V. (Eds). Proceedings of the 3rd. International Conference on Environment and Health*. Chennai, India. 15-17 December, 2003. Chennai Department of Geography, University of Madras and Faculty of Environmental Studies, York University. 346-352

Ragin, C. C. and Becker, H.S. (1998). *Foundations of Social Inquiry*. New York: Cambridge University Press

Ratnayake, V. U. (1999). Solid Waste Management in Colombo. In Atkinson, A. et al, 1999. *The Challenges of Environmental Management in Urban Areas*. Aldershot and Vermont: Ashgate

Rawls, J. (1971). *A theory of Justice Revised Edition Sixth Printing 2003*. Harvard: Harvard University Press

Rhyner, C.R. *et a.l*, (1995). *Waste Management and Resource Recovery*. Boca Rotan: FL Lewis Publisher

Scholar, R. (Ed) 2003. *Divided Cities The Oxford Amnesty Lectures 2003*. Oxford: Oxford University Press.

Schubeller, P., Wehrle, K and Christen, J. (1996). *Urban Management and Infrastructure. Conceptual Framework for Municipal Solid Waste Management in Low-Income Countries*. Working Paper No. 9. UNDP/UNCHS (Habitat/World Bank/SDC Collaborative Programme on Municipal Solid Waste Management in Low- Income Countries. St, Gallen: SKAT.

Toulmin, Stephen (1953) *The philosophy of science: an introduction*. Hutchinson University Library. London, UK.

KNUST

APPENDIX A

Interview with households A.

i. Name of suburb

iii. How long have you lived in this neighbourhood? Years Months..... iv. How many people live in your house?

B.

Household waste generation and disposal practices

1. What are the items commonly found in your household waste and how often you generate them?

How often do you generate this?

(e.g. daily, weekly, occasionally)

2. How do you store your waste before disposal?

3. What type of waste collection service is available to your household?

4. How will you describe the general waste situation in your neighbourhood?

5. Do you pay for your waste disposal service?

6. How will you describe the quality of waste disposal service you receive?

7. If you were to compare with other communities or suburbs in this city, would you say your community receives a fair share of resources for waste disposal? 8. In your view, how can waste disposal be improved in your community?

9. Would you like to ask any question or make some further comments with regard to what we have just discussed?

KNUST

APPENDIX B

Interview with officials of municipal waste department in Kumasi

Designation of officer granting interview.....

Professional background of officer:.....

Job history:.....

1. Which institutions are involved in the organization of waste management in this city and what are their respective roles?
2. How would you describe the solid waste situation in this city?
3. What considerations influence your decisions to serve or not to serve an area?
4. How do Asawase and Nhyaeiso communities dispose of their waste?
5. What are the arrangements for waste collection in the Asawase and Nhyaeiso communities?

Method of collection

Frequency of collection

Service provider

6. What considerations influence the level or quality of service to provide in Asawase and Nhyaeiso communities?
7. How will you describe public attitude towards waste disposal in this city?
8. What do you consider to be the cause of the waste problem in this city?

9. How can waste management be improved in this city?

10. Would you like to make any other comments or ask questions in relation to this discussion?

KNUST

