ANALYSIS OF SOLID WASTE MANAGEMENT IN MAITAMA DISTRICT, ABUJA NIGERIA

BY

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A DESERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES AHMADU BELLO UNIVERSITY ZARIA, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTERS OF SCIENCES DEGREE IN ENVIRONMENTAL MANAGEMENT

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DECLARATION

I declare that this thesis entitled "Analysis of Solid Waste Management in Maitama District, Abuja Nigeria", has been performed by me in the Department of Geography under the supervision of Dr. J. O. Folorunsho and Dr.Y.Y. Obadaki. The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this thesis was previously presented for another degree or diploma at this or any other Institution.

.....	.....	.....
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CERTIFICATION

This thesis titled Analysis of Solid Waste Management in Maitama District, Abuja Nigeria, by Freedom Gajere JOSEPH meets the regulations governing the award of the degree of Master of Science (Environmental Management) of the Ahmadu Bello University, and is approved for its' contribution to the knowledge of Literary Presentation

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DEDICATION

This thesis is dedicated to my parents, Mr. and Mrs. Joseph Gajere for their continual support and encouragement all the time.

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ABSTRACT

Municipal solid waste management constitutes one of the most crucial health and environmental problem facing the world especially African cities. Most cities spend 20-50% of their annual budget on solid waste management. This study "Analysis of solid waste management in Maitama, Abuja" The set objectives were to identify the structure of solid waste management in Maitama district, examine the coordination of the solid waste management in the district, examine the sustainability of the process of solid waste management from generation to disposal and to identify the role of scavengers in solid waste management in Maitama. These were carried out by administration of questionnaires to the residents and waste managers. The socio-demographic characteristics in the study revealed that women are mostly involved in domestic solid waste management than men and that Maitama district is inhabited mostly by high income earners hence an average house size of 4-10 persons. The study reveals the heterogeneous nature of solid waste composition in the area which may require sorting for effective recycling process. Among the various methods of municipal solid waste collection, collection of waste by the waste managers has the highest proportion in the study area, different times of solid waste collection was reported ranging daily, twice or thrice in a week depending on when the waste managers come. However, the residents adjudged the services (collection and disposal) of the solid waste managers as satisfactory and that their charges for collection of waste were moderate. Among the problems of domestic solid waste as perceived by the respondents in the study area was poor sanitary habits of residents, and poor attitude towards payment of waste are the major problem of solid waste management,. It has been revealed through this study that some of the contractors /waste managers are not thorough in the collection of waste. The AEPB should device other means to ensure residents comply with payment for their waste since this happened to be a major challenge that affect them. They can liaise with other government agencies like First Inland Revenue Service (FIRS), Power Holding Company of Nigeria (PHCN) since they use pay as you go/use. Other agencies like banks can be of good help to ease payment

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CHAPTER ONE;INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Human society makes a living by extracting environmental resources for food, shelter, and clothing, using tools he conceives, fabricates and develops over time. His ingenuity at making tools perfects his power to obtain and utilize the available resources sometimes with impunity. Such technological sophistication termed civilization facilitates faster acquisition and utilization of environmental resources. The consumption of these resources tends to generate waste or unwanted materials that must be discarded. These wastes vary from gaseous, liquid and solid substances, generated as a result of human activities (Peter, Karl, and Jurg, 1996).

According to Ezema (2009), wastes are useless, unwanted and discarded materials. Douglas (2004) corroborates Ezema's stance and argues that waste is material which arises from animal and human life and activities and is discarded as useless and unwanted items. Solid waste can also be referred to as wastes from households, municipal services, construction debris and agricultural activities (Amalu and Ajake, 2014). Odacha (1994) considered wastes as material which though may no longer be needed here become feed stock or materials elsewhere. In fact, he defines waste as those materials which are generated as a result of normal operations over which we have control in terms of their production, disposal, and discharge.

Human society at every stage of civilization generates wastes, however, the rate of generation and methods of disposal vary from the individual to nation depending on the level of the technological development. One of the challenges of the 21st century is how to

achieve cost-effective and environmentally sound strategies to deal with the global waste crisis confronting humanity in both developed and developing countries. The crisis has threatened the carrying capacity of the life support systems. Waste generation and disposal has in time past caused environmental pollution with disastrous health consequences (Ayuba, 2005). Srinivas (2002) reported that at least 60% of the countries that submitted the national report to the United Nations in advance of the 1992 UN Earth Summit said that solid waste disposal was among their biggest environmental concern, while the United Nation Centre for Human Settlement report that only between 25% and 55% of all waste generated in large cities are collected by municipal authorities.

The United Nation Development Program (UNDP, 2009) estimated that more than five million people die each year from disease related to inadequate waste disposal system. Most cities in Africa are with fast expansion of urban areas and are characterized by lack of resources, institutional organization and the capacity to provide basic infrastructure, which will in turn cause increased problem concerning the management of solid waste. Moreover, the lack of proper land use planning has resulted in the creation of informal settlement, with narrow streets and makes it difficult for collection trucks to reach many areas in the cities.

Solid waste management could be defined as the discipline associated with the control of generation, storage, collection, transfer and transport, processing and disposal of solid waste in a manner that is in accord with the best principles of public health, economic, engineering, conservation, aesthetics and other environment consideration that is also responsive to public attitudes (Tchobanoglous *et al* 1993). Municipal solid waste management is an important part of urban infrastructure that ensures the protection of the environment and human health (Aliyu, 2010).

The current capacity of most solid waste management system in Africa is inadequate and too slow to meet the increasing demand of solid waste generated (Tadesse, 2004). Solid waste management has emerged as one of the greatest challenges facing state and local government environmental protection agencies in Nigeria. The volume of solid waste being generated continues to increase at a faster rate than the ability of the agencies to improve on the financial and technical resources needed to parallel this growth. Solid waste management in Nigeria is characterized by inefficient collection methods, insufficient coverage of the collection system and improper disposal of solid waste (Amber, Kulla and Gukop, 2012). The challenge in handling solid waste management in Nigeria is the ineffective institutional framework that will effectively tackle the problem. This is due mainly to lack of political will and misunderstanding of the magnitude of the problem that waste poses to the society and the inability of authority to take cognizance of the dangers posed by solid waste such as clogging of sewage channels resulting to flooding, malaria from stagnant and stored water, and other forms of diseases (Patrick, 1999).

The sustainable management of waste approach aims at global environmental quality, which is a pre-requisite for a rise in per capita welfare over a period of time (Ayininuola and Muibi, 2008). Efficient management of waste is a global concern requiring extensive research and development works towards exploring newer application for a sustainable and environmentally sound management (Bari, Hassan and Haque, 2012). The problem of waste management is a primordial and present issue in developing countries in Africa, particularly Nigeria. Municipal waste management problems in Nigeria cut across concerns for human health, air, water, and land pollution among others. The analysis of the key problem affecting the efficient management of municipal waste is critical for evolving a workable solution in an emerging economy like Nigeria. The transformation of the

existing trends in municipal waste management is necessary for ensuring sustainable environments and other objectives (Abila and Kantola, 2013).

In Federal Capital Territory (FCT), Abuja waste composition is heterogeneous and is mixed: non-degradable materials and degradable components. The territory is classified into three categories for management of solid waste; category (i) the satellite towns which include Nyanya, Gwagwalada, Bwari, Kuje among others are managed by their municipal area councils. Category (ii) the city centre, which include; Garki, Gwarimpa, Wuse Zones and category (iii) the Central Business Distrct, which include; Wuse II, Garki, Gwarimpa, Wuse zones and category three; Maitama, Asokoro and Central Business District (CBD) been managed Abuja Environmental Protection Board (AEPB). The funding comes from the FCT administration.

1.2 STATEMENT OF THE RESEARCH PROBLEM

According to Ogu (2000), a major consequence of rapid urbanization is the growing generation of waste, and many city authorities face unprecedented challenges in managing. Kgosiesele and Zhaohui (2010) stated that among the various kinds of waste, municipal solid waste is the mostly generated type of waste. Municipal solid waste (MSW) comprises of combined domestic, commercial and industrial waste generated in a given municipality or locality (Kothari, Tyagi and Pathak, 2010). Domestic wastes constitute the highest percentage of municipal waste which are neither disposed properly nor collected by wastes management authorities. Fakere, Fadairo and Oriye (2012) opined that domestic waste constitutes the highest percentage of waste generated in Akure when compared with other sources which is similar to the situation in several other South-Western Nigerian cities.

In most developing countries, the problems associated with solid waste management are more acute than in the developed countries (Zerbock, 2003). Lack of financial resources

and infrastructure to deal with solid waste creates a vicious cycle; lack of resources leads to low quality of service provision which leads to fewer people willing to pay for services, which in turn further erodes the resource base and so on (Kuniyal, Jain and Shannigrahi, 1998; Zerbock, 2003). The problem is further complicated by the rapid growth in population and urbanization, which has influenced an increase in the volume of waste being generated and also on waste retrieval/disposal services in municipal areas. However, more often than not, an increase in population is not matched with an equal increase in service and revenue for the local municipalities for waste management (Zerbock, 2003).

Al-Khatib, Monou, Zahra, Shaheen and Kassinos (2010) study discovered that based on the estimate that the total solid waste quantity was 51,160 tons in 2005, the cost of collection and disposal of each ton is approximately 53 USD. The fee collection for the Nablus city municipality was 466,273 USD in 2005; this represents only 17% of the total expenditure costs. Despite the assigned fees for waste collection and transportation, most people are unable to pay resulting in the revenue collected contributing to less than 20% of the money needed to run the services (UNEP, 2003). The collection rate of municipal solid waste fees from Nablus city residents has been at a record low during the past five years, ranging from 30 to 60%. Consequently, this has reflected negatively on the level of services offered.

Srinivas (2002), in his assessment of solid waste management, discovered that one of the most pressing problems facing major urban areas in the developing countries at present is indiscriminate disposal of huge quantities of solid wastes, which accumulate in their cities as a by-product of modernization. Unfortunately, all aspects of man's productive activities virtually involve wastes generation. Similarly, Babayemi and Dauda (2009) reported that solid waste management in Southwest Nigeria suffers set- backs due to

unwholesome waste disposal habits of the citizens as well as funding and sanitation laws enforcement impotency. Troschinetz (2005) further observed that in many developing countries, adequate funds are not available to implement technology that is reliable and appropriate.

Sunday (2013) assessed the waste disposal problems and management in Ughelli, Nigeria. The study revealed that the Government agencies Niger Delta Development Commission (NDDC) accounted for 12% of the collection of solid wastes in the area, 23% from private agencies, while the remaining 65% which is a very large proportion of the population disposed their wastes themselves. The implication of this is that the local government council Ughelli does not put any agency in place for the evacuation of solid wastes except the waste van provided by NDDC in recent times for the evacuation of waste, which is not very regular and effective. Thus wastes are dumped indiscriminately in the neighbourhoods.

A study carried out by Fakere, Fadairo and Oriye (2012) revealed the state of refuse disposal as generally absurd which emanates from the laissez-faire approach of the people towards indiscriminate dumping of refuse and delay in evacuation by the waste management authority. Refuse dumps littered the environment which was an eyesore and that 68.5% dispose their refuse indiscriminately out of which 31.5% dump theirs in open spaces that constitute breeding grounds for rodents, flies, mosquitoes, snakes and harbour for other dangerous animals as well as hindering the free flow of run-off.

However despite the structure put in place by the administration of Federal Capital Territory to collect and manage solid waste in the study area one still finds solid wastes littered along the major streets in Maitama District. Similarly, the attendant environmental implication of the above has become worrisome to the various stakeholders in the territory,

hence the need for sustainable domestic solid waste management system. It is against this background that this study intends to fill the knowledge gap. The study will attempt to answer the following questions;

i. Who are the residents of the area of Maitama District?
ii. How is this structure coordinated?
iii. How sustainable is solid waste management in Maitama?
iv. What role do scavengers play in solid waste management in Maitama?

1.3 AIM AND OBJECTIVES OF THE STUDY

The aim of this study is to Analyse the structure and sustainability of solid waste management and in Maitama District of Abuja. The specific objectives of the study are to:-

i. to identify the residents of the area of Maitama district
ii. examine the coordination of the solid waste management in the district
iii. examine the sustainability of the process of solid waste management from generation to disposal
iv. identify the role of scavengers in solid waste management in Maitama

1.4 SCOPE OF THE STUDY

The spatial scope of this study intends to cover domestic solid waste management in Maitama District of Abuja while the content scope is limited to types of solid waste, composition of waste, collection and disposal methods of domestic solid waste in the study area. The temporal scope will cover all the domestic solid waste management systems in Maitama District as at December, 2014.

1.5 SIGNIFICANCE OF THE STUDY

Although a lot of study has been done on the issue of solid waste in FCT, Abuja metropolis, nevertheless this study want to demonstrate an aspect of understanding that a lot of the strategies used by FCT can be adopted by some parts of FCT and other states of the federation to keep a clean and good environment, as this will go a long way in control of a lot of sickness, diseases and clogging of water ways which eventually lead to flooding.

It is enough to put structures in place to maintain waste, it will require some level of supervision and maintenance and also as you swing the structure into action think of sustainability. Maitama district was chosen because it happens to be classified with Asokoro, Wuse II and Central Business District CBD under category A according to Abuja Environmental Protection Board (AEPB). Waste generation is an important aspect of the study which was used with the annual population growth to project future waste generation between 5-10 years ahead, knowing well that our population is on the increase daily statistic from FCT administration shows that about 100,000 people come into Abuja daily, only 15,000 travele back. This research will greatly affect planners, policy makers and the public to evolve rational and sustainable policies on proper solid waste management and disposal practice in Abuja. The findings in this research will arouse awareness and involvement of residents within and outside the capital city and neighbouring states around in solid waste management for sustainable and responsible environmental management.

CHAPTER TWO; CONCEPTUA FRAMEWOK AND LITERATURE REVIEW

2.1 Conceptual Framework

In this section, the study tries to explain some of the basic concepts used in getting information. These include environment, waste, solid waste disposal, rapid development, population increase, etc. the advantages of this section is that it enables the study to explain how the various concepts are used in the course of the study as against their general usages.

The study of man's activities over the surface of the earth combines two themes; how he lives, and makes a living on earth. The former includes the social aspects, such as his well-being, cultural and political activity ideas, and settlements, while the latter includes the economic aspects such as industry, trade, transport and agriculture, among others (Gandy, 1994).

To begin with, what do we mean when we talk about the environment and how is the concept used in this study? By environment, the study refers to all of the external factors affecting man and his environment. It could also mean all the circumstances, people, things, and events around what man does or the community, that in turn affect the quality of life. These can be in an attempt to meet his daily needs.

Mankind naturally depends on the environment to sustain their lives, but solid waste is one of the three major environmental problems (other major environmental issue include flooding and desertification) in Nigeria. Many other developing and even the developed countries are threatened by this. It plays a significant role in the ability of nature to sustain life within its capacity. Most cities spend 20-50% of their annual budget on solid waste management and only 20-80% of the waste is collected.

The problem of solid waste has become the nation's most serious environmental problem. In recent years, the problem has become so aggravating that between 1977 and 1982, a total

of nine conferences and meetings of local governments, commissioners were organised in various States across the nation to discuss problems of refuse collection and disposal (FMHE, 1983). The environment is a very broad concept and in order to be more specific in policy measures, it is essential to perceive it in terms of its various sub-systems with the urban subsystem at the fore. According to Srinivas (2002), one of the most pressing problems facing major urban areas in the developing countries at present is disposing of huge quantities of solid wastes, which accumulate in their cities as a by-product of modernization. This also is walking in same line with (Spamer,2009), which states that the leading industrial countries in the world have recognised that continued waste generation cannot be offset by improved land filling techniques, but that alternative policies, practices and technologically advanced disposal methods need to be developed and implemented.

A research on the evaluation of solid waste management policy in Benin, by Kalu et al (2009) stated that Solid waste disposal constitutes a nuisance and creates a breeding ground for pests and diseases in Benin metropolis. Study was undertaken to assess how the policy on solid waste management had faired in waste disposal. Kalu et al said that awareness campaign, payment of bonus for well sorted out disposed solid wastes and technically desirable managed dump sites should be the main strategies of environmental solid waste policy in Benin City. Unfortunately, all aspects of man's productive activities virtually involve wastes generation (Scott, 1953). Municipal Solid Waste Management (MSWM) is a globally challenging issue especially in developing countries, due to its adverse environmental effects (Zamorano *et al*., 2009; Jalil, 2010; Adekunle *et al*., 2011).

(Achankeng, 2003). The standards of waste management is still poor and outdated in many developing countries, with poor documentation of waste generation rates and its composition, inefficient storage and collection systems, disposal of municipal wastes with toxic and hazardous waste, indiscriminate disposal or dumping of wastes and inefficient utilization of disposal site space. This agree with the United Nations Conference on Human Settlement report, one third to one-half of solid waste generated within most cities in low- and middle-income countries, are not collected. They usually end up as illegal dumps on streets, open spaces, and waste lands (UNCHS 1996)

Improper solid waste management has contributed greatly to river pollution, also contributes to climate change. Rapid development, population increase and changes in consumption pattern have directly (and indirectly) resulted in the generation of enormous amount of waste, ranging from biodegradable to synthetic waste. However, several solid waste management practices, including scavenging activities, reuse and recycling prevent or divert materials from the waste stream. Thus, solid wastes can be considered a true "resource" when properly managed by the household, the community and the local authority responsible for it (Bartone, 1988).

Before the concentration of people living in cities, wastes almost entirely organic materials derived from plants were burned for fuel, used as crop fertilizers, or fed to livestock. Or, in the case of people who subsisted by hunting and gathering, communities simply moved when the garbage heap became problem. People in some rural regions of the world still practice these types of waste management, (SW-Overview.ht, 2000).

As populations became concentrated in larger towns and cities, their garbage heap also grew, people could not just pack up and move to another city when their heap got too

big. Some cities, notably in parts of the orient solved their garbage problem by hauling organic wastes out to farms and composting it to revitalizes croplands. Another solution was simply to take garbage out to the countryside, and dump it in piles. As cities spread out and people became increasingly farther away from their food sources, organic waste was no longer useful to them hence it became "garbage". Thus, the old habits of throwing wastes out of the windows or the doors to animals or into the garden posed public health problems in the densely populated cities.

It was reported in SW-Overview.ht (2000) that around 500 B.C., Athens issued the first known law against throwing garbage into the streets, requiring scavengers to dump waste not less than one mile outside the city walls**.** This also showed that scavengers and scavenging activities have been in existence since around the year 500 B.C. Remarkably, 2506 years after Athens' first garbage edict (from 500 B.C. to year 2013), open dumps still exist in some advanced/industrial society and the Third World countries. As cities grew and spaces for dumping trash became scarce, dumps became centralized and evolved into burial pits that were covered with soil. Thus, it was reported that, in 1999, approximately 61% of America's solid waste was disposed in landfills, and that there were 2,300 landfills in the United States in the same year (Facts.htm, 2001).

Nowadays, many wastes, which we send to the landfills, are made of materials that were beyond the wildest dreams of a Greek citizen in 500 B.C. The modern, solid wastes stream includes glass, complex metal alloys, plastics, construction materials; paper, and products such as paints, pesticides and cleaning agents. Many of these are classified as hazardous wastes. The composition of the waste stream varies from area to area throughout the world, the country, and the state. This variance, as reported by Bartone (1988), is due to factors such as the extent of industrialization, climate patterns,

cultural differences, local economic conditions, demographic patterns and socio-economic forces. Not only has the composition of waste become more complex over the years, but the sheer volume of what we generate has also grown. Many products have been introduced over the last forty years that have made human lives simpler or safer and that have allowed for future technological advances.

The good news is that we are recycling more, while the bad news is that we are also consuming, producing, and disposing more. However, no one would suggest that we should turn back the hands of time and abandon these advances as well as our current quality of life to regain some control over solid waste. Instead, we need to take responsibility for how we use these advances so that we can maintain a standard of living that is sustainable.

2.2 WASTE

Waste includes all items that people no longer have any need or use for, which they either intend to get rid of or have already discarded. Additionally, waste are such items which people are required to discard. Many items can be considered as waste e.g. household rubbish, sewage sludge, waste from manufacturing activities, packaging items, discarded cars, old television, garden waste, old paint containers etc. Thus, all our daily activities can give rise to a large variety and different waste arising from different sources.

2.2.1 Types of Waste

Wastes are generally categorized into solid and liquid waste, which are materials discharge in household dustbins, flush-down toilets and chemical processing. Household waste includes bottles, vegetables, trimmings, cans, plastics and the waste from the toilets (sludge and sewage). Furthermore, other waste may come from chemicals and industrial processes. These include the chemical by-product from brewing, pharmaceuticals and electroplating. Solid wastes are the products of urban metabolism.

Agunwamba (1998), regard cities as the most efficient agents of production and consumption and observed that as the city grows in population and size so does the complexity in its land uses and its ability to generate variety of solid wastes. In the rural areas where the only significant land uses are residential and agricultural, mostly domestic and agricultural wastes are generated. The mixture of commercial, industrial, institutional and other land uses, each of which generates its own peculiar type of solid waste, compounds the situation in the city. Urban society generates solid material regularly due to rapid increase in production and consumption habits. The problem is more acute in developing nations where economic growth as well as urbanization is rapid and unplanned. Rapid urbanization and its planlessness makes management of solid waste at generation, storage, collection, evacuation and processing and disposal stages cumbersome and less efficient. Thus, solid waste management includes all administrative, financial, legal, planning and engineering functions (Ramchandra and Varghese, 2003).

There are various types of waste which includes: municipal waste, industrial waste, agricultural waste, hazardous waste, construction and demolition waste, mining waste, waste from electrical and electronic equipment (WEEE), packaging waste, end-of-life

Vehicles (ELVs) and tyres. Though the study is focused on municipal waste, the other types of waste will be discussed briefly (www.eea.europa.eu).

2.2.2 Industrial Waste

Manufacturing industry waste comprises many different waste streams arising from a wide range of industrial processes. Some of the largest waste generating industrial sectors in Western and Central Europe include the production of basic metals, food, beverage and tobacco products, wood and wood products and paper and paper products. It has been estimated that over 33 million tonnes of industrial waste was generated in Europe in 1998. Waste from the manufacturing sector continues to rise, despite national and international declarations to reduce waste from manufacturing industry, to introduce cleaner technologies and other waste minimisation initiatives and to work towards manufacturing practices that are sustainable in the long term. The manufacturing industry has a central role to play in the prevention and reduction of waste as the products that they manufacture today become the wastes of tomorrow. (www.eea.europa.eu)

2.2.3 Agricultural Waste

Agricultural waste is composed of organic wastes (animal excreta in the form of slurries and farmyard manures, spent mushroom compost, soiled water and silage effluent) and waste such as plastic, scrap machinery, fencing, pesticides, waste oils and veterinary medicines. No overall estimates are available on the quantity of agricultural waste produced in the EU. Ireland has estimated that in 1998 over 80% of national waste arising were from agricultural sources. There are a number of methods used to treat agricultural waste. These

include spreading the waste on land under strict conditions, anaerobic digestion and composting. There are a number of potential environmental impacts associated with agricultural waste if it is not properly managed not least of which is the run-off of nutrients to surface waters which can cause over enrichment of the water body. (www.eea.europa.eu)

2.2.4 Hazardous Waste

Hazardous waste arises from a wide range of different sources including households, commercial activities and industry. Waste are classified as being hazardous depending on whether they exhibit particular characteristics

The main disposal route for hazardous waste is landfill, incineration and physical or chemical treatment. On the recovery side, a significant proportion of hazardous waste is recycled or burned as a fuel.

2.2.5 Construction and Demolition Waste

Construction and demolition waste is made up of two individual components: construction waste and demolition waste. It arises from activities such as the construction of buildings and civil infrastructure, total or partial demolition of buildings and civil infrastructure, road planning and maintenance. In some countries even materials from land levelling are regarded as construction and demolition waste.

Construction and demolition waste makes up approximately 25% of all waste generated in

the EU with a large proportion arising from the demolition and renovation of old buildings. It is made up of numerous materials including concrete, bricks, wood, glass, metals, plastic, solvents, asbestos and excavated soil, many of which can be recycled in one way or another. (www.eea.europa.eu)

2.2.6 Waste electrical and electronic equipment

Waste electrical and electronic equipment (commonly referred to as WEEE) consists of end of life products and comprises of a range of electrical and electronic items such as: Refrigerators, IT and telecommunication equipment, Freezers, Electrical and electronic tools, Washing machines, Medical equipment Toasters, Monitoring and control instruments, Hair driers, Automatic dispensers, Televisions, etc. Thus, sources are all users of electrical and electronic equipment from householders to all kinds of commercial and industrial activities. (www.eea.europa.eu)

2.2.7 Mining Waste

Mining waste is generated in three primary wastes. First, in the most mining operations, large amount of rock and soil need to be removed to get to the valuable ore. This waste material is generally left on the surface at the mine site. Second, mining operations use various technologies to extract the valuable materials from the sites. The techniques vary from relatively simple grinding and sorting to sophisticated chemical separation processes. Regardless, of the technology involved once the valuable material is recovered, the remaining waste materials, commonly known as tailing must be disposed

of solid. Materials are typically dumped on the land near the mining site, and liquid wastes are typically stored in ponds. It is difficult to get vegetation to grow on these piles of waste rock and tailings, so they are unsightly and remain exposed to rain and wind (Enger and Smith, 2008).

2.2.8 Municipal Waste

Municipal waste is generated by households, commercial activities and other sources whose activities are similar to those of households and commercial enterprises. It does not include other waste arising e.g., from mining, industrial or construction and demolition processes. Municipal waste is made up to residual waste, bulky waste, secondary materials from separate collection (e.g., paper and glass), household hazardous waste, street sweepings and litter collections. It is made up of materials such as paper, cardboard, metals, textiles, organics (food and garden waste) and wood. Municipal Solid Waste (MSW) consists of all the materials that people in a region no longer want because they are broken, spoiled, or have no further use, it includes waste from households, commercial establishments, institutions, and some industrial sources. (www.eea.europa.eu)

Various legislations concerning the management of waste and basic sanitation were enacted in England in order to promote a healthy environment and enhance man's standard of living. Over the past twenty years, Nigeria has witnessed rapid economic growth, these growth does not appear everywhere it manifest itself in ‘point’ or ‘pole’ of growth with variable economy as a whole. The waste management efforts of Nigeria dates back to the colonial era where several efforts have been made by the federal

government to ensure an adequate standard of living however, it is clear that solid waste management requires a holistic and carefully considered approach (Enger and Smith 2008).

Nigerian cities and towns are currently facing serious environmental problem arising from poor solid waste management. Solid waste is generated at a rate beyond the capacity of the city authorities to handle in order to maintain a sustainable urban environment. This has resulted in poor solid-waste management system that portends serious environmental crisis in most Nigeria towns and cities (Abel and Afolabi, 2007).

2.2.9 Waste Generation

Waste generation is an integral part of human activity influenced by social dynamics and economic development. Although nature has the capacity to dilute, disperse, degrade, absorb and reduce the impact of unwanted residues in the environment. Ecological imbalances have occurred where the natural assimilative capacity has been exceeded (Tchobanoglous *et al*.,1993b). Improper waste handling and management pose great threats to the environment and public health. In Nigeria, The commonly practised waste management option in Nigeria, basically involves the collection of mixed waste materials and subsequent dumping at designated dumpsites. It is not a practice to separate waste materials at source or any point during its management (Adekunle *et al*., 2011).

Solid waste is generated from households, offices, shops, markets, restaurants, public institutions, industrial installations, water works and sewage facilities, construction and demolition sites, and agricultural activities (emissions from manure management as well as on-site burning of agricultural residues are treated in the Agriculture, Forestry and other

land use. It is good practice to account for all types of solid waste when estimating waste-related emissions in the greenhouse gas inventory (Riitta *et al.,* 2006). Despite these difficulties, there is general agreement that residents of industrialized countries dispose of much more waste than residents of developing countries. A World Bank study (Cointreau, 1982) found that urban areas in industrialized countries generate 2 to 3 times more waste per capita than low income nations. In developing countries, waste is a luxury available to only the wealthy minority. Most wastes are recycled or reused by residents who scavenge through the waste stream for valuable materials (Medina, 1997).

In 2006, the total amount of municipal solid waste generated in Africa was estimated to be 2.02 billion tones being about 7% annual increase since 2003 (UNEP, 2002). It is was also estimated that between 2007 and 2011, generation of municipal waste must have raised to 37.3%, equivalent to roughly 8% increase per year most especially those wastes categorized as hazardous. UNEP (2002) estimated the total health-care waste per person per year in most low income countries range from 0.5 kg to 3 kg while the European Union estimated that its 25 member states produces 700 million tons of agricultural wastes annually. Although there has been no estimate about global industrial wastes generation, American industrial facilities generated and disposed some 7.6 billion tons of non-hazardous industrial solid waste each year. If the solid wastes could be diverted for material and resource recovery then a substantial reduction in final volumes of waste could be achieved and could be utilized to generate revenue to fund waste management. This formed the premise for Integrated Solid Waste Management system based on reduce, re-use and recycle principle. (Seadon, 2006).

2.2.10 Waste Composition

There is no consistent definition of what constitutes municipal solid waste. For example, some countries consider construction and demolition debris as part of the municipal waste stream, while others do not. Wastes from low and middle income countries contain fewer paper products and non-food items than waste from industrialized countries. The composition of solid waste is a key determinant in decisions concerning types of vehicles needed for collection and transfer, requirements for final disposal, and resource recovery alternatives. In both developing and industrialized countries, human and hazardous wastes may contaminate the waste stream.

Municipal solid waste of Abuja city is a composition of heterogeneous and mixed; non-degradable materials and degradable components. The waste bulk is mainly made up of plastics, paper, glass, metal and other recyclable components. The degradable portions of the waste consist of food waste and garden or yard waste (Ayuba, Manaf, Sabina and Nur Azmin, 2013).

2.3 Solid Waste Management and the Environment

Solid waste is generally made up of objects or particles that accumulate on the site where they are produced, as opposed to water and airborne wastes that are carried away from the site of production. Solid waste is typically categorized by the sector of the economy responsible for producing them, such as mining, agriculture, manufacturing and municipalities. Municipal waste which is generated as a result of consumption of good which can either be raw or processed stage which poised health hazard if not properly

managed, which include biodegradable, semi biodegradable and non biodegradable. This is a common scenario in cities and mega cities of the world.

Solid waste management practices include: collection, recycling, solid waste disposal on land, biological and other treatments as well as incineration and open burning of waste. Although recycling (material recovery) activities will affect the amounts of waste entering into other management and treatment systems, the impact on emissions due to recycling (e.g., changes in emissions in production processes and transportation) is covered under other sectors, Guidance on how to collect data on waste generation and management practices is given separately for municipal solid waste (MSW), sludge, industrial and other waste. (Riitta *et al.,* 2006) It also means the handling process of solid waste materials from generation at the source to its appropriate disposal. Solid waste management is a growing issue that has caused environmental pollution, especially in the urban areas of Nigeria. The term solid waste refers to low liquid content waste materials, which includes municipal garbage, industrial and commercial wastes, sewage sludge, waste of agricultural and animal husbandry, demolition wastes and mining residues (UNEP-IETC, 1996).

Human beings produce solid wastes, but it is noted that the levels of socio-economic, development of an area determine the quantity and composition of solid waste produced. The higher the level of economic development of an area, the greater proportion of non-biodegradable materials in the waste composition. Therefore, solid waste is not a serious problem in agricultural rural economy compared to urban areas, solid waste generation is directly related to population density. In small rural communities with low population density, natural systems are able to absorb domestic waste; the percentage of biodegradable waste is generally higher in composition in such

rural communities. Thus, Olowomeye (1991) stated that the problem of solid waste management is not yet felt in rural areas of Nigeria. On the other hand, the concentration of population with higher densities in urban areas as well as unmanaged growth of settlements are among the causes leading to the problem of solid waste that affect public health and natural environmental systems.

Solid waste management has emerged as one of the greatest challenges facing federal state and local government environmental protection agencies in Nigeria. The volume of solid waste being generated continues to increase at a faster rate than the ability of the agencies to improve on the financial and technical resources needed to parallel this growth. Solid waste management in Nigeria is characterized by inefficient collection methods, insufficient coverage of the collection system and improper disposal of solid waste (Agunwamba, Egbuniwe and Ogweleka, 2003).

The quantity of solid waste generated in urban areas in industrialized countries is higher than in developing countries; but the problems of municipal solid waste management remains inadequate in both. Most developing countries like Nigeria have solid waste management problems different from those found in industrialized countries in areas of composition, density, political, and economic framework, waste amount, access to waste for allocation, awareness, and attitude. Wastes are broadly classified into solid, semi-solid, and liquid waste. For an effective urban waste management in Nigeria, efforts of governmental and nongovernmental organizations are highly needed for sustainable development. These agencies include women organizations, private and public agencies, the joint effort of these organizations will help to keep a sound and healthy environment, thus, giving room for sustainable development in Nigeria.

According to Gandy (1994), the difficulties in municipal waste management are particularly acute in urban centers, as a result of several factors such as:

- Higher waste collection costs, where wastes are collected via communal chutes, etc from the in-accessed thickly built-up areas,
- Higher per capita waste generation rates as a result of greater use of prepackage and convenience foods along with higher levels of personal consumption than in the rural areas,
- Logistical difficulties in waste collection in densely built-up areas,
- Limited urban space over which recycling centers 'must compete with other land uses.
- Higher waste disposal costs because of dwindling supplies of landfill space and ever-greater distances for waste to be transported; necessitating the implementation of complex bulk haulage arrangements; the construction of waste transfer stations and other waste management infrastructure,
- Households living in Moms or apartments often do not have access to gardens for the composting of their putrescible (kitchen) wastes,

Techniques vary from country to country, depending upon physical geography, demographics, and level of economic development. Most industrialized countries have regular solid waste collection and disposal services. Therefore, most waste disposal sites there are required by law to have at least some environmental prevention and control technologies. In contrast, most developing countries provide formal waste collection and disposal services to only a portion of the population. The urban poor as

well as residents of rural areas often have no formal collection services or designated dumping areas.

2.3.1 Solid Waste Scavenging/ Recovery Activities

Scavenging has been and still is a common activity that takes place in the developing countries. According to DiGregorio (1994), scavenging is an occupation, a labour process and an industry, which involves several activities and many individuals concerning the handling of waste materials. Most of the scavengers in developing countries tend to be migrants from the rural areas, who come to urban areas in the hope of getting a job and improving their living conditions, their cultural and social background may therefore be different from the majority of the population in the urban centre in which they settle. Though scavengers are not the poorest of 'the poor, their occupation is one *of* the lowest in the society because people tend to associate them with the waste they work with, the social and economical status of the scavengers is therefore generally very low (Medina, 1992). In order to earn cash, scavengers must sell the materials they collect; industries usually require a minimum quantity of sorted and clean materials, which encourages the existence of intermediaries (major dealers) and other waste dealers who purchase the recyclables recovered by the scavengers. This has resulted in another common practice, where scavengers and other collectors enter into agreements with traders, which usually commit the scavengers to selling all of their collected materials to one or several traders; this has resulted in scavengers/other smaller collectors all around the worlds being exploited by intermediaries and dealers operating at higher levels in the system.

According to DiGregorio (1994), the arrangements that scavengers make with other actors in the recovery system is basically the benefits ‘money’ and usually based on ethnicity, caste or other relationship. This relationship gives the scavenger access to the materials required for collection and recovery, and implies that not all individuals can engage in this occupation. The picture of scavenging activities/solid waste recovery system that emerges from reviewing the literature is that of an occupation that provides a livelihood to the poor. Throughout cities in Asia, Africa, and Latin America, varying numbers of poor individuals survive by salvaging materials from the waste stream (Abad, 1991). These people recover materials to sell for reuse or recycling, as well as divert items for their own consumption. Those individuals are generally known as ‘scavengers' or `rag pickers' in English. But they also receive different names, depending on the local language of the people of the area where they operator example, Colombians use the generic term *basuriegos* for scavengers (Medina, 1997). In Mexico, dumpsite ‘scavengers are known as *papenadores (*ibid), while in Kano, Kaduna, Jos and Abuja they are referred to as *Yan-bola* or *Barayin-bola.*

According to Furedy (1990), in regions where industrialization is relatively more advanced, such as in Latin America and Southeast Asia, inexpensive materials recovered by scavengers are demanded and used by industries. On the other hand, Katzman (1988) observed that immigrants from the rural areas comprise an important percentage of scavenger population in urban areas citing example of the United States where the Jewish immigrants at the end of the century made a living and prospered by collecting metal scraps to sell to recycling industries using horse carts.

The scarcity and cost of basic necessities account for the retrieval of items in some cities that would be regarded as valueless in a better-off society. There are sharp contrasts

in the extent to which synthetic and natural materials are removed from waste streams before they reach the disposal sites in different parts of the world. Indian, Nepalese, Bangladeshi, Pakistani and Chinese dumps, for instance, have minimal quantities of bottles, tins, plastics, rubber and the like compared with what is deposited at dumps in countries like South Korea, the Philippines, Thailand and Malaysia (Furedy and Yang, 1993).

Furedy and Alamgir (1992) reported that it is poverty and scarcity that compel large numbers of people in the developing countries to seek whatever recyclable remnants they can find at the dumpsites. According to them, although there is no formal recycling in any of the countries in the Asian and African regions, there is however extensive recycling going on, once again for economic reasons. Furthermore, Furedy and Yang (1993) noted that separation of bottles and newspapers at the household level for sale to vendors has been a feature of South Asian life for decades. Hence, they concluded that source separation of wastes has been practiced in countries in the South Asian region long before it was introduced in the West.

2.3.2 Organization and Hierarchy of a Recovery System

In most situations, a hierarchy exists in the solid waste recovery system. The arrangement of the hierarchy is generally in the form of a division of labour and labour processes based on the degree of specialization. DiGregorio (1994) distinguishes scavenging into four different kinds of occupations within the waste recovery system: foragers, scavengers, municipal refuse workers, and itinerant buyers. In addition, DiGregorio (1994) divides the recovery system into two circuits. The lower circuit

where the collection of materials takes place and the upper circuit that represents the trading and transformation of materials collected for recovery.

Scavengers perform their activities based on economic benefits, which are driven by a market demand for recovered materials. On the either hand, those who work within the public refuse system already receive a salary for their work but they collect and trade recovery materials in order to earn extra income. Their access to the waste sources also makes it very easy for them to collect and separate different kinds of inorganic material for recovery.

2.3.3 The Scavenging Process

Scavenging is carried out at various stages of the waste management system and in different manners. Scavengers or collectors in some countries are involved in separating recycle material from the waste stream right from the point of collection through to the disposal site. The scavenging process includes retrieval systems, recovery methods, reuse processes, waste centers and the waste.

2.3.3.1 Retrieval System

Recyclable/reusable solid waste materials can be retrieved from:

- The source, that is, the place of waste generation and initial ownership,
- Designated place of waste pickup, such as among the herb or collection points,
- Within the refuse collection and transport vehicle,
- At an interim transfer station or waste processing facility, and
- At the ultimate disposal site.

Wastes may be retrieved for recycling, by scavengers at the designated place of waste pickup (collection bins/collection centers) and sold to the salvage/waste dealers.

In some cases, collection crews of municipalities in developing countries often supplement their income by recovering materials from refuse and selling it to agents buying for various end-users (Furedy, 1984).

Meyer (1997) reported that in Cairo, Egypt, some 30,000 *zabbaleen* make up a network of garbage collectors. A pair of *zabbaleen* working with a donkey-drawn cart can collect garbage from 350 households in a day. After sorting the garbage, the collectors feed the edible portion to pigs to fatten them for sale; sell pig droppings and human excrement to farmers for fertilizer; and sell scrap metal, glass, paper and plastics to middlemen, who then sell the materials to craftsmen or to industries. Thus, the monthly income of a zabb*aleen* family at the end of 1984 ranged from 1 to 5 times that of a civil servants salary.

However, it is reported that sorting of waste by collection crews has resulted in significant delays and inefficiencies to the collection system (Cointreau, 1984). For example, in Bangkok, Thailand, collection crews spend up to 40 percent of the time while on their service routes recovering and sorting paper, bottles, metal scraps, cans and plastics (ibid). A similar study done in Songhkla, Thailand by Furedy (1993) show that between 30-40 percent of collection time is spent by crews sorting waste at collection centers, and that, in addition to reducing the collection efficiency, this creates major traffic congestion problems in Songhkla, a city with narrow streets.

The introduction of compactor trucks has resulted in slowing down the waste collection process when collectors are involved in scavenging as well. In Metro Manila (the Philippines), where a mix of large open trucks and compactors are used for primary

waste collection, it was observed by Medina (1993) that collection efficiency has been greater in regular covered trucks than in compactors, since collection crews scavenge the waste during transport rather than at kerbside or collection points. In Mumbai, the Municipal Corporation force the contractors to cover all vehicles carrying waste with tarpaulin to ensure that collection crew does not sort the waste during transport, thereby ensuring efficiency in transport and preventing spillages on the road (Cointreau, 1992).

Bartone (1993) reported that an estimated number of scavengers at dumpsites are as high as 5,000 in Metro Manila, a metropolis of about 8 million; 10,000 for Mexico City's of 10 million people; 1,000 for Lima Metropolitan's of 4 million people; and 40 for Cali, Colombia, with its population of between 0.5 and 1.0 million people. Various informal organizations or networks emerge in salvaging operations. These can be operating within the neighborhoods involving scavengers or at the dumping sites with strong informal networks of agents and buyers. For example, Medina (1993) reported that only certain scavengers are allowed access to the main dumpsite in Manila. All materials retrieved at this site reportedly must be sold to one of the approved agents. Any scavenger found removing materials from the site is likely to have his access privileges revoked.

However, this system can also lead to fierce competition among them. For instance, Sheshu (2002) reported that conflicts in Calcutta or Mumbai dumps over certain choice materials have resulted to killings. Similar incidence was noted by Medina (1993) where such conflicts reportedly led to a large fight at the dump in Manila, which resulted in the death of 28 scavengers. Scavenging practices can determine the success of innovation in collection and disposal. In Bandung, Jakarta and other cities in Indonesia, for instance, hand-operated baling equipment was introduced to increase the capacities

of the open-top collection vehicles; but, the scheme was sabotaged when scavengers went for the bales pith cutters to remove and salvage the baling wires (Poebo, 1991).

This response to technical intervention was not envisaged and indicates the need for carefully designed demonstration projects as precursors to full-scale implementation; taking into consideration the various factors involved and their survival needs. Also, in order to find metal from insulated materials such as electric cables or cans, scavengers sometimes burn the refuse leading to accidental fires. This, according to Huang (2001) greatly adds to the air pollution from dumps seen especially in cities like Karachi and Tehran.

2.3.3.2 Recovery Methods

Today, recyclable materials are recovered from municipal refuse by a number of methods, including hand-picking and sorting, shredding, magnetic separation of materials, air classification that separates light and heavy fractions, screening, and washing. Another method of recovery, as reported by Huang (2001), is the wet pulping process, where incoming refuse is mixed with water and ground into slurry in the wet pulper, which resembles a large kitchen disposal unit. A magnetic device pulls out large pieces of metal and ether non-pulpable materials before the slurry from the pulper is loaded into a centrifuge called a liquid cyclone. In the centrifuge, the heavier non-combustibles, such as glass, metals, and ceramics are separated out and sent to a glass- and metal-recovery system; other lighter materials go to a paper-final recovery system (ibid.). Lastly, the final residue is either incinerated.

2.3.3.3 Reuse Processes

Reuse activities require less mechanical energy for sorting, processing and transporting. It also requires wastes to be separated before its potential degradation, direct reuse of a product or material without changing its basic form and/or function is a common example of reuse. For example, packaging containers such as cans, bottles or boxes can be directly reused. Standardization of bottles in Germany has facilitated this level of reuse (Spencer, 1993).

Therefore reuse materials is of importance to our society due to our various activities and also to reduce pressure on the environment. When not properly manage it clog the drainage, it use should be encourage rather than having less regards for it.

CHAPTER THREE; THE STUDY AREA AND METHODOLOGY

3.1 THE STUDY AREA

3.1.1 Introduction \ Location

The Federal Capital Territory is located just north of the confluence of Niger and Benue rivers. It is bounded in the North by Kaduna State, the West by Niger State, the East and South by Nassarawa State and the Southwest by Kogi State. The FCT is located between Latitudes 8^0 25' - 9^0 20' North of the Equator and Longitudes 6^0 45' - 7^0 39' East of the Greenwich Meridian (Figure 1).

The Territory was in 1976 carved out of three States, namely Niger State, which contributed seventy nine percent of the land area and seventy one percent of indigenous population, and Nassarawa State which contributed sixteen percent of the land area and twenty one percent of indigenous population, and Kogi State which made the contribution of five percent of the land area and eight percent of indigenous population. Abuja is geographically located at the centre of the country. It has a landmass of approximately 8000Km^2, of which the actual city occupies 250Km^2 (Agunwamba, 1998). Before going into the issue of waste disposal in Abuja, it is important to attempt a spatial description of Abuja. Abuja, a city in central Nigeria and capital of Nigeria, is located at the Federal Capital Territory. After 15 years of planning and construction, it officially replaced Lagos as the capital of Nigeria in December 1991.

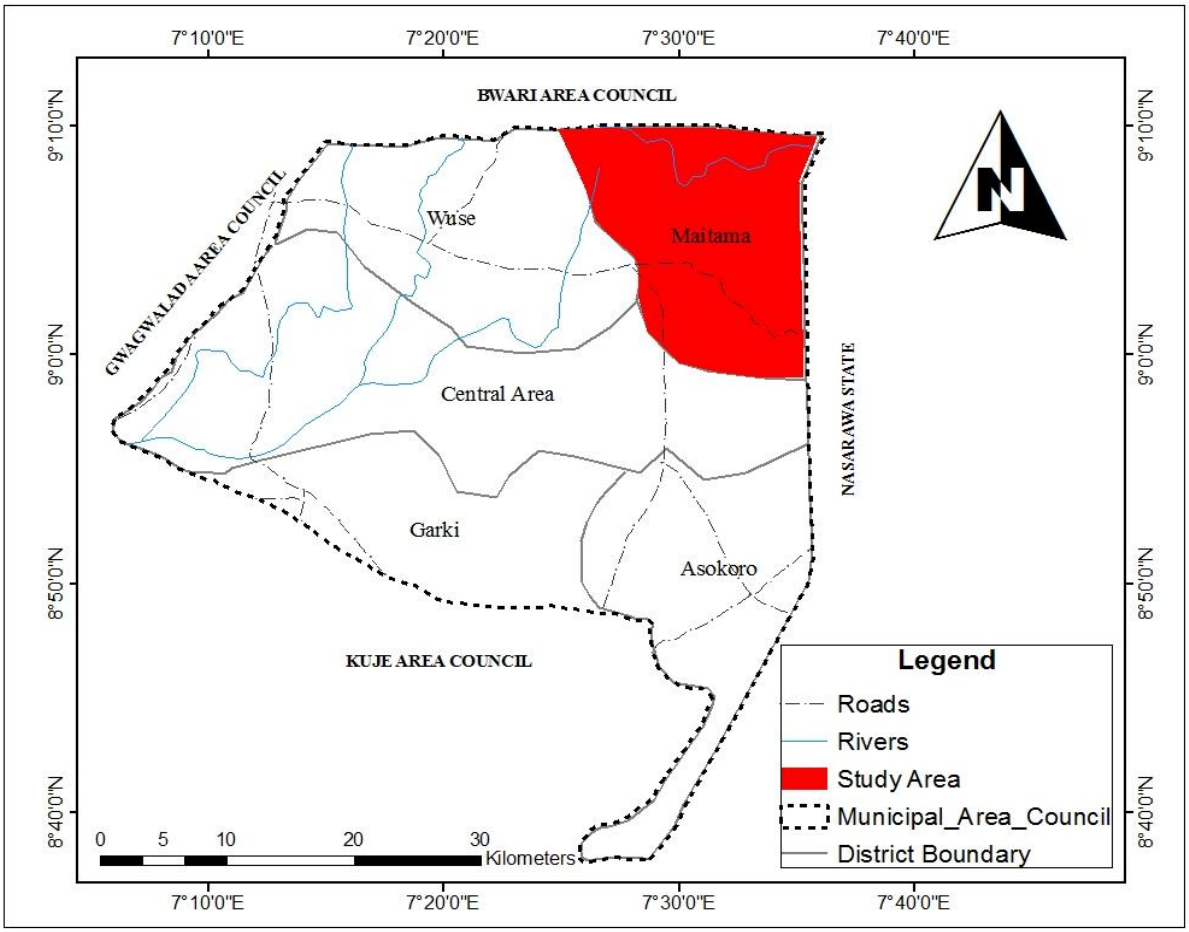


Figure 3.1.1: Abuja Municipal Council Showing Study Area
Source: Modified from the Administrative Map of FCT

3.1.2 Climate

The FCT experiences three weather conditions annually; these include the warm, humid and rainy season and a blistering dry season. In between the seasons, there is a brief interlude of harmattan occasioned by the North and East trade wind, with the main feature of dust and haze, intensified coldness and dryness. The rainy season begins in April and end in October when daytime temperature reaches 28-30^{0}C and nighttime lows over around 22-23^{0}C. In the dry season, daytime temperature can soar as high as 40^{0}C and nighttime temperature can dip to 12^{0}C resulting in chilling evenings. Even the chilliest night can be

followed by daytime temperature well above 50^0C. The high altitude and undulating terrain of the FCT act as moderating influence on the weather of the territory. Rainfall on the FCT reflects the territory's location on the windward side of the plateau and the zone of rising air masses. The annual total rainfall is in the range of 1100mm to 1600mm (Udo, 1981).

3.1.3 Geology and Drainage

The FCT is a hilly and dissected terrain and undulating plain. The lowest elevation is found in the extreme south in the flood plain of River Gurara and this is about 70 metres above sea level. The highest elevation in the territory is in the North East Bwari-Aso hills where elevation is up to 940 metres above sea level (Babayemi and Dauda, 2009). The hilly and dissected terrains in the FCT include Agwai-Karu, Bwari-Aso, Kawu and Suleja while the plains are at Bada, Gwagwa, au, Iku-Gwagwa and Ribochi.

3.1.4 Soils and Vegetation

The main types of rock underlying the FCT are the sedimentary belt in the Southern and South-west extremities of the territory and the Pre-Cambrian Basement complex rock which account for more than 80 percent of the territory. The sedimentary formation, being part of the Nupe land sandstone covers about 52 percent of the area. It consis only of fine-grained sandstone with inclusion of grits, siltstone and clay lense, and the Basement complex rocks covers about 46 percent of the FCT. It consists of wide variety of rock types which can be classified into three broad groups:

i. The igneous rocks made up mostly of biotite granites, rhyolite,syenite,gabro,diorite.

The granites account for most of the rock domes and massive hills in the north-eastern and north-western part of the territory, including the Bwari-Aso hills. The Iku-Gurara plans are largely underlain by rhyolite which also occurred in large sections of Gwagwa plains.

ii. The migmatite and gnesis complex which are the metamorphic rocks consisting mostly of migmatite, granite, gnesis and porphyritic gnesis occur on the Gwagwa, Iku-Gurara and Robo plains.

iii. Schist, including biotite/muscolite, schist, muscovite and tale schist with quartzite

intrusive account for most of the rugged landscape in the eastern and southern part of FCT.

The migmatite, granite, gnesis and biotite granite have underlain the site of the FCT. These are rocks of medium to high strength which are not expected to present serious engineering problems and which therefore, should provide suitable locations for engineering structures. The rocks in FCT are generally quartz-rich acidic types which account for generally sandy nature of the soil, especially on the Iku-Gurara, Robo and Rubochi plains. The Gwagwa plain has the most fertile soil and best agricultural lands of all the plains of the FCT while the sand content of most soil within the FCT account for the relatively high erosion status.

The area now designated as the FCT lies within the savannah zone vegetation of the West African sub region. Patches of rain forest, however, occur in the gwagwa plains, especially in the gullied trains to the south and the rugged south eastern parts of the

territory. These areas of the FCT form one of the surviving occurrences of the mature forest vegetation in Nigeria.

3.1.5 Administration of the FCT

Prior to 1996, the FCT had four area councils, namely: Abaji, Gwagwalada, Kuje and Municipal. In 1996, two more area councils were created namely: Kwali (from Gwagwalada) and Bwari (from Municipal area council). Each area council is now headed by an elected Executive Chairman. It should be noted that, the Federal Capital Territory Administrative (FCTA) was created on 31st December 2004, following dissolution of the Ministry of the Federal Capital Territory (MFCT). The city is divided into five (5) districts of the phase 1. They are Central, Garki, Wuse, Maitama, and Asokoro. There are also five districts of the phase 2; these are Kado, Durumi, Gudu and Jabi. Phase 3 district are, Mabuchi, Katampe, Wuye and gwarimpa. There are also five suburb districts, which are Nyanya, Karu, Gwagalada, Kubwa and Jukwoyi. Along the airport road are clusters of satellite settlements namely, Lugbe, Chika, Kuchigworo and Pyakassa. Other satellite settlements are Idu (the main industrial zone) Mpape, Karimu, Gwagwa and Dei-Dei of which all is these are in phase 1 within AMAC.

3.1.6 Problems of the FCT

The major problems of the FCT include transportation, accommodation and unemployment. It has been observed that the FCT experiences high traffic congestion during the early hours of the day and the close of work. This is as a result of the concentration of the government offices in the FCT. Accommodation remains a mirage in

the FCT; this is because the rent is extra-ordinarily high. The high rent has gradually moved to areas outside the FCT. While the cost of living in Abuja is beyond what a middle class can afford, the tenement rates in its surrounding of communities are becoming unbearable as landlords are continuously exploiting the people by increasing their rent. Lastly, the rate of unemployment is high in the FCT. This is largely attributed to immigration. According to Gaza (2008), the influx of migrant into the FCT is for perceived better economic opportunities.

3.2 METHODOLOGY

This section covered the reconnaissance survey, types and sources of data, study population, sample size and technique, method of data collection, method of data analysis and presentation of collected data.

3.2.1 Reconnaissance Survey

A reconnaissance survey was carried out to acquaint the researcher with the study area, especially solid waste disposal methods, and the operations of Abuja Environmental Protection Board in the collection and management of domestic solid waste in the study area. It was discovered that there was no dumpsite in Maitama, beside the ones at Ajata, Dawaki and Gossa.

3.2.2 Types of Data

In order to achieve the aim and objectives of this study, the following data were required;

i. Type and composition of domestic solid waste
ii. Method of solid waste collection

iii. Agency responsible for waste collection

iv. Cost and frequency of solid waste collection

v. Solid waste disposal and management methods

vi. Challenges of management domestic solid waste

vii. Activities of scavengers

3.2.3 Sources of Data

The study required data from both primary and secondary sources.

3.2.3.1 Primary Source of Data Collection

Primary data were derived from the structured questionnaire that was developed and administered to respondents in Maitama District of FCT Abuja on how solid domestic waste are managed. Oral interview with the officials of Abuja Environmental Protection Board (AEPB) was also conducted on the evacuation of the solid domestic waste in the study area.

3.2.3.2 Secondary Source of Data Collection

The Secondary data were sourced from documented materials such as journals, seminar proceedings, and other research texts on domestic solid waste management. These were helpful in literature review for this study.

3.2.4 Sampling Techniques

The study used random sampling technique to administer questionnaire to the residents of Maitama District on how they manage their domestic solid waste. Given 100,000 numbers of households in the district in (NPC, 2009) which served as the study

population, Krejcie and Morgan was used to determine the sample size of 380. Of these, 373 were returned.

Systematic sampling technique was used in the area of study, so many streets were administered with the questionares systematically depending on the number of houses, some streets have more houses than others. A questionnaire was given to a house after five houses and in bigger streets six houses. some of the streets includes; Gana, Osuma, Bobo, Pop John Paul II, Osse, Omega, Yedseram, Limpopo, Komoe, Owena, Cuito, Katsina Ala, Ruvuma, Gurara, Seiviri, Rio Negro, Yobe Close, Ganges, Panama, Rhine, Osun Crescent, Baltic Crescent, Nun, Pep, Nolin Lake, Danube, River Niger, Danube Close, River Nahan, Nike lake, Nilaka, Oguta Lake, Tangayika, Rima, Amazon, Thames, Salween Mississippi and Oyi River.

3.2.5 Methods of Data Analysis

Descriptive statistical test was used in analyzing the data for this study. The descriptive statistics was used to summarize data gathered and presented using tables, percentages, figures and plates. All statistical analyses were carried out using Statistical Package for Social Science version 20 statistical programme and Microsoft Excel 2013.

CHAPTER FOUR; RESULTS AND DISCUSSION

4.1 INTRODUCTION

This study titled 'Analysis of Solid Waste Management in Maitama District, Abuja, Nigeria' was carried out in Maitama. This chapter presents the analysed results of the study. The results of the data analysed were presented according to the objectives set for this study. The result is based on a total of 373 respondents to the questionnaire collected out of 380 administered to the residents in the study area.

4.2 SOCIO-DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

The socio-demographic characteristics considered include; gender, age, income, number of household and size of the household. They are presented in tables below with their discussions.

4.2.1 Gender of Respondents

Majority of the respondents were observed to be female with few male. This is presented in Table 4.1

Table 4.1: Gender of Respondents

	Frequency	Percentage
Male	130	34.9
Female	243	65.1
Total	373	100

Source: Field Survey, 2014.

Table 4.1 reveals that 65.1% of the respondents are female whereas the male constituted 34.9%. This implies that female mostly engage in domestic waste management than the males; hence it is believed to be the female role in a household. This agrees with the report of Moser (1993) which revealed that women in African society actively

participate more than men in solid waste management activities in the domestic environment.

4.2.2 Age of Respondents

Age is an important socio-demographic attribute because adults tend to participate in solid waste management than the dependent population. Table 4.2 shows the age distribution of the respondents.

Table 4.2: Age of Respondents

	Frequency	Percentage
Less than 20 years	4	1.1
21-30 years	80	21.4
31-40 years	121	32.4
41-50 years	136	36.5
51-60 years	32	8.6
Total	373	100

Source: Field Survey, 2014.

As indicated in Table 4.2, it shows that respondents within the age of 41-50 years constitute the highest proportion with 36.5%, followed by those aged between 31-40 years and 21-30 years that constitutes 32.4% and 21.4% respectively. Whereas the least age group of respondents is 1.1% which accounted for those less than 20 years of age as well as the older age group of 51-60 years with 8.6%. Given that majority of the respondents are of the active age, it could be deduced that there is a positive correlation between age group and participation in domestic waste management.

4.2.3 Marital Status of Respondents

Table 4.3 presents the marital status of the respondents to include married, single and separated.

Table 4.3: Marital Status of Respondents

	Frequency	Percentage
Married	305	81.8
Single	64	17.2
Separated	4	1.1
Total	373	100

Source: Field Survey, 2014.

The result as shown in Table 4.3 reveals that 81.8% of the respondents are married while 17.2% and 1.1% are single and separated accordingly. The belief in African culture that married women are responsible for the sanitation of the home and its immediate environment could be the reason for the above result.

4.2.4 Occupation Characteristics of Respondents

Occupation determines the level of income of a person thus the relationship between occupation and method of solid waste disposal. Table 4.4 shows that 52.5% of the respondents are civil servants.

Table 4.4: Occupation of Respondents

	Frequency	Percentage
Civil servant	196	52.5
Trader	12	3.2
Self employed	112	30
Unemployed	19	5.1
Others	34	9.1
Total	373	100

Source: Field Survey, 2014.

This is followed by respondents on self employment with 30%, while others, unemployed and traders have 9.1%, 5.1% and 3.2% respectively. It is expected that the

respondents should have positive attitudes towards participating in domestic waste management.

4.2.5 Educational Status of Respondents

Educational status sometimes reflects the participation of people in domestic solid waste management. Table 4.5 analyses the distribution of the sampled respondents by level of education attainment.

Table 4.5: Educational Qualification of Respondents

	Frequency	Percentage
Secondary school	30	8
Tertiary	343	92
Total	373	100

Source: Field Survey, 2014.

Table 4.5 reveals that majority of the respondents have attended tertiary institution representing 92% while 8% agreed to have attended up to secondary school. This result indicates that the respondents given their educational attainment should easily and readily co-operate in achieving a healthy environment through effective and efficient domestic waste management methods. This finding is in line with Kayode and Omole (2011) report of positive relationship between educational attainment, occupation, income as well as types and quantity of household waste generated.

4.2.6 Income of Respondents

Income is a major determinant of standard of living given that it informs the method people use to manage their household waste. Table 4.6 revealed the income of the respondents.

Table 4.6: Monthly Income of Respondents

Amount	Frequency	Percentage
5,001-10,000	4	1.1
10,001-15,000	8	2.1
20,000 above	346	92.8
No entry	15	4
Total	373	100

Source: Field Survey, 2014.

As revealed in Table 4.6, over half of the respondents (92.8%) agreed to earn above #20,000 monthly. This is followed by those between #10,000-15,000 and #5000-10000 representing 2.1% and 1.1% respectively. This might be unconnected with high educational status of the respondents which in most cases determine their income.

4.2.7 Household Size of Respondents

More often, the family size of respondents determine the quantity of domestic solid waste generated.

Table 4.7: Household Size

	Frequency	Percentage
1-3	112	30
4-6	191	51.2
7-10	70	18.8
Total	373	100

Source: Field Survey, 2014.

From Table 4.7, 30% of the respondents reside in homes with a population between 1 and 3 while 51.2% and 18.8% of the respondents have a household size 4-6 people and 7-10 people respectively. The implication here is that majority of houses in the area have an

average of 4-10 persons. Given the correlation between household size and waste (Sunday, 2013) one should expect much generation of waste in the study area.

4.3 THE COORDINATION OF THE SOLID WASTE MANAGEMENT IN THE DISTRICT

4.3.1 Composition of Municipal Solid Waste in Maitama District

Municipal solid waste is generally composed of three groups of materials: organic waste (kitchen waste, garden waste, etc), non-recyclable inorganic waste (coal ash, cinder, dust, etc), and recyclable waste (paper, plastics, glass, metal, etc.). Table 4.8 shows the various types of waste generated in the study area.

Table 4.8: Waste Type Generated

	Frequency	Percentage
Garbage only	8	2.1
Plastic only	4	1.1
Bottle only	4	1.1
All of the above	357	95.7
Total	373	100

Source: Field Survey, 2014.

From Table 4.8, 2.1% of the respondents generate only garbage type of waste, 1.1% each for both plastic and bottle only while 95.7% generated all types of domestic solid wastes. This reveals the heterogeneous composition of solid waste in the area which may require sorting for effective recycling process (Plate 1).



Plate 1: Domestic Solid Waste Types
Source: Field Survey, 2014.

4.3.2 Method of Waste Disposal

The analysis confirmed the different methods of domestic waste disposal in the study area. The categories of the solid domestic waste disposal used are shown in Table 4.9

Table 4.9: Frequency of Waste Collection

	Frequency	Percentage
Burrowed pit/ backyard	12	3.2
Burn them	52	13.9
Collected by waste manager	293	78.6
Taken to designated points	16	4.3
Total	373	100

Source: Field Survey, 2014.

Table 4.9 shows that collection of waste by the waste managers is highest with 78% while 13.9%, 4.3%, and 3.2% of the respondents dispose their waste through burning, taken to designated points along the street and burrowed pit/backyard respectively. This reveals an organized system of municipal solid waste management system in the area as against

open dumping, land filling, incineration and composting methods of solid waste disposal and management as identified in the study of Babayemi and Dauda (2009).

4.3.3 Solid Waste Collection Method

Municipal Solid Waste collection includes both formal (government authorities, private waste managers) and informal (scavengers, waste pickers) in Maitama District of the Federal Capital Territory, Abuja as shown in Table 4.10.

Table 4.10: Who Collect Your Waste

	Frequency	Percentage
Government authority	187	50.1
Private waste managers	170	45.6
Scavengers	4	1.1
Others	12	3.2
Total	373	100

Source: Field Survey, 2014.

Table 4.10 confirms that 50.1% of the respondents reported that a government authority do collect their solid domestic waste as shown in Plate 2, private waste managers with 45.6%, scavengers with 1.1% and others with 3.2%. The above shows the deep involvement of public sector in solid waste management in the study area as against the findings of Sunday (2013) where individuals accounted for 65% of collection of waste in Ughelli.



Plate 2: Collection of Waste by Waste Managers
Source: Field Survey, 2014.

Table 4.11: How Often They Collect Your Waste

	Frequency	Percentage
Weekly	12	3.2
Monthly	4	1.1
Others	325	87.1
No entry	32	8.6
Total	373	100

Source: Field Survey, 2014.

As shown in Table 4.11 most of the respondents (87.1%) reported different times of solid waste collection ranging daily, twice or thrice in a week, while 3.2% and 1.1% reported that their waste are collected weekly and monthly respectively.

Table 4.12: Distance to Respondents Home

	Frequency	Percentage
Less than 500m	357	95.7
500m-1km	4	1.1
Above 1km	8	2.1
No entry	4	1.1
Total	373	100

Source: Field Survey, 2014.

The Table 4.12 above revealed that most respondents walk a distance of between less than 500m to dispose their domestic solid waste which represents 95.7%. This is followed by above 1km walk distance with 2.1% and 1.1% representing 500m-1km walk distance. This implies that the residents dispose their solid waste close within their immediate environment as shown in Plate 3, which if not collected daily may be a place of harbour for rats and other rodents.



Plate 3: Solid Waste Bin Close to Resident House
Source: Field Survey, 2014.

Fig. 4.1 clearly reveals that majority of the respondents do have standard waste bin in the study area.

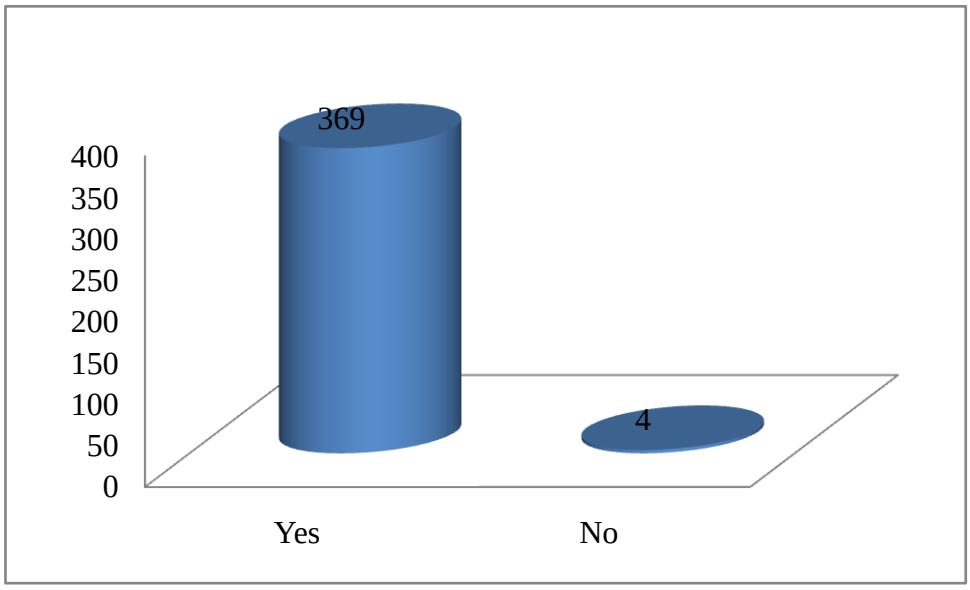


Figure 4.1: Possession of Standard Waste Bin
Source: Field Survey, 2014.

This suggests a convenient method of solid domestic waste disposal method by the residents.

4.4 THE SUSTAINABILITY OF THE PROCESS OF SOLID WASTE FROM GENERATION TO DISPOSAL

The response with respect to how much is paid for waste disposal service is presented in Table 4.13.

Table 4.13: Cost for the Service

Cost per Annum (N)	Frequency	Percentage
10,001-15,000	91	24.4
25,001-30,000	169	45.3
Above 35,000	73	19.6
No Response	40	10.7
Total	**373**	**100**

Source: Field Survey, 2014.

Table 4.13 shows that majority of the respondents pay between #25,000-30,000 per annum (About #500 weekly) for the collection of their solid waste with 45.3% while 24.4% and 19.6% represent those that pay #10,000-15,000 and above #35,000 respectively.

4.4.1 Perception of the Residents on Solid Waste Collection Fee

Table 4.14 shows the distribution of respondents based on their perception of solid waste collection rates. It shows that over half of the respondents (74.8%) agreed that the charges are moderate.

Table 4.14: Payment Rate

	Frequency	Percentage
Cheap	27	7.2
Moderate	279	74.8
Expensive	19	5.1
Very expensive	8	2.1
No entry	40	10.7
Total	373	100

Source: Field Survey, 2014.

This is followed by those who said that the charges are cheap with 7.2%, 5.1% and 2.1% represent the expensive and very expensive perception on payment rate respectively. This shows that the charges collected by the waste managers do not constitute a financial burden to majority of the residents as a result one should expect prompt payment of charges.

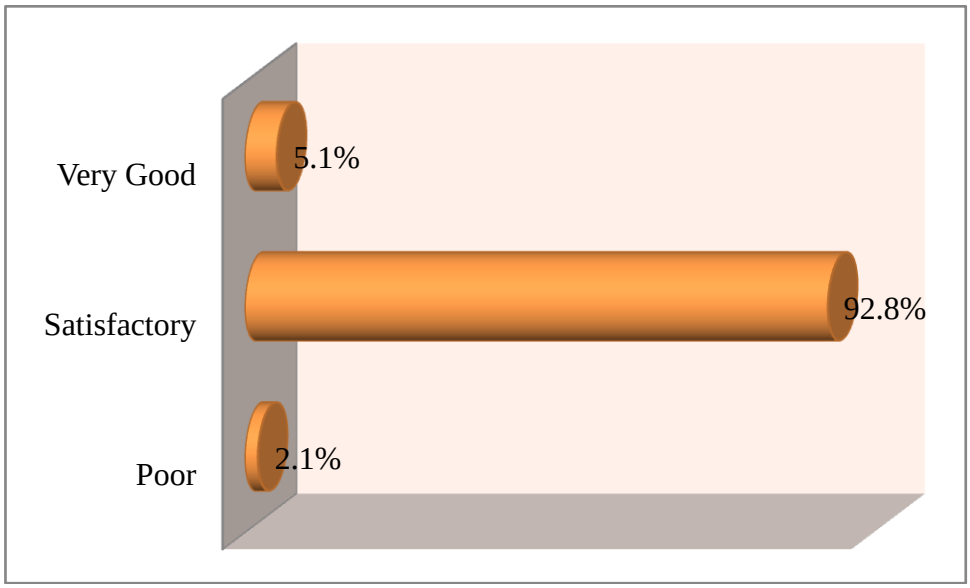


Figure 4.2: Assessment of Solid Waste Management Service
Source: Field Survey, 2014.

Figure 4.2 above shows that 92.8% of the respondents adjudge the services of the solid waste managers as satisfactory while 2.1% and 5.1% agreed that the services are poor and very good respectively. The above might be connected with the use of private waste managers whose promptness in collection and disposal of waste cannot be compared with the public managers. This result agrees with Wali (2014) that 64.3% severity index of the public was satisfied with the current solid waste management system.

4.4.2 Problems of Solid Waste Management in Maitama District of FCT

Table 4.15 explains the problems of domestic solid waste as perceived by the respondents in the study area. The table shows the residents' poor attitude towards payment (67%) is the major problem of solid waste management. This corroborates UNEP (2003), that despite the assigned fees for waste collection and transportation, most people are unable to pay resulting in the revenue collected contributing to less than the money needed to run the service. Consequently, this might have reflected on the level of services offered.

About 11.3% of the respondents consider poor sanitary habits of residents as among the serious problem in the study area.

Table 4.15: Problems of Solid Waste Management

	Frequency	Percentage
Lack of waste facilities	23	6.2
Poor sanitary habits of the residents	42	11.3
Large population	38	10.2
Residents poor attitude towards payment	250	67
Improper physical planning	16	4.3
High waste charges	4	1.1
Total	373	100

Source: Field Survey, 2014.

10.2% perceived large population as the problem of domestic waste management in the area, while lack of waste facilities, improper physical planning and high waste charges represents 6.2%, 4.3% and 1.1% respectively.



Plate 4: Overflowing Solid Waste Bin
Source: Field Survey, 2014.



Plate 5: Solid Waste Littering along the Street
Source: Field Survey, 2014.

4.5 THE ROLE OF SCAVENGERS IN SOLID WASTE MANAGEMENT IN MAITAMA

The recyclable materials from solid waste are often collected at the source by scavengers and reusable waste collectors patrolling the residential areas. Residents often times sell their recyclables to buyers who call door-to-door or sometimes deliver recyclables to the service sites themselves. The buyers in turn sell the materials to a nearby recyclables distribution centre where the materials are sorted and sold to factories as raw or processed materials. Fig 4.3 shows the use of scavengers in the study area.

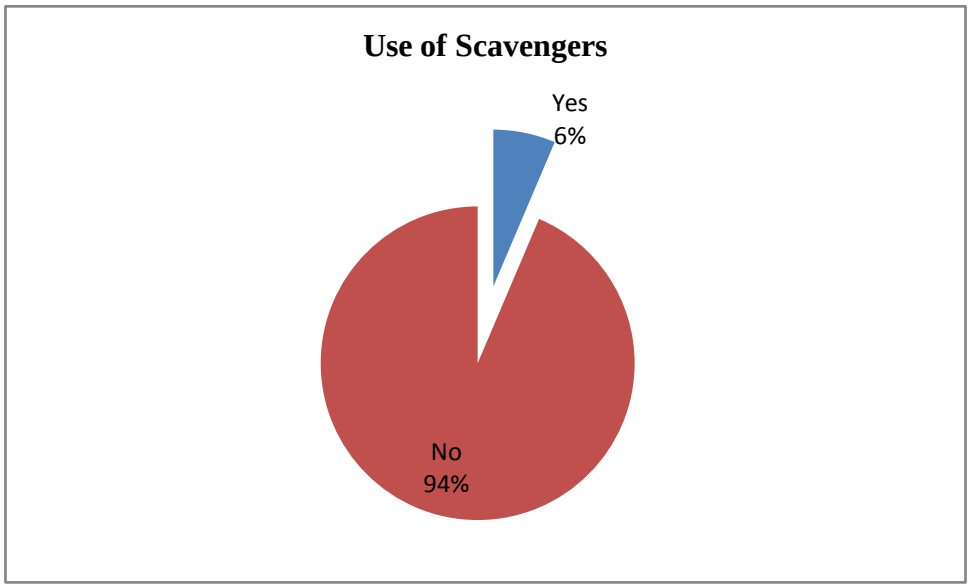


Figure 4.3: Use of Scavenger
Source: Field Survey, 2014.

Fig. 4.3 above shows that 94% of the respondents do not patronize the services of scavengers while 6% agreed do so. The implication of this is that the activities of informal solid waste sector consisting of itinerant waste collectors, scavengers and waste pickers are restricted or discouraged in the study area.

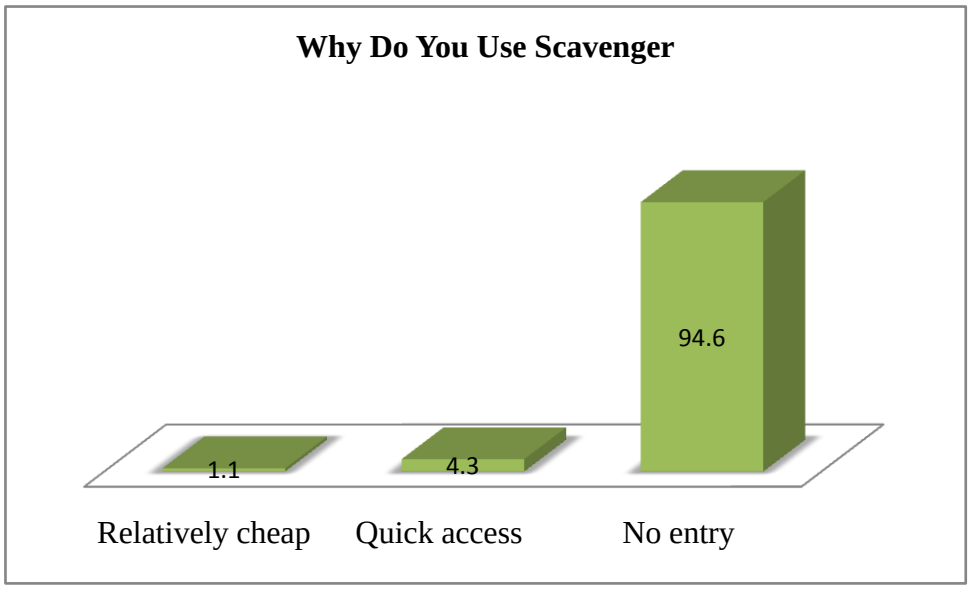


Figure 4.4: Reason for Use of Scavenger
Source: Field Survey, 2014.

Fig. 4.4 shows that 1.1% of the respondents patronize scavengers because their solid waste collection rates are relatively cheap while 4.3% do so because they are easily accessed. This reveals that little activity of scavenging in the study area.

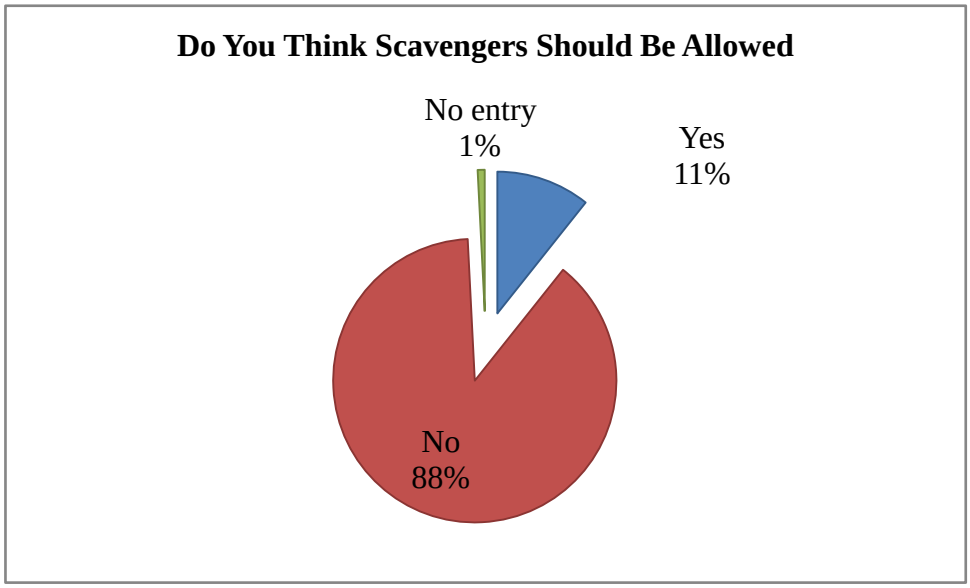


Figure 4.5: Should Scavengers be Allowed
Source: Field Survey, 2014.

The Fig. 4.5 above shows that majority of the respondents are of the view that the activities of informal solid waste collectors like the scavengers should not be allowed in Maitama District of the FCT. This might be connected with the unsecured nature of this sector given that most use it to break into houses.

4.5.1 Solid Waste Managers Perception

Interview conducted with the solid waste managers revealed that waste bins/Cans were positioned at the front of residents building which they are expected to empty their

waste. The waste managers always move around to collect these wastes with their trucks 2-3 times weekly and dispose to the nearest dump site. This system is often termed as roadside/curbside waste collection system which has proven to be effective and economical. Among the problems identified by the managers was the non-payment of service charges by the residents of which the charges do not cover the cost of waste collection, transportation and disposal. The activities of scavengers and waste pickers were identified by the waste managers as a welcome development in the management of solid waste in the study area. The scavengers have assisted in collection of non-biodegradable solid waste like bottles, plastics, etc which have made their work easier. They further argued that the activities of the scavengers should not be stopped but properly integrated into the solid waste management system in the study area.

CHAPTER FIVE; SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter presents the major findings of the study with conclusion and recommendations made for the sustainability of solid waste management in Maitama District of the Federal Capital Territory, Abuja.

5.2 SUMMARY OF FINDINGS

This study analysis the solid waste management in Maitama which is said to be the base for the top rank 'the wealthy' of the society and some of these were revealed. The study also made a number of findings from the data analysis, which is highlighted below.

The socio-demographic characteristics of the respondents in the study area revealed that women are mostly involved in domestic solid waste management than men and that Maitama district is inhabited mostly by high income earners hence an average house size of 4-10 persons. The study reveals the heterogeneous nature of solid waste composition in the area which may require sorting for effective recycling process. Among the various methods of solid waste collection of waste by the waste managers has the highest in the study area.

It was also discovered that the residents disposed their solid waste close to their immediate environment which if not consistently collected may pose a serious health and environmental challenge to them. Majority of the respondents reported different times of solid waste collection time ranging from daily, twice or thrice in a week depending on when the waste managers collect them. However, the residents judged the services (collection and disposal) of the solid waste managers as satisfactory and that their charges are moderate.

Among the problems of domestic solid waste management as perceived by the respondents in the study area were poor sanitary habits, large population, lack of waste

facilities, improper physical planning and high waste charges of which poor attitude towards payment was the major problem. Despite the role of informal solid waste collectors like scavengers in the disposal of waste, majority of the residents are of the view that their activities should not be allowed within the Maitama District of the FCT which is in contrast to the view of waste managers.

5.3 CONCLUSION

This study shows that Abuja Environmental Protection Agency has a structure for domestic solid waste collection and disposal in Maitama district. This structure was found to be satisfactory in the management solid waste. Though, poor attitude towards payment tends to limit the sustainability of the waste management process. This therefore calls for urgent measures by the solid waste managers as well as the administration of the territory to ensure the sustainability of the structure hence achieving environmental cleanliness in Maitama district.

5.4 RECOMMENDATIONS

The following recommendations are made based on the researcher's findings, to point the way forward on the sustainability of management of domestic solid waste in Maitama district of the Federal Capital Territory, Abuja. They are;

i. The AEPB should device other means to ensure residents comply with payment for their waste since this happened to be a major challenge that affect them. They can liaise with other government agencies like First Inland Revenue Service (FIRS), Power Holding Company of Nigeria (PHCN) since they use pay as you go/use. Other agencies like banks can be of good help to ease payment

ii. It has been revealed through this study that some of the contractors /waste managers are not thorough in the collection of waste in that only waste on major streets are properly collected, while some waste on minor streets are left which lead to overflow of waste in those streets. Proper supervision on the part of contractors should be in place to guarantee an effective waste management of the area.

iii. The FCT administration should intensify its efforts in assisting the AEPB to carry out its statutory duties by constituting a taskforce that will enforce the payment of charges and also mete out appropriate punishments for erring residents.

iv. The informal sector (Scavengers) of waste management should be coordinated instead of being discouraged because they help in sorting of the waste from the source which can contribute in the sustainable to waste management not only in Maitama but the city capital at large.

v. Structures should be put in place to regulate informal solid waste managers since it ensures that the teaming unemployed youth could be gainfully employed.

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QUESTIONNAIRE FOR RESIDENTS

DEPARTMENT OF GEOGRAPHY, AHMADU BELLO UNIVERSITY, ZARIA, NIGERIA

Dear Respondent,

The researcher is a Masters student from the above named university carrying out a study on 'Evaluation of the Structure and Sustainability of Solid Waste Management in Maitama District in the Federal Capital Territory, Abuja, Nigeria'. The study is an academic research leading to the award of Master of Science in Environment Management. Any information given will be kept confidential and used for academic purpose only. Your kind gesture is appreciated.

Yours faithfully

Freedom,
M.Sc/SCI/10204/2011-2012

1. Name of street ……
2. Sex Male [ ] Female [ ]
3. Age Less than 20 [ ] 21-30 [ ] 31-40 [ ] 41-50 [ ] 50-60 [ ] Above 60 [ ]
4. Marital status Married [ ] Single [ ] Separated [ ] Divorced [ ]
5. Occupation Civil servant [ ] Trader [ ] Business [ ] Unemployed [ ] Others specify
6. Educational Status No Formal Education [ ] Primary School [ ] Secondary School [ ] Tertiary [ ] others specify ……
7. Monthly Income Below #5000 [ ] 5001-10,000 [ ] 10,001-15,000 [ ] 15,001-20,000 [ ] Above 20,000 [ ]
8. Number of household 1-3 [ ] 4-6 [ ] 7-10 [ ]
9. Household size 1-3 [ ] 4-6 [ ] 7-10 [ ] Above 10 [ ]
10. What type of waste do you generate Garbage [ ] Plastic [ ] Tin [ ] Bottles [ ] All of the above [ ] others specify …….
11. Where do you dispose your refuse Inside the drainage [ ] Burrowed pit/backyard [ ] Burn them [ ] collected by waste managers [ ] taken to designated points [ ] others specify ……..
12. How far is the location to your place less than 500m [ ] 500-1km [ ] Above 1km [ ]
13. Do you have a waste bin Yes [ ] No [ ]
14. If yes, who collects your waste bin Government Authorities [ ] Private Waste Managers [ ] Nobody [ ] Scavengers [ ] others specify ……

15. How often do they collect your waste daily [ ] weekly [ ] monthly [ ] occasionally [ ] others specify ……
16. How much do you pay for this service ……
17. How would you rate the payment cheap [ ] moderate [ ] expensive [ ] very expensive [ ]
18. In your opinion, how would you assess waste management in the area very good [ ] satisfactory [ ] poor [ ] very poor [ ]
19. What do you think is the problem of waste management in this area
    Lack of waste facilities [ ]
    Poor sanitary habits of residents [ ]
    Large population [ ]
    Residents poor attitude towards payment [ ]
    Improper physical planning [ ]
    High waste charges [ ]
    Others specify ……..
20. Do you patronize scavengers Yes [ ] No [ ]
21. If yes, why …….
22. Do you think scavengers should still be allowed in Abuja Yes [ ] No [ ]
23. If yes, why …….
24. If No, why ……..

Thank You.

QUESTIONNAIRE FOR WASTE MANAGERS

DEPARTMENT OF GEOGRAPHY, AHMADU BELLO UNIVERSITY, ZARIA, NIGERIA

Dear Respondent,

The researcher is a Masters student from the above named university carrying out a study on 'Evaluation of the Structure and Sustainability of Solid Waste Management in Maitama District in the Federal Capital Territory, Abuja, Nigeria'. The study is an academic research leading to the award of Master of Science in Environment Management. Any information given will be kept confidential and used for academic purpose only. Your kind gesture is appreciated.

Yours faithfully,

Freedom,
M.Sc/SCI/10204/2011-2012

1. Name of the waste managers company ……
2. Location/Address of the company ……
3. Designation of the Respondent ……
4. Ownership of the company government [ ] private [ ] others specify ……
5. What are the processes involved in managing solid waste in Maitama from generation to disposal
   ……
   ……
   ……
   ……
   ……
6. What are the challenges you face in the process of managing solid waste in Maitama
   ……
   ……
   ……
   ……
   ……
7. Is the present way of managing solid waste in Maitama efficient and effective
   Yes [ ] No [ ]
8. If No, what method do you think is the best
   ……
   ……
   ……
   ……
   ……

9. What in your view are the role of scavengers in solid waste management in Maitama

……
……
……
……

10. Should their activities be scrapped in Maitama Yes [ ] No [ ]
11. If Yes, why

……
……
……
……

12. If No, why

……
……
……
……

Thank You.